

# CONSTRUCTION-RELATED MATTERS. (Rehill)

**IN THE MATTER OF AN APPLICATION TO  
AN BORD PLEANÁLA  
FOR PERMISSION FOR  
STRATEGIC INFRASTRUCTURE DEVELOPMENT  
(THE CHILDREN'S HOSPITAL OF IRELAND)  
THE BOARD Reg. No. PL29N.PA0024**

**AND IN THE MATTER OF AN ORAL HEARING**

**Statement of Evidence of**

**David Rehill, O'Connor Sutton Cronin Consulting Engineers**

**On the Topic of Construction Related Matters**

## **1.0 PROFESSIONAL QUALIFICATIONS AND EXPERIENCE**

My name is Mr David Rehill. I am a Chartered Engineer with the Institute of Structural Engineers and Engineers Ireland and hold a Bachelor of Engineering from University College Dublin (2003) as well as a Diploma in Project Management from Trinity College Dublin (2007).

I am currently an Associate with O'Connor Sutton Cronin Consulting Engineers. In this role I am responsible for the project management and co-ordination of civil and structural projects, from concept through to completion on site. My experience includes various commercial, mixed-use and public developments throughout Dublin, notably;

- Heuston South Quarter;
- Convention Centre Dublin.

## **2.0 ROLE IN PROPOSED DEVELOPMENT**

I am directly responsible for the following areas of the project, and the preparation of the corresponding sections of the Environmental Impact Statement [EIS]:

- The Outline Construction Strategy.

## **3.0 KEY ISSUES IN RELATION TO CONSTRUCTION IMPACT**

### **3.1 Introduction**

The **Outline Construction Strategy** (OCS) document outlines the following issues:

- An indicative sequence of the works from the initial enabling works through to the bulk excavation, substructure and superstructure construction;
- Specific reference to the activities that may have an impact on the general public; such as the truck movements associated with the bulk excavation.
- It ensures the maintenance of appropriate safety measures for the public and particularly for vulnerable road users including pedestrians.

The outline construction strategy document is a precursor to, and forms the basis of, the **Construction Management Plan** which the Contractor must

submit to Dublin City Council for approval prior to commencement of works. This is stipulated in the Submission to An Bord Pleanála by Dublin City Council under Section 15.0 Planning Authority View on Conditions:

Section 15.3 Item 5 states:

*“A project traffic management plan for all stages of construction traffic shall be agreed in writing with the Planning Authority before demolition, excavation and construction commences. The plan shall detail access arrangements for labour, plant and materials and shall indicate the locations of plant and machine compounds.”*

### **3.2 Description of Existing Environment**

The development site subject to this application is c2.65 hectares and is located at the Mater Hospital on Eccles Street, Dublin 1. The site is bound to the south by Eccles Street, to the east by the Mater Private Hospital, to the North by the new Mater Misericordiae Adult Acute Hospital (currently under construction) and to the west by the Old Mater building. The proposed Metro North Mater Stop Box is located to the north east corner of the site. There is a residential area adjacent to the Mater Stop Box.

Of the surrounding road network, the main pedestrian entrances and drop off points for both the Mater Misericordiae University Hospital (MMUH) and the Mater Private Hospital (MPH) are located on Eccles Street. The entrances to both the staff and public surface car parks for the MMUH are also located on Eccles Street (the public car park closed temporarily in September 2011 to facilitate the construction works for the new MMUH Adult Hospital).

### **3.3 Construction Sequence**

The following section Madam Inspector outlines the general construction sequence of the building. A more detailed breakdown of activities is included in the OCS and Appendix A of this document.

Prior to commencement, an initial liaison or briefing period will be held with the relevant adjoining neighbours; namely the Local Residents, the MMUH and the MPH. These discussions will outline the sequence of works and the potential impacts that may result.

It is intended that a community liaison committee will be established prior to commencement of the development. Committee membership will include a number of members of the local community, as well as elected members of the Council, Officials of the Council and representatives of the developer. The committee will liaise with the appointed contractor who will be required to monitor noise, dust and vibration during construction.

A detailed survey will be carried out on all overhead and buried services. A 3m hoarding, including a protected temporary walkway, will be erected along Eccles Street. An 8m proprietary hoarding will be erected on the north, east and west boundaries.

Throughout this document, the overall site is reviewed in two areas. Area 1 is east of the existing entrance ramp to the concourse building and comprises of the current surface car park. Area 2/3 is west of the existing entrance ramp and extends up to the Old Mater Building and out to the North Circular Road.

The entrance to the Area 1 section of the site will be formed next to 38 Eccles Street. The exit for Area 1 will be located to the east of the site and construction traffic egress will be co-ordinated with the RPA Construction entrance, access to the new MMUH Adult Hospital car park, Ambulance access to the new MMUH A&E Department and finally pedestrian access to the new MMUH Adult Hospital (Madam Inspector, further information will be outlined on this issue later in this document). Similarly, a dedicated construction access / egress point will be created on the North Circular Road. At both locations, a team of Flagman will co-ordinate traffic movements and ensure safe passage of pedestrians / cyclists.

An initial Services Diversion Contract will involve the re-routing of existing services within the development area that currently serve the MMUH buildings that are proposed to be retained, namely the Old Mater Building and No's. 30 to 38 Eccles Street.

Prior to the commencement of the bulk excavations, a series of buildings or structures will be removed or demolished. The particular buildings and the demolition methods that will be employed are outlined in the OCS.

The perimeter pile wall to form the basement will consist of interlocking secant piles ranging from 900mm to 1200mm diameter. The piles will be installed by a rotary piling rig at a rate of approximately 1.5 No. piles per day and will operate in strict compliance with the vibration and noise tolerances specified in Chapter 10 of the *EIS Noise & Vibration*.

The Area 1 and Area 2/3 excavation will involve the removal of approximately 157,000m<sup>3</sup> and 112,000m<sup>3</sup> of soil respectively. A series of site investigations were carried out and are documented within Chapter 7 of the EIS; Soils, Geology and Hydrogeology. A number of protocols that will be adopted during the excavation process are outlined within the OCS and Appendix A of this document. It is considered that approximately 7 No. trucks for excavation disposal will access and depart the site per hour. Strict limitations and constraints will apply to the construction vehicle movements and these are outlined in the OCS and Appendix A of this document. Road sweeping and washing will be in continuous operation along the North Circular Road,

Berkeley Road and Eccles Street for the full duration of the substructure works.

Due to the large footprint of the site it is envisaged that the Contractor will construct the basement slabs in phases; commencing at the east of the site and progressing west. On average, the concrete deliveries to site will be 35-40m<sup>3</sup> per hour (4-5 concrete wagons). A similar sequence of construction will occur as the building levels progress.

The procedures adopted for the substructure construction will be maintained for the superstructure construction. The Contractor will receive feedback from the adjoining neighbours, via the Community Liaison Committee and Independent Specialist Monitoring Consultant, on potential disruptions and work activities can be amended to minimise this as works progress.

In addition to the main building structure, a description of the unitised façade system and also the mechanical and electrical installations are outlined the Appendix A of this document.

### **3.4 Hours of Work**

We propose the hours of construction works on site Monday to Friday- 7.00am to 6.00pm and Saturday 8.00am to 2.00pm with no deviation from these times unless in exceptional circumstances where prior written approval shall be obtained from Dublin City Council (DCC). We note and confirm that these hours of works are in agreement with and consistent with the hours as proposed by DCC. In consideration of the exceptional circumstances for out of normal hours working and in order to comply with the very strict vibration limits for sensitive areas and activities within the Mater Private Hospital and having discussed with the MPH as part of the agreed mitigation measures, certain piling works along the eastern site boundary may require to be carried out outside of these core hours on Monday to Saturday. We also note that a similar approach was proposed by the RPA under the works proposals for Metro North for working outside of the normal hours and the Board in its decision considered this to be an appropriate and reasonable approach to mitigation. In this regard, written agreement for the CHol out of hours construction works shall be obtained in writing from DCC prior to commencement of these works. At this time, it is expected that it will take an estimated 8 to 10 weekends out of normal hours working commencing Saturdays at 2pm to 6pm and Sundays/Public Holidays 9am to 6pm, relating to certain piling operations along the eastern boundary.

Accordingly, NPHDB is proposing that the Board considers permitting a derogation from the standard proposed hours of construction work in relation to the exceptional requirements to carry out certain piling works, as detailed above.

### **3.5 Potential Impacts, Mitigation Measures and Residual Impacts Arising from Proposed Development**

As the last section highlights, the Construction process involves the sequence of individual tasks; from the initial excavation phase to the fit-out of the ward floors. A series of tables identifying the sections of the EIS that address the *Potential Impacts, Mitigation Measures and Residual Impacts* are identified in Appendix B.

