BASEMENT IMPACT ASSESSMENT

Proposed Development at Emmet Road

For DCC

PROJECT NO. B967

26 September 2022

OCSC

O'CONNOR | SUTTON | CRONIN

Multidisciplinary
Consulting Engineers

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BASEMENT IMPACT ASSESSMENT

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1 INTRODUCTION

1.1 Appointment

O'Connor Sutton Cronin & Associates (OCSC) have been appointed by *DCC* as part of an integrated Design Team led by Bucholz McEvoy to undertake the Civil & Structural design for the proposed redevelopment at Emmet Road, Inchicore, Dublin 8.

1.2 Administrative Jurisdiction

The proposed development is located in the jurisdiction of Dublin City Council.

1.3 Site Location

The site for the proposed development is located in the heart of Inchicore, as indicated in Figure 1.1 over.

Inchicore is a suburb of Dublin located approximately 4km to the west of Dublin city centre. Inchicore is primarily a residential area comprising predominantly of 2 storey early to mid 20th century housing stock with some medium rise apartments developments of both social and private built in more recent decades.

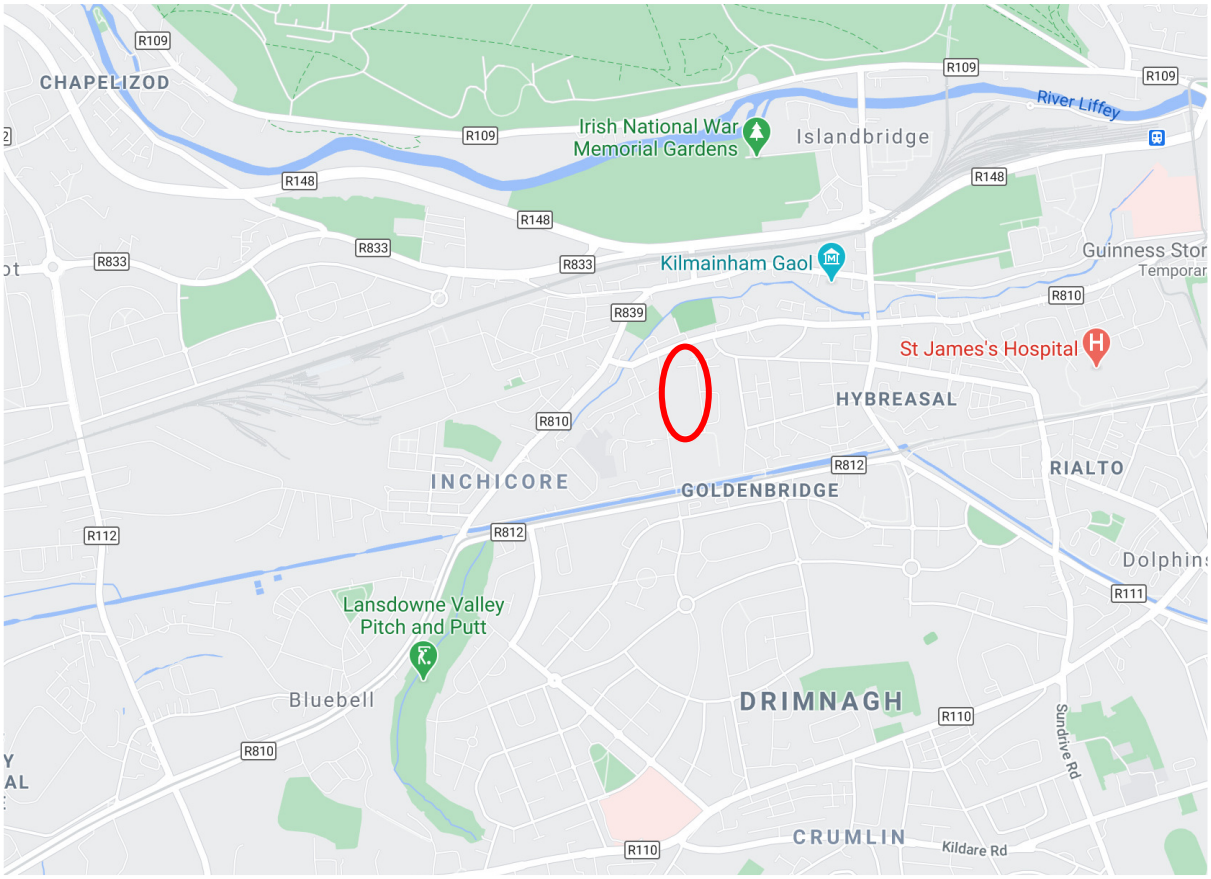

Figure 1.1 - Site Location (www.myplan.ie)

1.4 Existing Site Overview

The site covers an area of approximately 4.68 hectares including works relating to watermain upgrade on Emmet Road and the main development site area (c. 3.72 hectares) is bounded by:

- Emmet Road to the north;
- St Vincent Street West to the western boundary;
- Goldenbridge Cemetery to the southern boundary;
- Patriots Path to the eastern boundary

The site currently comprises of a mixture of brownfield areas which previously housed the St Michaels Estate development together with the current existing buildings/structures:

- St Michael's Community Centre (to be demolished as per permitted Part 8);
- Eve Tuiscint Health Centre (to be demolished as per permitted Part 8);
- Inchicore Community Sports Centre (to be retained)
- Boundary wall to the north western corner of the site (works to include opes to wall but majority to be retained).

There are a number of existing structures outside of the site that are of importance. These include:

- Inchicore Primary Care Centre to the east of the site;
- Richmond Barracks to the east of the site.

The locations of the above buildings relative to the site are shown in Figure 1.2 over.

