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 5228:2009+A1:2014), 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 (for example 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 26 – Typical Noise Mitigation Measures

7.3 Vibration

During the course of the work proposed at Site 4 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 and repairs to the historic structures / protected structures themselves immediately adjoining.

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.

(d) Works to the historic / protected structures themselves.

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*
-

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 *Note 1	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 (for example 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.

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 350mg/(m²/day) based on a 30-day average using Bergerhoff gauges (Limits to be agreed with local authority).

Figure 27 – 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

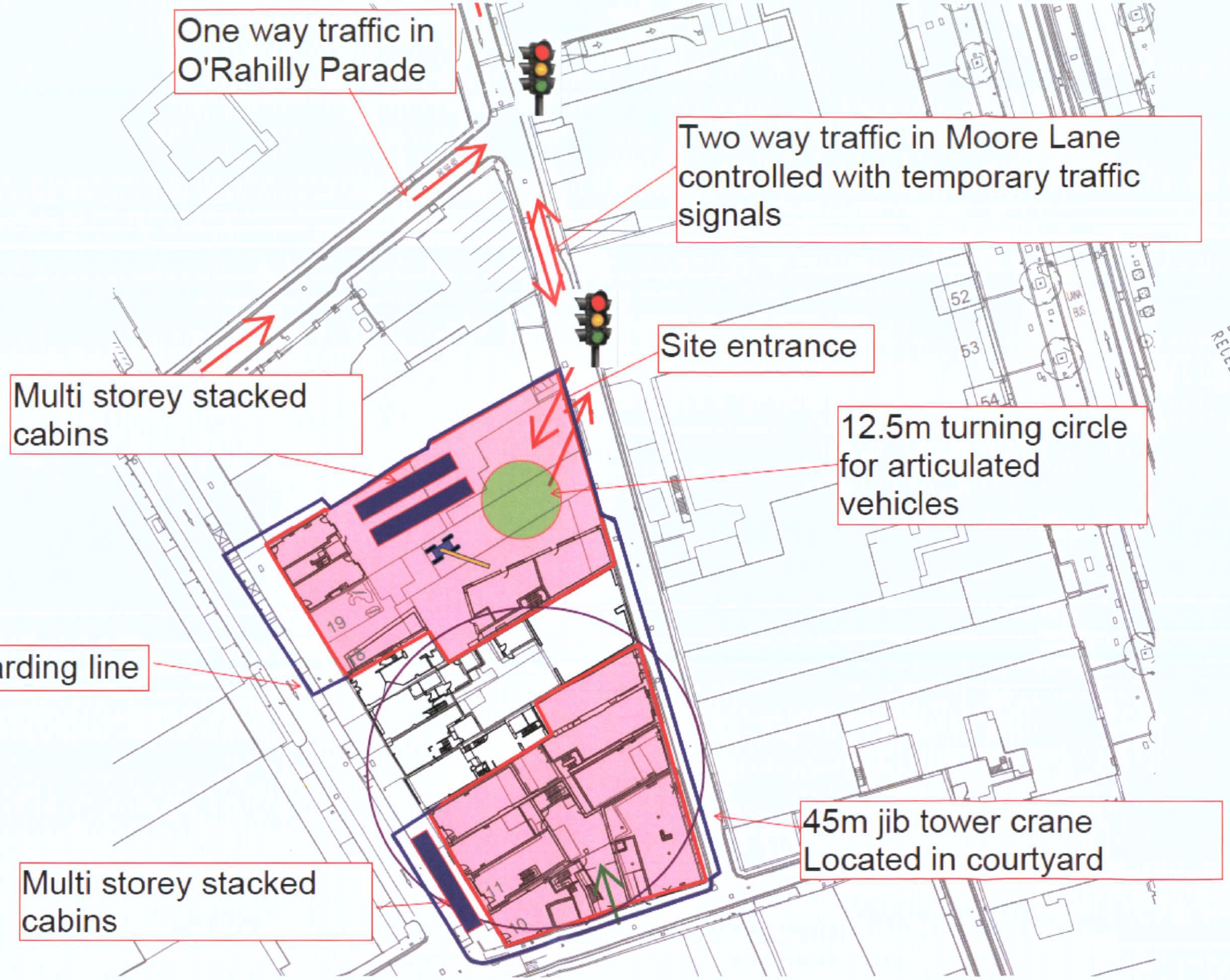
It is imperative that the Main Contractor/Contractors engages in discussions with local residents, businesses and the general public well in advance of work commencing on site. Formal communication should be provided to immediate neighbours regarding activities or possible disruptions.

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 4 – Site Setup



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STATUS
PRELIMINARY

CLIENT / ARCHITECT: Dublin Central GP Ltd.
PROJECT: Dublin Central - Site 4

TITLE: Preliminary Site Setup Plan

DRWN.	DESIGNED	APPROVED	DATE
RN	RN	RO	26.11.20

SCALE	JOB NO.	DRG. NO.	REVISION
NTS	19-021	DC-WM-ZZ-ZZ-SK-S-101	

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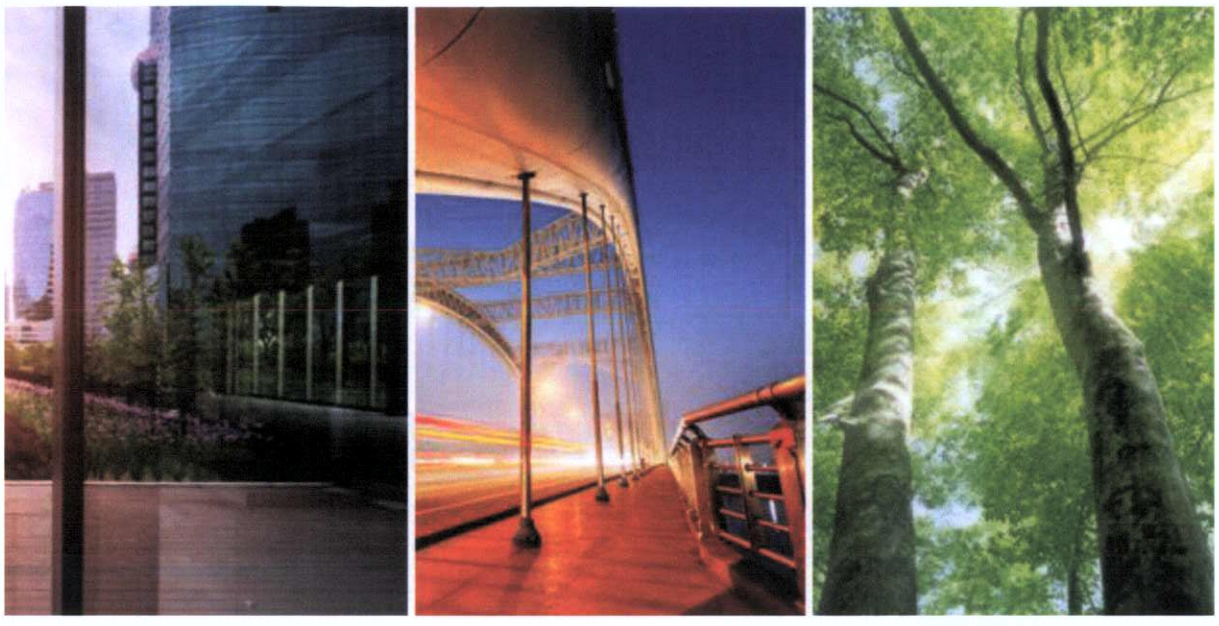
APPENDIX 3.4 OUTLINE CONSTRUCTION & DEMOLITION MANAGEMENT PLAN – SITE 5



Dublin Central

Outline Construction & Demolition Management Plan – Site 5

Dublin Central GP Limited

DC-WAT-5X-XX-RP-C-001016

May 2021

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Waterman Moylan
Engineering Consultants

Client Name: Dublin Central GP Limited
Document Reference: DC-WAT-5X-XX-RP-C-001016
Project Number: 19-021

Quality Assurance – Approval Status

This document has been prepared and checked in accordance with Waterman Group's IMS (BS EN ISO 9001: 2015, BS EN ISO 14001: 2015 and BS OHSAS 18001:2007)

Issue	Date	Prepared by	Checked by	Approved by
P1	07.05.21	R. Nelson	C. Beresford	R. Osborne
P2	10.05.21	R. Nelson	C. Beresford	R. Osborne
P3	11.05.21	R. Nelson	C. Beresford	R. Osborne
P4	18.05.21	R. Nelson	C. Beresford	R. Osborne
P5	19.05.21	R. Nelson	C. Beresford	R. Osborne

Comments

FINAL ISSUE

Disclaimer

This report has been prepared by Waterman Moylan, with all reasonable skill, care and diligence within the terms of the Contract with the Client, incorporation of our General Terms and Condition of Business and taking account of the resources devoted to us by agreement with the Client.

