

Figure 19 – Proposed Foundation Arrangement Adjacent to Existing Building

#### 4.6.2 Existing Basements

There is an existing basement beneath Nos. 22 and 23 Moore Street, which extends to 13 Moore Lane to the rear, which lies within the Site 5 boundary. The buildings are to be demolished and it is proposed that the basements are infilled to provide a level piling platform, from which the proposed steel frame structure can be constructed.

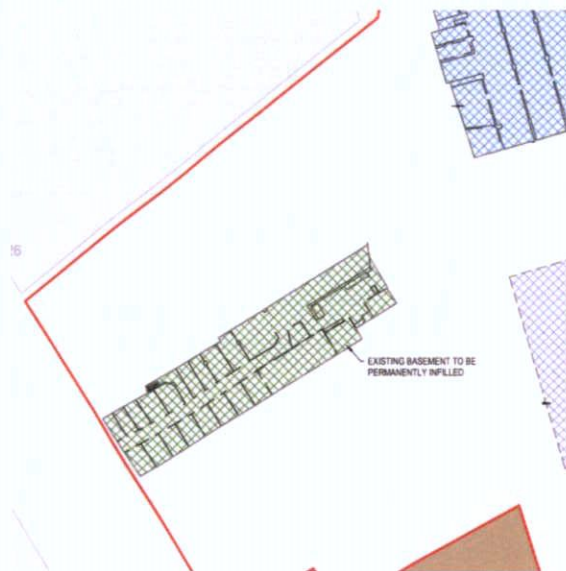


Figure 20 – Existing Basements on Site 5 Site (22&23 Moore Street and 13 Moore Lane).

Whilst not shown on current survey drawings, it is understood that there may be existing basements at 20 and 21 Moore Street. Therefore, as the existing basement at No. 22 Moore Street is to be infilled a new retaining wall is to be installed adjacent to the retained/existing basement at 21 Moore Street to avoid surcharging the existing walls. The retaining wall can be cast in situ or installed as pre-cast concrete units, placed on the existing soil level adjacent to the basement wall. Should the existing condition of the basement walls be required to be maintained, i.e., with an open environment to each side of the wall, then the retention structures can be installed to provide a cavity between the new concrete and the existing basement wall. This is to be developed at the next stage alongside any requirements to vent the cavity.

#### 4.7 Envelope

Proposals for the façade include a curtain walling system with architectural fins fronting the public square on the south elevation while the setback façade at ground floor will be full height double glazing. The east elevation of the building is to be clad with perforated cementitious boards. The facades to the external boundaries of Site 5, north and west, are to be clad in red brick to match the existing fabric of neighbouring properties.

Construction of masonry facades will either be traditional requiring a perimeter scaffolding or prefabricated precast construction where the bricks are fixed to a precast concrete greyback panel.



Figure 21 – Typical Precast Concrete Panel & Curtain Wall Panel Installation

## 5. Construction and Demolition Waste Management

AWN Consulting Ltd. has prepared a Site-specific Construction & Demolition Waste Management Plan (C&D WMP) on behalf of Dublin Central GP Limited and is submitted as part of this planning application [document reference CB/20/11784WMR01].

The C&D WMP provides information necessary to ensure that the management of C&D waste at the site is undertaken in accordance with the current legal and industry standards including the Waste Management Acts 1996 - 2011 and associated Regulations, Protection of the Environment Act 2003 as amended, Litter Pollution Act 1997 as amended and the Eastern-Midlands Region Waste Management Plan 2015 – 2021.

In particular, the C&D WMP aims to ensure maximum recycling, reuse and recovery of waste with diversion from landfill, wherever possible. It also seeks to provide guidance on the appropriate collection and transport of waste from the site to prevent issues associated with litter or more serious environmental pollution (e.g. contamination of soil and/or water).

The C&D WMP includes information on the legal and policy framework for C&D waste management in Ireland, estimates of the type and quantity of waste to be generated by the proposed development and makes recommendations for management of different waste streams.

### 5.1 Non-Hazardous Construction Waste

There will be waste materials generated from the demolition and renovation of the existing buildings, hardstanding areas on site, as well as from the further excavation of the building foundations. The volume of waste generated from demolition will be more difficult to segregate than waste generated from the construction phase, as many of the building materials will be bonded together or integrated i.e. plasterboard on timber ceiling joists, steel embedded in concrete etc.

There will be soil, stones, clay and made ground excavated to facilitate construction of new foundations, underground services, and the installation of the proposed basements. The preliminary estimated 163,490m<sup>3</sup> of material will need to be excavated to do so. There is limited chance for reuse of material onsite and it is envisaged that all material, will need to be removed offsite due to the limited opportunities for reuse on site. This will be taken for appropriate offsite reuse, recovery, recycling and/or disposal.

During the construction phase there may be a surplus of building materials, such as timber off-cuts, broken concrete blocks, cladding, plastics, metals and tiles generated. There may also be excess concrete during construction which will need to be disposed of. Plastic and cardboard waste from packaging and supply of materials will also be generated. The contractor will be required to ensure that oversupply of materials is kept to a minimum and opportunities for reuse of suitable materials is maximised.

Waste will also be generated from construction workers e.g. organic/food waste, dry mixed recyclables (waste paper, newspaper, plastic bottles, packaging, aluminium cans, tins and Tetra Pak cartons), mixed non-recyclables and potentially sewage sludge from temporary welfare facilities provided on site during the construction phase. Waste printer/toner cartridges, waste electrical and electronic equipment (WEEE) and waste batteries may also be generated infrequently from site offices.

## 5.2 Potential Hazardous Wastes Arising

### 5.2.1 Contaminated Soil

In 2008 an initial joint geotechnical and environmental site investigation was undertaken (by O' Callaghan Moran & Associates) comprising the excavation of trial pits, the installation of boreholes in the subsoils and bedrock and the collection and testing of soil and groundwater samples. The intrusive investigations were confined to open areas in the middle of the site and around the site parameter. It is envisaged that further site investigations and environmental soil analysis will be undertaken post demolition and prior to any excavated material being removed from site.



Figure 22 – Site 5 areas of Potential Contaminated Material

If any potentially contaminated material is encountered, it will need to be segregated from clean/inert material, tested and classified as either non-hazardous or hazardous in accordance with the EPA publication entitled 'Waste Classification: List of Waste & Determining if Waste is Hazardous or Non-Hazardous' using the HazWasteOnline application (or similar approved classification method). The material will then need to be classified as clean, inert, non-hazardous or hazardous in accordance with the EC Council Decision 2003/33/EC, which establishes the criteria for the acceptance of waste at landfills.

In the event that Asbestos containing materials (ACMs) are found, the removal will only be carried out by a suitably permitted waste contractor, in accordance with S.I. No. 386 of 2006 Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2006-2010. All asbestos will be taken to a suitably licensed or permitted facility.

In the event that hazardous soil, or historically deposited waste is encountered during the construction phase, the contractor will notify DCC and provide a Hazardous/Contaminated Soil Management Plan, to include estimated tonnages, description of location, any relevant mitigation, destination for disposal/treatment, in addition to information on the authorised waste collector(s).

## 5.2.2 Fuel/Oils

Fuels and oils are classed as hazardous materials; any on-site storage of fuel/oil, and all storage tanks and all draw-off points will be bunded and located in a dedicated, secure area of the site. Provided that these requirements are adhered to and the site crew are trained in the appropriate refuelling techniques, it is not expected that there will be any fuel/oil waste generated at the site.

## 5.2.3 Invasive Plant Species

An ecological site survey was undertaken by Scott Cawley Ecology in June 2020. This included a site walkover survey of the entire site, and around part of the outside perimeter to search for any schedule 3 invasive species. Japanese Knotweed *Fallopia japonica*, which is listed on the Third Schedule of the Birds and Habitats Regulations, was not recorded on the site.

Japanese Knotweed (*Fallopia japonica*) is an alien invasive species listed under schedule 3 of Regulations SI No. 355/2015. SCE's report concludes that it is not present on this site and there was no indication that it is growing in the immediate vicinity.

## 5.2.4 Asbestos

Multiple asbestos refurbishment/demolition survey were undertaken by About Safety Ltd in September and October 2020. The scope of the survey's were confined to all accessible areas of the existing buildings which are due for demolition and/or refurbishment in the future.

Asbestos Containing Materials (ACM) were detected in several locations within some of the buildings including but not limited to floor tiling, roof slates, roof felt, rope seals, bitumen and woven rope.

Removal of asbestos or ACMs will be carried out by a suitably qualified contractor and ACM's will only be removed from site by a suitably permitted/licenced waste contractor. in accordance with S.I. No. 386 of 2006 Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2006-2010. All material will be taken to a suitably licensed or permitted facility.

## 5.2.5 Other known Hazardous Substances

Paints, glues, adhesives and other known hazardous substances will be stored in designated areas. They will generally be present in small volumes only and associated waste volumes generated will be kept to a minimum. Wastes will be stored in appropriate receptacles pending collection by an authorised waste contractor.

In addition, WEEE (containing hazardous components), printer toner/cartridges, batteries (Lead, Ni-Cd or Mercury) and/or fluorescent tubes and other mercury containing waste may be generated from during C&D activities or temporary site offices. These wastes, if generated, will be stored in appropriate receptacles in designated areas of the site pending collection by an authorised waste contractor.

## 5.3 Main Construction and Demolition Waste Categories

AWN Consulting Ltd. has prepared Site-specific Construction & Demolition Waste Management Plan submitted as part of this planning application [document reference CB/20/11784WMR01] and is summarized below.