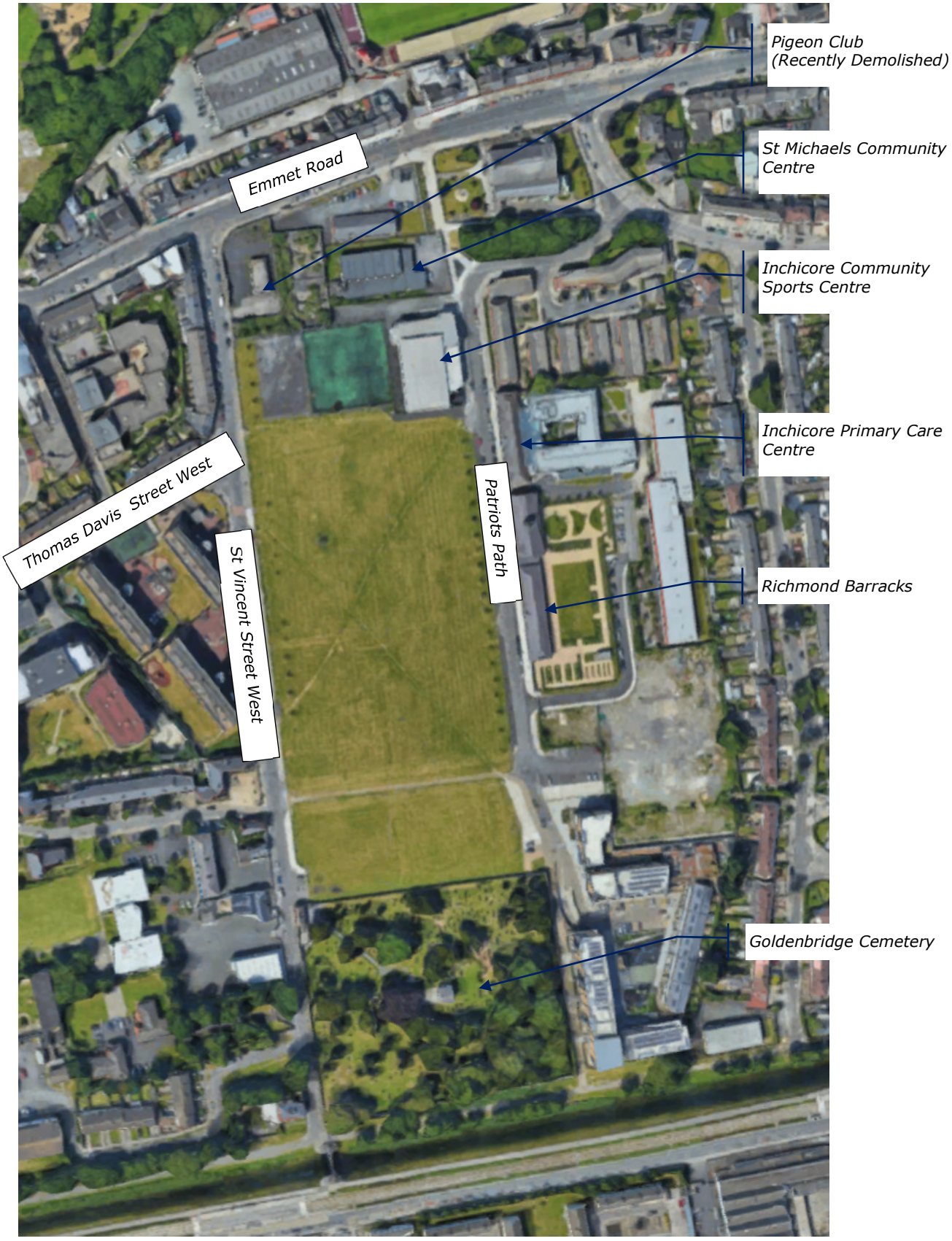

Figure 1.2 – Site Environs

1.5 Proposed Development Context

The proposed scheme consists of a mixed-use development with a strong emphasis on residential units in addition to commercial, retail and community facilities together with all associated infrastructure including roads, footpaths, services and landscaping.

Figure 1.3 – Proposed Site Layout

The development will comprise 578 no. apartments, consisting of 110 no. studio apartments, 172 no. 1 bedroom apartments, 250 no. 2 bedroom apartments (including 10 no. duplex apartments) and 46 no. 3 bedroom apartments (all apartments to have balconies or terraces), community facilities Library/Community Hub, Creche, Supermarket, 5 no. units (retail/café/restaurant/class 2 financial services floorspace) & 2 no. Café units), a public plaza fronting onto Emmet Road and the installation of a new watermain c 200m in length along Emmet Road to the junction with Tyrconnell Road/Grattan Crescent. The proposal includes works to a protected structure (8705 - Richmond/Keogh Barracks, relating to works to rubble stone boundary walls).

2 SCOPE OF BASEMENT IMPACT ASSESSMENT

This report has been prepared following the guidelines outlined in *Appendix 9-Basement Development Guidelines* as set out in the *DCC Draft Development Plan 2022-2028.*

Discussed in the following sections are:

- Non-Technical Summary;
- Baseline Characteristics of the Project;
- Site Investigation and Geotechnical Information;
- Impact Assessment;
- Construction Management Plan;
- Impact Assessment & Mitigation.

3 NON-TECHNICAL SUMMARY

O'Connor Sutton Cronin (OCSC) have been appointed by Dublin City Council as part of an integrated Design Team led by Bucholz McEvoy Architects (BMCEA) as Civil & Structural Engineers for a proposed development at Emmet Road, Inchicore Dublin 8.

The development will comprise 578 no. apartments, consisting of 110 no. studio apartments, 172 no. 1 bedroom apartments, 250 no. 2 bedroom apartments (including 10 no. duplex apartments) and 46 no. 3 bedroom apartments (all apartments to have balconies or terraces), community facilities Library/Community Hub, Creche, Supermarket, 5 no. units (retail/café/restaurant/class 2 financial services floorspace) & 2 no. Café units), a public plaza fronting onto Emmet Road and the installation of a new watermain c 200m in length along Emmet Road to the junction with Tyrconnell Road/Grattan Crescent. The proposal includes works to a protected structure (8705 - Richmond/Keogh Barracks, relating to works to rubble stone boundary walls). The site of the proposed development has a long history of previous uses. It originally formed part of the Richmond Barracks-a British Army Barracks first occupied in 1814. Following the formation of the Irish Free state, the barracks changed into Irish hands in 1922 and remained in use as a barracks until its closure in 1925. Subsequently the site was handed over to Dublin Corporation with the development of Keogh Square purpose-built residential accommodation in 1947. A large-scale social housing development known as St Michaels Estate was completed in the 1970s consisting of a number of tower blocks. The buildings were in use up until the early 2000s with demolition of the various blocks being undertaken between 2004 and 2013.

The site covers an area of approximately 4.68 hectares and is bounded by:

- Emmet Road to the north;
- St Vincent Street West to the western boundary;
- Goldenbridge Cemetery to the southern boundary;
- Patriots Path to the eastern boundary

The site currently comprises of a mixture of brownfield areas which previously housed the St Michaels Estate development together with the current existing buildings/structures:

- St Michael's Community Centre (to be demolished as part of Permitted Part 8);
- Eve Tuiscint Health Centre (to be demolished as part of Permitted Part 8);
- Inchicore Community Sports Centre (to be retained)
- Boundary wall to the north western corner of the site (majority to be retained with works to include new opes).

There are a number of existing structures outside of the site that are of importance. These include:

- Inchicore Primary Care Centre to the east of the site;
- Richmond Barracks to the east of the site.

The site is broadly gently sloping in a south west to north east direction with an overall gradient of 1 in 70 generally across the main body of the site but more extreme in localised areas. The site is approximately 350m long with a varying width from approximately 105-115m.

A section of lower ground floor plant space is to be provided within the development. This section of lower ground floor extends to c.530m^2 within the entire site area of 4.68 hectares (3.72 main development area). The proposed foundation structure to all the buildings within the development are rotary bored piles to be socketed into the underlying bedrock

A full topographical survey of the site, its surroundings and the existing buildings has been undertaken. A number of previous site investigations have been undertaken on or in close proximity to the site. These indicate ground conditions to consist of fill material, overlying black boulder clay on limestone bedrock. The depths of fil vary across the site with the previous investigations

indicating an average depth of 2m across the site but locally up to 4m depth of fill. These investigations have been reviewed to inform the project specific site investigation works that have been undertaken on site.

A comprehensive project specific site investigation was undertaken in 2020 to obtain physical and environmental parameters that can inform the design proposals for the development. This found the ground conditions to consist of:

- Topsoil/surfacing on;
- Made Ground on ;
- Granular deposits;
- Cohesive deposits;
- Weathered bedrock;
- Bedrock.

The basement impact assessment has followed the guidelines as set out in Appendix 9 of the Draft Dublin City Council Development Plan 2022-2028. The assessment reviewed potential impacts on:

- General items;
- Groundwater Flow;
- Land Stability and Ground Movement;
- Surface Flow and Flooding;
- Cumulative Effects;
- Construction Related Impacts;
- Temporary Works;
- Heritage and Biodiversity Impacts;
- Land use.

A Construction and Environmental Management Plan for the works has been prepared under a separate report to accompany this Part 10 application.