We disclaim any responsibility to the Client and others in respect of any matters outside the scope of the above.

This report is confidential to the Client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at its own risk.

Content

1. Introduction

Waterman Moylan have prepared the following Outline Construction and Demolition Management Plan for the implementation of the construction stages of the proposed Dublin Central development. It is noted that the development will be constructed in phases which are outlined in this report. This plan is prepared for Site 5 relating to the relevant Planning Application.

Dublin Central GP Limited are aware of the challenges that exist in delivering such a large and complex development within the city centre.

The plan sets out typical arrangements and measures which may be undertaken during the demolition and construction stages of the project in order to mitigate and minimise disruption and disturbance to the area around the site. Of particular note, are the protected and retained buildings and facades within the site, and the adjoining National Monument.

This plan will be used to guide the Main Contractor/Contractors who will have ultimate responsibility for developing a more detailed demolition and construction management plan for formal agreement with Dublin City Council in advance of them commencing the demolition or construction works on site. This plan will provide Dublin City Council with an outline proposal of how construction will be managed to comply with Local Authority and statutory requirements and will be updated post award of planning to reflect specific planning conditions which may be applied to the development.

This plan should be read in conjunction with all other planning stage reports included as part of this planning application.

2. Site Master Plan

2.1 Overall Site Development

A site wide cumulative masterplan encompassing an area of c2.2 Ha has been prepared by the Applicant to set out the overall development vision for the Dublin Central project. 'The Masterplan' area encompasses almost entirely three urban blocks. The area is bounded generally by O'Connell Street Upper and Henry Place to the east, Henry Street to the south, Moore Street to the west, and O'Rahilly Parade and Parnell Street to the north. Moore Lane extends south from Parnell Street through the centre of the masterplan area, as far as its junction with Henry Place.

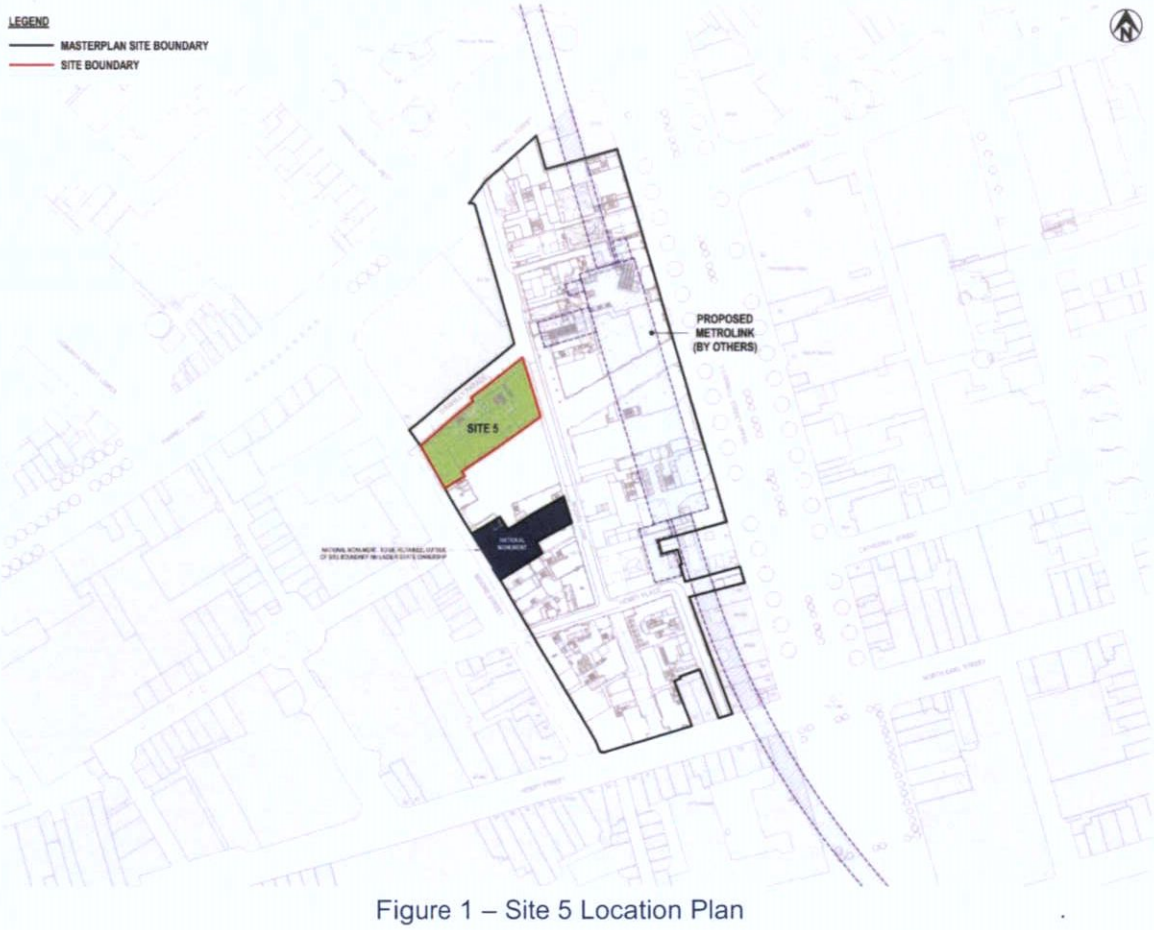


Figure 1 – Site 5 Location Plan

'The Masterplan' area includes structures of heritage significance that will be retained. Nos.14 -17 Moore Street are under the ownership of the Irish Government Office of Public Works and are not part of the Masterplan area. The buildings have been designated National Monument status and are subject to a preservation order.

The area will include a new Metrolink Station, to be the subject of a separate application by TII. The structure of the Metrolink Enabling Works (MEW) will be designed by the DCGP Ltd. civil/structural designer given the complex interface involved. The MEW is to be undertaken as part of the Dublin Central Development.

2.2 Development Phasing Strategy

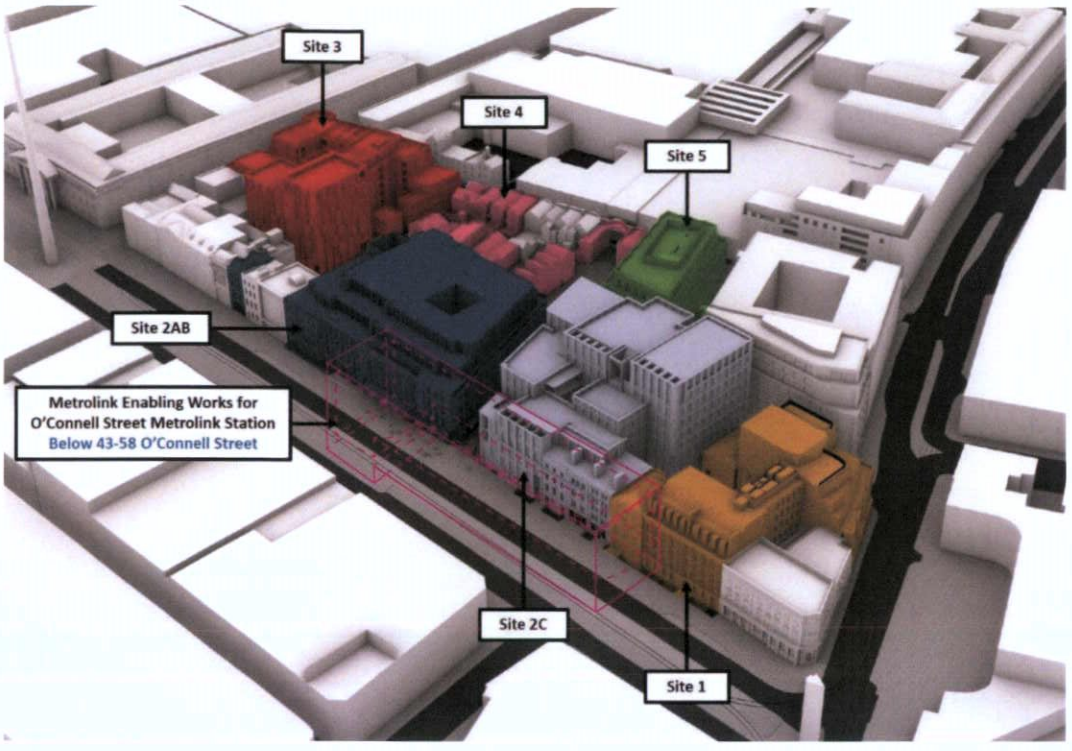


Figure 2 – Phasing Strategy

The Masterplan represents the cumulative development planned by the Applicant. Those elements outside the planning application site boundaries for Dublin Central Site 3, Site 4 and Site 5 are not fixed and remain simply an aspirational part of the 'the Masterplan' overall vision at this time. The Masterplan area has been divided into six identifiable sites for the purpose of making planning applications. The adopted site numbering is shown In Figure 2.