The main non-hazardous and hazardous waste streams that could be generated by the demolition and construction activities at a typical site are shown in. The List of Waste (LoW) code (as effected from 1 June 2015) (also referred to as the European Waste Code or EWC) for each waste stream is also shown.

| Waste Material   | LoW/EWC Code        |
|--|---------------------|
| Concrete, bricks, tiles, ceramics                                    | 17 01 01-03 & 07    |
| Wood, glass and plastic  | 17 02 01-03         |
| Treated wood, glass, plastic, containing hazardous substances        | 17-02-04*           |
| Bituminous mixtures, coal tar and tarred products                    | 17 03 01*, 02 & 03* |
| Metals (including their alloys) and cable                            | 17 04 01-11         |
| Soil and stones  | 17 05 03* & 04      |
| Gypsum-based construction material                                   | 17 08 01* & 02      |
| Paper and cardboard  | 20 01 01            |
| Mixed C&D waste  | 17 09 04            |
| Green waste  | 20 02 01            |
| Electrical and electronic components                                 | 20 01 35 & 36       |
| Batteries and accumulators   | 20 01 33 & 34       |
| Liquid fuels   | 13 07 01-10         |
| Chemicals (solvents, pesticides, paints, adhesives, detergents etc.) | 20 01 13, 19, 27-30 |
| Insulation materials   | 17 06 04            |
| Organic (food) waste   | 20 01 08            |
| Mixed Municipal Waste  | 20 03 01            |

\* individual waste type may contain hazardous substances

Table 1. Typical waste types generated and LoW codes (individual waste types may contain hazardous substances)

## 5.4 Demolition Waste Generation

The demolition stage will involve the demolition of multiple brick buildings onsite. The demolition areas are identified in the planning drawings provided with this application. The anticipated demolition waste and rates of reuse, recycling/recovery and disposal is shown in Table 2 and 3.

| Waste Type                        | Tonnes        | Reuse |              | Recycle/Recovery |              | Disposal |              |
|-----------------------------------|---------------|-------|--------------|------------------|--------------|----------|--------------|
|                                   |               | %     | Tonnes       | %                | Tonnes       | %        | Tonnes       |
| Glass                             | 124.9         | 0     | 0.0          | 85               | 106.1        | 15       | 18.7         |
| Concrete, Bricks, Tiles, Ceramics | 707.6         | 30    | 212.3        | 65               | 459.9        | 5        | 35.4         |
| Plasterboard                      | 55.5          | 30    | 16.6         | 60               | 33.3         | 10       | 5.5          |
| Asphalts                          | 13.9          | 0     | 0.0          | 25               | 3.5          | 75       | 10.4         |
| Metals                            | 208.1         | 5     | 10.4         | 80               | 166.5        | 15       | 31.2         |
| Slate                             | 111.0         | 0     | 0.0          | 85               | 94.3         | 15       | 16.6         |
| Timber                            | 166.5         | 10    | 16.6         | 60               | 99.9         | 30       | 49.9         |
| Asbestos                          | 1.0           | 0     | 0.0          | 0                | 0.0          | 100      | 1.0          |
| <b>Total</b>                      | <b>1387.4</b> |       | <b>256.0</b> |                  | <b>963.5</b> |          | <b>167.9</b> |

Table 2. Estimated off-site reuse, recycle and disposal rates for demolition waste from the Site 5 [extract AWN document ref. CB/20/11784WMR01]

| Waste Type   | Tonnes       | Reuse |             | Recycle/Recovery |              | Disposal |             |
|--------------|--------------|-------|-------------|------------------|--------------|----------|-------------|
|              |              | %     | Tonnes      | %                | Tonnes       | %        | Tonnes      |
| Mixed C&D    | 127.4        | 10    | 12.7        | 80               | 101.9        | 10       | 12.7        |
| Timber       | 108.1        | 40    | 43.2        | 55               | 59.4         | 5        | 5.4         |
| Plasterboard | 38.6         | 30    | 11.6        | 60               | 23.2         | 10       | 3.9         |
| Metals       | 30.9         | 5     | 1.5         | 90               | 27.8         | 5        | 1.5         |
| Concrete     | 23.2         | 30    | 6.9         | 65               | 15.1         | 5        | 1.2         |
| Other        | 57.9         | 20    | 11.6        | 60               | 34.7         | 20       | 11.6        |
| <b>Total</b> | <b>386.0</b> |       | <b>87.6</b> |                  | <b>262.1</b> |          | <b>36.3</b> |

Table 3. Estimated off-site reuse, recycle and disposal rates for construction waste from the Site 5 [extract AWN document ref. CB/20/11784WMR01]

## **5.5 Appointment of C&D Waste Manager**

The Main Contractor/Contractors will appoint a C&D Waste Manager. The C&D Waste Manager will have overall responsibility for the implementation of the project Waste Management Plan (WMP) during the construction phase.

Copies of the Waste Management Plan will be made available to all relevant personnel on site. All site personnel and sub-contractors will be instructed regarding the objectives of the Waste Management Plan and informed of the responsibilities which fall upon them as a consequence of its provisions. Where source segregation, selective demolition and material reuse techniques apply, each member of staff will be given instructions on how to comply with the Waste Management Plan. Posters will be designed to reinforce the key messages within the Waste Management Plan and will be displayed prominently for the benefit of site staff.



## 6. Protection of Buildings during Construction

Of particular importance to the Site 5 development are the neighbouring buildings to the site.

### Nearby Building to Site 5 include:

- 14-17 Moore Street (National Monument)
- 20-21 Moore Street
- The Rotunda Hospital

### 6.1 Site 5: Basement Impact Assessment

The Basement Impact Assessment (BIA) including a Ground Movement Analysis is included as part of the planning documents.

The Ground Movement Analysis considered each stage of the development including demolition, piling, bulk excavation and construction of the each phase of the development. Predicted ground movements resulting from the works shall be monitored against baseline readings prior to commencing the works. Monitoring of noise and vibration shall be undertaken to all protected structures during the works.

The overall aim of the Ground Movement Analysis included the predicted potential impact of the proposed development to the adjacent buildings and retained structures. A building damage assessment was used in accordance with CIRIA C760 'Criteria of building damage assessment'.

The maximum predicted results predict that the potential damage for all neighbouring buildings and structures adjacent to Site 5 remains at categories ranging of Category 0 'Negligible' to Category 1 'Very Slight' damage during all construction and demolition stages. A full schedule of the predicted ground movement and the associated damage category for all nearby buildings and retained elements is shown in the Basement Impact Assessment.

According to the Site 5 Subterranean Construction Method Statement and in accordance with the DCC guidance, the damage to the existing buildings should not exceed Category 2 generally and Category 1 for protected buildings.

## 6.2 Site 5 - Temporary Works & Exclusion Zones

Particular consideration has been given to the adjacent 20-21 Moore Street party/boundary wall. The wall shall be protected during demolition and construction via temporary works that will be coordinated and incorporated into the permanent works. The following proposed retention systems outlined in this report are for guidance purposes only and will be subject to site investigations of the existing conditions and design by the Temporary Works Specialists.

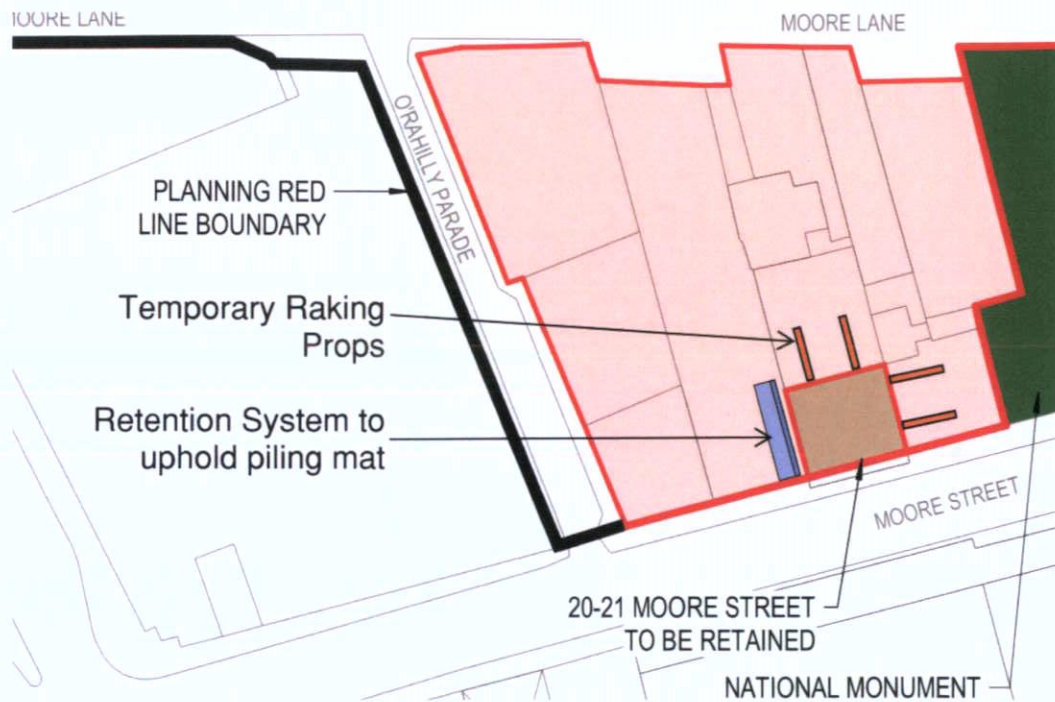


Figure 23 – Preliminary Site 5 Temporary Works

## 6.3 Adjoining & Retained Buildings

The 20-21 Moore Street boundary/party walls that rely on the existing buildings within Site 5 for lateral restraint will require a temporary retention system to restrain the existing buildings during demolition and construction stages.