This assessment has demonstrated that:

- The construction of the lower ground floor space will not unduly impact on groundwater conditions and that groundwater quality, quantity and classification will be protected;
- Groundwater or surface water flows will not be impacted on to the extent that there is likely to be an increase in flooding;
- The basement development will not have an adverse impact on existing patterns of surface water drainage, including infiltration into groundwater consistent with best practice in SuDS;
- The structural stability/integrity of adjoining and neighbouring buildings will not be compromised;
- The design of the lower ground floor space relates to the characteristics of the site-the footprint is only a small portion of the overall site;
- The basement structure is of suitable design and will be constructed in lien with the Construction and Environmental Management Plan;
- The construction will not cause undue nuisance to the residential amenities of the local area;
- The design of the space considered impacts on future planting;
- The development will not adversely impact on existing protected structures.

4 BASELINE CHARACTERISTICS OF THE PROJECT

4.1 Site Context

The Site is located in the heart of Inchicore village within a well-established setting. The site is approximately 350m long with width varying from 105-115m in an east west direction. The main development site (excluding works along Emmet Road) covers approximately 3.72 hectares in total across a mixture of existing buildings, existing hard landscaped areas and existing greenfield/brownfield space.

The site is bounded by:

- Emmet Road to the north;
- St Vincent Street West to the western boundary;
- Goldenbridge Cemetery to the southern boundary;
- Patriots Path to the eastern boundary.

The site is generally rectangular on plan and only slightly offset from a north south axis. The site can be broadly split into two portions:

- The northern third of the site consists of existing buildings and hard landscaped areas as discussed in section 4.2.
- The southern two thirds of the site is currently undeveloped (but has been previously developed) and is soft landscaped.

Vehicular access to the site is provided from Emmet Road directly to the site, via Saint Vincent Street West to the west of the site and via Bulfin Road/Patriots Path to the east of the site. Pedestrian links are also provided on these routes with additional pedestrian linkages via public paths along the Grand Canal to the south of the site.

The site is gently sloping in a broadly south-west to north east direction. The highest point of the site is located in the south western corner of the site adjacent to the gate house of Goldenbridge Cemetery at 27.5m OD. The ground level falls by approximately 1m along the length of the boundary wall to Goldenbridge Cemetery to 26.5m OD at the south eastern corner of the site. Levels fall to approximately 24m OD adjacent to the existing Inchicore Community Sports Centre across a length of c. 240m-this equates to an average fall of approximately 1 in 70 across the main open space of the site.

Figure 4.1: General view across site from south eastern corner

The gradual fall continues across the northern portion off the site up to the boundary with Emmet Road. At this point, the fall in level is more pronounced with the boundary wall forming a retention structure to maintain the high levels on the site than on the road. This is characterised by a 1.5m level drop from the grounds around the north of the site to the public footpath along Emmet Road. This level difference is less pronounced to the front of the Health Centre and the ground slopes down at the entrance to provide vehicular access from Emmet Road.

Figure 4.2: Entrance to Health Centre from Emmet Road

St Vincent Street West mirrors the site topography generally. The road falls generally gradually from the southern end towards the north at an approximate gradient of 1 in 100 from Goldenbridge Cemetery to the junction with Thomas Davis Street West. This fall continues north at approximately 1 in 50 before becoming steeper to approximately 1 in 20 across the final 15m of the road to its junction with Emmet Road.

Figure 4.3: General view junction St Vincent Street West with Emmet Road

The vehicular access along Bulfin Road followers a shallower gradient that St Vincent Street West.

4.2 Site History

There is a long history of development at the Emmet Road site. Discussed below are the major developments over this time.

Richmond Barracks

Richmond Barracks was built on the site in 1810 and first occupied by the British Army in 1814. It consisted of a range of buildings with a mixture of single storey, two storey and three storey structures. The buildings were laid out in a general north-south and east-west orientation with buildings lining the street that are currently St Vincent Street West and Patriots Path, as indicated in Figure 4.4 below with images of buildings shown in Figure 4.5 over.

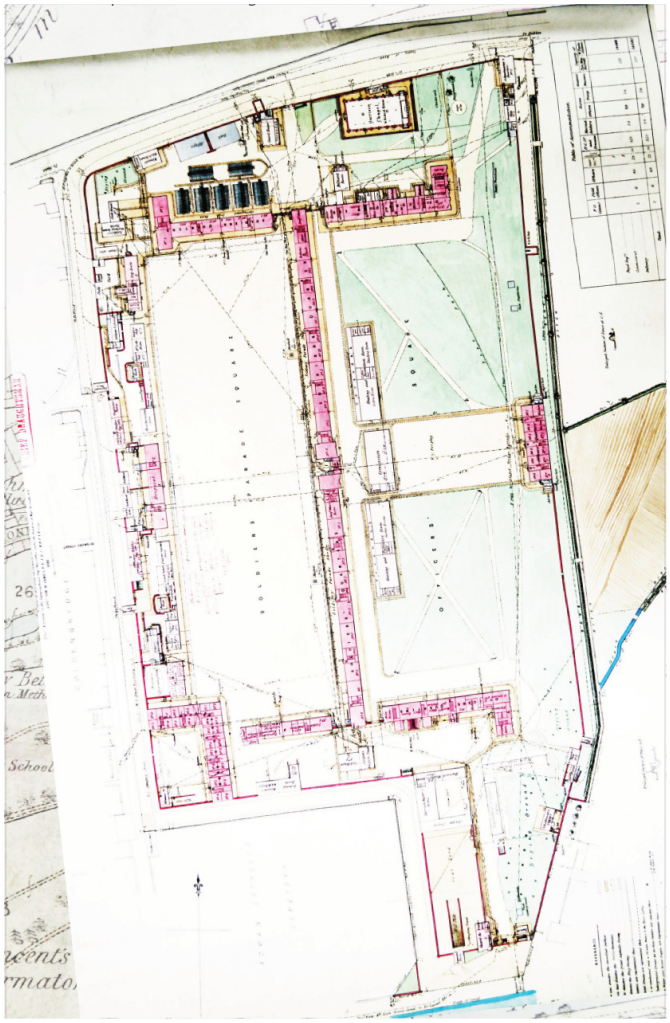

Figure 4.4: Richmond Barracks C. 1861

Figure 4.5: Images Showing Original Structures of Richmond Barracks

The barracks remained in use by the British Army up until the formation of the Irish Free State in 1922 when the barracks was occupied by the Irish Army and named Keogh Barracks. The buildings that remain of the original barracks are located on the eastern side of Patriots Path. They are currently occupied in part by the HSE to form part of Inchicore Primary Care Centre with the remaining elements converted in recent times to use as a museum.

Goldenbridge Cemetery

Goldenbridge Cemetery is located to the southern boundary of the proposed development, set on approximately 2 acres of land. The cemetery was purchased in 1828 and represents Irelands first Catholic Cemetery founded since the reformation. It was built in the style of a garden cemetery and includes a small mortuary chapel. A gate house is located to the north eastern corner of the boundary wall.

Figure 4.6: Aerial Photograph of Goldenbridge Cemetery

(source-St Michaels Estate Land Initiative/Regeneration Project)

Keogh Square

The barracks was used by the Irish Army from 1922 until the closure of the barracks in 1925. The buildings were subsequently handed over to Dublin Corporation and used to house families who were on the waiting list. Purpose built housing was developed on the barracks grounds with the construction of Keogh Square-this development is indicated on historical mapping from 1947 as shown on Figure 4.7.

Figure 4.7: Cassini 6" Map 1947-Keogh Square

Keogh Square was subsequently demolished in 1970 to make way for St Michaels Estate. It is unknown at which time the majority of the buildings from the original barracks were demolished.

St Michaels Estate

St. Michaels Estate was constructed in the 1970 and consisted of a variety of blocks varying in height from four to eight storeys as shown in Figure 4.8.

The blocks were demolished in phases beginning in 2004 with the last block demolished in 2013. Some record drawings of these demolition phases have been provided by DCC.