## **4.0 SUBMISSIONS AND RESPONSES**

A number of submissions<sup>1</sup> made to the Bord in respect of the proposed development included reference to construction related matters. Given that many of the submissions raised similar issues, it is proposed to deal with those issues on an aggregate as opposed to individual basis so as to minimise repetition

### **4.1 Issue – Construction Impact**

#### ***Submission:***

A number of submissions refer to the matter of the construction works and the impact on the immediate neighbouring buildings. Ms Nuala Morris refers to the noise and pollution from years of construction. Ms Patricia Fennelly and Ms Clare Fallon address the imposed inconvenience already present in the vicinity from the Metro North and MMUH Adult Hospital construction works. Finally, the Berkeley Environment Awareness Group raise concerns on noise, pollution, dust and dirt and the impact this will have on their homes.

#### ***Response:***

A series of measures will be implemented during the construction works to minimise potential disruption to the neighbouring properties from Noise, Dust and Vibration. Each topic is addressed within the Chapter 8 and 10 of the EIS. The construction methodologies that will be adopted are also outlined in the OCS. The following identifies the construction activities and the measures employed to ensure minimal impacts from Noise, Dust, Dirt and Vibration.

As noted earlier in the Statement, a dedicated Community Liaison Officer will outline to the neighbouring residents the sequence of works, and the potential impacts that may result.

The initial construction activities will involve constructing an 8m hoarding on the north, east and west boundaries, with a lower 3m hoarding along Eccles Street. The “Layher” acoustic screen system (or similar) is proposed, which

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<sup>1</sup> Includes Nuala Morris, Patricia Fennelly, Clare Fallon, Berkeley Environment Awareness Group.

utilises prefabricated cassettes that are fixed to a scaffold frame (see Figure 6 of the OCS). Insulation mats within the cassettes provide the acoustic performance. This system has been used recently at the Royal Hospital in London adjacent to operating hospital wards.

Prior to the commencement of the bulk excavations, a series of buildings or structures will be removed or demolished. The reinforced concrete elements will be removed using non-percussive demolition techniques such as saw-cutting, splitting etc. to minimise disruption to the Hospital and the surrounding buildings. Explosive or high vibrating generating techniques are not permitted. All skips and chutes will be covered during the demolition phase to prevent dust escaping.

The perimeter pile wall will consist of interlocking secant piles ranging from 900mm to 1200mm diameter. The piles will be installed for the existing site level to a predetermined toe level. The analysis to date has indicated that this toe level will be -7.5mOD. Rock level on site was generally encountered at -10mOD.

The Area 1 and Area 2/3 excavation will involve the removal of approximately 157,000m<sup>3</sup> and 112,000m<sup>3</sup> of soil respectively. As noted, the basement formation level is approximately 12-14m above the anticipated rock level. It is not envisaged that rock breaking will be required as part of the basement excavation works. The excavation vehicles will enter the site next to 38 Eccles Street and exit to the east boundary of the site. The site is located within the 5-axle HGV cordon restriction. The Contractor will submit a weekly HGV Management Plan outlining any deliveries that necessitate 5-axle vehicles. The site speed limit will be restricted to 10 km/hr. The speed limit on Eccles Street will be limited to 30 km/hr. All vehicles will be fitted with flashing beacons, reversing sirens and comply with all relevant regulations. Site vehicles will be prohibited from parking or turning in residential areas.

Following a review of similar sites located throughout the city centre, it is considered that approximately 7 No. trucks for excavation disposal will access and depart the site per hour. As noted previously, strict control will apply to approaching and departing vehicles to ensure disruption to the public is kept to an absolute minimum. The excavation vehicles will be 4-axle Hino 700 rigid tippers (or similar) and will carry approximately 10m<sup>3</sup> of excavated material. The excavation vehicles will enter / exit the excavation via a constructed haul road. The gradient of the haul road will be in the order of 15% which is in keeping with the noise assessment. The haul road will be finished with a temporary tar macadam surfacing (or similar) to minimise the spreading of dust and provide an even surface for truck movements.

The tippers will have a built-on tarpaulin that will cover the excavated material during transit. No large off-road Dump trucks will be allowed to operate on public roads. A wheel wash system will be implemented on-site to prevent mud being tracked onto the adjoining roads. The wheel wash will be located a minimum of 20m but sufficiently far from the exit to allow trucks to 'drip off' prior to exit. The wheel wash footprint will measure approximately 5m x 3m will consist of a wash platform to allow for one full wheel revolution. Direct spray nozzles will be located on side walls and will be designed to prevent overspray from the jets and allow for maximum water retention. The water will be directed into a settlement tank to allow for the silt/clay particles to settle out and the water to be recycled and used again. The material that has settled out following the above process will be carefully stockpiled on-site in advance of intermittent disposal to a suitable disposal outlet.

The co-ordination of the excavators with the truck movements may necessitate stockpiling material. The height of stock piles will be limited to 5-6m, but never higher than the 3m high hoarding along Eccles St. Any stockpiled material will be dampened during dry periods to prevent the spreading of dust. A "Dust Boss" system will also be adopted to suppress any air borne dust. This system utilises a low grade fan to blow a fine controlled water mist over the excavation area and haul routes. This system was used during the basement excavation of the MMUH Adult Hospital. Dust deposition will be monitored, using Bergerhoff gauges, at the boundary of the site to ensure compliance with the EPA limit of 350 mg/m<sup>2</sup>/day. Should the limits be exceed, the works will cease and appropriate procedures will be implemented; such as reducing travel speeds, reduction of spoil heights, increase water suppressions systems etc. All machinery will be monitored and maintained to ensure the operating noise limits do not exceed the limits outlined in the EIS.

Road sweeping and washing will be in continuous operation along the North Circular Road, Berkeley Road and Eccles Street for the full duration of the substructure works. There after the roads will be inspected twice daily and cleaning as required.

As part of the design of the concrete works, a review was carried out on the frequency of concrete deliveries to large sites around the city centre. On average, the concrete deliveries to site will be 35-40m<sup>3</sup> per hour (or 4 - 5 concrete wagons). The Contractor will limit the size of the pour based on the concrete that can be delivered over the course of a day. The control of concrete vehicles will be similar to the control of the excavation vehicles. Vehicles accessing Area 1 will enter the site adjacent to 38 Eccles Street and exit at the eastern boundary. Vehicles accessing Area 2 will enter and exit the site from the North Circular Road. A concrete pump will assist the concrete placement. For the low level pours, the concrete pump will be located on the platform next to Eccles St. For Area 2, the concrete pump will be located next to location of the current Freeman Auditorium. The



concrete wagons will discharge to the concrete pump and exit the site. A separate bunded wash down facility will be provided for the concrete wagons next to the wheel wash. The run off will also run through the settling tanks and oil interceptor.

The works will progress through the building in a similar manner. The Community Liaison Committee will continually brief the neighbours on the progression of the works. Any complaints will be directed to the Contractor by the Community Liaison Committee and the works will be amended where necessary.

#### **4.2 Issue – Monitoring During Construction**

***Submission:***

A submission from Berkeley Environment Awareness Group and Mr Paschal Donohoe TD highlight the issue of monitoring during the construction works.

***Response:***

It is proposed that a suitably qualified Independent Specialist Monitoring Consultant will be appointed to carry out and report on monitoring outputs during the course of the CHol works at agreed intervals and for a sufficient period of time following completion of the relevant parts of the works. The Monitoring Consultant will report to the Community Liaison Officer and outline potential mitigation measures that will be implemented should the receptors indicate an exceedence in pre-determined limitations on noise, dust, vibration and settlement.

#### **4.3 Issue – Construction Impact on Neighbouring Buildings**

***Submission:***

A submission from Robert Foley Architects makes reference to the protected structures along Eccles Street and the potential for building damage due to truck movements.

***Response:***

A detailed assessment was carried out on the potential impact of the construction works on the Protected Structures on Eccles Street – EIS Appendix 7F. In addition, an Independent Specialist Monitoring Consultant will continually monitor the vibration and settlement receptors around the perimeter of the site as the works progress. Finally, a speed limit will be imposed on construction vehicles on Eccles Street.

### **5.0 CONCLUSION**

Throughout the pre-planning period it has been acknowledged that the site is located in a very sensitive hospital environment. The construction

methods and sequences have been developed in tandem with a strict set of environmental limits to reflect the hospital surroundings. A detailed monitoring regime will be implemented at sensitive areas which will react via a 'traffic light' warning system allowing corrective action to be taken.

The development is also in close proximity to residential areas and the MPH. The strict guidelines that will be implemented for construction activities will ensure that the Contractor adheres to the noise, vibration and dust limits. A Community Liaison Committee will keep in constant contact with the neighbouring parties informing them as the works proceed. They will also provide feedback to the Contractor on any concerns that arise over the course of the works.

DAVID REHILL  
For O'Connor Sutton Cronin

## **APPENDIX A**

### **Construction Sequence**

The following outlines a proposed sequence of the site activities.