2.3 Site 5 Location

Located in the west of 'the Masterplan' area, Site 5 is bounded by Moore Street to the west, Moore Lane to the east, O'Rahilly Parade to the north and Site 4 to the south. Site 5 includes Nos. 22 – 25 Moore Street, Nos. 1 – 8 O'Rahilly Parade and Nos. 13 – 15 Moore Lane. The proposed development generally comprises a mixed-use scheme accommodating office and café / restaurant uses in a single building ranging in height from 2 – 6 storeys (top floor set back).

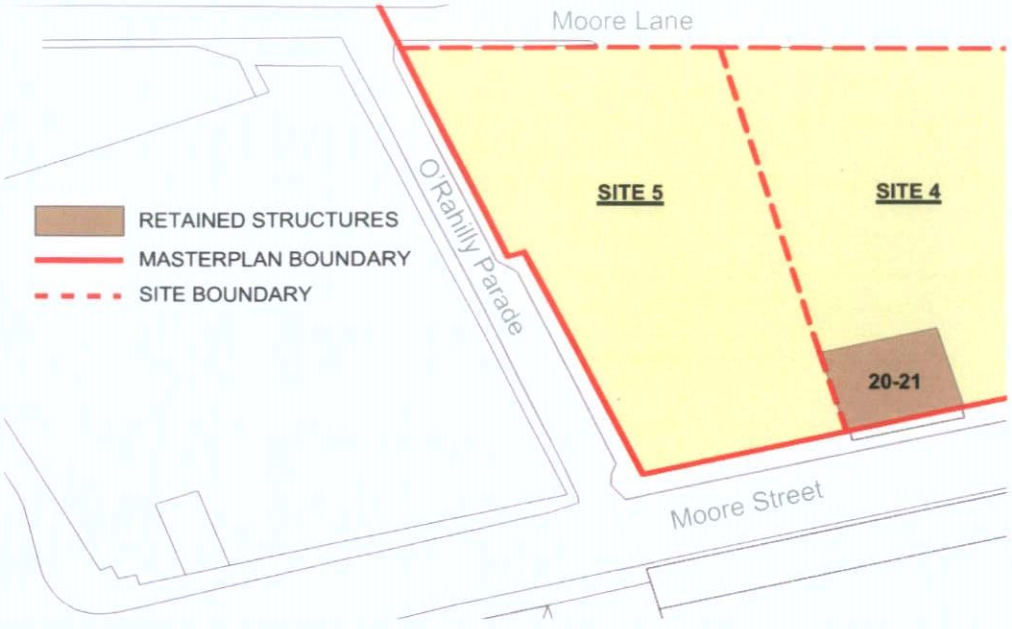


Figure 3 – Site 5 Location Plan

2.4 Key Milestones

Key Milestone Date	Site 5 Works
(Q3) 2022	Site Preparation
(Q4) 2029	Construction
(Q3) 2031	Fit-Out Works
(Q4) 2031	Completion

3. Site 5: Site Setup

3.1 Site Boundary

Hoarding will be required to the Site 5 boundary. This will be located along the Site 5 boundary to O'Rahilly Parade, Moore Street and Moore Lane.

Vehicle gates with barriers will likely be accommodated at a security hut combined with a secure turnstile to control pedestrian and vehicle access.

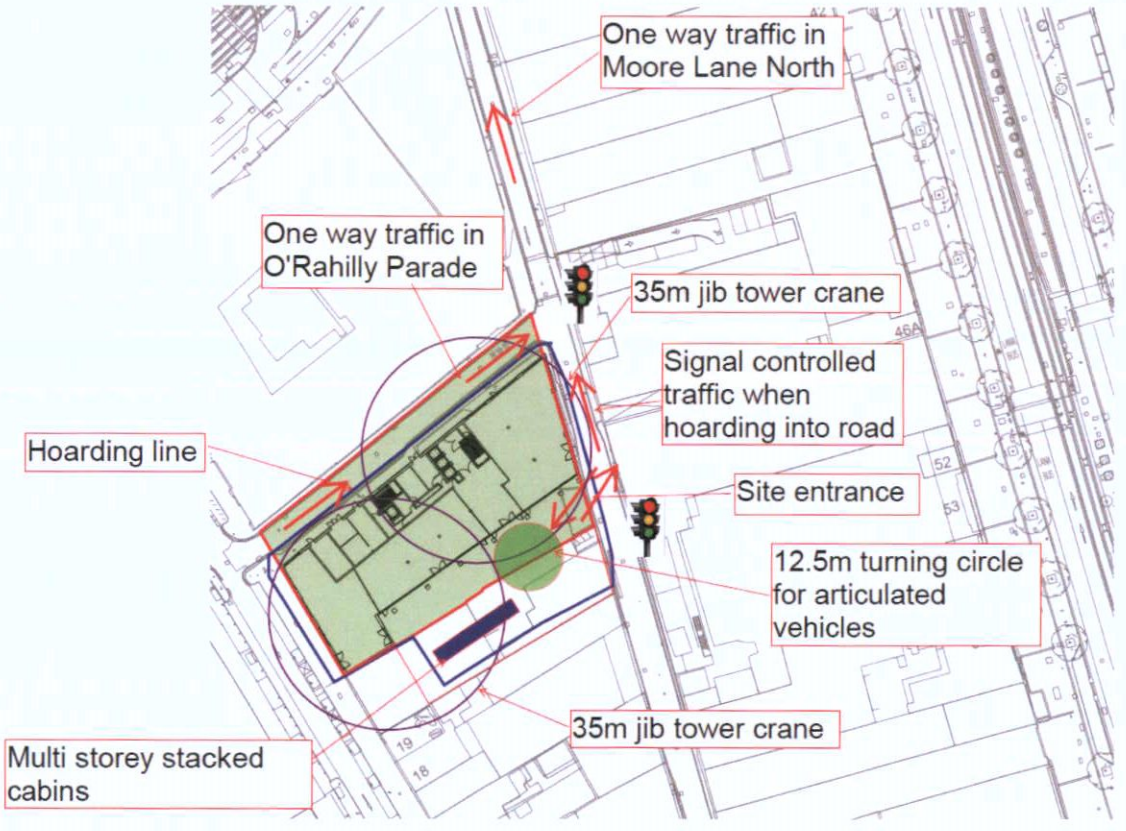


Figure 4 – Site 5 Proposed Site Setup

3.1.1 Site Hoarding

The hoarding will be designed at a later date by the Main Contractor/Contractor and will be designed to minimise impact to the footpaths along Moore Street and O'Rahilly Parade. Where necessary, the hoarding may be designed to incorporate covered walkways and elements of temporary works as part of the façade retention systems, to the agreement and approval of Dublin City Council.

The hoarding line will be maintained at all times during demolition and construction. In the event of any of the hoarding having to move outwards to facilitate construction activities, this will be done with the agreement of Dublin City Council including obtaining new hoarding licenses as required. If this encroaches on minimum footpath widths, the Main Contractor/Contractor will erect diversions to opposite footpaths to the agreement of Dublin City Council.