Figure 4.8: St Michaels Estate

4.3 Existing Buildings and Context

The site currently comprises of a mixture of brownfield areas which previously housed the St Michaels Estate development together with the current existing buildings/structures as indicated on Figure 4.9 following:

- St Michael's Community Centre

  This is an existing single/part two storey structure measuring approximately 50m x 20m on plan located the north eastern corner portion of the site. A small carpark adjoins the building with the area

enclosed by a low-level wall with steel railing above. It is planned to demolish this building as part of the works to the site.

- Eve Tuiscint Health Centre

  This is an existing single storey structure located to the north eastern corner of the site. The building measures approximately 11m x 30m on plan and is adjoined by a carpark to the north. The carpark is defined by a low level boundary wall along Emmet Road with direct vehicle access. The building is planned to be demolished as part of the works to the site.

- Inchicore Community Sports Centre

  The Sports Centre consists of a two storey structure with a portion of the centre consisting of a double height sports hall. The building measures approximately 30m x 45m on plan with highest roof level approximately 10m above surrounding ground levels. The building was constructed in the early 2000s and is currently in use as a sports centre and creche, together with ancillary uses. This building is proposed to be retained and integrated into the design of the development.

- Boundary Wall

  The north western corner of the site is delineated by a section of historic walling. This wall previously formed the boundary of the original Richmond Barracks grounds. The wall is approximately 60m in length with frontage onto St Vincent Street West and Emmet Road. The wall is approximately 3.5m in height along St Vincent Street West with the top of wall dropping to be approximately 2.5m above footpath level at the junction with Emmet Road. This section of boundary wall is to be retained, with some interventions to provide permeability.

- The Celtic Pigeon Club (Recently Demolished)

  This building consisted of single storey structure approximately 8m x17m on plan located to the north western corner of the site, located within the historical section of boundary wall to the old Richmond Barracks. It was further separated from the other surrounding buildings by more recent sections of boundary wall.

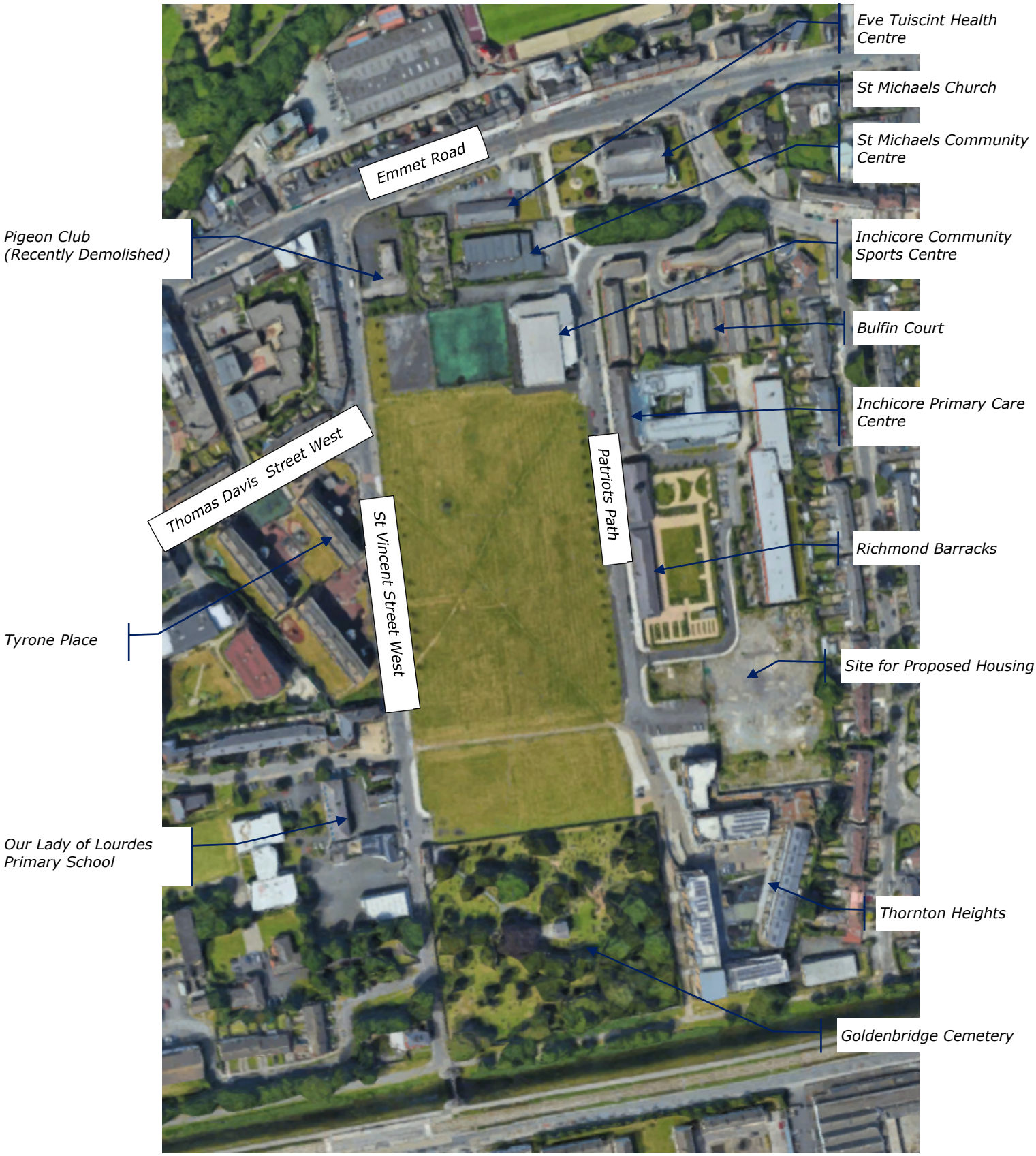

Figure 4.9: Adjoining Buildings

There are a number of existing structures outside of the site that are of significance. These include:

- Inchicore Primary Care Centre

  The Inchicore Primary Care Centre is located to the east of the site. It consists of a section of the original Richmond Barracks-renovated and refurbished to meet health centre requirements-together with a modern two storey over single level basement structure to the rear. This is the closest existing basement to the proposed lower ground floor plant space within the development.
- Richmond Barracks

  The remaining building of Richmond Barracks are located to the east of the site. These buildings have been recently renovated and re-purposed as a museum building.

Figure 4.10: General View of Richmond Barracks

- Thornton Heights

  Thornton Heights is located to the south east of the site. It is a social housing development completed by Dublin City Council in 2014 and consisting of 75 units in a mix of 5-6 storey apartment blocks and 2 storey terraced housing.
- Goldenbridge Cemetery

  Goldenbridge Cemetery is located immediately to the south of the site. Please refer to section 4.2 for further detail. Of particular significance for

the proposed development is the substantial stone boundary wall, arched gateway and gate house at the north west corner of the cemetery. The gate house is currently in use by Common Ground-an arts organisation.

Figure 4.11: Gate House and Arched Gateway to Goldenbridge Cemetery

- Our Lady of Lourdes Primary School

  This school is located to the south-east of the site. It comprises a two storey permanent structure together with a two storey prefabricated structure along the St Vincent Street West elevation.
- Tyrone Place

  Tyrone Place consists of 3 blocks of apartments 5 storeys tall located directly to the west of the site.
- Bulfin Court

  Bulfin Court is located to the east of the site and is a housing development for Senior Citizens. It consists a series of 8 blocks with a mixture of single and two storey structures.
- St. Michaels Church

  St Michaels Church is located to the north east of the site. The structure was originally constructed as the garrison church for Richmond Barracks before becoming a catholic church for the people of Inchicore in 1926.