This will likely comprise of temporary raking props between the boundary/party walls and thrust blocks located a ground level. The thrust blocks may form part of the foundations to the new development. The temporary raking props will be designed to provide lateral restraint at every existing floor level in addition to lateral wind loads applied to the building.

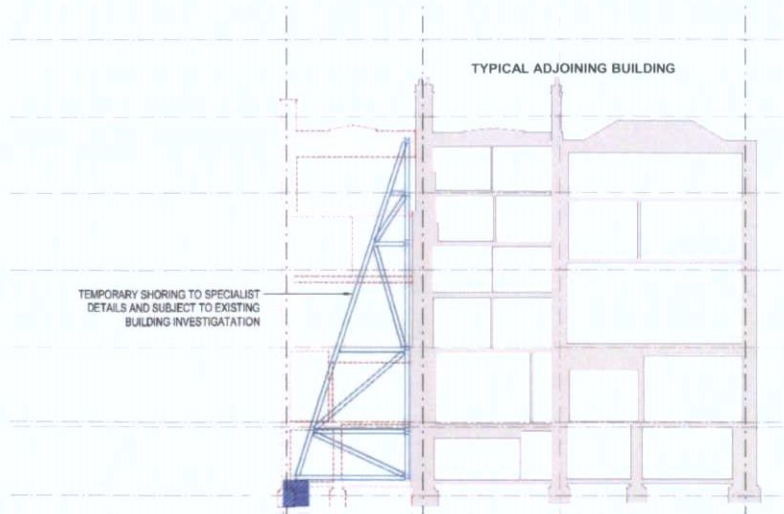


Figure 24 – Typical Temporary Boundary/Adjoining Retention System

Once the temporary raking props have been installed the exposed party/boundary walls will be protected from the weather using felt and battens (or as agreed with the neighbouring property owner). The boundary walls and retained structure within the site will be continuously monitored for movement and vibration during demolition and construction.

On completion of the adjoining structural frame, the new development may restrain the existing boundary/party walls via lateral restraint fixings. Typically, these are fixed into the existing masonry walls at every floor level.

Considerations are to be made by the contractor during demolition and construction where the existing building are to be temporarily exposed to external elements, such as new openings for stair connections or where roof structures are being removed. The contractor is to ensure suitable protection is provided through the use of external scaffolding and building sheeting to avoid the ingress of water.

## 6.4 Movement Monitoring of Retained and Existing Structures

### 6.4.1 Overview

Prior to demolition of the existing building, an external survey control system is to be established around the site, including all adjoining buildings.

This will be carried out using either traditional closed traverse surveying techniques or continuous automated total station (AMTS) monitoring of movement, depending on the sensitivity of the existing buildings and proposed method of construction/demolition. The form of monitoring will be subject to the condition of the existing structures following site surveys. The Contractor will ensure there are sufficient external control stations to allow for the continuous monitoring of the structures during and after demolition and throughout the construction stage.

The monitoring regime shall have co-ordinates which are directly correlated to the building grids and datum levels related to those shown on the Land Survey drawings, issued by the Architect. An initial control survey is to be carried out by the Contractor and may be independently checked and verified by the appointed survey contractor.

The targets will consist of reflective optical survey targets (typically prisms) that shall be adhered to the external surface of the retained structures and neighbouring buildings. The target locations shall be agreed with the relevant parties and the target adhesive shall be tested to demonstrate that no damage will be caused to the existing building fabric surface upon removal of the targets.

### 6.4.2 Proposed Monitoring Regime

The retained structures and neighbouring buildings shall be continuously monitored for changes in vertical and lateral movement with real-time data available. The monitoring of movement will be measured against trigger levels with direct alerts (via email/SMS text) sent from the system to nominated persons.

The results shall be measured with co-ordinates in eastings, northings and elevation (E, N, Z) established. A minimum number of baseline co-ordinates shall to be recorded and checked for control purposes 2 weeks prior to commencement of the demolition works. The results are to be recorded and the directional change and quantum movement from the controls and previous readings calculated.

| Proposed Trigger Level | Movement (mm)     |
|------------------------|-------------------|
| Green                  | Less than 12      |
| Amber                  | Between 12 and 15 |
| Red                    | Greater than 15   |

Unless otherwise agreed, movements of any target position equal to or greater than 12mm from baseline readings shall trigger 'amber' and shall be addressed by the Contractor. The Contractor shall advise the Engineer on the reason for the movement and advise his proposals to control further movement.

Movements of any target equal to or greater than 15mm from baseline readings shall trigger 'red' where immediate action is required by the Contractor. The Engineer and Contract Administrator shall be notified immediately.

The monitoring of retained structures and neighbouring buildings shall continue after completion of the demolition works and the construction of the superstructure and building envelope is substantially complete with removal of all temporary works.

## 7. Control and Monitoring of Noise, Vibration and Dust on site

### 7.1 Condition Surveys

It will be necessary to carry out a detailed condition survey of all adjoining lands and properties prior to any works commencing on site, with particular attention paid to the protected structures noted previously in this report. In addition, baseline movement monitoring will be carried out in line with best practice.

### 7.2 Noise Monitoring

The contractor will deal with the immediate dangers to hearing etc. associated with high noise levels and the impact of same on construction operatives by means of risk assessment and mitigation / precautionary measures and equipment, all in full compliance with the current Health and Safety legislation.

Noise on site shall comply with Safety, Health and Welfare at work (construction) Regulations 2006 to 2013, Safety, Health and Welfare at Work Act 2005, BS 6187:2011 - Code of Practice for full and partial demolition, BS 5228:2009+A1:2014 Parts 1 & 2 - Code of Practice for noise and vibration control on construction and open sites (hereafter referred to as BS 5228), Environmental Protection Agency Act 1992 Sections 106-108, including all Local Authority specific requirements for this specific site.

A survey of baseline noise and vibration will be undertaken to gain an understanding of the typical range of the existing conditions in the surrounding area. Methods of minimising construction noise and vibration will be implemented where possible. The Main Contractor is to implement these recommendations and utilise the most efficient construction methods to reduce the impact on the neighbouring environment.

The nature of construction activities means that a certain level of noise is inevitable, but the appointed Main Contractor must endeavour to minimise this as far as practically possible and reduce the effect and any nuisance to the surrounding environment and neighbours.

Work methods are to be reviewed to ensure minimal noise and vibration are created; methods should include:

- Each item of plant used on site complies with the noise limits quoted in the relevant European Commission Directive 2000/14/EC/ [S.I. No. 632 of 2001].
- All plant and equipment liable to create noise whilst in operation will, as far as reasonably practicable, be located away from sensitive receptors and neighbouring occupied buildings.
- The use of barriers and hoarding to absorb and/or deflect noise away from noise sensitive areas will be employed where required and reasonably practicable.
- All plant, equipment and noise control measures applied to plant and equipment shall be maintained in good and efficient working order and operated such that noise emissions are minimised as far as reasonably practicable. Any plant, equipment or items fitted with noise control equipment found to be defective shall not be operated until repaired.
- Fixed items of construction plant shall be electrically powered in preference to diesel or petrol driven. The Main Contractor shall ensure that vehicles and mechanical plant employed for any activity associated with the construction works will, where reasonably practicable, be fitted with effective exhaust silencers.
- Machines in intermittent use shall be shut down or throttled down to a minimum during periods between works. Static noise emitting equipment operating continuously will be housed within suitable acoustic enclosures, where appropriate.
- Tower cranes will be utilized instead of crawler cranes as these are electrically powered and quieter in operation.
- Noise suppression hammers and shields will be used on rock breaking equipment.

- Working hours will be confined to those stipulated in the grant of planning permission.
- Noise emitting processes such as rock breaking can be suspended during sensitive hours, to be agreed in consultation with DCC and neighbours.
- Alternative work practices will be investigated where the noise emitted is reduced. E.g. prefabricating building components off site.
- Site deliveries will be confined to working hours and allocated offloading location will be utilized for all deliveries.
- The Site Manager will also continually review and monitor the noise / dust / vibration levels / risk throughout the duration of the project and if necessary, adjust / add to the control measures to be employed to reduce nuisance.

### 7.2.1 Measures to Mitigate Noise

Of particular consideration is the noise from construction activities adjacent to the public footpaths and commercial areas (Moore Street, Henry Street and O'Connell Street Upper). Noise mitigation measure will be proposed by the Contractor and may include:

1. The installation of a solid timber hoarding to provide noise insulation.
2. A high-level acoustic wrap applied to the scaffolding to provide some degree of noise barrier
3. Particularly noisy works can have an acoustic noise control barrier put around them when the works are being carried out.
4. When jack hammers are used a "no racket" jacket will be applied which reduced the noise by up to 10db when 50ft away.



Figure 25 – Typical Noise Mitigation Measures

## 7.3 Vibration

During the course of the work proposed at Site 5 Ground borne vibrations from the proposed works could give rise to adverse effects to the Heritage Structures / Protected Structures / National Monument and these control measures are to be put in place during the works to ensure protection of the structures and finishes.