Figure 5 – Typical pavement hoarding with street lighting

Where there are ESB/telecommunication kiosks, light poles and traffic signage on the footpaths these will be maintained by the Main Contractor/Contractor where practical. The hoarding will be constructed around traffic lights and the kiosks to maintain visibility and access to the agreement of Dublin City Council.

3.1.2 Site Compound

The Site 5 compound will consist of:

- Offices
- Meeting Rooms
- Toilet / Shower Rooms
- Drying Rooms
- Canteens
- Storage Containers

All cabins will be steel securi-type with steel lockable shutters to windows and steel lockable door. All cabins will come to site in good condition and will be maintained in good order throughout the project. Double / triple stacking of cabins may be required with safe stairs and walkways provided to the upper levels of offices.

3.1.3 Site Access & Egress

Safety and ease of access to Site 5 are to be provided for by the Main Contractor/Contractor when planning the works. Separation of vehicular and heavy plant traffic from pedestrians and operatives will be implemented as far as is practical when considering the layout of the site infrastructure and access points.

Where a site access crossing is required on a pavement this will require a dedicated pedestrian management setup to ensure there are no incidents of crossovers between pedestrians and site vehicles. This may require a turtlegate barrier in addition to with semi-permanent barriers along the kerb edge, flagmen to control barriers and flagmen to watch truck movement and pedestrians.

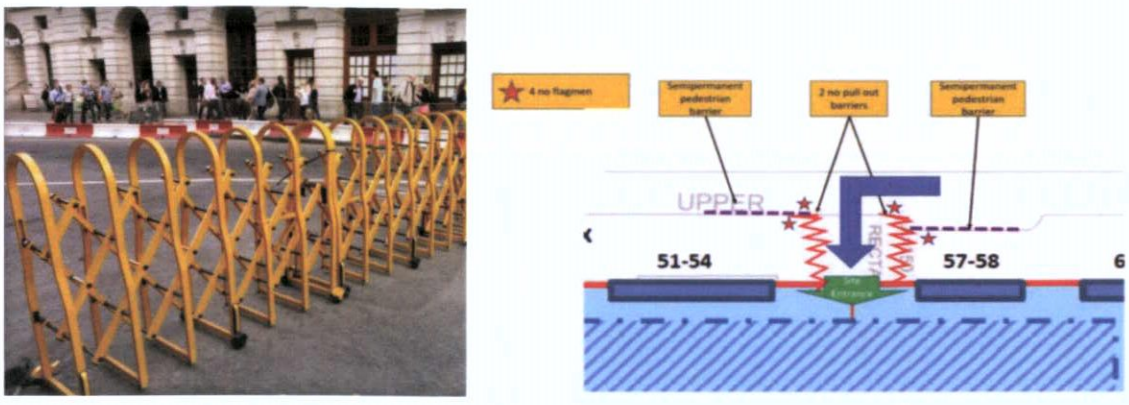


Figure 6 – Typical Pavement Crossover System

3.1.4 Site Logistics

Site 5 will require dedicated tower cranes to service the construction activities. This will include all stages of construction including the building envelope and fit-out lifting requirements. These may be complemented with teleporters, mobiles cranes, hoists and mobile concrete pumps as required.

The construction traffic and pedestrian routes are outlined in the Construction Traffic Management Plan. In general, trucks will be off loaded from the designated laydown areas. Deliveries will typically be on a just in time basis and this system will be strictly controlled by Main Contractor/Contractors who will organise the deliveries. The Main Contractor/Contractors will advise their suppliers on the delivery routes, ensuring the drivers are made aware of the site location and the correct route to site in accordance with the Dublin City Council heavy goods vehicles cordon restrictions.

If any plant setups are required outside the site, a road lane closure may be required. The road closure license will be obtained from Dublin City Council and an agreed traffic management plan will be implemented as required. Any traffic management measures will be designed by qualified personnel in accordance with Chapter 8 of the Traffic Signs Manual and implemented by Signing, Lighting & Guarding (SLG) trained operatives.

The logistics plan will be presented to workers during the site induction. Refresher training in the logistics plan will be presented in toolbox talks.

3.1.5 Proposed Craneage Strategy

Tower cranes will be required during each stage of the construction of the Site 5. The Main Contractor/Contractor will nominate the location(s) of these once appointed but indicative locations are shown in Appendix A – Proposed Site Setup. Mobile cranes may also be utilised on a short-term basis throughout the construction period.

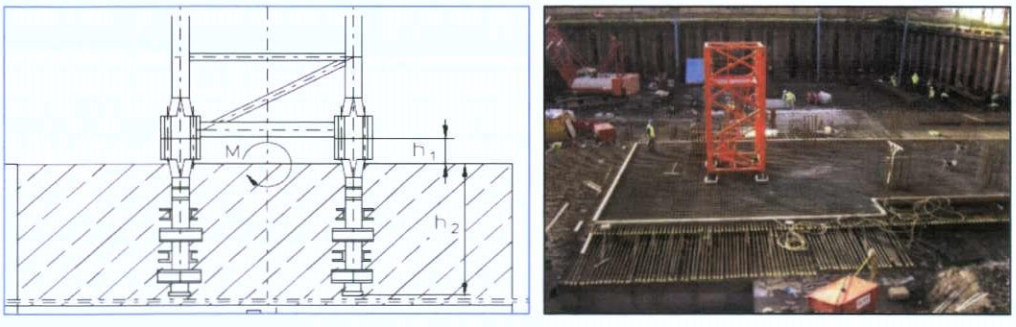


Figure 7 – Typical Tower Crane Anchors

3.1.6 Site Power, Waste & Drainage

A power supply from ESB Networks to power both the compound and the construction site will be applied for by the Main Contractor/Contractors. The size of supply will be calculated to ensure it is sufficient to power both the site compounds and construction site activities. A dedicated power supply will be provided for the tower cranes, task lighting, power tools and charging stations for plant such as electric hoists.

In the event of any delays securing the required power supply to power offices and cranes, generators may be required. Diesel generators will have sound enclosures and will be regularly serviced to prevent noise and odour pollution and setup in a spill tray to prevent any spillage contaminating the ground. Temporary site lighting will be installed to provide safe and well-lighted walkways around the site compounds and task lighting to the construction sites.

Water and drainage will be required to service the site toilets and canteen facilities. The Main Contractor/Contractors will carry out a site survey to identify the locations of the water and foul drainage connections to each of the sites. It will be the Main Contractor/Contractors responsibility to apply to Irish Water for connections to the water main and foul drain, ideally utilising existing connections.

3.1.7 Working Hours

The working hours will be dictated by the planning conditions and are expected to be as follows:

Days	Start Time	Finish Time
Monday-Friday	8:00	18:00
Saturday	8:00	14:00
Sunday	No work permitted	No work permitted
Bank or Public Holiday	No work permitted	No work permitted

Working times will be within the hours permitted by the Planning Decision for the development. It may be necessary to work outside these hours at times, for example for early morning concrete pours and late evening concrete finishing. The Contractor will consult Dublin City Council regarding out of hours working and local residents and businesses will be informed of any out of hours works required. A planning derogation will be applied for to Dublin City Council when out of hours working is required. The terms and conditions of the planning derogation will be strictly adhered to at all times.

3.1.8 Car Parking

In general, there will not be car parking for operatives on site. Personnel will be encouraged and informed of the numerous public transport options available to access the works.

3.1.9 Wheel Washing Facility Requirement

The Main Contractor/Contractors will ensure that the enabling works package will include provisions for a wheel washing facility with water collection and filtering before any discharge to the public surface water drainage system. Trucks discharging concrete should have a wash out area to clean the chute prior to entering the wheel wash.

Figure 8 – Typical Wheel Washing Facility

3.1.10 Expected Vehicle Movement

An outline construction traffic management plan has been prepared and details access routes, site signage, haulage license protocols and environmental control procedures. Reference should be made to the Construction Traffic Management Plan submitted as part of the planning documents.

Once the construction programme is finalised by the appointed Main Contractor/Contractors, a detailed breakdown of the expected vehicle movements will be available.

3.1.11 Security

In additional to the hoard to the site perimeter the following measures will be adopted by the Main Contractor/Contractors:

- A dedicated site security team with 24hr access to the site and direct contact with the local An Garda Siochana station.
- Each person on site will have been inducted and fingerprint access control will be used for site entry and exit. The Contractor will know who is on site at all times.
- There will be a site CCTV system which may be extended to cover the footpaths and roads around the site (depending on the GDPR regulations).
- Hoarding lighting will be incorporated to increase the general illumination levels around the site.
- Siting the cabins behind the hoarding with windows overlooking the streets will provide a greater degree of natural surveillance to the area to ward against anti-social behaviour.