#### Site Preparation

- A commencement notice will be issued to Dublin City Council;
- Dublin City Council will be contacted concerning the removal of some street parking from Eccles Street (the extent is indicated in the OCS; Part 3; Section 1.0). In addition, Dublin Bus and the Irish Taxi Council will be notified of the temporary removal of the bus stop and taxi set-down areas;
- The condition of Eccles Street will be reviewed with Dublin City Council Road Maintenance Department;
- A detailed survey will be carried out on all overhead and buried services. The various utility companies will be contacted for any records relevant to this area;
- The existing coal cellars below the footpath on Eccles Street will be photographed and the features recorded to ensure preservation by record in compliance with the terms of the excavation licence and to the satisfaction of the National Monuments Section at the Dept. of Arts Heritage and the Gaeltacht, its statutory consultee, the National Museum of Ireland and the City Archaeologist with Dublin City Council.
- The existing security hut will be decommissioned and the relevant communication infrastructure will be diverted to the facility in the new MMUH Adult Hospital;
- The works necessitate the removal of access and fire escape stairs to Rosary House, the Entrance Concourse and the Technical Services Workshops, located to the west and north of Area 1 (Rosary House will remain in operation during the first phase of works). In advance of this, staff and students will be notified of the new Fire Escape Strategy that will be implemented over the duration of the works. A fire drill will be carried out in conjunction with the MMUH.
- The buildings in Area 2/3 to be demolished will be decanted by the MMUH. Similar notification concerning fire escape and potential impacts of the works will be addressed with the Staff in the buildings surrounding this section of the development namely; the Phase 1A building; the Old Mater building and the new Hostel Building.

#### Commencement of Works – Hoarding and creation of Site Access – Area 1

- The 3m hoarding will be erected along Eccles Street following approval of the final setting out with Dublin City Council Road Maintenance and Traffic Departments. The hoarding will be supported by intermittent steel posts at approximately 2.5m - 3m centres, with cast-in-situ concrete bases. The hoarding panels will be constructed from WBP plywood with rockwool infill. The panels will be finished with Children's Hospital of Ireland livery to inform the public on the project. The hoarding will be maintained and inspected on a weekly basis, and after inclement weather.

- A protected temporary pedestrian walkway will be provided along the hoarding line as per the requirement of the Building Regulations Part M;
- Temporary road markings will be provided on Eccles Street to form the new road centre line. Construction site warning signs will be located on the east and west bound approach to the site (refer to the OCS; Part 2; Section 2.0) Convex mirrors will be put in place at each site entrance;
- The 8m hoarding will be erected on the north, east and west boundaries. We propose the "Layher" system (or similar) which utilises prefabricated cassettes that are fixed to a scaffold frame (see Figure 6 of the OCS). Insulation mats within the cassettes provide the acoustic performance outlined within the EIS Chapter 10, *Noise & Vibration*. The scaffold frame is self supporting, however, secondary diagonal members required to resist wind loading will be positioned within the site confines;
- The entrance to the Area 1 section of the site will be formed next to No. 38 Eccles Street. Temporary hoarding will be positioned in front of No. 38 Eccles Street to facilitate the construction of the site entrance. Six to eight existing car park spaces will need to be removed local to the entrance. The granite paving slabs, kerbs and coal cellar access lids will be carefully lifted and stored for the duration of the works. The road will be levelled locally along the line of the previous kerb to match the site entrance level. Existing road gullies will be maintained to ensure no rainwater collects on the street. A security hut will be constructed next to the entrance in front of No. 38 Eccles Street. Two Flagmen will be based at this hut and will co-ordinate the approach of construction vehicles via radio contact with the drivers. No vehicles will be allowed to park or wait temporarily on Eccles Street. Should an incident occur at the exit from the site that would result in vehicles accumulating; one Flagman will direct vehicles already committed to the entrance into the site. The second Flagman will instruct other vehicles to "pass-by" via radio contact. The Flagmen will be in constant contact with the Security and Emergency Departments from the MMUH and MPH. The Flagmen will instruct vehicles to "pass-by" should a major emergency incident occur that increases Ambulance activities approaching the site. No pedestrian access will be possible via this entrance;

The site exit from Area 1 (indicated in the OCS; Part 4; Section 2) was discussed in detail with the RPA, MCHD (developing company responsible for the new MMUH Adult Hospital) and Dublin City Council. This area needed to respect the construction entrance for the RPA Mater Box construction works, car access to the new MMUH Adult Hospital car park, Ambulance access to the new MMUH A&E Department and finally pedestrian access to the new MMUH Adult Hospital. Since this planning application was lodged to THE BOARD; a series of discussions were held with Dublin City Council, the RPA and MCHD to review the scenario where the CHol excavation works

proceed in advance of the Mater Stop Box construction. In addition, arising from the submissions made on behalf of the MPH to the Board, the NPHDB caused an investigation to be carried out into utilising the current RPA haulage route along the eastern boundary of the site, adjacent to the MPH. Under this arrangement, the CHoI excavation vehicles could proceed to the south east corner of the site as per the OCS. At this point the vehicles would turn left onto the previously approved RPA haul route and proceed along the eastern boundary of the site towards the North Circular Road. Autotrack analysis was carried out for the construction vehicle movements to ensure they would not impede pedestrians along Eccles Street or cars accessing the MMUH Adult Hospital Car Park. The co-ordination of this junction at Eccles Street will be controlled by a team of Flagmen. Finally, an ambulance operating under a siren and blue light will receive priority. The junction layout for this particular egress arrangement was discussed with Dublin City Council Traffic Department;

- It is envisaged that the workforce during the basement works will be approximately 200-300 persons. It is estimated that an average of 1,000 people per annum will be employed during construction of the superstructure. A Site Compound will be set up by the Contractor for offices, staff welfare facilities, canteen etc. During the initial phases of the development, the Compound will be set up in pre-fab units that will need to be moved as the works progress. The Compound can then move to the basement one these levels are constructed. The Compound must satisfy the requirements of the *Safety, Health and Welfare at Work (Construction) Regulations 2006*. The act stipulates the following site compound requirements:

- Drying and Changing Rooms (approximately 200-300m<sup>2</sup> at the peak construction period);
- Canteen with hot food service (approximately 300-400m<sup>2</sup> at the peak construction period)
- Cleaning facilities – 1 No. wash hand basin per 20 persons;
- Toilet facilities - 1 No. sanitary convenience per 25 persons.

The site facilities must be properly ventilated, adequately lighted and kept in a hygienic and orderly condition. A temporary water connection will be made to the Public Water main on the NCR. The outfall drainage will outfall to the Local Authority sewer as outlined within the Engineering Services Report.

#### Commencement of Works – Hoarding and creation of Site Access – Area 2/3

- Similar 8m hoarding will be erected along the north boundary adjacent to the Phase 1A building, the west boundary at the Old Mater building and to the south along the rear of No's. 30-38 Eccles Street;
- A dedicated construction access / egress point will be created on the North Circular Road. The location is indicated on the OCS. Vehicle movements will be limited to left turn only for accessing and egressing

vehicles. Flexible bollards will be positioned to ensure this is enforced. The granite paving slabs and kerbs will be carefully lifted and stored for the duration of the works. The road will be levelled locally along the line of the previous kerb to match the site entrance level. Existing road gullies will be maintained to ensure no rainwater collects on the street;

- A team of Flagmen will be positioned at the entrance to control the movement of construction vehicles and to ensure pedestrian safety is upheld. The Flagmen will be in radio contact with the truck drivers and will instruct a driver accessing the site to 'pass-by' should an incident occur at the entrance;

#### Services Diversions – Phase 1

- An initial Services Diversion Contract will involve the re-routing of existing services within the development area that currently serve the MMUH buildings that are proposed to be retained, namely the Old Mater Building and No's. 30 to 38 Eccles Street. This will ensure that the main basement excavation works proceed unimpeded by major service diversion works. It will also reduce the risk of unidentified services being damaged by the piling works as the initial contract will identify any redundant services. The services to be diverted include the following:
  - Foul drainage from Rosary House (Rosary House will remain in operation during the first phase of works);
  - Decommissioning of the water main to the existing buried water tank. A new water tank is being provided within the basement of the new MMUH Adult Hospital. This will be operational prior to decommissioning the existing tank;
  - Provision of a dry main to the perimeter of Rosary House;
  - Diversion of IT services;
  - Telecom diversions through the Old Mater Building (within the corridor ceiling);
  - Re-routing of fire and intruder services;
  - Re-location of the gas skid currently located at No. 38 Eccles Street;
- The excavation for the services diversion will involve the displacement of made ground material adjacent to live operational buildings. Dust suppressions methods, such as water dampening, will be implemented to minimise potential spread of air-borne diseases. In addition, the works will operate within the noise and vibration limit outlined in the EIS Chapter 10; *Noise & Vibration* and Chapter 8; *Air*.