### 7.3.1 Proposed works and potential risks

The proposed works involve excavations; piling works and general construction works of basements, multi-storey framed building, adjacent to heritage and protected structures including the nearby National Monument.

Potential risks arising from Demolition and Construction Works identified:

- (a) Vibration induced damage from demolition, piling and excavation works.
- (b) Physical impact from machinery and /or swing of material deliveries
- (c) General implementation of works such as landing shutters / reinforcement / steelwork deliveries in close proximity to the historic / protected structures.

### 7.3.2 Vibrations Standards

Vibration standards come in two varieties: those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. In both instances, it is appropriate to consider the magnitude of vibration in terms of Peak Particle Velocity (PPV). Guidance relevant to acceptable vibration within buildings is contained in the following documents:

- British Standard *BS7385: 1993: Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration* (hereinafter referred to as BS7385:1993).
- British Standard *BS5228-2: 2009 + A1: 2014: Code of practice for noise and vibration control on construction and open sites – Vibration* (hereinafter referred to as BS 5228-2 2009+A1:2014)

### 7.3.3 Impact of ground borne vibrations arising from Proposed works

Peak particle velocity (PPV) is commonly used to assess the structural response of buildings to vibration. Reference to the following documents has been made for the purposes of this assessment in order to discuss appropriate PPV limit values:

- British Standard *BS7385: 1993: Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration*.
- British Standard *BS5228-2: 2009 + A1: 2014: Code of practice for noise and vibration control on construction and open sites – Vibration*
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BS7385-2:1993 and BS5228-2:2009+A1:2014 advise that, for soundly constructed residential property and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak component particle velocity (in frequency range of predominant pulse) of 15mm/s at 4Hz increasing to 20mm/s at 15Hz and 50mm/s at 40Hz and above for transient vibration. Where the dynamic loading caused by continuous vibration is such as to give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values in Table B.2 might need to be reduced by up to 50%. On a cautious basis, therefore, continuous vibration limits are set as 50% of those for transient vibration across all frequency ranges.

The documents note that minor structural damage can occur at vibration magnitudes which are greater than twice those presented in Table 4. Major damage to a building structure is possible at vibration magnitudes greater than four times the values set out in the Table. It should be noted that these values refer to the vibration at base of the building.

Historically important buildings, that are difficult to repair might require special consideration on a case by case basis, but buildings of historical importance should not be assumed to be more sensitive unless they are structurally unsound. If a building, is in an unstable state, then it will tend to be more vulnerable to the possibility of damage arising from vibration or any other groundborne disturbance.

The vibration limit range for protected and historical buildings are equal to or up to 50% of those for light framed, depending on their structural integrity. Where no structural defects are noted, the same limit to those for light framed buildings apply. For other structures and buildings that are determined to be potentially vulnerable to vibration due to significant structural defects, a further stringent criteria has been applied for transient vibration. It is assumed that known buildings and structures of this kind, will be subject to condition surveys well in advance of the works, and any defects identified repaired. The results of conditions surveys will determine whether a building or structure is classed as “vulnerable”.

Table 4 sets out the limits as they apply to vibration frequencies below 4Hz where the most conservative limits are required. At higher frequencies, the limit values for transient vibration within Table B.2 of BS5228-2:2009+A1:2014 will apply, with similar reductions applied for continuous vibration and those for protected structures.

| Structure Type  | Allowable Vibration (in terms of PPV) at the Closest Part of Sensitive Property to the Source of Vibration, at a Frequency of 4Hz and less: |                      |
|---|---|----------------------|
|   | Transient Vibration   | Continuous Vibration |
| Reinforced or framed structures. Industrial and heavy commercial buildings              | 50mm/s  | 25mm/s               |
| Unreinforced or light framed structures. Residential or light commercial-type buildings | 15mm/s  | 7.5mm/s              |
| Protected and Historic Buildings <sup>*Note 1</sup>                                     | 6mm/s – 15mm/s  | 3 mm/s – 7.5mm/s     |
| Identified Potentially Vulnerable Structures and Buildings with Low Vibration Threshold | 3mm/s   |                      |

- *Note 1: The relevant threshold value to be determined on a case by case basis. Where sufficient structural information is unavailable at the time of assessment, the lower value within the range will be used.*

Table 4 – Thresholds relating to the Transient and Continuous Vibrations in buildings and structures

### 7.3.4 Mitigation Measures to be put in place prior to works

For controlling vibration reference should be made to BS 5228:2009+A1:2014 which offers detailed guidance on the control of vibration from demolition and construction activities. In general, BS5228:2009+A1:2014 advises the following:

- Use rubber linings in, for example, chutes and dumpers to reduce impact noise.
- Minimize drop height of materials.
- Regular and effective maintenance by trained personnel should be carried out to reduce vibration from plant and machinery.
- Hand demolition, cutting of the separation joints of the buildings in advance and small robotic breakers and 'munchers'



Level of protection and procedure put in place will be dictated by potential risk resulting from work to be carried out.

The proposed construction methodology for the structures directly adjacent to upstanding historic structures will be designed by the contractor to ensure that all protection measures are adhered to and that all new works are undertaken in such a way as to limit vibration.

All works within the sensitivity zones of the historic structures will be carried out using piling and excavation and assembly techniques to ensure vibration levels are kept below the threshold level.

### 7.3.5 Monitoring and Mitigation for Ground borne Vibrations during Construction Works

Detailed monitoring will be used to control the proposed works and to ensure compliance with the proposed control limit to protect the Historic Structures / Protected Structures / National Monument.

Vibrations movements will be actively measured during the works with a pre-determined plan of action ready to be put in place should actual measurements vary from the expected levels.

The works will have appropriate level of site management, on site monitoring and supervision. A site representative will be present during the works to ensure the levels are as expected and to supervise any measures should the levels be exceeded.

A real-time response remote monitoring system with warning system will be adopted to monitor vibration. This is to be continuously monitored by on site personnel during demolition; excavation; piling and general construction works. Review of the monitoring data will happen concurrently with the works to ensure that corrective action is undertaken if a limit is breached, or if the developing trend in measurements indicates a limit may be breached if works continue. This real time review and response of the monitoring data is critical to ensuring no limit is exceeded.

In the event that control limit is approached the contractor for the works will explore a revised approach for completion of the works.

Monitoring will include vibration monitoring carried out at the historic structures along with survey points installed on the walls of the historic structures to monitor any movement during the works.

Tell-tale crack monitors will also be installed on existing defects on the historic structures and or its boundary wall where appropriate.

In accordance with established good practice, baseline monitoring will be undertaken in advance of the proposed works in order to establish the existing environment around the historic structures and to verify the correct operation of the proposed instruments.

A series of trigger limits will be set for the works following what is commonly called a 'traffic light' system.

- For measurements below an 'amber limit' works can continue.
- For measurements between an 'amber/red limit' and below the 'red limit' operations will be suspended immediately. The construction methodology will be reviewed and adjusted as required to allow works to proceed on a manner that maintains the integrity of the historic structures.
- Works can continue between the amber and maximum red limit but only when methodologies have been revised to attempt to bring vibrations back below the amber level and also with a greater level of monitoring and control.

Should vibrations go above the red limit works will be suspended for a full review of the exceedance event(s); revision of works procedures and approval by the clients' representatives / OPW before operations can proceed again.

### 7.3.6 Limits for Ground Borne Vibrations

Vibration monitoring and controls are required to be installed prior to the works commencing and for the full duration of the works to ensure the proposed control limit is not exceeded thus avoiding adverse impacts on the historic structure.

A warning threshold shall be implemented as per the limits outlined in Tables 4 above.

Baseline vibration monitoring will be undertaken prior to commencement. The baseline readings should be referenced and incorporated into any Agreement with neighbouring properties and DCC on maximum vibration limits permissible when working nearby.

Toolbox talks should also be carried out with personnel in respect to managing vibration on site. Exposure limits as set out in Regulation 4 of BS 5228:2009+A1:2014 will be reviewed, risk assessments carried out, detecting signs of injury, safe working practices and suppression techniques will all be incorporated. Methods of construction should be adopted to omit and or control vibration at the source, utilize lower levels of vibration; use vibration pads and gloves where possible. Any activity which will generate vibration should as far as practicable be isolated from sensitive receptors.

## 7.4 Air & Dust Management

A dust management plan will be compiled by the Main Contractor for the development.

The following precautions to minimise nuisance to the public and neighbouring occupiers caused by dust and dirt will be carried out by the contractor.

- Vehicle and wheel washing facilities shall be provided at site exit where practicable. If necessary, vehicles are to be washed down before exiting the site.
- Netting is to be provided to enclose scaffolding to mitigate escape of air borne dust from the existing buildings.
- Shroud piling machinery as shown below when operating near to boundaries.
- Engines and exhaust systems should be maintained so that exhaust emissions do not breach stationary emission limits set for the vehicle / equipment type and mode of operation.
- Dust emission over the site boundary should be minimised using static sprinklers or other watering methods as necessary.
- No burning of materials to be permitted on site.
- Water sprays for dust suppression should be affixed to mechanical excavators/munchers involved in demolition works.
- Demolition waste should be removed from site as quickly as possible to minimise risk of dust generation and any fine material should be covered with a tarpaulin or similar material and tied down.
- Water sprays and cannons should be used where possible during cutting, with protective measures applied to retained finishes local to the cutting.
- Prior to commencement, the Main Contractor should identify the construction operations which are likely to generate dust and to draw up action plans to minimise emissions.
- In areas of poor natural ventilation, dust capture/extraction methods should be employed by the Main Contractor.
- The Main Contractor should allocate suitably qualified and experienced personnel to be responsible for ensuring the generation of dust is minimised and effectively controlled.
- The Main Contractor will be required to appoint a senior member of its site management team to act as the liaison with third parties in respect of complaints regarding dust and or site activities.
- Monitoring of dust deposition should be undertaken at nominated boundary locations to ensure that dust levels comply with the TA Luft limit value of  $350\text{mg}/(\text{m}^2/\text{day})$  based on a 30-day average using Bergerhoff gauges (Limits to be agreed with local authority).