The structure consists of a cut stone building set in church grounds surrounded by low level railings.

4.4 Characteristics of Proposed Development

The description of the proposed development is set out in Section 1.5 of this report with the plan extents indicated on Figure 1.3.

In terms of characteristics of the development relating to basement impact assessment, the following is noted:

- A section of lower ground floor plant space is to be provided within the development. This section of lower ground floor extends to c.530m^2 within the entire site area of 4.68 hectares (including watermain works on Emmet Road). This section of lower ground floor is located
    - c. 12m from Inchicore Community Sports Centre;
    - c. 25m from the nearest section of public road;
    - c.40m from Richmond Barracks;
    - c. 50m from the closest existing basement under Inchicore Primary Care Centre

The plan layout of the basement (in cyan) relative to the site with the proposed hoarding line shown in orange is indicated in figure 4.12 below.

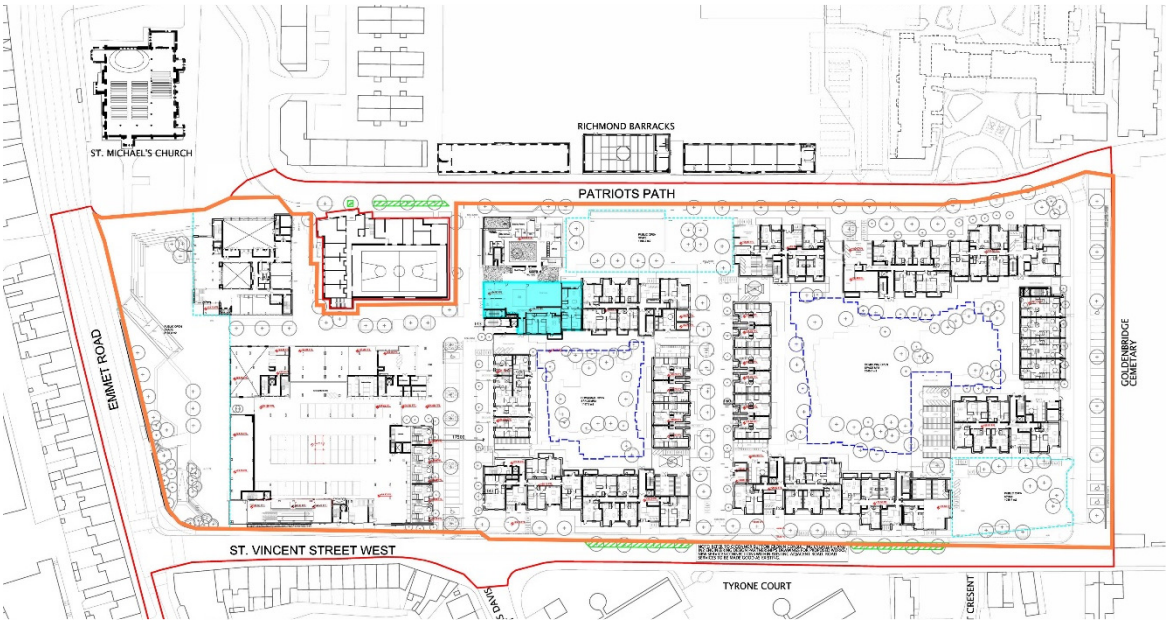

Figure 4.12: Basement Outline set in site context

The lower ground floor plant space is proposed to be constructed by:

- Construction of load bearing piles from ground floor level;
- Construction of a secant pile wall to the perimeter of the lower ground floor space. These piles will only be required in the temporary case;
- Excavations down to the lowest formation level (c. 5m below ground level);
- Temporary dewatering as may be required;
- Breaking down of pile foundations;
- Placing of waterproofing;
- Casting of lower ground floor slab;
- Casting of RC wall to perimeter;
- Continuation of ground floor and superstructure.

It is not envisaged that anchors be required in the temporary case to support the pile wall during excavations given the single level nature of the basement. However, if such anchors were required, the distances to the closest buildings and site boundary are such that any anchors would not extend beyond the site extents.

- The proposed foundation structure to all the buildings within the development are rotary bored piles to be socketed into the underlying bedrock-please refer to section 5.3 for further detail on the existing ground conditions.
- It is envisaged that the works will commence in summer 2023 with overall project completion in summer 2026. However, the lower ground floor works would be envisaged to be undertaken at the outset of the project and would likely be completed within the first 6 months of the works on site.

Please refer to the Construction and Environmental Management Plan that accompanies this application for further detail on matters relating to site management, particularly in terms of conditions surveys and vibration monitoring during the works.

5 SITE INVESTIGATION AND GEOTECHNICAL INFORMATION

5.1 Overview

A series of surveys and investigations works have been undertaken since the appointment of the Design Team. These have included:

- Topo & Utilities Survey

  A full topographical and utilities survey was undertaken by Apex Surveys Ltd to the areas identified in Figure 5.1 over. The topographical survey of general site extents and services was undertaken to Band E as set out in RICS document "*Measured surveys of land, buildings and utilities-3rd Edition*". Surveys of existing buildings were generally to Band D with survey requirements for the Sports Centre adjoining the site and boundary wall at junction of Emmet Road and St Vincent Street West to Band C.

  A full utilities survey for above and below ground services was undertaken with the survey extents as shown on Figure 5.1. The utilities survey was a Type D, C & B survey in accordance with PAS 128:2014.

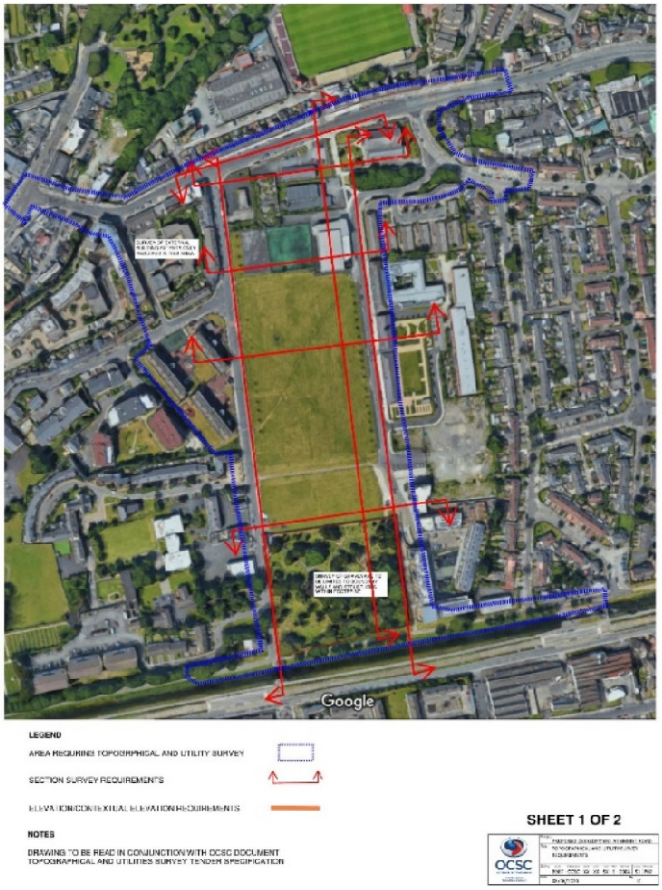

Figure 5.1: Topographical & Utilities Survey Requirements

- Geotechnical Site Investigation

  Please refer to Section 5.3 for further details.