#### Services Diversions – Phase 2

- The second Phase of Services Diversion are required to allow for the demolition of the existing buried services duct that links the Old Mater building to the Phase 1A building and the plant rooms below the

existing concourse. The removal of this Service Duct will be required during the excavation and construction of the basement within Area 2/3. A Temporary Link Corridor or bridge will be constructed between the Old Mater Building and the Phase 1A building, over the existing Canteen building. This will allow the Canteen building to be demolished during construction of the main CHol superstructure.

- The temporary steel bridge will consist of storey high trusses that will be fabricated off site and transported under Garda escort if required. The bridge will then be lifted onto a support tower with a mobile crane during a weekend period. The bridge corridor will be formed with prefabricated insulated timber panels that will be lifted by crane into position.
- The following services will be provided along the temporary bridge between the Old Mater Building and the Phase 1A building:
  - MV ring line;
  - Mains water supply;
  - Internal fibre ring;
  - CHP low pressure hot water;
  - Pneumatic tubes.
- The temporary bridge will be dismantled once the permanent service connections are made between the Old Mater building and the Phase 1A building (via the CHol basement).

#### Demolitions - Area 1

- Prior to the commencement of the bulk excavations, the following buildings or structures will be removed or demolished:
  - Underground water tank;
  - Staff Bicycle shed adjacent to Eccles St.;
  - Security Hut;
  - Ramp to Staff Car Park (incl Technical Services Workshops);
  - Podium to the front of the existing Concourse;
  - Temporary cabins to the west of Rosary House;
  - Hard standing concrete slab constructed as part of the MMUH Adult Hospital site compound.
- An Asbestos Survey, contained in Chapter 5 of the EIS, outlines the findings of a non-intrusive survey. In general the buildings within Area 1 are “very low risk”, with the exception of two “medium risk” areas.
- The reinforced concrete elements will be removed using non-percussive demolition techniques such as saw-cutting, splitting etc. to minimise disruption to the Hospital and the surrounding buildings. Explosive or high vibrating generating techniques are not permitted.
- The following waste streams will arise from the demolition activities:
  - *Concrete*: This material will be crushed on site and used as infill during construction for access ramps or working platforms. The material will subsequently be disposed at an inert landfill.
  - *Masonry blocks and stone*: This material will be crushed on site and used as infill during construction for access ramps or



working platforms. The material will subsequently be disposed at an inert landfill.

- *Timber*: This will be collected on site in designated areas and sent to a timber recycling company;
- *Steel*: A segregated skip will be provided on site prior to sending the steel to a recycling company;
- *Glass*: The glass will be segregated at source and stored in dedicated covered skips prior to collection by recycling company;
- Throughout the duration of the demolitions; noise, vibration and dust limits outlined in Chapter 8 and 10 of the EIS will be implemented.

#### Demolitions - Area 2/3

- Prior to the commencement of the bulk excavations, the following buildings or structures will be demolished (none of the buildings within Area 2/3 are Protected Structures):
  - Rosary House;
  - Radiology;
  - Central Stores;
  - PET CT Scan;
  - Link Corridor;
  - Service trench;
  - Freeman Auditorium;
  - Heart Lung / GI Building.
- An Asbestos Survey was not possible in many of the buildings within Area 2/3 as they form part of an operating hospital. The older buildings; namely Radiology and Rosary House, will require a detailed survey prior to the commencement of demolition to ascertain the areas with possible asbestos material.
- The demolition techniques and segregation of waste material will be as per Area 1.

#### Area 1 Piling

- The perimeter pile wall will consist of interlocking secant piles ranging from 900mm to 1200mm diameter. The piles will be installed for the existing site level to a predetermined toe level. The analysis to date has indicated that this toe level will be -7.5mOD. Rock level on site was generally encountered at -10mOD. The piles will be installed by a rotary piling rig at a rate of approximately 1.5no. piles per day. It is envisaged that four piling rigs will operate simultaneously (with a maximum of 2 No. rigs operating adjacent to sensitive areas, refer to *Impact Assessment of Basement Construction for the Children's Hospital of Ireland on the Mater Private Hospital*);
- The piling rigs will operate in strict compliance with the vibration and noise tolerances specified in Chapter 10 of the EIS *Noise & Vibration*.

- The spoil generated by the augering process will be disposed at an appropriate inert landfill site (discussed later). The construction of the pile wall will also require the concrete deliveries to site. Approximately 130m<sup>3</sup> of concrete per day will be required and the traffic impact of the concrete deliveries has been assessed in Appendix 13a of the EIS, *Transportation and Traffic Assessment Report*. Reinforcing steel cages will be required for the male piles and these will be delivered to site on a 'just-in-time' basis.
- As the excavation progresses, soil anchors will be installed to laterally restrain the piled wall. There will be 3 to 4 rows of diagonal anchors at approximately 1.8m spacing. The anchors will be approximately 150mm diameter and 17m - 20m long. The location of the anchors below Eccles Street has been discussed and agreed with Dublin City Council. The anchors consist of a central hollow steel rod that acts as the auger. As the auger proceeds, a cementitious grout is injected down the centre of the steel rod. The volume of grout is controlled to ensure there is minimal wastage.
- The piling rigs will operate in strict compliance with the vibration and noise tolerances specified in Chapter 10 of the EIS *Noise & Vibration*. In addition, adequate dust suppression systems will be employed to ensure dust levels do not exceed the limits outlined in Chapter 8 of the EIS *Air*.
- Adequate guards will be fitted to the auger to ensure that excavated material does not spread outside the site.

#### Area 2/3 Piling

- The piling platform within Area 2/3 will be at a reduced level (approximately 15m - 16mOD) to ensure that all foundations of demolished buildings have been exposed and removed.
- The perimeter pile wall will consist of interlocking secant piles ranging from 900mm to 1200mm diameter. The piles will be installed for the existing site level to a predetermined toe level. The analysis to date has indicated that this toe level will be -7.5mOD. Rock level on site was generally encountered at -10mOD.
- The same piling techniques and controls will be adopted as outlined in Area 1.

#### Area 1 Excavation – Excavated Material

- The Area 1 excavation will involve the removal of approximately 157,000m<sup>3</sup> of soil. As noted, the basement formation level is approximately 12m - 14m above the anticipated rock level. It is not envisaged that rock breaking will be required as part of the basement excavation works.
- A series of site investigations were carried out and are documented within Chapter 7 of the EIS; Soils, Geology and Hydrogeology. The existing ground conditions comprise of the following build-ups:

- Made Ground on;
  - Brown Boulder Clay on;
  - Black Boulder Clay on
  - Limestone Bedrock.
- The OCSC soil classification report is based on the 2003/33/EC – *Procedures for the acceptance of waste at landfills*. The soil classification programme indicates that the majority of the excavated material may be disposed of at an inert landfill facility for recovery or disposal (Category A1 or A2). The soil classification programme undertaken by OCSC indicates that approximately 2,100m<sup>3</sup> of material has been categorised as Category B and 1,250m<sup>3</sup> as Category C, all of which is located in the top 1m of the site.
- Review of historic information indicates that no significant sources of contamination were located on the proposed development site.
- The following protocols will be adopted for the excavation of material:
  - The site is to be divided up into grids to match the grids as detailed in the soil classification report;
  - A competent person will be present on-site to ensure that the material excavated from a particular grid is sent to the appropriate disposal outlet that has been nominated prior to the commencement of excavation works;
  - The on-site competent person will complete a site exit docket that will indicate the following:
    - The time and date that the material was loaded;
    - The site address;
    - The nominated destination;
    - The waste collection permit number of the haulier; and
    - The vehicle registration number.
  - Details of this docket will be retained on-site with a copies retained by the haulier and the landfill;
  - If at any stage during the excavation process material is observed as being potentially contaminated, i.e. exhibiting odours or staining, it will be excavated and stockpiled on-site in a controlled manner and further assessed to determine a suitable disposal outlet.
- The procedures for accepting excavated material at the landfill site will be as follows:
  - Prior to any waste being transported to a landfill the representative analytical results, as contained in the soil classification report, will be forwarded to the landfill to ensure that the material meets the landfill's acceptance criteria;
  - The landfill will be notified as to when the material is expected to arrive;
  - Upon arrival a landfill operator will inspect the docket that was filled out by a competent person on-site, as referred to above. A copy of this docket will be filed at the landfill facility;
  - A sample will be obtained from every 100 loads of material and analysed to confirm that the material complies with the

facility's acceptance criteria (**Note:** The one sample per 100 loads will vary depending on the landfill's waste licence conditions); and

- An odour and visual inspection will be undertaken on the material by a landfill operative at the weighbridge and also at the tipping face.
- Provision will be made to allow for and fund the integration of archaeological monitoring and the remediation of any issues arising from the discovery of archaeological remains at the site. This includes providing for the temporary protection of archaeological features during the bulk excavation programme, and the archaeological excavation and recording of features revealed in compliance with the terms of the excavation licence and to the satisfaction of the National Monuments Section at the Dept. of Arts Heritage and the Gaeltacht, its statutory consultee, the National Museum of Ireland and the City Archaeologist with Dublin City Council.