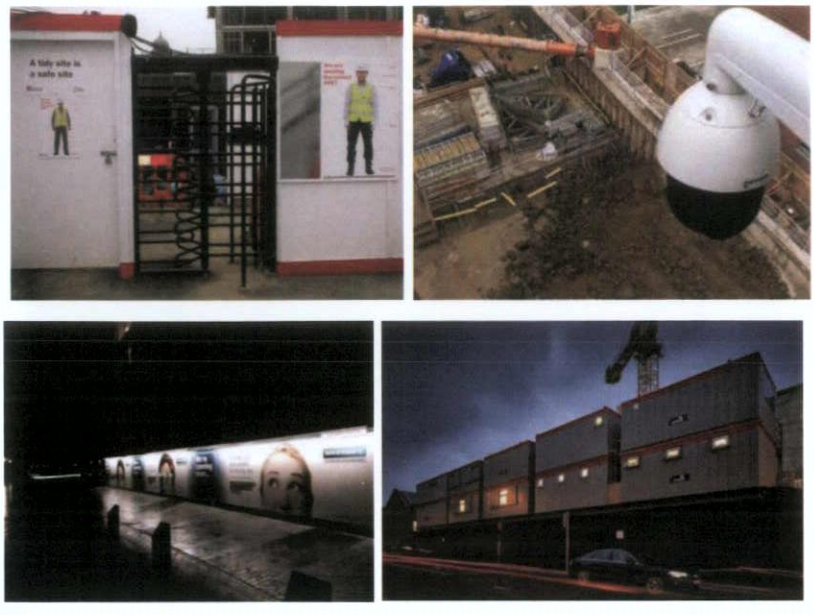


Figure 9 – Typical Site Security Measures

4. Site 5: Construction Methodology:

4.1 Description of the works

Site 5 is a 2 to 6 storey building for office use. In addition to the office entrance and reception there are food and beverage units at ground floor and a partial single storey basement to house plant.

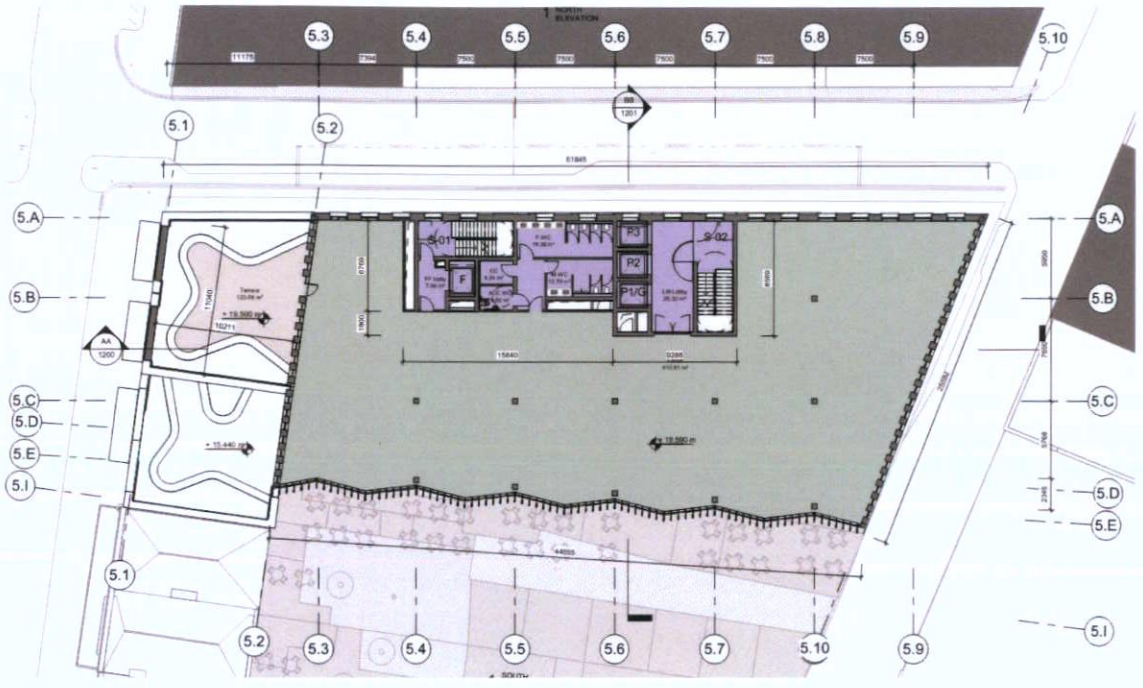


Figure 10 – Site 5 Architectural Layout

4.2 Site Surveys Required

At the next stage of the project, intrusive structural investigations will be undertaken on the structural fabric These have not been possible at this stage because of the restrictions on travel and access due to the COVID-19 pandemic. Investigations will include sampling and testing of the structural fabric to determine strength and material properties. Structural works will be based on the desire to conserve the structures with intervention limited to the essential works required to enable the buildings to provide the required performance and long-term durability. As the approach for these particular buildings is refurbishment and conservation rather than replacement, consideration will also be given to the need for ongoing and potentially increasing maintenance given the age of the existing structures.

Ahead of the demolition activities commencing, extensive site surveys will be required, including:

- Opening-up works to confirm existing buildings load-paths;
- Opening-up works to confirm existing materials & historic alterations and adaptations made;
- Opening-up works to areas covered, unexposed or inaccessible;
- Conditions/dilapidation surveys of the existing retained/protected structures;
- Additional Geotechnical Investigations (if required);

4.3 Demolition & Enabling Works

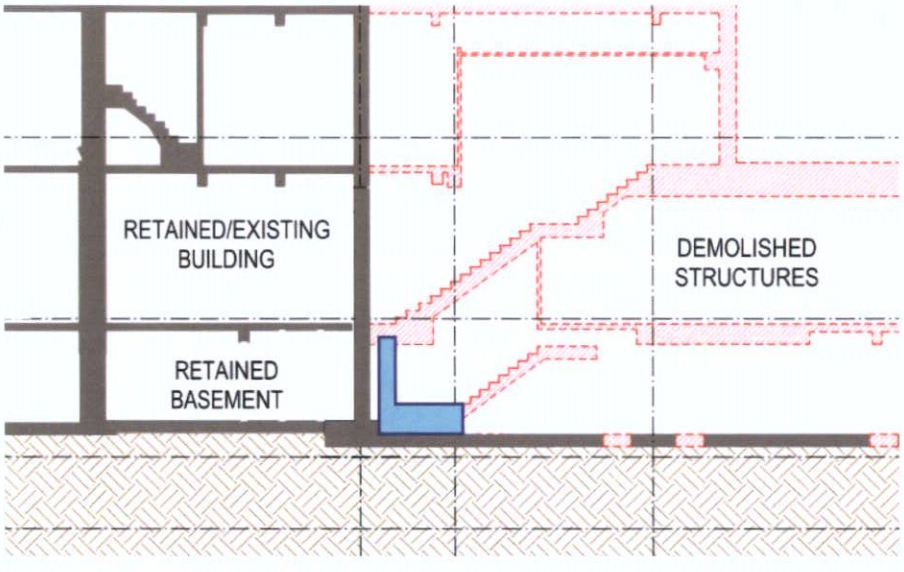
All demolition is to be carried out in accordance with *BS 5228-1 2009, Code of Practice for Noise & Vibration Control on Construction and Open Sites.*

The sequence of works for Site 5 is typically as follows:

STAGE 1 – INSTALLATION OF TEMPORARY / ENABLING WORKS

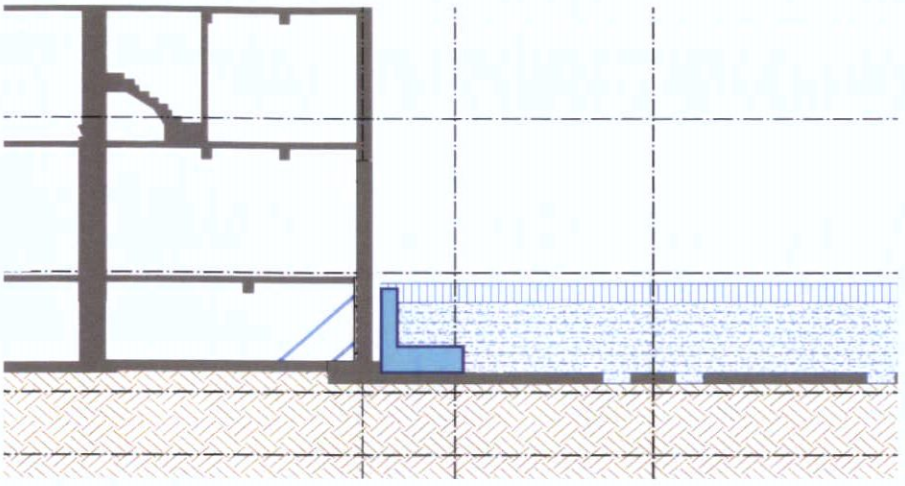
- Temporary works will may required to the boundary/party to 20-21 Moore Street subject to site investigations.