5.2 Desktop Study & Historical Site Investigations

A desktop review was undertaken at the outset of the project to review sources of previous information on the ground conditions on the Emmet Road site and its surrounding areas. The Geological Survey of Ireland provides an online service with records of previous site investigations undertaken around the country. A review of the information available on this portal (www.gsi.ie) uncovered available information from the following investigations:

- Glover Site Investigation 1968;
- Irish Soil Laboratories Investigation 1978;
- IGSL St Michaels Estate 1999 (Extracts Only);
- IGSL St Michaels Estate 2005;
- IGSL Inchicore Health Care Centre 2008;
- IGSL Inchicore Nursing Home 2008.

The locations of the boreholes undertaken as part of these investigations are indicated on Figure 5.2.

Of the above information, the IGSL report from 2005 is the most relevant as it captures the greatest extent of the site. The investigations of 2005 were supplementary works to the original 1999 investigation also undertaken by IGSL. The programme of supplementary investigation included the construction of boreholes at six locations and six machine excavated trial pits to establish geotechnical criteria on which to base foundation and infrastructural design. The report notes that the *"findings reflect the typical glacial stratification of the area with surface deposits of fill generally overlying the glacial till succession of brown and black boulder clay".* The boreholes terminated at c.6m below ground level-this was taken to represent the limestone rock horizon on site.

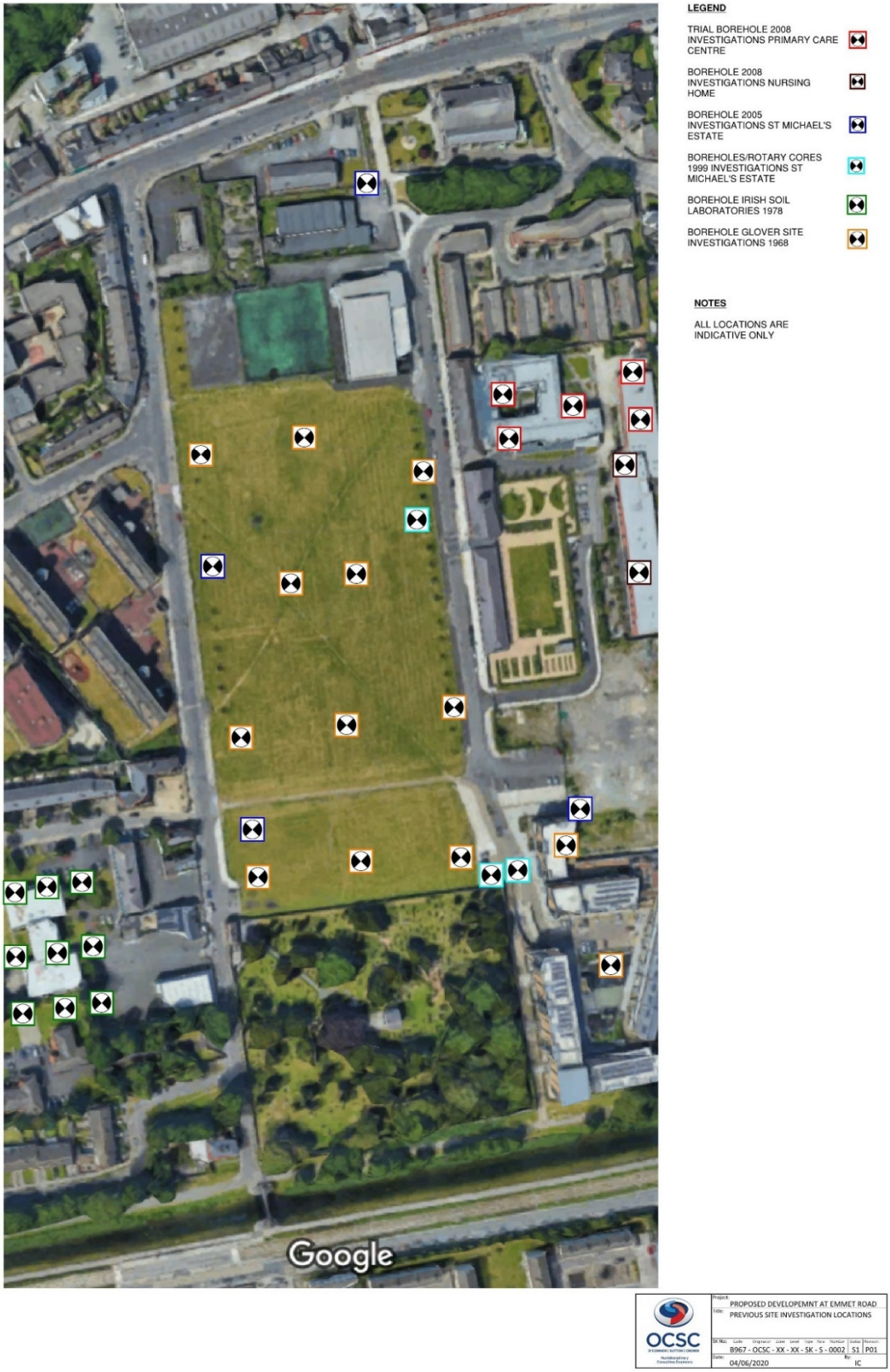

Figure 5.2: Previous Site Investigation Locations

The depth of made ground encountered across the site varied with a maximum depth of 4m with this material noted as "unsuitable as a founding medium for both structural and ground floor loading". The average thickness of fill encountered across the site was approximately 2m.

Guidance on foundation solutions discussed within the report consisted of:

- ***Pad/Strip footings***
  An allowable bearing capacity within the underlying grey black glacial till deposits of at least 200kN/m^2 was advised as "can be assumed". Settlement under such loads was estimated to be low (<10mm) with differential movement advised to be negligible. The required depths to bearing stratum suggested that trench fill techniques would be appropriate in most instances.
- ***Piled foundations***
  It is advised that where the thickness of fill exceeds about 2.5m it may be more economic to consider a piled foundation solution. This would entail short piles to transfer the loads to the underlying boulder clay or bedrock.

5.3 Project Specific Site Investigation 2020

A comprehensive project specific site investigation was undertaken in 2020 to obtain physical and environmental parameters that can inform the design proposals for the development. A copy of same is included in Volume III of the EIAR;

The site investigation consisted of the following with locations as indicated on Figure 5.3:

- 18no. trialpits to a maximum depth of 3.6m below ground level;
- 9no. foundation inspection pits to determine existing foundation details;
- 6no. plate bearing tests to establish CBR values for pavement design;

Figure 5.3 – Site Investigation Locations

- 2no. soakaway tests to determine a soil infiltration value to BRE digest 365;
- 12no. slit trenches to expose existing services and foundations;
- 52no. window sampling locations to recover soil samples;
- 12no. rotary core boreholes to a maximum depth of 15.4m below ground level
- Installation of 4no. groundwater monitoring wells;
- Installation of 6no. gas monitoring wells.

The findings of this investigation and interpretation of same are discussed below.