#### Area 2/3 Excavation – Excavated Material

- The Area 2/3 excavation will involve the removal of approximately 112,000m<sup>3</sup> of soil. As noted, the basement formation level is approximately 12-14m above the anticipated rock level. It is not envisaged that rock breaking will be required as part of the basement excavation works.
- Due to the location of the operational hospital buildings in Area 2/3 it was not possible to carry out a detailed site investigation and soil classification of the material. As this area is uphill of Area 1; there is a relatively low risk of variance of the ground conditions. The historic maps do not indicate any previous occupancy on this portion of the site that would lead to concerns on contamination.
- Following the demolition of the buildings and the soil classification testing, the procedures for classifying material and disposal off site will be as per the guidance outlined for Area 1.

#### Area 1 Excavation – Truck movements

- The OCS and Chapter 13 of the EIS outline the truck movements that will be generated by the bulk excavation. The Contractor will develop their Construction Management Plan (CMP) based on the Traffic Impact Assessment. This CMP must be approved with Dublin City Council prior to commencement of works. The requirements of this document are outlined in the OCS;
- As outlined in the Soils, Geology and Hydrogeology Witness Statement, the majority of the bulk excavation material is classified as inert (99.5%). It is envisaged that this material will be disposed at an inert facility such as Murphys Inert Landfill at Gormanstown and / or The Naul. Both facilities are located in North County Dublin approximately 30km from the site and would be accessed via the M1.

Unladen excavation Vehicles approaching the site will travel to the M50, exit at Junction 6 and proceed along the N3. The vehicles will turn off the North Circular Road (NCR) onto Berkeley Road before turning onto Eccles Street. They will then make a left turn into the site; adjacent to No. 38 Eccles Street. As described earlier, recent discussions with DCC, the RPA and MPH have identified the possibility of utilising the RPA haulage route along the east boundary of the site for egressing vehicles. Ladened vehicles would exit along this route towards the NCR. A right turn onto the NCR was discussed with DCC following completion of adequate Autotrack analysis of the manoeuvre. The excavation vehicles will then turn left onto Dorset Street and proceed north along the M1 to Junction 7 for Gormanstown / The Naul. Accordingly, the construction vehicles movements through the junctions in the vicinity of the Mater Campus were assessed within Chapter 13a of the EIS; *Transportation and Traffic Assessment Report*. As the construction traffic moves away from the city centre it is evident that overall traffic levels will begin to fall and congestion will become less of an issue. Furthermore it is intended that construction traffic will follow primary routes meaning minor roads and junctions will not be affected. Regardless, the hourly level of traffic estimated to be generated by the construction phase is considerably low and as such will have a negligible impact on link and junction capacity.

- As noted previously, the vehicles will enter the site next to 38 Eccles Street and exit to the east boundary of the site. The site is located within the 5-axle HGV cordon restriction. The Contractor will submit a weekly HGV Management Plan outlining any deliveries that necessitate 5-axle vehicles.
- The site speed limit will be restricted to 10 km/hr. The speed limit on Eccles Street will be limited to 30 km/hr. All vehicles will be fitted with flashing beacons, reversing sirens and comply with all relevant regulations. Site vehicles will be prohibited from parking or turning in residential areas.
- Following a review of similar sites located throughout the city centre, it is considered that approximately 7 No. trucks for excavation disposal will access and depart the site per hour. As noted previously, strict control will apply to approaching and departing vehicles to ensure disruption to the public is kept to an absolute minimum. The excavation vehicles will be 4-axle Hino 700 rigid tippers (or similar) and will carry approximately 10m<sup>3</sup> of excavated material. The tippers will have a built-on tarpaulin that will cover the excavated material during transit. No large off-road Dump trucks will be allowed to operate on public roads.
- A wheel wash system will be implemented on-site to prevent mud being tracked onto the adjoining roads. The wheel wash will be located a minimum of 20m but sufficiently far from the exit to allow trucks to 'drip off' prior to exit. The wheel wash footprint will measure approximately 5m x 3m will consist of a wash platform to allow for one full wheel revolution. Direct spray nozzles will be

located on side walls and will be designed to prevent overspray from the jets and allow for maximum water retention. The water will be directed into a settlement tank to allow for the silt/clay particles to settle out and the water to be recycled and used again. The material that has settled out following the above process will be carefully stockpiled on-site in advance of intermittent disposal to a suitable disposal outlet.

- The excavation works will be carried out by a series of CAT 320 and 340 (or similar) standard and long reach hydraulic excavators. It is envisaged that 3 to 4 excavators will work in tandem during the excavation process (with a maximum of 2 No. excavators operating adjacent to sensitive areas, refer to *Impact Assessment of Basement Construction for the Children's Hospital of Ireland on the Mater Private Hospital*);.
- The sequence of reducing the site level via a series of 3.0m benches or terraces is outlined in the OCS; Part 1; Section 3.6.1.
- The excavation vehicles will enter the excavation via a constructed haul road. The gradient of the haul road will be in the order of 15% which is in keeping with the noise assessment. The haul road will be finished with a temporary tar macadam surfacing (or similar) to minimise the spreading of dust and provide an even surface for truck movements.
- Road sweeping and washing will be in continuous operation along the North Circular Road, Berkeley Road and Eccles Street between 8.00am and 6.00pm for the full duration of the substructure works. There after the roads will be inspected twice daily and cleaning as required.
- The co-ordination of the excavators with the truck movements may necessitate stockpiling material. The height of stock piles will be limited to 5m - 6m, but never higher than the 3m high hoarding along Eccles St.
- Any stockpiled material will be dampened during dry periods to prevent the spreading of dust. A "Dust Boss" system will also be adopted to suppress any air borne dust. This system utilises a low grade fan to blow a fine controlled water mist over the excavation area and haul routes. This system was used with great success during the basement excavation of the MMUH Adult Hospital;
- All machinery will be monitored and maintained to ensure the operating noise limits do not exceed the limits outlined in Chapter 10 of the *EIS Noise & Vibration*;
- Whilst the secant pile wall will form a watertight box, the ground water contained within the box will need to be pumped away as the excavation work proceeds. Prior to the discharge of any water to the Local Authority sewer a discharge licence will be applied for to Dublin City Council. As part of the application process laboratory analysis of the groundwater to be discharged will be undertaken in accordance with Dublin City Council's '*Application for a Licence / Licence Review to discharge Trade Effluent of Other Matter to a Sewer*'. The ground water analysis carried out to date in the various site investigations

does not highlight any hazardous content. A series of settlement tanks; 3 No. measuring approximately 4m x 3m; will be provided to ensure that no silt is discharged to the public sewer. In addition, oil interceptors will be provided to deal with any contamination due to oil leakages from vehicles.

- Neighbouring buildings and public roads will be continually monitored as the works progress to ensure there is no excessive settlement; beyond that specified in Chapter 7 of the EIS; *Soils & Hydrogeology*. Areas with sensitive equipment in the MMUH and the MPH have strict limits set. Monitoring systems will be put in place with appropriate traffic light trigger levels. Precautionary procedures and corrective actions will be carried out if necessary.

#### Area 2/3 Excavation – Truck movements

- Construction access and egress to Area 2/3 will be from the NCR. As outlined in Area 1, it is envisaged that the excavated material will be disposed at an inert facility such as Murphys Inert Landfill at Gormanstown and / or The Naul. Unladen excavation Vehicles approaching the site will travel south on the M1 and proceed through the Port Tunnel to the Docklands. The vehicles will then turn right from North Wall Quay onto Guild Street and on to Seville Place. Finally, the vehicles will turn left into the site from the NCR. Ladened vehicles will turn right onto the NCR and proceed towards Phibsborough and the N3. At the M50 the vehicles will travel north to Junction 3 and proceed onto the M1 towards Gormanstown / The Naul. The construction vehicles movements through the junctions in the vicinity of the Mater Campus were assessed within Chapter 13a of the EIS; *Transportation and Traffic Assessment Report*.
- The procedures highlighted above for Area 1 will also apply to the works at Area 2/3 which is accessed via the North Circular Road.