STAGE 2 – DEMOLISH EXISTING BUILDINGS & PROBE/BREAK OUT FUTURE PILE LOCATIONS



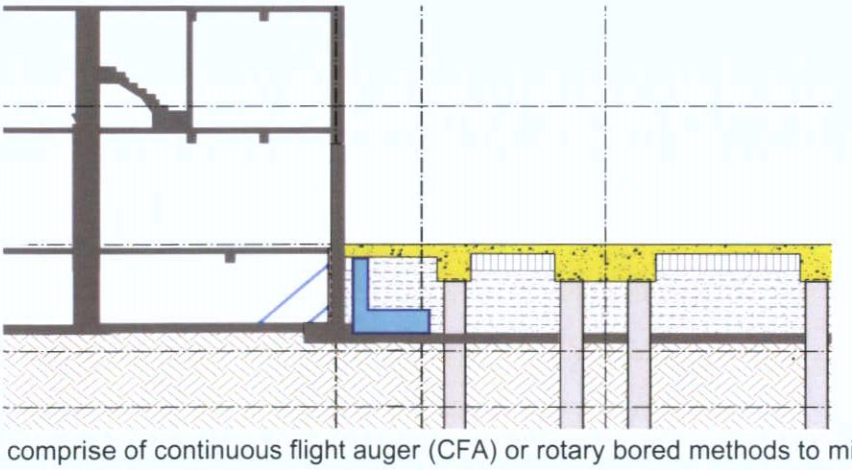
- Demolition of the existing buildings will be undertaken top-down using traditional methods with all demolition arising segregated and removed from site. The extent of demolition is shown on the Architect's drawings.
- Portions of the existing Basement Level slab, foundations and obstructions will be removed at proposed pile locations.
- Structure adjacent to 20-21 Moore Street boundary/party wall will be demolished using non-percussive methods. This will likely involve saw-cutting the slabs/walls first to isolate the members before commencing the demolition activities.
- The retained basements will require a new basement retention system to avoid surcharging the existing structure. This may involve new precast reinforced concrete retaining walls located against the existing basement walls included as part of the enabling works to support the follow-on piling activities.
- In consultation with the conservation Architect, it is envisaged that a breather membrane and compressible filler will be installed between the new retaining wall and the existing basement wall to protect the existing wall.
- A void between the new retaining walls and existing basement walls may be accommodated and will be to the Conservation Architect requirements and details.

STAGE 3 – EXISTING BASEMENTS WILL BE BACKFILLED WITH WELL GRADED HARDCORD IN COMPACTED LAYERS TO SUIT PILING MAT REQUIREMENTS



- The piling mat will be well graded hardcore to the Piling Contractors requirements and subject to design by the Temporary Works specialist. This will provide a level platform from which the piling operation will be undertaken.
- The existing basement will be infilled with well graded hardcore that is suitable for piling and conforms to SR:21 Annex E requirements.

STAGE 4 – INSTALL BEARING PILES AND SECANT PILED BASEMENT WALL



- Piling will comprise of continuous flight auger (CFA) or rotary bored methods to minimise ground borne vibrations during piling.
- Piling will also include a secant piled wall that will form the enclosure to the new basement perimeter wall.
- Reinforced concrete will form the new pile caps, basement slab and ground floor structure.

4.4 Sub-Structure & Foundations

In order to minimise the excavation to form the basement level it is proposed to construct the single storey basement via a 600mm diameter secant pile wall.

The secant piled wall comprises interlocking hard (male) and firm (female) piles, which will provide an inherently stiff wall which will enable a robust temporary works solution to be adopted. The secant wall will also provide resistance to water penetration and loss of any fine material from behind the wall which could affect adjacent buildings and infrastructure. Piles will be spaced to be ensure interlock to below base excavation level and of sufficient length to achieve hydraulic cut-off for construction. The secant wall will also provide direct support for the superstructure, with the capping beam distributing substantial vertical loads on to the embedded retaining wall and using the inherent vertical load capacity of the wall and thus minimising bearing pile requirements.

The top of the piled wall will be tied together with a 1050x1000m reinforced concrete capping beam which will allow the transfer of vertical frame and floor loads onto the piles. The secant wall will be designed by the piling specialist for the lateral pressures due to earth, water and surcharge plus vertical loads both in the temporary and permanent conditions. The specialist will also be responsible for all temporary propping prior to completion of the permanent works for final load transfer.

The secant wall will be designed by the piling specialist for the lateral pressures due to earth, water and surcharge plus vertical loads both in the temporary and permanent conditions. The specialist will also be responsible for all temporary propping prior to completion of the permanent works for final load transfer. A 300mm thick reinforced concrete floor at basement level will be tied to and supported by the secant wall.

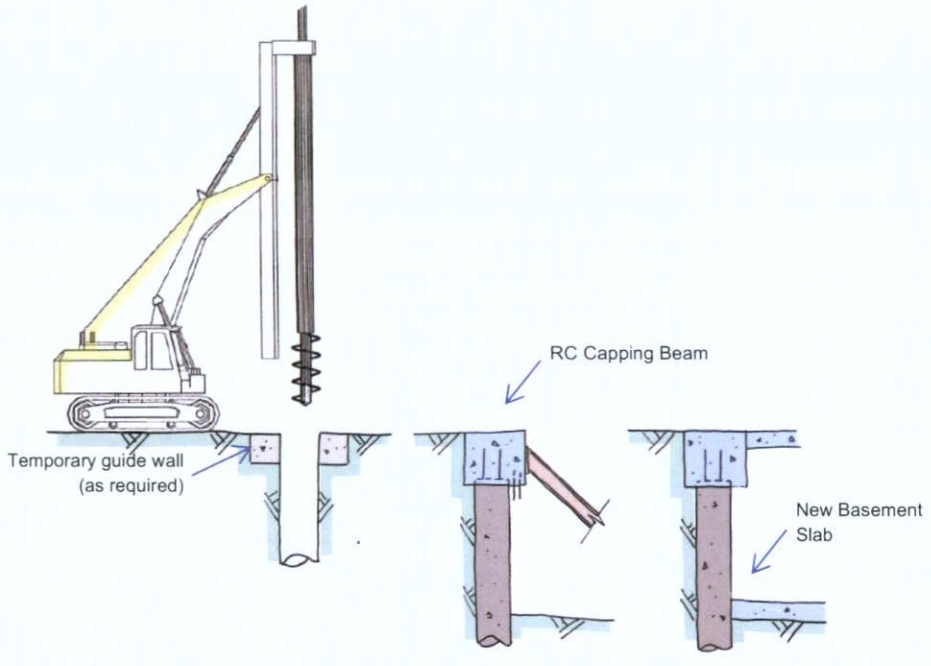


Figure 11 – Typical Secant Piled Wall Installation

Where columns are not located above the secant pile wall of the basement they are proposed to be founded on piles. Piles are anticipated to be traditional non-displacement rotary bored piles founded within the clay Based on the ground conditions identified and the building frame loads, 3 piles are used per column. Using 3 piles also provides the stability for individual columns and avoids restraint ground beams. 1200mm deep pile caps above the piles support the columns over.