Figure 26 – Typical Dust Mitigation Measures

## **8. Archaeology**

Archaeological monitoring will take place where any preparatory ground reduction works are required including site investigation works and opening up works at basement or ground levels. Post-demolition archaeological investigation will be carried out in areas across the site without basements. This is required to establish the nature of below ground structures, foundation remnants and features of archaeological and historical importance and to establish the presence or otherwise of archaeological remains. Further resolution may involve the recording of historic features and full archaeological excavation (i.e., preservation of the archaeology in record form, of all archaeological soils or features encountered). The resolution will occur during this post demolition phase in the area of the find spot in advance of the main construction phase.

## **9. Building Control Amendment Regulations**

### **9.1 Quality Assurance during Construction and BC(A)R Compliance**

The Main Contractor/Contractors will need to demonstrate how they will be providing quality in construction. They shall comply fully with all requirements of the Amended Building Control regulations to the satisfaction of the Ancillary and Assigned certifiers.

The Main Contractor/Contractors will be responsible for the preparation of benchmark samples of each new element of the works to the satisfaction of the Assigned and Ancillary Certifiers under the Building Control regulations (BCAR). Each benchmark sample will be considered a 'hold point' under the Preliminary Inspection Plan (PIP) and will be required to be offered up to the Certifiers involved ahead of the works starting - with a minimum of two days' notice (in writing).

The Main Contractor/Contractors will be required to keep pre- and post-pour check sheets for submission to the assigned and ancillary certifiers where required.

Written acceptance will be required from the Certifiers after inspection of the benchmark samples before the rest of the works proceed.

Where 'specialist' suppliers are noted by the design team to have design responsibility, they will be required to provide Certificates of Design (Sd), Certificates of Inspection (Si) and Certificates of Completion (Sc). Ahead of appointment of the 'specialist' suppliers / designers - evidence of competency and Professional Indemnity insurance cover will be required for the approval of the Contract Administrator and Waterman Moylan.

This is to be confirmed by the Main Contractor/Contractors once appointed and will include a quality check regime.

## **10. Liaison with Third Parties**

It is imperative that the Main Contractor/Contractors engages in discussions with local residents, businesses and the general public well in advance of work commencing on site. Formal communication should be provided to immediate neighbours regarding activities or possible disruptions.

The appointed contractor will be required to adopt the practices covered under the 'Considerate Constructors Scheme' for establishing a good neighbour strategy and maintaining good relationships with neighbouring communities. The ideas described within this scheme will be implemented on site where applicable to minimize negative impact on local community and the environment.

Handling of any complaints must be logged and actioned quickly by the Main Contractor/Contractors.

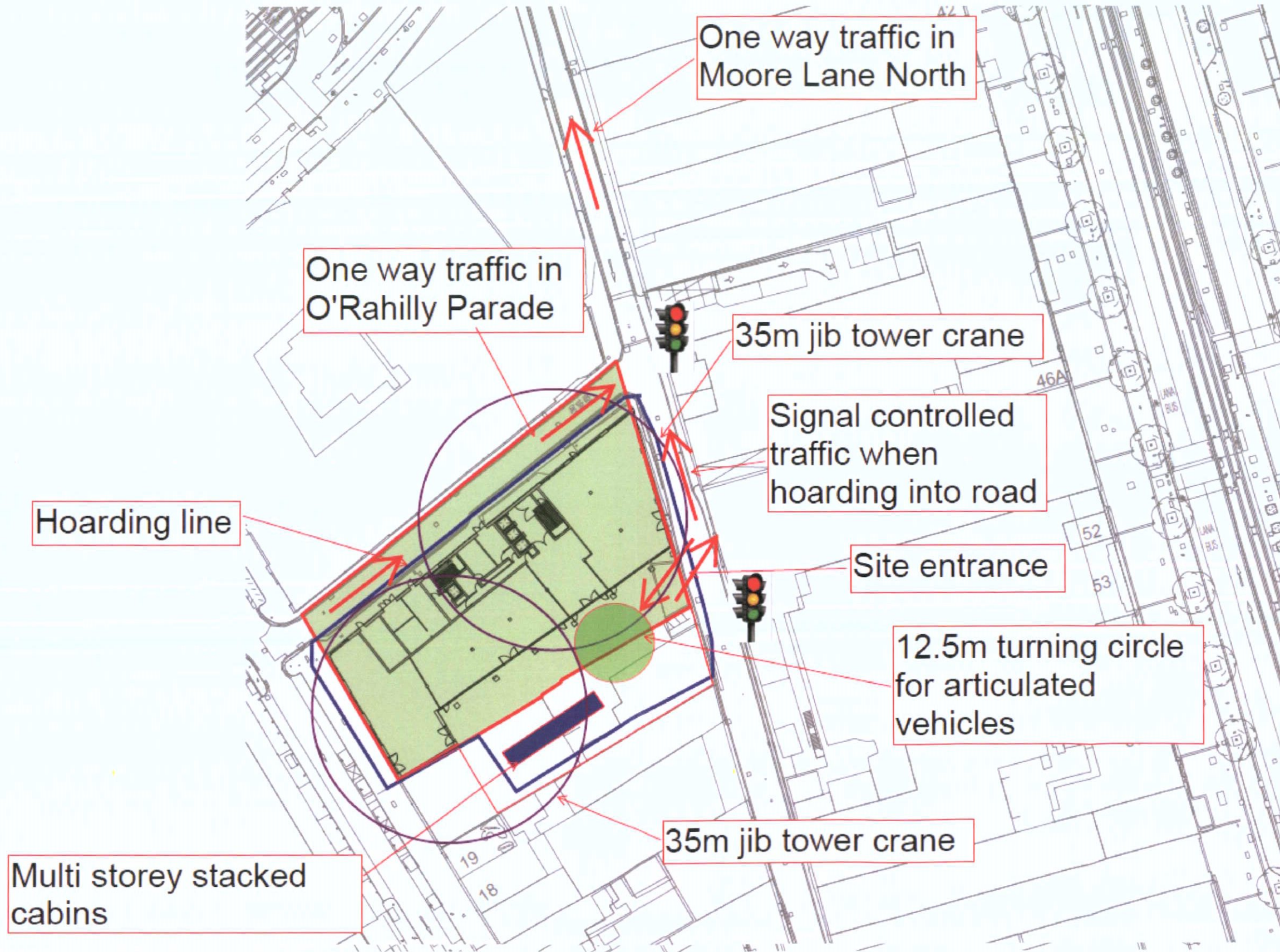


**APPENDIX A**

**Site 5 – Site Setup**







Hoarding line

Multi storey stacked cabins

One way traffic in Moore Lane North

One way traffic in O'Rahilly Parade

35m jib tower crane

Signal controlled traffic when hoarding into road

Site entrance

12.5m turning circle for articulated vehicles

35m jib tower crane

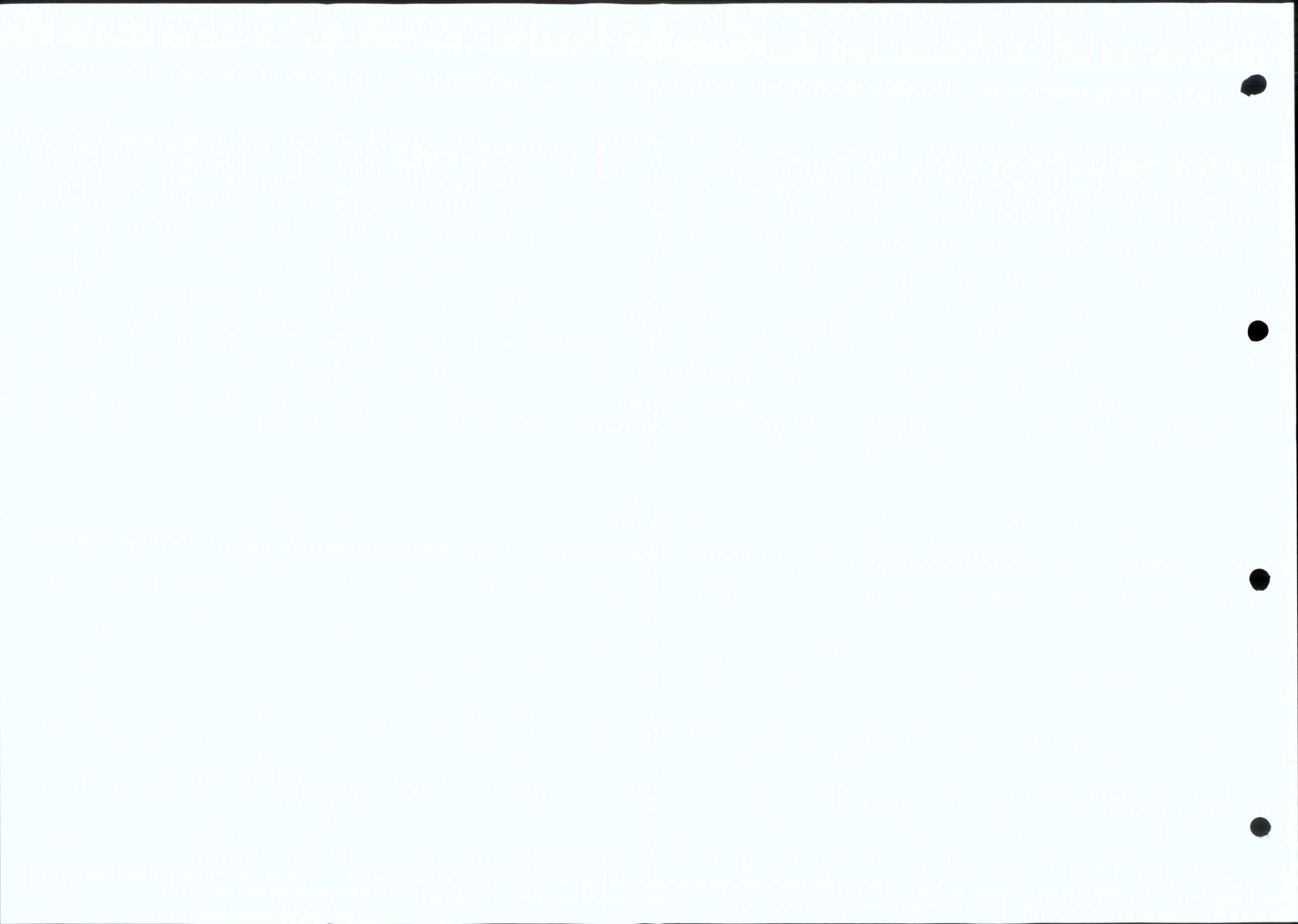
| REV. | DATE | DRN | APP. |
|------|------|-----|------|
|      |      |     |      |
|      |      |     |      |
|      |      |     |      |