5.3.1 Ground Conditions

The ground conditions encountered generally on the site consisted of:

- *Topsoil*-encountered in the majority of exploratory holes and present up to a depth of 0.3m below ground level;
- *Made Ground*-encountered beneath the topsoil/surfacing and were present in varying depths between 1m below ground level and 3.5m below ground level. These deposits were described generally as brown or grey slightly sandy gravelly clay or brown slightly sandy clayey subangular to subrounded fine to medium gravel with occasional cobbles and boulders and contained occasional fragments of concrete, red brick, glass and plastic;
- *Cohesive Deposits*-were encountered beneath the made ground and were described as brown slightly sandy gravelly clay with occasional cobbles and boulders overlying a stiff dark grey slightly sandy gravelly clay with occasional cobbles and boulders. The strength of the cohesive deposits typically increased with depth and was firm to stiff below 2.5m below ground level in the majority of exploratory holes. These deposits had some occasional or frequent cobble and boulder content noted in the logs;

- *Granular Deposits*-were encountered with the cohesive deposits and were typically described as grey brown or slightly sandy subangular to subrounded gravel or dark grey clayey fine to coarse sand with occasional cobbles and rare boulders;
- *Weathered bedrock*-encountered in some of the exploratory boreholes and was recovered as angular gravel and cobbles of limestone/mudstone however there was some variability in the fracture spacing and the ease at which the excavator could progress. Some clay and sand were also present with the rock mass either from weathering or as infilling to fractures which were opened upon excavation;
- *Bedrock*-was recovered as medium strong to very strong grey/dark grey fine to medium grained laminated limestone interbedded with weak black fine grained laminated mudstone. This is typical of the Calp formation which is noted on the geological mapping to the east of the proposed site. The depth to rock varies from 3.05m below ground level to the south of the site to a maximum of 12.6m below ground level to the north of the site.

5.3.2 Groundwater

Groundwater strikes were noted on exploratory boreholes during the investigations with standpipes installed in 4no. boreholes to establish the equilibrium groundwater levels. These levels were monitored over the period of a month with results outlined in table 5.1 over.

It is also noted that a series of soakaway tests were undertaken on site but that the water level dropped too slowly to allow for calculation of an infiltration rate.

It is noted that the general flow of any groundwater would be in a northerly direction towards the Camac River.

	17/11/20	19/11/20	23/11/20	26/11/20	01/12/20	03/12/20	16/12/20
BH02	2.35	2.39	2.39	2.38	2.42	2.39	2.30
BH07	1.68	1.71	1.75	1.78	1.84	1.85	1.66
BH08	1.15	1.18	1.18	1.20	1.23	1.20	1.11
BH12				2.27	2.29	2.25	2.19

Table 5.1 – Groundwater Monitoring Results-meters below ground level

5.3.3 Lab Testing

A series of laboratory testing was undertaken on samples from site. These included:

- Geotechnical testing on soil samples recovered to confirm the descriptions on logs and to establish geotechnical parameters of same;
- Chemical testing including pH and sulphate testing;
- Environmental testing undertaken under the direction of OCSC to allow for separate Waste soil Classification-refer to section 5.4 below;
- Rock testing to establish physical and strength parameters of the underlying bedrock.

5.4 Waste Soil Classification

As part of the site investigation phase of the project, OCSC were engaged to prepare a Waste Soil Classification Report which sought to:

- Provide environmental information on the site including its environmental setting, past activities and current soil quality in terms of contamination; and
- Classify the waste deposited on site in terms of inert, non-hazardous or hazardous, assess total pollutant content data via HazWasteOnline software, assess leachate data against Irish Landfill Acceptance Criteria

and to characterise the material in terms of the physical and chemical components as per the EPA List of Waste

To comply with S.I. 233 of 2015 a hazardous waste assessment was carried out utilising HazWasteOnline software using classification engine WM3.v1.1. The software enables the user to review the total pollutant content analysis in terms of any hazardous properties the material may have. The material is assessed against an array of hazardous property thresholds as prescribed in the relevant regulations and guidance.

The site was prepared with approximate 25mx25m grid spacings with samples taken within each grid within 1m bands down through the strata.

The ground investigation completed between September to October 2020 gave rise to a total 183No. soil samples to be analysed from 68No. locations including boreholes, trial pits and window sampling.

A total of 11No. samples were identified as category A Inert, 98No. samples as category B1 Inert, 30No. samples as category B2 Inert Inc. Limits, 26No. samples as C1 Non-Haz, 1No. samples as C1 Non-Haz with Quantifiable asbestos, 16No. samples as D Hazardous and 1No. sample as D Hazardous with >0.1% asbestos.

The ground in the vicinity of the proposed lower ground floor plant space was classified as B1 Inert and C1 Non-Haz as indicated in Figure 5.4 over with the approximate outline of the proposed lower ground floor plant space indicated in green.

This information will be provided to the Contractor to inform their works on site and ensure appropriate handling and disposal of this material.

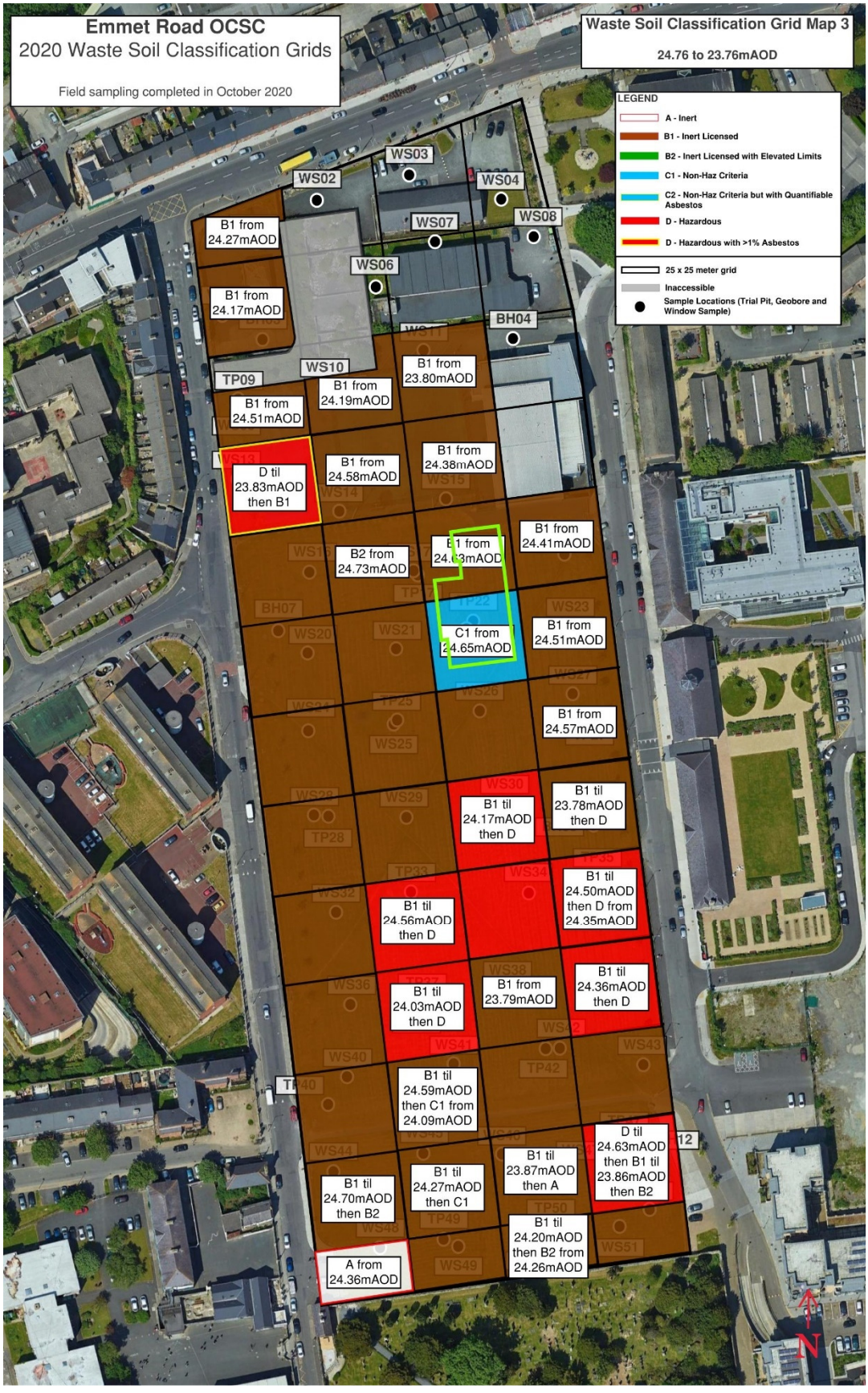

Figure 5.4 – Extract Waste Soil Classification

6 IMPACT ASSESSMENT

6.1 General

The construction of any below ground structure has the potential, if not managed and executed correctly, to impact upon neighbouring properties and public realm. The following is noted with regards to the proposed lower ground floor plant space associated with the proposed development:

- The lower ground floor space is located within the site and set back from adjacent properties;
- No works outside of the site boundary would be required to facilitate the construction of the lower ground floor plant space;
- Condition surveys of adjacent buildings to be undertaken prior to works commencing on site;
- Strict vibration, noise and dust monitoring to be undertaken during the works as outlined in the Construction and Environmental Management Plan that accompanies this application.