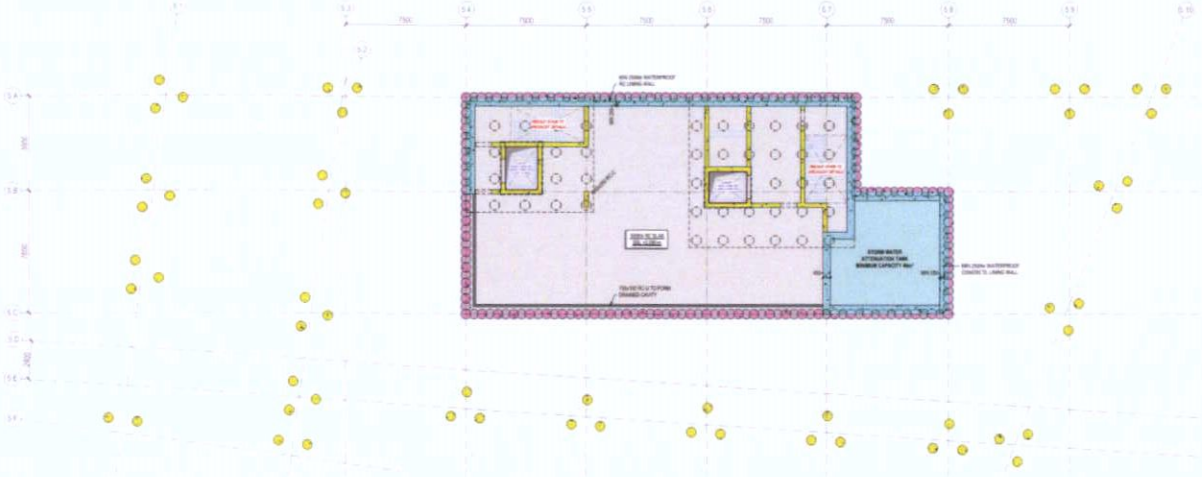


Figure 12 – Proposed Pile Layout

4.4.1 Attenuation Tank

The drainage strategy includes attenuation to regulate the flow to the main sewer system which is to be provided through a combination of attenuation tanks and blue roofs. Site 5 requires 46m³ of attenuation through the combination of blue roofs and an attenuation tank. With regard to the attenuation tank, it is understood that the requirement of the local authority is for a concrete tank into which access can be gained. Therefore, a below ground crate storage system has been discounted from current proposals.

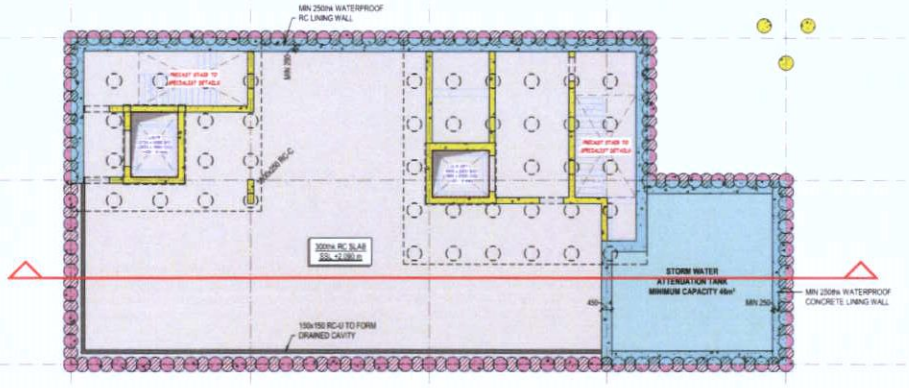


Figure 13 – Proposed Attenuation Tank

The secant pile wall will follow the perimeter of the basement and the attenuation tank. The separating wall between the attenuation tank and the basement will be constructed as a 450mm thick RC wall spanning between the secant pile perimeter wall/core walls, with minimum 250mm thick concrete lining walls to the secant piled wall. The tank slab is to be a minimum 300mm thick Waterproofing for the tank is to be provided by including a waterproof additive within the walls and slab. Should the invert levels of the attenuation tank not allow for gravity drainage to the main sewer a sump will be included within the slab of the attenuation tank.

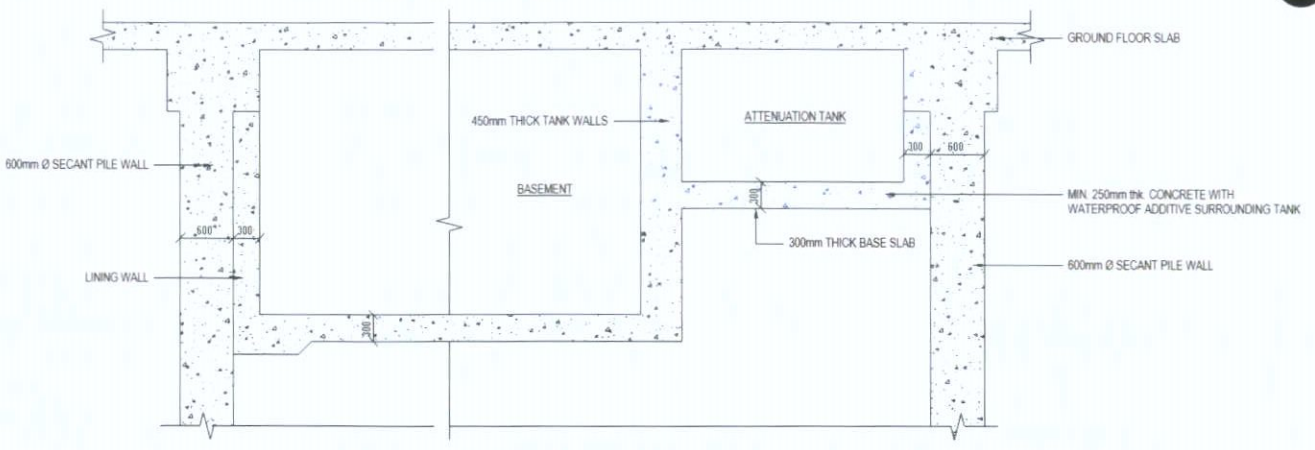


Figure 14 – Typical Section Through Attenuation Tank

4.5 Super-Structure

The proposed structural solution for superstructure is a steel frame with composite concrete metal deck slabs.

This will coprise of a grillage of 533x210x82 UB primary structural beams typically run parallel to the long with 533x165x66 UB secondary beams are provided at 2.5m centres. Spacing of secondary beams allows for un-propped Comflor51 re-entrant metal decks slabs to be used in construction.

Columns are typically 305x305x118 UC sections. Slabs are proposed as 140mm thick to support the applied loads and provide 90 minutes fire resistance. 250mm thick in situ concrete core walls to house the lifts and stairs provide stability to the structure.

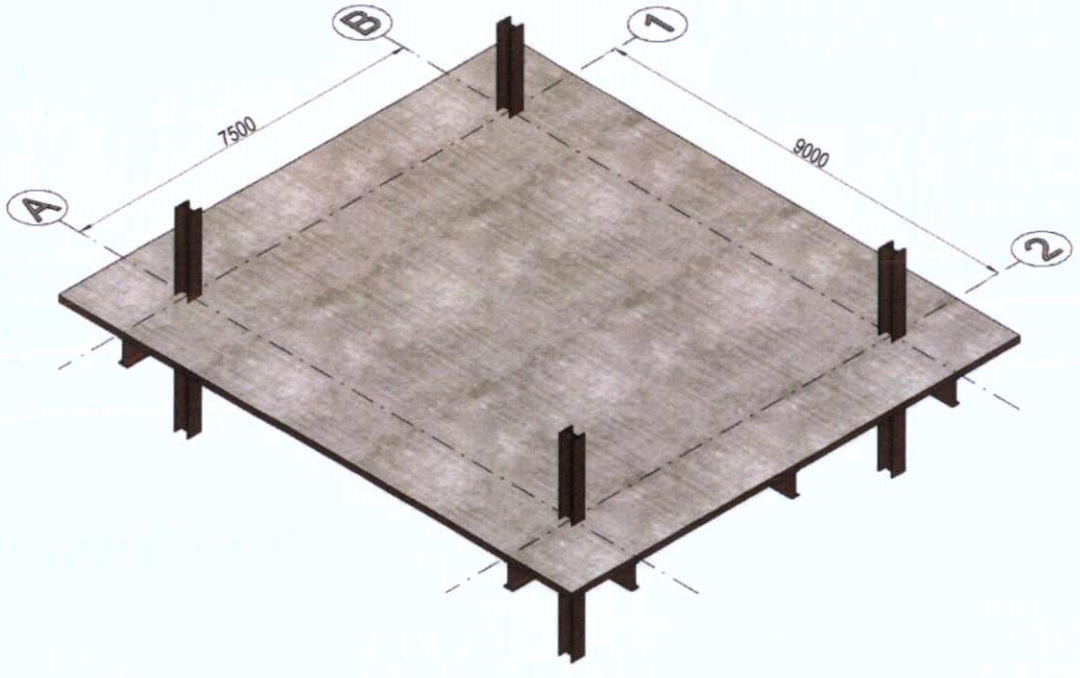


Figure 15 – Typical Steel Frame Structural Grid

The super-structure will likely use traditional construction techniques. The steel beams and stanchions will be erected typically on a floor-by-floor basis using the tower cranes to lift the bolted section in to position. The metal decks on each floor will provide a safe working platform to guide the sections in to position.