|        |             |
|--------|-------------|
| STATUS | PRELIMINARY |
|--------|-------------|

|         |                         |
|---------|-------------------------|
| CLIENT  | Dublin Central GP Ltd.  |
| PROJECT | Dublin Central - Site 5 |

|       |                             |          |        |          |                      |          |          |
|-------|-----------------------------|----------|--------|----------|----------------------|----------|----------|
| TITLE | Preliminary Site Setup Plan |          |        |          |                      |          |          |
| DRWN. | RN                          | DESIGNED | RN     | APPROVED | RO                   | DATE     | 26.11.20 |
| SCALE | NTS                         | JOB NO.  | 19-021 | DRG. NO. | DC-WM-ZZ-ZZ-SK-S-102 | REVISION |          |

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# UK and Ireland Office Locations





## APPENDIX 6.1 PROTECTED SITES FOR NATURE CONSERVATION IN THE VICINITY OF THE PROPOSED DEVELOPMENT AND THE MASTERPLAN

European sites in the vicinity of the proposed development and the Masterplan are listed below in Table 1, along with their qualifying/special conservation interests, reference to the most recent conservation objectives document, and their location relative to the proposed development site.

Other nationally protected sites for nature conservation in the vicinity of the proposed development are listed below in Table 2, along with the nature conservation interests for which they are designated, and their location relative to the proposed development site and the Masterplan.

| European Site Name [Code] and its Qualifying interest(s) / Special Conservation Interest(s) (*Priority Annex I Habitats)  | Location Relative to the Proposed Development Site and the Masterplan         |
|---|---|
| <b>Special Area of Conservation (SAC)</b>   |   |
| <p><b>South Dublin Bay SAC [000210]</b><br/>           [1140] Mudflats and sandflats not covered by seawater at low tide<br/>           [1210] Annual vegetation of drift lines<br/>           [1310] <i>Salicornia</i> and other annuals colonising mud and sand<br/>           [2110] Embryonic shifting dunes</p> <p>NPWS (2013b) <i>Conservation Objectives: South Dublin Bay SAC 000210</i>. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.</p>   | <p>c.3.5km south east of the proposed development site and the Masterplan</p> |
| <p><b>North Dublin Bay SAC [000206]</b><br/>           [1140] Mudflats and sandflats not covered by seawater at low tide<br/>           [1210] Annual vegetation of drift lines<br/>           [1310] <i>Salicornia</i> and other annuals colonising mud and sand<br/>           [1330] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>)<br/>           [1395] Petalwort <i>Petalophyllum ralfsii</i><br/>           [1410] Mediterranean salt meadows (<i>Juncetalia maritimi</i>)<br/>           [2110] Embryonic shifting dunes<br/>           [2120] Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes)<br/>           [2130] Fixed coastal dunes with herbaceous vegetation (grey dunes)<br/>           [2190] Humid dune slacks</p> <p>NPWS (2013a) <i>Conservation Objectives: North Dublin Bay SAC 000206</i>. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.</p> | <p>c. 5.3km north east of the proposed development and the Masterplan</p>     |

| European Site Name [Code] and its Qualifying interest(s) / Special Conservation Interest(s) (*Priority Annex I Habitats)   | Location Relative to the Proposed Development Site and the Masterplan           |
|--|---|
| <p><b>Baldoyle Bay SAC [000199]</b></p> <p>[1140] Mudflats and sandflats not covered by seawater at low tide<br/>           [1310] Salicornia and other annuals colonising mud and sand<br/>           [1330] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>)<br/>           [1410] Mediterranean salt meadows (<i>Juncetalia maritimi</i>)</p> <p>NPWS (2013b) <i>Conservation Objectives: Baldoyle Bay SAC 000199</i>. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.</p>  | <p>c. 10.4km north east of the proposed development site and the Masterplan</p> |
| <p><b>Howth Head SAC [000202]</b></p> <p>[1230] Vegetated sea cliffs of the Atlantic and Baltic coasts<br/>           [4030] European dry heaths</p> <p>NPWS (2016) <i>Conservation Objectives: Howth Head SAC 000202</i>. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.</p>   | <p>c. 11km east of the proposed development site and the Masterplan</p>         |
| <p><b>Glenasmole SAC [001209]</b></p> <p>[6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites)<br/>           [6410] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>)<br/>           [7220] Petrifying springs with tufa formation (<i>Cratoneurion</i>)</p> <p>NPWS (2018) Conservation objectives for Glenasmole Valley SAC [001209]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.</p>   | <p>c. 12.5km south west of the proposed development site and the Masterplan</p> |
| <p><b>Malahide Estuary SAC [000205]</b></p> <p>[1140] Mudflats and sandflats not covered by seawater at low tide<br/>           [1310] Salicornia and other annuals colonising mud and sand<br/>           [1320] <i>Spartina</i> swards (<i>Spartinion maritimae</i>)<br/>           [1330] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>)<br/>           [1410] Mediterranean salt meadows (<i>Juncetalia etanus</i>)<br/>           [2120] Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes)<br/>           [2130] Fixed coastal dunes with herbaceous vegetation (grey dunes)</p> <p>NPWS (2013b) <i>Conservation Objectives: Malahide Estuary SAC 000205</i>. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.</p> | <p>c. 13.1km north east of the proposed development site and the Masterplan</p> |

| European Site Name [Code] and its Qualifying interest(s) / Special Conservation Interest(s) (*Priority Annex I Habitats)   | Location Relative to the Proposed Development Site and the Masterplan          |
|--|--|
| <b>Special Protection Area (SPA)</b>   |  |
| <p><b>South Dublin Bay and River Tolka Estuary SPA [004024]</b></p> <p>[A046] Light-bellied Brent Goose <i>Branta bernicla hrota</i></p> <p>[A130] Oystercatcher <i>Haematopus ostralegus</i></p> <p>[A137] Ringed Plover <i>Charadrius hiaticula</i></p> <p>[A141] Grey Plover <i>Pluvialis squatarola</i></p> <p>[A143] Knot <i>Calidris canutus</i></p> <p>[A144] Sanderling <i>Calidris alba</i></p> <p>[A149] Dunlin <i>Calidris alpina</i></p> <p>[A157] Bar-tailed Godwit <i>Limosa lapponica</i></p> <p>[A162] Redshank <i>Tringa totanus</i></p> <p>[A179] Black-headed Gull <i>Croicocephalus ridibundus</i></p> <p>[A192] Roseate Tern <i>Sterna dougallii</i></p> <p>[A193] Common Tern <i>Sterna hirundo</i></p> <p>[A194] Arctic Tern <i>Sterna paradisaea</i></p> <p>[A999] Wetland and Waterbirds</p> <p><b>NPWS (2015b) Conservation Objectives: South Dublin Bay and River Tolka Estuary SPA 004024. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.</b></p> | <p>c.3.5km south east of the proposed development site and the Masterplan</p>  |
| <p><b>North Bull Island SPA [004006]</b></p> <p>[A046] Light-bellied Brent Goose <i>Branta bernicla hrota</i></p> <p>[A048] Shelduck <i>Tadorna tadorna</i></p> <p>[A052] Teal <i>Anas crecca</i></p> <p>[A054] Pintail <i>Anas acuta</i></p> <p>[A056] Shoveler <i>Anas clypeata</i></p> <p>[A130] Oystercatcher <i>Haematopus ostralegus</i></p> <p>[A140] Golden Plover <i>Pluvialis apricaria</i></p> <p>[A141] Grey Plover <i>Pluvialis squatarola</i></p> <p>[A143] Knot <i>Calidris canutus</i></p> <p>[A144] Sanderling <i>Calidris alba</i></p> <p>[A149] Dunlin <i>Calidris alpina</i></p> <p>[A156] Black-tailed Godwit <i>Limosa limosa</i></p> <p>[A157] Bar-tailed Godwit <i>Limosa lapponica</i></p> <p>[A160] Curlew <i>Numenius arquata</i></p> <p>[A162] Redshank <i>Tringa totanus</i></p> <p>[A169] Turnstone <i>Arenaria interpres</i></p> <p>[A179] Black-headed Gull <i>Croicocephalus ridibundus</i></p> <p>[A999] Wetlands &amp; Waterbirds</p>   | <p>c. 5.4km north east of the proposed development site and the Masterplan</p> |