#### Substructure Construction

- The site can be serviced by a number of concrete plants located around the city; depending on the overall city demand and preferred routes. Locations of potential plants include Clonee (via the N3), Ringsend (via the NCR / East Link) and Tallaght (via the M50).
- The post excavation vehicle movements to Area 1 will access the site as outlined previously (along the N3 and left into the site from Eccles Street). As a result of discussions arising from the submission made by MPH on the application, it is now proposed by the Applicant that, during the course of post-excavation construction, vehicles egressing the site will (insofar as is practicable) use the RPA haul route. Moreover, I should clarify that those vehicles which cannot use the RPA route (e.g. articulated vehicles) will use Eccles Street as necessary (i.e. as originally proposed in the Planning Application). Finally in this respect other exceptional vehicles (e.g. crainage, large delivery vehicles

etc) which similarly cannot use the RPA route will use Eccles Street as necessary (again, as originally proposed). It should be noted that, subject to approval by the Board, this updated construction traffic proposal will be reflected in the tender documents to be issued. The proposal to use the RPA haul route is subject to agreement with the RPA and MMUH and the route being available exclusively to the NPHDB. In other words, the RPA haul route will not be used simultaneously by the RPA (in relation to Metro North) and the NPHDB. For the avoidance of doubt, this refined construction traffic proposal has been subjected to traffic analysis. In addition, O'Connor Sutton Cronin has presented the details of the proposal and the traffic analysis to the Traffic Dept of DCC. Accordingly, as a result of the additional traffic analysis conducted in respect of the alternative haul route, it has been established that the additional construction traffic accessing the NCR is below the 5% capacity threshold. In addition, Autotrack analysis has been performed on the NCR / Dorset Street junction which establishes that standard rigid body trucks can be accommodated without impeding west-bound traffic. Again, Madam Inspector, this Autotrack analysis has been submitted to the Traffic Department of DCC. In these circumstances, the potential impacts of the alternative haul route on traffic on the NCR and the NCR / Dorset Street junction have been assessed for example, (see Appendix C). Of course, as the Board is aware the original proposal to use Eccles Street / Dorset Street junction has previously been assessed as part of the Planning Application. Finally, for the avoidance of doubt, it is re-iterated that the proposal remains for certain construction traffic to use the Eccles Street / Dorset Street egress route in the circumstances outlined above.

- The Area 2/3 movements will be as specified for the excavation vehicles.
- The construction vehicles movements through the junctions in the vicinity of the Mater Campus were assessed within Chapter 13a of the EIS; *Transportation and Traffic Assessment Report*. As the construction traffic moves away from the city centre it is evident that overall traffic levels will begin to fall and congestion will become less of an issue. Furthermore it is intended that construction traffic will follow primary routes meaning minor roads and junctions will not be affected. Regardless, the hourly level of traffic estimated to be generated by the construction phase is considerably low and as such will have a negligible impact on link and junction capacity.
- A concrete blinding layer will be cast at formation level to protect the sub-soil. This will also reduce the possibility of dust arising from exposed soil.
- Due to the large footprint of the site it is envisaged that the Contractor will construct the Level -4 raft slab in phases; commencing at the east of the site and progressing west. The 1m deep RC raft slab will involve the laying and fixing of reinforcing steel prior to the concrete pour.



- A review was carried out on the frequency of concrete deliveries to large sites around the city centre. On average, the concrete deliveries to site will be 35-40m<sup>3</sup> per hour. The Contractor will limit the size of the pour based on the concrete that can be delivered over the course of a day.
- The control of concrete vehicles will be similar to the control of the excavation vehicles. Vehicles accessing Area 1 will enter the site adjacent to No. 38 Eccles Street and exit at the eastern boundary. Vehicles accessing Area 2 will enter and exit the site from the North Circular Road.
- A concrete pump will assist the concrete placement. For the low level pours, the concrete pump will be located on the platform next to Eccles St. For Area 2, the concrete pump will be located next to location of the current Freeman Auditorium. The concrete wagons will discharge to the concrete pump and exit the site. A separate bunded wash down facility will be provided for the concrete wagons next to the wheel wash. The run off will also run through the settling tanks and oil interceptor.
- Power floating operations for the concrete slabs will need to operate within the noise limits specified in Chapter 10 of the EIS *Noise & Vibration*. For very large concrete pours or where an incident occurs, the Contractor must apply to Dublin City Council for a dispensation on the allowable working hours. The Community Liaison Officer will notify the adjoining neighbours in advance of any foreseen work extensions.
- The concrete works will progress through the levels. The Contractor will adopt formwork 'tables' for the slabs and 'slip forming' for the core elements. At all stages, the control of concrete wagons accessing and egressing the site must be carefully managed. The OCS indicates proposed locations for the tower cranes. The Contractor will position the cranes based on the phasing of the works. Particular attention will be paid to free slewing jibs, lighting fixed to the cranes, operating hours etc.
- The Contractor will operate a 'just-in-time' approach for deliveries to site. In particular during the initial phases of the basement construction. To facilitate this, the Contractor will set up a Staging Area off site. The Staging Area will be in the order of 0.5 hectares and would allow for bulk deliveries, preparation of materials and parking for construction works. Materials would be then delivered to site as required. In addition, a shuttle bus would transport staff from this off site facility to the construction site, therefore alleviating parking demands at the Mater Site. During the pre-planning process, the Design Team considered possible sites for the Staging Area; examples include sites along the N1, N2 and N3. The sites analysed are examples of appropriate sites and deliberately considered to coincide with already assessed haul routes. The sites have good transport links, are easily accessible and perhaps have already fulfilled this function for large construction projects. Ultimately the Contractor will select

the site and access the impacts on the local environs. This process will be outlined in the Construction Management Plans that must be submitted to Dublin City Council.

### Superstructure Construction

- The procedures adopted for the substructure construction will be maintained for the superstructure construction. The Contractor will receive feedback from the adjoining neighbours, via the Community Liaison Committee, on potential disruptions and work activities can be amended to minimise this.
- The Level 0 transfer structure (16.86mOD) will result in the larger of the superstructure concrete pours. The Contractor will limit the pour size to 350-400m<sup>3</sup> of concrete per day to ensure a sustainable concrete supply and also to allow time for powerfloating of the concrete.
- As the building levels are constructed, the Contractor may use the lower basement levels to store materials and as a site compound.
- As the building progress through the levels, the construction works will become quite close to some of the adjoining buildings; namely 30-38 Eccles Street and the Phase 1A building. The Contractor must limit any noise as per Chapter 10 of the *EIS Noise & Vibration*. In addition, the Contractor must liaise with the MMUH and other affected stakeholders for appropriate times for powerfloating.
- Tower cranes will be erected at the concrete cores to facilitate construction of the upper levels. The tower cranes will operate from sound attenuated generator at basement levels. Any site lighting fixed to the tower will be positioned to avoid light spillage to neighbouring properties.
- The façade proposal is a unitised curtain walling system for all elevations and at all levels. Unitised curtain walling will incorporate stone, metal and glass elements within the one construction. Panels are factory produced and incorporate interlocking profiles for weather-resistant assembly on site. Individual panels are typically storey height, transported to site by container, hoisted to relevant floors and then erected by controlled manipulation of them out from the floor using a specialised crane. Panels hang on the outside of the structure and interlock together, hence the term 'curtain wall'. This form of construction has been continuously developed since the 1960s and can be carried out by experienced local and/or international specialist facade contractors.
- During installation, the working area is cordoned off and all exposed operatives are connected to man-safe lines. The wind speed is monitored and installation does not take place during high winds.
- Screens will be provided to perimeter areas looking over Ward areas to ensure privacy of patients in surrounding hospitals.

- As noted previously, the site is located within the 5-axle HGV cordon restriction. The Contractor will submit a weekly HGV Management Plan outlining any deliveries that necessitate 5-axle vehicles.

### Mechanical and Electrical Installation

The primary mechanical and electrical plant requirements within the building are as follows:

#### Mechanical Installation

- The major items of mechanical equipment are located at Levels -4, -3, -2, 5, 10, 11, 12, 13 and 16.
- Level -4 contains the bulk liquid storage tanks and pump sets. It is proposed that all tanks will be sectional in construction with each 1 metre x 1 metre section transportable by hand. The pump sets will be easily manhandled on trolleys from the carpark to each plantroom.
- Level -3 will contain the absorption chiller unit and air compressors. A service shaft has been provided at the front of the hospital down which these items can be craned and then manhandled on trolleys into position. This level will also contain a boiler house plantroom accessible of the car parking area. Large removal air transfer grilles and fire dampers will be provided in the structure to permit offloading of the boiler sections and transfer into the boiler house. The boilers shall be constructed in-situ.
- Level -2 will contain the heating distribution pump sets and pressurisation unit plantrooms accessed via double doors from the carpark. This equipment is easily manhandled on trolleys from the car park into each plantroom.
- Level 5 will contain the majority of the air handling plant associated with the building. This plant will be sectional in nature and constructed in-situ. The plant can be either positioned by craning it into the plantroom space through removable louvres or transporting it up the building in the bed lifts.
- Levels 10, 11, 12 and 13 will contain air handling plant located in pods on the north elevation of the building. These units will be sectional in nature and constructed in-situ. The plant can be positioned by transporting it up the building in a bed lift and manhandling it on trolleys down the Hospital Corridor to each plantroom.
- Level 16 will contain exposed sectional air handling plant and chiller units which can be craned into position on the open section of the roof and replaced when required in a similar manner. Replacement of individual sections or motors on the air handling plant can be achieved by using a bed lift within the building to transport items to the roof.