Figure 16 – Typical Steel Frame Erection

The bolted steel sections will typically arrive on site with prefixed edge protection and off-site applied intumescent paint fire protection applied, to limit the amount of site works required.

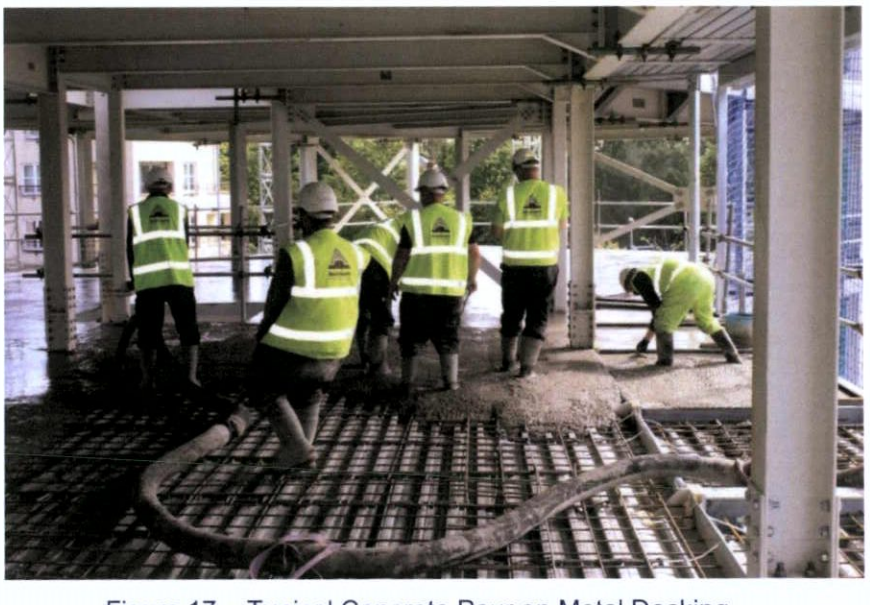


Figure 17 – Typical Concrete Pour on Metal Decking

The sequence of pouring the concrete on the metal decks will typically occur after 2-storeys of metal deck are completed to safeguard the concrete pours from the overhead steel erection operations. The metal decks will typically not require temporary back-propping or formwork in advance of the concrete placement. Concrete placement to the metal decks will typically be via pumping for all large pours to free-up the crane for other lifting operations. Wind and weather will be monitored, and crane usage will be restricted as required during inclement weather to ensure safety of all personnel.

4.6 Existing Structures

4.6.1 Interface to 20-21 Moore Street

No. 20-21 Moore Street is located within the Site 4 boundary which sits adjacent to Site 5. Consideration for the boundary has been made within the structural proposals where there is no proposed basement in this location and foundations for the superstructure adjacent to the building have been moved away from the boundary to mitigate the risk of undermining existing foundations and causing damage to the existing building during construction.

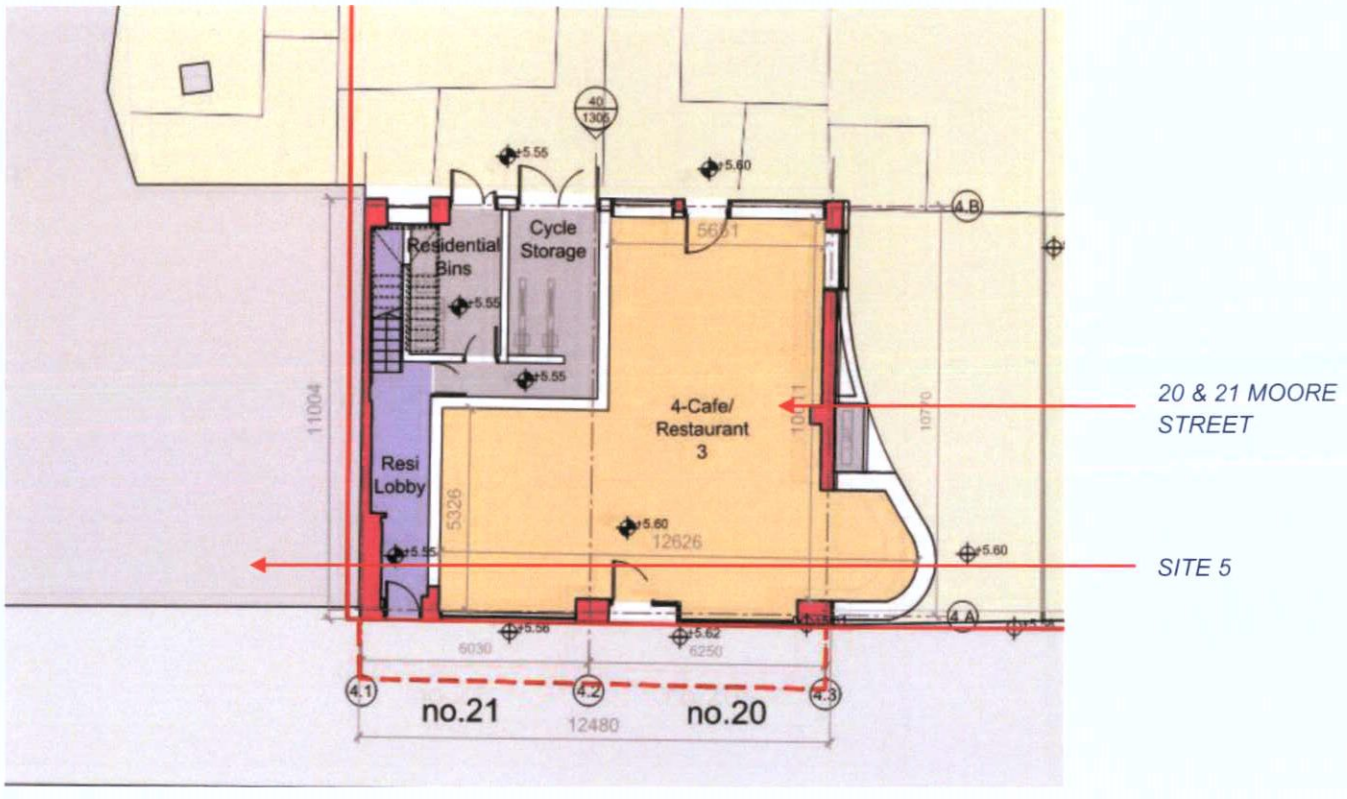


Figure 18 – Retained 20-21 Moore Street - ACME Site 4 Drawing DC-ACM-4X-B1-DR-A-20-1199-P05.

At the next stage of the project, intrusive structural investigations will be undertaken on the structural fabric. This will include a visual structural inspection with the finishes removed and sampling and testing of the structural fabric to test for strength and material properties. Structural works will be limited to essential works required to enable the buildings to provide the required performance and long-term durability. As the approach for these particular buildings is refurbishment rather than replacement, consideration will also be given to the need for ongoing and potentially increasing maintenance given the age of the existing structures.

Pile foundations along the boundary with No. 20-21 Moore Street, will be offset from the building line to allow access for a piling rig away from the retained wall. Ground beams will cantilever from the pile caps to support the columns at the corners of the building. It is understood that there are no basements beneath 20 and 21 Moore Street therefore construction at the ground level will not surcharge the structure.