| European Site Name [Code] and its Qualifying interest(s) / Special Conservation Interest(s) (*Priority Annex I Habitats)  | Location Relative to the Proposed Development Site and the Masterplan           |
|---|---|
| <p>NPWS (2015a) <i>Conservation Objectives: North Bull Island SPA 004006</i>. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.</p>   |   |
| <p><b>Baldoyle Bay SPA [004016]</b></p> <p>[A046] Light-bellied Brent Goose <i>Branta bernicla hrota</i><br/> [A048] Shelduck <i>Tadorna tadorna</i><br/> [A137] Ringed Plover <i>Charadrius hiaticula</i><br/> [A140] Golden Plover <i>Pluvialis apricaria</i><br/> [A141] Grey Plover <i>Pluvialis squatarola</i><br/> [A157] Bar-tailed Godwit <i>Limosa lapponica</i><br/> [A999] Wetland and Waterbirds</p> <p>NPWS (2013b) <i>Conservation Objectives: Baldoyle Bay SPA 004016</i>. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.</p>   | <p>c. 10.4km north east of the proposed development site and the Masterplan</p> |
| <p><b>Malahide Estuary SPA [004025]</b></p> <p>[A005] Great Crested Grebe <i>Podiceps cristatus</i><br/> [A046] Light-bellied Brent Goose <i>Branta bernicla hrota</i><br/> [A048] Shelduck <i>Tadorna tadorna</i><br/> [A054] Pintail <i>Anas acuta</i><br/> [A067] Goldeneye <i>Bucephala clangula</i><br/> [A069] Red-breasted Merganser <i>Mergus serrator</i><br/> [A130] Oystercatcher <i>Haematopus ostralegus</i><br/> [A140] Golden Plover <i>Pluvialis apricaria</i><br/> [A141] Grey Plover <i>Pluvialis squatarola</i><br/> [A143] Knot <i>Calidris canutus</i><br/> [A149] Dunlin <i>Calidris alpina</i><br/> [A156] Black-tailed Godwit <i>Limosa limosa</i><br/> [A157] Bar-tailed Godwit <i>Limosa lapponica</i><br/> [A162] Redshank <i>Tringa totanus</i><br/> [A999] Wetland and Waterbirds</p> <p>NPWS (2015b) <i>Conservation Objectives: Malahide Estuary SPA 004025</i>. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.</p> | <p>c. 13.1km north east of the proposed development site and the Masterplan</p> |

**Table 1:** European sites in the vicinity of the proposed development.

| Designated Site Name [Code] and its nature conservation features  | Location Relative to the Proposed Development Site                      |
|---|---|
| <b>proposed Natural Heritage Area (pNHA)</b>  |   |
| <b>Royal Canal pNHA [002103]</b><br>Diversity of flora and fauna species the canal ecosystem supports and the presence of legally protected plant species, opposite-leaved pondweed <i>Groenlandia densa</i> .  | c. 1.3km north east of the proposed development and the Masterplan      |
| <b>South Dublin Bay pNHA [000210]</b><br>Diversity of coastal, estuarine, intertidal and marine habitats, and the flora and fauns species they support – see also <i>South Dublin Bay SAC and South Dublin Bay and River Tolka Estuary SPA</i>  | c. 3.5km south east of the proposed development site and the Masterplan |
| <b>Dolphins, Dublin Docks pNHA [000201]</b><br>Nesting common terns – see also <i>South Dublin Bay and River Tolka Estuary SPA in Table 1 above</i>   | c. 4.4km east of the proposed development and the Masterplan            |
| <b>North Dublin Bay pNHA [000206]</b><br>Diversity of coastal, estuarine, intertidal and marine habitats, and the flora and fauns species they support – see also <i>North Dublin Bay SAC, North Bull Island SPA and South Dublin Bay and River Tolka Estuary SPA in Table 1 above</i>  | c. 5.3km north east of the proposed development and the Masterplan      |
| <b>Santry Demesne pNHA [000178]</b><br>The site comprises the remnants of a former demesne woodland. The remaining woods are generally good quality. Hairy St. John's wort ( <i>Hypericum hirsutum</i> ), a species legally protected under the Flora (Protection) Order (2015), was recorded here in 1991. The primary importance of this site is that it contains a legally protected plant species. The woodland, however, is of general ecological interest as it occurs in an area where little has survives of the original vegetation. | c. 5.8km north of the proposed development site and the Masterplan      |
| <b>Boosterstown Marsh pNHA [001205]</b><br>An enclosed area of saltmarsh and muds that is cut off from the sea by the Dublin/Wexford railway line, being linked only by a channel to the east, the Nutley stream. Sea water incursions into the marsh occur along this stream at high tide.<br>- see also <i>South Dublin Bay and River Tolka Estuary SPA</i>   | c. 5.9km south east of the proposed development site and the Masterplan |
| <b>Liffey Valley pNHA [000128]</b><br>Diversity of flora and fauna species the river ecosystem supports, including rare and/or legally protected plant species (hairy St. John's wort <i>Hypericum hirsutum</i> , green figwort <i>Scrophularia umbrosa</i> and yellow archangel <i>Lamiastrum galeobdolon</i> )  | c. 5.9km east of the proposed development and the Masterplan            |

| Designated Site Name [Code] and its nature conservation features   | Location Relative to the Proposed Development Site                             |
|--|--|
| <p><b>Dodder Valley pNHA [000991]</b></p> <p>This site represents the last remaining expanse of natural river bank of the Dodder in the built up Greater Dublin Area with the proposed designation extending for approximately 2km between Firhouse Bridge and Old Bawn Bridge. The Dodder Valley supports riparian woodland and scrub mainly of Willow (<i>Salix</i> spp.) Along the banks are wild flower meadows with a good diversity of plant species. The Valley also supports several riparian bird species of conservation interest.</p> | <p>c. 8.2km south west of the proposed development site and the Masterplan</p> |
| <p><b>Fitzsimons Wood pNHA [001753]</b></p> <p>Fitzsimons Wood is a semi-natural woodland located west of Sandyford Village. Birch dominates the woodland with Alder and Holly distributed throughout. Some Oak, Beech and Sycamore also occur. Woodland birds are abundant, with Long-eared Owls, newts, foxes, badgers and deer also present. The woodland is a valuable wildlife reserve at the edge of the suburban landscape.</p>   | <p>c. 9.1km south of the proposed development site and the Masterplan</p>      |

**Table 2:** Nationally protected sites in the vicinity of the proposed development

## APPENDIX 6.2 DESK STUDY FLORA AND FAUNA RECORDS

Desktop records of protected, rare, or other notable plant species are listed below in **Table 1**. These are plant species which are legally protected under the Flora (Protection) Order, 2015 and/or are listed as Critically Endangered, Endangered or Vulnerable on the relevant national Red Data list for Ireland<sup>1</sup>.

| Common Name/<br>Scientific name                            | Legal Status <sup>2</sup> | Red List Status       | Source                      |
|--|---------------------------|-----------------------|-----------------------------|
| Opposite-leaved Pondweed<br><i>Groenlandia dena</i>        | FPO                       | Endangered            | NBDC online database record |
| Round-leaved Crane's bill<br><i>Geranium rotundifolium</i> | None                      | Endangered            | NBDC online database record |
| Fringed Heartwort<br><i>Ricciocarpos natans</i>            | None                      | Near threatened       | NBDC online database record |
| Common extinguisher-moss<br><i>Encalypta vulgaris</i>      | None                      | Near threatened       | NBDC online database record |
| Lance-leaved Pottia<br><i>Torula lanceola</i>              | None                      | Critically endangered | NBDC online database record |
| Tall aloe-moss<br><i>Aloina ambigua</i>                    | None                      | Endangered            | NBDC online database record |
| Tiny feather-moss<br><i>Amblystegium confervoides</i>      | None                      | Near threatened       | NBDC online database record |
| Twisting thread-moss<br><i>Bryum torquescens</i>           | None                      | Vulnerable            | NBDC online database record |

**Table 1:** Records of protected, red-listed or notable flora recorded from the desk study in the vicinity of the study area.

Desktop records of protected, rare, or other notable fauna species are listed below in Table 2. In relation to amphibian, reptile and mammal species those which are protected under the Wildlife Acts, the Habitats Directive and/or are listed as threatened (Vulnerable to Critically Endangered) on the relevant national Red Lists are included. In the case of bird species, only those species listed in Annex I of the Birds Directive or on the Birds of Conservation Concern in Ireland (BoCCI) Red List are included in the table below. For invertebrate species, those which are listed as threatened (Vulnerable to Critically Endangered) on the relevant national Red List are included.

<sup>1</sup> Vascular flora from Wyse Jackson, M., FitzPatrick, Ú., Cole, E., Jebb, M., McFerran, D., Sheehy Skeffington, M. & Wright, M. (2016) *Ireland Red List No. 10: Vascular Plants*. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs, Dublin, Ireland.