### Electrical Installation

- The major items of electrical equipment are located at Levels -4 and -3.
- Level -4 will contain the MV Substation and LV Switchroom. The MV/LV equipment will be transported in a vehicle down to level -4 and manhandled into the Switchroom using trolleys.
- Level -3 will contain the electrical generators plus CHP plant and MV/LV Switchroom. A service shaft has been provided at the front of the hospital down which the generators and CHP plant can be craned and then manhandled on trolleys into position. The MV/LV Switchboards will be sectional items which can be transported in a vehicle down to level -3 and manhandled into the Switchroom using trolleys before assembly.

## **APPENDIX B**

### **Construction Related Matters:**

#### **Potential Impacts, Mitigation Measures and Residual Impacts**

## **APPENDIX B**

### **CONSTRUCTION RELATED MATTERS:**

#### **Potential Impacts, Mitigation Measures and Residual Impacts**

	Element of Work	Brief Description of Work	Duration (approx.)	<u>Potential Impacts</u>	Mitigation Measures	Residual Impacts
STAGE 2: Enabling Works	Element of Work	Brief Description of Work	Duration (approx.)	<u>Potential Impacts</u>	Mitigation Measures	Residual Impacts
	Hoarding erection	Acoustic Hoarding to a height of 8m will be installed on the north, east, west and southwest perimeters of the construction site for the privacy and comfort of the existing hospitals	Duration of the works	<u>Noise</u> : Refer to EIS Chapter 10, <i>Noise &amp; Vibration</i> - Section 10.4  <u>Human Beings</u> : Refer to EIS Chapter 5, <i>Human Beings</i> - Section 5.5.5	<u>Noise</u> : Refer to EIS Chapter 10, <i>Noise &amp; Vibration</i> - Section 10.5  <u>Human Beings</u> : Refer to EIS Chapter 5, <i>Human Beings</i> - Section 5.6.1	<u>Noise</u> : Refer to EIS Chapter 10, <i>Noise &amp; Vibration</i> - Section 10.6
	Temporary Link	A temporary link bridge between the Old Mater building and the Phase 1A building will be constructed. This must be in place prior to the main construction works and is to facilitate the removal of the existing Level -1 service corridor and the Level 0 link corridor between the Old MMUH building and the Phase 1A building.	5-7 months	<u>Noise</u> : Refer to EIS Chapter 10, <i>Noise &amp; Vibration</i> - Section 10.4.  <u>Air</u> : Refer to EIS Chapter 8, <i>Air</i> - Section 8.5 & 8.7	<u>Noise</u> : Refer to EIS Chapter 10, <i>Noise &amp; Vibration</i> - Section 10.5  <u>Air</u> : Refer to EIS Chapter 8, <i>Air</i> - Section 8.6	<u>Noise</u> : Refer to EIS Chapter 10, <i>Noise &amp; Vibration</i> - Section 10.6  <u>Air</u> : Refer to EIS Chapter 8, <i>Air</i> - Section 8.7
				<u>Human Beings</u> : Refer to EIS Chapter 5, <i>Human</i>	<u>Human Beings</u> : Refer to EIS Chapter 5, <i>Human</i>	

Element of Work	Brief Description of Work	Duration (approx.)	Potential Impacts	Mitigation Measures	Residual Impacts
<b>STAGE 2:</b> Enabling Works	<ul style="list-style-type: none"> <li>• Technical Services stores;</li> <li>• Boilers and miscellaneous small services structures;</li> <li>• Bicycle shelter located adjacent to the footpath at Eccles Street;</li> <li>• A security hut at the entrance to the access ramp;</li> <li>• Removal of underground concrete water tanks below the existing car park;</li> <li>• Asbestos de-contamination and removal within existing structures;</li> <li>• Link Corridors;</li> <li>• Freeman Auditorium;</li> <li>• Heart Lung / GI Building;</li> <li>• Outpatient building adjacent to the North Circular Road.</li> </ul>		Chapter 12, <i>Material Assets</i> - Section 12.2  <u>Human Beings</u> : Refer to EIS Chapter 5, <i>Human Beings</i> - Section 5.5.5	Chapter 12, <i>Material Assets</i> - Section 12.2  <u>Human Beings</u> : Refer to EIS Chapter 5, <i>Human Beings</i> - Section 5.6.1	Chapter 12, <i>Material Assets</i> - Section 12.2  <u>Air</u> : Refer to EIS Chapter 8, <i>Air</i> - Section 8.7
			<u>Air</u> : Refer to EIS Chapter 8, <i>Air</i> - Section 8.5 & 8.7  <u>Traffic</u> : EIS Chapter 2 <i>Traffic and Transportation Impact Assessment</i> , Section 13.7	<u>Air</u> : Refer to EIS Chapter 8, <i>Air</i> - Section 8.6  <u>Traffic</u> : EIS Chapter 2 <i>Traffic and Transportation Impact Assessment</i> , Section 13.7	<u>Traffic</u> : EIS Chapter 2 <i>Traffic and Transportation Impact Assessment</i> , Section 13.7
Piling	The temporary secant pile wall around the footprint of the basement will involve the	6-8 months	<u>Noise</u> : Refer to EIS Chapter 10, <i>Noise &amp; Vibration</i> - Section 10.4	<u>Noise</u> : Refer to EIS Chapter 10, <i>Noise &amp; Vibration</i> - Section 10.5	<u>Noise</u> : Refer to EIS Chapter 10, <i>Noise &amp; Vibration</i> - Section 10.6



	Element of Work	Brief Description of Work	Duration (approx.)	Potential Impacts	Mitigation Measures	Residual Impacts
				13.7		
STAGE 2: Enabling Works	Excavation	The footprint of the basement is approximately 11,500m <sup>2</sup> and will involve the excavation and removal from site of approximately c269,000m <sup>3</sup> of material. This volume can be broken down between Area 1 and Area 2/3 as 157,000m <sup>3</sup> and 112,000m <sup>3</sup> respectively.	12-14 months	<u>Noise</u> : Refer to EIS Chapter 10, <i>Noise &amp; Vibration</i> - Section 10.4	<u>Noise</u> : Refer to EIS Chapter 10, <i>Noise &amp; Vibration</i> - Section 10.5	<u>Noise</u> : Refer to EIS Chapter 10, <i>Noise &amp; Vibration</i> - Section 10.6
				<u>Soil</u> : Refer to EIS Chapter 7, <i>Soils &amp; Hydrology</i> - Section 7.5	<u>Soil</u> : Refer to EIS Chapter 7, <i>Soils &amp; Hydrology</i> - Section 7.6	<u>Soil</u> : Refer to EIS Chapter 7, <i>Soils &amp; Hydrology</i> - Section 7.7
				<u>Drainage</u> : Refer to EIS Chapter 12, <i>Material Assets</i> - Section 12.2	<u>Drainage</u> : Refer to EIS Chapter 12, <i>Material Assets</i> - Section 12.2	<u>Drainage</u> : Refer to EIS Chapter 12, <i>Material Assets</i> - Section 12.2
				<u>Human Beings</u> : Refer to EIS Chapter 5, <i>Human Beings</i> - Section 5.5.5	<u>Human Beings</u> : Refer to EIS Chapter 5, <i>Human Beings</i> - Section 5.6.1	
				<u>Air</u> : Refer to EIS Chapter 8, <i>Air</i> - Section 8.5 & 8.7	<u>Air</u> : Refer to EIS Chapter 8, <i>Air</i> - Section 8.6	<u>Air</u> : Refer to EIS Chapter 8, <i>Air</i> - Section 8.7