6.2 Groundwater Flow

It is noted that the groundwater flow would generally be in a northerly direction towards the Camac River. The footprint of the proposed below ground floor plant space is small relative to the overall site extents with the space set back from adjacent buildings and site boundaries. In addition, the prevailing ground conditions consist of boulder clay material which would limit the flow of groundwater in the overburden layers. However, it is considered that there is sufficient space to allow for any groundwater flow around the basement without impacting upon adjacent buildings.

The works are likely to require temporary dewatering to facilitate excavations over a short period of time. It is proposed that monitoring of groundwater levels outside of the excavation be undertaken during the works to ensure there is adverse impact on groundwater levels outside of the excavations.

6.3 Land Stability and Ground Movement

It is noted that a temporary secant pile wall is proposed as the temporary works element to allow for the construction of the lower ground floor plant space. This pile wall will be designed by the Contractors specialist designer with due cognisance taken of the proximity of the buildings around the site. The proposed single level space is located 12m away from the nearest adjacent building at its closest point. The CEMP outlines appropriate monitoring of the vibration, noise and dust during the works. The proposed RC walls to the permanent structure will provide the required support to the land and ground surrounding the lower ground floor space in the permanent condition.

With these measures in place. it is thus considered that the proposed works should not impact upon adjacent buildings from a lateral stability and ground movement perspective.

6.4 Surface Flow and Flooding

A site specific flood risk assessment has been undertaken for the proposed development-please refer to OCSC report B967-OCSC-XX-XX-RP-C-0007 for detail of same. This assessment demonstrates that the site is located outside of Flood Zones A and B and thus the general restriction against the development of basements below the estimated flood levels is not applicable.

The proposed development incorporates a series of SuDS measures all of which have been designed in accordance with CIRIA C753, the SuDS Manual-please refer to Engineering Services Report B967-OCSC-XX-XX-RP-C-0006 that accompanies this report for more detail. Measures adopted include:

- Pervious paving;
- Green roofs;
- Trapped road gullies;
- Filter drains
- Underground pipe system;

- Silt traps;
- Cellular storage systems with interception;
- Bio-retention/detention ponds;
- Outlet protection;
- Flow control device (to control run-off to green field rates)
- Oil separator.

Thus, it is considered that the proposed development will not cause an impact from a surface flow and flooding perspective.

6.5 Cumulative Effects

It is noted that the proposed below ground plant space only forms a very small percentage of the overall site footprint. In addition, the closest existing basement is c.50m to the east of the building so it is not considered to be an adjoining basement scenario. Given the small footprint of the proposed below ground space, together with distance to closest existing basement, the proposed development is not considered to provide a cumulative impact.

6.6 Construction Related Impacts

The proposed design seeks to minimise the risk of any construction related impacts associated with the proposed development. The lower ground floor structure is set back from adjacent structures and site boundaries. A temporary secant pile wall is proposed to facilitate the excavations. A series of site management and monitoring measures are set out in the CEMP-please refer to section 7 and to CEMP which accompanies this application for further detail.

With the above measures in place, the risk of construction related impacts is considered to be low.

6.7 Temporary Works

A secant pile wall is proposed as the temporary works solution to facilitate the construction works. It is not envisaged that ground anchors would be required to facilitate the works. However, if ground anchors were required, there is sufficient set back from adjacent buildings and site boundaries. Thus, there are no temporary works either below third party lands or public lands to facilitate the lower ground floor plant space works.

6.8 Heritage and Biodiversity Issues

It is noted that the proposed location of the lower ground floor plant space is outside of the footprint of the historical buildings on site associated with Richmond Barracks. It is also located c.40m away from the remaining historical buildings and this not considered to have an impact on heritage.

It is noted that there are no mature trees on the site currently. There is an extensive soft and hard landscaping proposal for the development which will add to the biodiversity of the site-please refer to landscape architect drawings and reports which accompany this application for further detail.

6.9 Land Use

The proposed use of the lower ground floor space is for plant to service the residential development above, thus supporting its development. The use of the site for residential development/mixed use development is in line with Z14 zoning as set out in the JSA Planning Report, included with the Part 10 application.

7 CONSTRUCTION MANAGEMENT PLAN

7.1 Overview

A Construction & Environmental Management Plan (CEMP) has been prepared by OCSC as a separate report to accompany this application. The CEMP has been prepared as an outline construction strategy setting out construction method and activities required for the construction of the proposed residential and commercial development. This outline plan seeks to demonstrate how works can be achieved in a logical, sensible and safe sequence with the incorporation of specific measures to mitigate the potential impact on people and the environment.

Included within the plan are construction and site management issues such as:

- Groundwater and Surface Water control;
- Dust;
- Dirt;
- Noise;
- Vibrations;
- Condition Surveys

Please refer to OCSC Report B967-OCSC-XX-XX-RP-S-0010 Construction and Environmental Management Plan for further detail.

8 IMPACT ASSESSMENT AND MITIGATION

The potential impacts associated with the proposed development are discussed under section 6 of this report.

This assessment has noted that the potential impacts of the proposed lower ground floor space have been mitigated against through:

- Positioning of the space away from adjacent buildings and site boundaries;
- Minimisation of the plan extent of the lower ground floor space relative to the overall site footprint;
- Positioning of the space remote from other basements in the area;
- Provision of a flow route around the space is so required by groundwater flow;
- Secant pile wall provision to perimeter of basement;
- Adoption of strict vibration, noise and dust monitoring during the critical stages of the works;
- Construction of cast in-situ RC box for the permanent structure.

9 SUMMARY

O'Connor Sutton Cronin have undertaken a Basement Impact Assessment for the proposed development at Emmet Road, Inchicore, Dublin. This assessment report details:

- Baseline Characteristics of the Project;
- Site Investigation and Geotechnical Information;
- Impact Assessment;
- Impact Assessment & Mitigation.

This assessment has demonstrated that:

- The construction of the lower ground floor space will not unduly impact on groundwater conditions and that groundwater quality, quantity and classification will be protected;
- Groundwater or surface water flows will not be impacted on to the extent that there is likely to be an increase in flooding;
- The basement development will not have an adverse impact on existing patterns of surface water drainage, including infiltration into groundwater consistent with best practice in SuDS;
- The structural stability/integrity of adjoining and neighbouring buildings will not be compromised;
- The design of the lower ground floor space relates to the characteristics of the site-the footprint is only a small portion of the overall site;
- The basement structure is of suitable design and will be constructed in lien with the Construction and Environmental Management Plan;
- The construction will not cause undue nuisance to the residential amenities of the local area;
- The design of the space considered impacts on future planting;
- The development will not adversely impact on existing protected structures.

IAN CREHAN (BE, CEng, MIStructE, MIEI, RConsEI)

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