Bryophytes from Lockhart, N., Hodgetts, N. & Holyoak, D. (2012) *Ireland Red List No.8: Bryophytes*. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

<sup>2</sup> HDII/IV/V = Habitats Directive Annexes II/IV/V; FPO = Flora (Protection) Order, 2015; WA = Wildlife Acts

| Common Name/<br>Scientific Name                         | Legal Status <sup>3</sup> | Red List Status <sup>4</sup> | Source                      |
|---|---------------------------|------------------------------|-----------------------------|
| <b>Amphibians</b>                                       |                           |                              |                             |
| Common frog<br><i>Rana temporaria</i>                   | HD_V, WA                  | Least concern                | NBDC online database record |
| Smooth newt<br><i>Triturus vulgaris</i>                 | WA                        | Least concern                | NBDC online database record |
| <b>Mammals (Terrestrial)</b>                            |                           |                              |                             |
| Badger  | WA                        | Least concern                | NBDC online database record |
| Otter<br><i>Lutra lutra</i>                             | HD_II & IV, WA            | Least concern                | NBDC online database record |
| Nathusius's Pipistrelle<br><i>Pipistrellus nathusii</i> | HD_IV, WA                 | Least concern                | NBDC online database record |
| Leisler's bat<br><i>Nyctalus leisleri</i>               | HD_IV, WA                 | Least concern                | NBDC online database record |
| Soprano pipistrelle<br><i>Pipistrellus pygmaeus</i>     | HD_IV, WA                 | Least concern                | NBDC online database record |
| Common pipistrelle<br><i>Pipistrellus pipistrellus</i>  | HD_IV, WA                 | Least concern                | NBDC online database record |
| Pygmy shrew   | WA                        | Least concern                | NBDC online database record |
| Red squirrel<br><i>Sciurus vulgaris</i>                 | WA                        | Least concern                | NBDC online database record |

**Table 2:** Records of protected, red-listed or notable fauna from the desktop study in the vicinity of the study area.

<sup>3</sup> HD\_II/IV/V = Habitats Directive Annexes II/IV/V; WA = Wildlife Acts; BD\_I/II/III = Birds Directive Annex I/II/III; OSPAR = Convention for the protection of the marine environment of the North-east Atlantic 1992

<sup>4</sup> Mammal Red-list from Marnell, F., Kingston, N. & Looney, D. (2009) *Ireland Red List No. 3: Terrestrial Mammals* and Marnell, F., Looney, D. & Lawton, C. (2019) *Ireland Red List No. 12: Terrestrial Mammals*.

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Damselflies and dragonflies from Nelson, B., Ronayne, C. & Thompson, R. (2011) *Ireland Red List No.6: Damselflies & Dragonflies (Odonata)*.

Water beetles from Foster, G. N., Nelson, B. H. & O Connor, Á. (2009) *Ireland Red List No. 1 – Water beetles*.

| Common Name/<br>Scientific Name              | Legal Status                    | Red List<br>Status | Source                      |
|--|---------------------------------|--------------------|-----------------------------|
| <b>Birds</b>                                 |                                 |                    |                             |
| Barn owl<br><i>Tyto alba</i>                 | WA                              | Red                | NBDC online database record |
| Black-headed gull<br><i>Larus ridibundus</i> | WA                              | Red                | NBDC online database record |
| Curlew<br><i>Numenius arquata</i>            | BD_II (II), WA                  | Red                | NBDC online database record |
| Dunlin<br><i>Calidris alpina</i>             | BD_I                            | Red                | NBDC online database record |
| Golden plover<br><i>Pluvialis apricaria</i>  | BD_I, II (II), III<br>(III), WA | Red                | NBDC online database record |
| Goldeneye<br><i>Bucephala clangula</i>       | BD_II (II), WA                  | Red                | NBDC online database record |
| Herring gull<br><i>Larus argentatus</i>      | WA                              | Red                | NBDC online database record |
| Lapwing<br><i>Vanellus vanellus</i>          | BD_II (II), WA                  | Red                | NBDC online database record |
| Pochard<br><i>Aythya ferina</i>              | BD_II (I), III (II),<br>WA      | Red                | NBDC online database record |
| Redshank<br><i>Tringa totanus</i>            | WA                              | Red                | NBDC online database record |
| Shoveler<br><i>Anas clypeata</i>             | BD_II (I), III (III),<br>WA     | Red                | NBDC online database record |
| Tufted duck<br><i>Aythya fuligula</i>        | BD_II (I), III (II),<br>WA      | Red                | NBDC online database record |
| Twite<br><i>Carduelis flavirostris</i>       | WA                              | Red                | NBDC online database record |
| Wigeon<br><i>Anas penelope</i>               | BD_II (I), III (II),<br>WA      | Red                | NBDC online database record |
| Woodcock<br><i>Scolopax rusticola</i>        | BD_II (I), III (III),<br>WA     | Red                | NBDC online database record |
| Yellowhammer<br><i>Emberiza citrinella</i>   | WA                              | Red                | NBDC online database record |
| Arctic tern<br><i>Sterna paradisaea</i>      | BD_I, WA                        | Amber              | NBDC online database record |
| Bar-tailed godwit<br><i>Limosa lapponica</i> | BD_I, WA                        | Amber              | NBDC online database record |
| Common tern<br><i>Sterna hirundo</i>         | BD_I, WA                        | Amber              | NBDC online database record |

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|  |          |                 |                             |
|--|----------|-----------------|-----------------------------|
| Great northern diver<br><i>Gavia immer</i>                   | BD_I, WA | Amber           | NBDC online database record |
| Hen harrier<br><i>Circus cyaneus</i>                         | BD_I, WA | Amber           | NBDC online database record |
| Kestrel<br><i>Falco tinnunculus</i>                          | BD_I, WA | Amber           | NBDC online database record |
| Kingfisher<br><i>Alcedo atthis</i>                           | BD_I, WA | Amber           | NBDC online database record |
| Little egret<br><i>Egretta garzetta</i>                      | BD_I, WA | Green           | NBDC online database record |
| Little tern<br><i>Sterna albifrons</i>                       | BD_I, WA | Amber           | NBDC online database record |
| Mediterranean gull<br><i>Larus melanocephalus</i>            | BD_I, WA | Amber           | NBDC online database record |
| Peregrine<br><i>Falco peregrinus</i>                         | BD_I, WA | Green           | NBDC online database record |
| Red-throated diver<br><i>Gavia stellata</i>                  | BD_I, WA | Amber           | NBDC online database record |
| <b>Invertebrates</b>   |          |                 |                             |
| Marsh fritillary butterfly<br><i>Euphydryas aurinia</i>      | HD_II    | Vulnerable      | NBDC online database record |
| Wall butterfly<br><i>Lasiommata megera</i>                   | none     | Endangered      | NBDC online database record |
| Dark green fritillary butterfly<br><i>Argynnis aglaja</i>    | none     | Vulnerable      | NBDC online database record |
| Grayling butterfly<br><i>Hipparchia semele</i>               | none     | Near threatened | NBDC online database record |
| Small heath butterfly<br><i>Coenonympha pamphilus</i>        | none     | Near threatened | NBDC online database record |
| Scarce Blue-tailed damselfly<br><i>Ischnura pumilio</i>      | none     | Vulnerable      | NBDC online database record |
| Barbut's Cuckoo bee<br><i>Bombus (Psithyrus) barbutellus</i> | None     | Endangered      | NBDC online database record |
| Great yellow bumble bee<br><i>Bombus distinguendus</i>       | None     | Endangered      | NBDC online database record |
| Hill Cuckoo bee<br><i>Bombus rupestris</i>                   | None     | Endangered      | NBDC online database record |
| Large red tailed bumble bee<br><i>Bombus lapidarius</i>      | None     | Near threatened | NBDC online database record |
| Moss carder-bee<br><i>Bombus muscorum</i>                    | None     | Near threatened | NBDC online database record |

|  |      |                 |                             |
|--|------|-----------------|-----------------------------|
| Common shelled slug<br><i>Testacella haliotideia</i> | None | Vulnerable      | NBDC online database record |
| Ear pond snail<br><i>Radix auricularia</i>           | None | Vulnerable      | NBDC online database record |
| Globular pea mussel<br><i>Pisidium hibernicum</i>    | None | Near threatened | NBDC online database record |
| Glutinous snail<br><i>Myxas glutinosa</i>            | None | Endangered      | NBDC online database record |
| Heath snail<br><i>Helicella itala</i>                | None | Vulnerable      | NBDC online database record |
| Lake orb mussel<br><i>Musculium lacustre</i>         | None | Vulnerable      | NBDC online database record |
| Mauge's shelled slug<br><i>Testacella maugei</i>     | None | Near threatened | NBDC online database record |
| Mollusc<br><i>Pisidium pseudosphaerium</i>           | None | Endangered      | NBDC online database record |
| Mollusc<br><i>Pisidium pulchellum</i>                | None | Endangered      | NBDC online database record |
| Silky snail<br><i>Ashfordia granulata</i>            | None | Near threatened | NBDC online database record |
| Smooth grass snail<br><i>Vallonia pulchella</i>      | None | Vulnerable      | NBDC online database record |
| Smooth ramshorn<br><i>Gyraulus laevis</i>            | None | Endangered      | NBDC online database record |
| Swan mussel<br><i>Anodonta cygnea</i>                | None | Vulnerable      | NBDC online database record |

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