Element of Work	Brief Description of Work	Duration (approx.)	Potential Impacts	Mitigation Measures	Residual Impacts
<p><u>STAGE 3:</u> Main Contract</p> <p>Basement Construction</p>	<p><u>Structure</u></p> <p>The following outlines a general construction sequence for the basement area (i.e. Level -4 to Level 0):</p> <ul style="list-style-type: none"> <li>• Consolidate the formation and pour blinding;</li> <li>• Construct the Level -4 raft RC slab;</li> <li>• Slipform the concrete cores to Level 0;</li> <li>• Construct the RC walls and columns to Level -3;</li> <li>• Construct the Level -3 RC slab;</li> <li>• Construct the RC walls and columns to Level -2;</li> <li>• Construct the Level -2 RC</li> </ul>	<p>22-24 months</p> <p>(structure 11-13 months)</p>	<p><u>Noise</u>: Refer to EIS Chapter 10, <i>Noise &amp; Vibration</i>- Section 10.4</p> <p><u>Soil</u>: Refer to EIS Chapter 7, <i>Soils &amp; Hydrology</i>- Section 7.5</p> <p><u>Drainage</u>: Refer to EIS Chapter 12, <i>Material Assets</i>- Section 12.2</p> <p><u>Human Beings</u>: Refer to EIS Chapter 5, <i>Human Beings</i>- Section 5.5.5</p> <p><u>Air</u>: Refer to EIS Chapter 8, <i>Air</i>- Section 8.5 &amp; 8.7</p>	<p><u>Noise</u>: Refer to EIS Chapter 10, <i>Noise &amp; Vibration</i>- Section 10.5</p> <p><u>Soil</u>: Refer to EIS Chapter 7, <i>Soils &amp; Hydrology</i>- Section 7.6</p> <p><u>Drainage</u>: Refer to EIS Chapter 12, <i>Material Assets</i>- Section 12.2</p> <p><u>Human Beings</u>: Refer to EIS Chapter 5, <i>Human Beings</i>- Section 5.6.1</p> <p><u>Air</u>: Refer to EIS Chapter 8, <i>Air</i>- Section 8.6</p>	<p><u>Noise</u>: Refer to EIS Chapter 10, <i>Noise &amp; Vibration</i>- Section 10.6</p> <p><u>Soil</u>: Refer to EIS Chapter 7, <i>Soils &amp; Hydrology</i>- Section 7.7</p> <p><u>Drainage</u>: Refer to EIS Chapter 12, <i>Material Assets</i>- Section 12.2</p> <p><u>Air</u>: Refer to EIS Chapter 8, <i>Air</i>- Section 8.7</p>

	Element of Work	Brief Description of Work	Duration (approx.)	Potential Impacts	Mitigation Measures	Residual Impacts
<p><u>STAGE 3:</u></p> <p>Main Contract</p>	<p>Construction from Level 0 to Level 6</p> <p>(i.e. the 'base' block)</p>	<p><u>Structure</u></p> <p>The following outlines a general construction sequence for the 'base' block (i.e. Level 0 to Level 6):</p> <ul style="list-style-type: none"> <li>• Slipform the concrete cores to Level 6;</li> <li>• Construct the RC walls and columns to Level 1;</li> <li>• Construct the Level 1 RC slab;</li> <li>• Construct the RC walls and columns to Level 2;</li> <li>• Construct the Level 2 RC slab;</li> <li>• Construct the RC walls and columns to Level 3;</li> <li>• Construct the Level 3 RC slab;</li> <li>• Construct the RC walls and columns to Level 4;</li> <li>• Construct the Level 4 RC slab;</li> <li>• Construct the RC walls and columns to Level 5;</li> <li>• Construct the Level 5 RC slab;</li> </ul>	<p>16-18 months</p> <p>(structure 11-13 months)</p>	<p><u>Noise:</u> Refer to EIS Chapter 10, <i>Noise &amp; Vibration</i>- Section 10.4</p> <p><u>Human Beings:</u> Refer to EIS Chapter 5, <i>Human Beings</i>- Section 5.5.5</p> <p><u>Air:</u> Refer to EIS Chapter 8, <i>Air</i>- Section 8.5 &amp; 8.7</p> <p><u>Traffic:</u> EIS Chapter 2 <i>Traffic and Transportation Impact Assessment</i>, Section 13.7</p>	<p><u>Noise:</u> Refer to EIS Chapter 10, <i>Noise &amp; Vibration</i>- Section 10.5</p> <p><u>Human Beings:</u> Refer to EIS Chapter 5, <i>Human Beings</i>- Section 5.6.1</p> <p><u>Air:</u> Refer to EIS Chapter 8, <i>Air</i>- Section 8.6</p> <p><u>Traffic:</u> EIS Chapter 2 <i>Traffic and Transportation Impact Assessment</i>, Section 13.7</p>	<p><u>Noise:</u> Refer to EIS Chapter 10, <i>Noise &amp; Vibration</i>- Section 10.6</p> <p><u>Air:</u> Refer to EIS Chapter 8, <i>Air</i>- Section 8.7</p> <p><u>Traffic:</u> EIS Chapter 2 <i>Traffic and Transportation Impact Assessment</i>, Section 13.7</p>

Element of Work	Brief Description of Work	Duration (approx.)	Potential Impacts	Mitigation Measures	Residual Impacts
<p><u>STAGE 3:</u> Main Contract</p>	<p><u>Fit-out</u></p> <p>The fit-out and finishing will progress behind the structure. The final finishes will be completed once a particular floor is weathertight. The 5<sup>th</sup> floor is a plant floor; and this will involve the installation of some mechanical plant via mobile crane.</p>				
	<p><u>Structure</u></p> <p>The following outlines a general construction sequence for Level 6 to Level 9:</p> <ul style="list-style-type: none"> <li>• Slipform the concrete cores to Level 9;</li> <li>• Construct the RC walls and columns to Level 7;</li> <li>• Construct the Level 7 RC slab;</li> <li>• Construct the RC walls and columns to Level 8;</li> <li>• Construct the Level 8 RC Transfer beams and slab;</li> <li>• Construct the RC walls and</li> </ul> <p>Construction from Level 6 to Level 9</p>	<p>10-12 months</p> <p>(structure 5-7 months)</p>	<p><u>Noise:</u> Refer to EIS Chapter 10, <i>Noise &amp; Vibration</i>- Section 10.4</p> <p><u>Human Beings:</u> Refer to EIS Chapter 5, <i>Human Beings</i>- Section 5.5.5</p> <p><u>Air:</u> Refer to EIS Chapter 8, <i>Air</i>- Section 8.5 &amp; 8.7</p>	<p><u>Noise:</u> Refer to EIS Chapter 10, <i>Noise &amp; Vibration</i>- Section 10.5</p> <p><u>Human Beings:</u> Refer to EIS Chapter 5, <i>Human Beings</i>- Section 5.6.1</p> <p><u>Air:</u> Refer to EIS Chapter 8, <i>Air</i>- Section 8.6</p>	<p><u>Noise:</u> Refer to EIS Chapter 10, <i>Noise &amp; Vibration</i>- Section 10.6</p> <p><u>Air:</u> Refer to EIS Chapter 8, <i>Air</i>- Section 8.7</p>

Element of Work	Brief Description of Work	Duration (approx.)	Potential Impacts	Mitigation Measures	Residual Impacts
	<u>Fit-out</u> The fit-out and finishing will progress behind the structure. The final finishes will be completed once a particular floor is weathertight.				
<b>STAGE 3:</b> Main Contract	<u>Structure</u> The following outlines a general construction sequence for the 'ward' block (i.e. Level 10 to Level 16): <ul style="list-style-type: none"> <li>• Slipform the concrete cores to Level 16;</li> <li>• Construct the RC walls and columns to Level 10;</li> <li>• Construct the Level 10 RC transfer beams and slab;</li> <li>• Construct the RC walls and columns to Level 11;</li> <li>• Construct the Level 11 RC slab;</li> <li>• Construct the RC walls and columns to Level 12;</li> <li>• Construct the Level 12 RC slab;</li> </ul> Construction from Level 10 to Level 16 (i.e. the 'ward' block)	15-17 months  (structure 9-11 months)	Noise: Refer to EIS Chapter 10, Noise & Vibration- Section 10.4  Human Beings: Refer to EIS Chapter 5, Human Beings- Section 5.5.5  Air: Refer to EIS Chapter 8, Air- Section 8.5 and 8.7  Traffic: EIS Chapter 2 Traffic and Transportation Impact	Noise: Refer to EIS Chapter 10, Noise & Vibration- Section 10.5  Human Beings: Refer to EIS Chapter 5, Human Beings- Section 5.6.1  Air: Refer to EIS Chapter 8, Air- Section 8.6  Traffic: EIS Chapter 2 Traffic and Transportation Impact Assessment, Section 13.7	Noise: Refer to EIS Chapter 10, Noise & Vibration- Section 10.6  Air: Refer to EIS Chapter 8, Air- Section 8.7  Traffic: EIS Chapter 2 Traffic and Transportation Impact Assessment, Section 13.7

Element of Work	Brief Description of Work	Duration (approx.)	<u>Potential Impacts</u>	Mitigation Measures	Residual Impacts
<p><u>STAGE 3:</u></p> <p>Main Contract</p>	<p><u>Facade</u></p> <p>The cladding solution is a unitised system that can be erected inside the building with minimal external scaffolding. The cladding will progress approximately 2-3 floors behind the structural frame.</p>				
	<p><u>Fit-out</u></p> <p>The fit-out and finishing will progress behind the structure. The final finishes will be completed once a particular floor is weathertight.</p>				

## **APPENDIX C**

### **Construction Haulage Routes**