APPENDICES: CHAPTER 2 – DESCRIPTION OF DEVELOPMENT

APPENDIX 2.1: DRAFT CONSTRUCTION MANAGEMENT PLAN

1.0 Executive Summary

The following Draft Construction Management Plan has been produced as part of, and has been submitted with the application for permission for the development of the National Maternity Hospital at St. Vincent's University Hospital campus, Elm Park, Dublin 4. This Draft Plan demonstrates how works will be delivered in a logical, sensible and safe sequence with the incorporation of specific measures to mitigate the impact on people, property and the environment. All mitigation measures set out in this Draft Plan will be included by the Main Contractor in the final Construction Management Plan which will be finalised and agreed prior to commencing works on site.

A key consideration for the project is to minimise the impact of the construction activities on the existing hospital campus, local area and wider community. The proposed development works will impact the on-going operation and function of the existing campus and local environment in terms of intensity and duration of activities.

This Draft Construction Management Plan sets out an indicative sequence for the key construction activities to mitigate these impacts, which will be adopted by the Main Contractor for incorporation into the final Construction Management Plan. These measures include:

- Adopting a phased approach for the development so that the level of construction activities on the campus at any one time are not unduly disruptive;
- Implementation of monitoring and control measures concerning construction activities;
- Identification of appropriate construction traffic controls;
- Appointment of a community liaison to provide the link between the Main Contractor and stakeholders to facilitate good relations and clear lines of communication.

The Draft Construction Management Plan proposes locations for the site compounds associated with the various sequences of works along with the anticipated site hoarding lines. A suggested construction methodology is outlined which will be developed by the Main Contractor in the final Construction Management Plan.

The management of site operations, waste materials and traffic are considered as being the most critical elements of the construction works. For each of these elements, an initial assessment of their impact on the existing environment is provided along with mitigation measures for same.

Key issues which are addressed in this document, and which will be finalised by the Main Contractor will be the detailed controls concerning the management of noise, dust, vibration and construction traffic during the works. The early construction of the extended car parking facility will provide the opportunity to accommodate some limited parking for construction personnel within the campus to alleviate the pressures on the surrounding road network.

The Main Contractor will be required to develop a detailed programme for each specific work element / works package prior to the commencement of works on site.

2.0 Introduction

2.1 Purpose

This Document presents a draft construction delivery sequence, supported by indicative construction methodologies and techniques in respect of the construction of the proposed new National Maternity Hospital. This Draft Plan demonstrates how such works will be delivered in a logical, sensible and safe sequence with the incorporation of specific measures to mitigate the potential impact on people, property and the environment.

The construction methodology will be finalised by the Main Contractor prior to commencing works. It is noted that all mitigation measures identified in this document will be incorporated in the Construction Management Plan to be finalised by the Main Contractor.

2.2 Development Setting

The design has accounted for the existing environment together with the various site challenges and planning constraints. It is the Project Team's aim to deliver a world class maternity hospital with a strong sense of identity and character for the overall benefit of the public.

The following key issues have been recognised within the proposed design:

- Existing Hospital Campus Location – The project is to be located within the existing St. Vincent's University Hospital campus site boundaries. The hospital campus must remain 'live' and fully operational at all times during the construction period. Maintaining safe pedestrian, vehicular and blue-light access to the campus is an absolute priority. The site has specific constraints with regard to existing site services, buildings in close proximity to the site, ground conditions etc. which are discussed in more detail in later sections of this document.
- Local Area and Wider Community Interactions – The site is in a suburban location immediately outside the city centre and is in close proximity to residential properties and Elm Park Golf Club. The impact of the construction activities on the local area and the wider community is to be kept to a minimum.

2.3 Description of Proposed Development

The proposed development comprises the development of The National Maternity Hospital at St. Vincent's University Hospital campus, Elm Park, Dublin 4. The proposed new National Maternity Hospital building will be located at the eastern side of the hospital campus and comprises the construction of a building that rises to 5 and 6 storeys above ground level, with one partial basement level, plus additional ancillary plant areas at the roof level. The proposed development also includes an extension to the existing multi-storey car park at the north of the campus. The proposed development will be constructed in a sequential manner that allows for the continual operation of the hospital campus and, as such, includes the phased demolition of existing buildings at St. Vincent's University Hospital campus to facilitate clearing the site for the proposed development and the construction of temporary accommodation to facilitate construction sequencing (including a single storey temporary canteen, catering staff changing facilities, household services store and carpenters workshop). The full detail of the nature and extent of the proposed development is set out in Chapter 2 of this EIS.

3.0 Construction Management

3.1 Introduction

The following Sections set out and describe the proposed sequencing of the project together with discussion on site management issues and logistics requirements.

3.2 Sequencing of the Project

The works described in this Draft Plan identify potential methods of construction available to the Contractor. This Draft Plan indicates the manner in which the Main Contractor may progress with the works on site to deliver the project in a manner that minimises the impact on people, property and the environment.

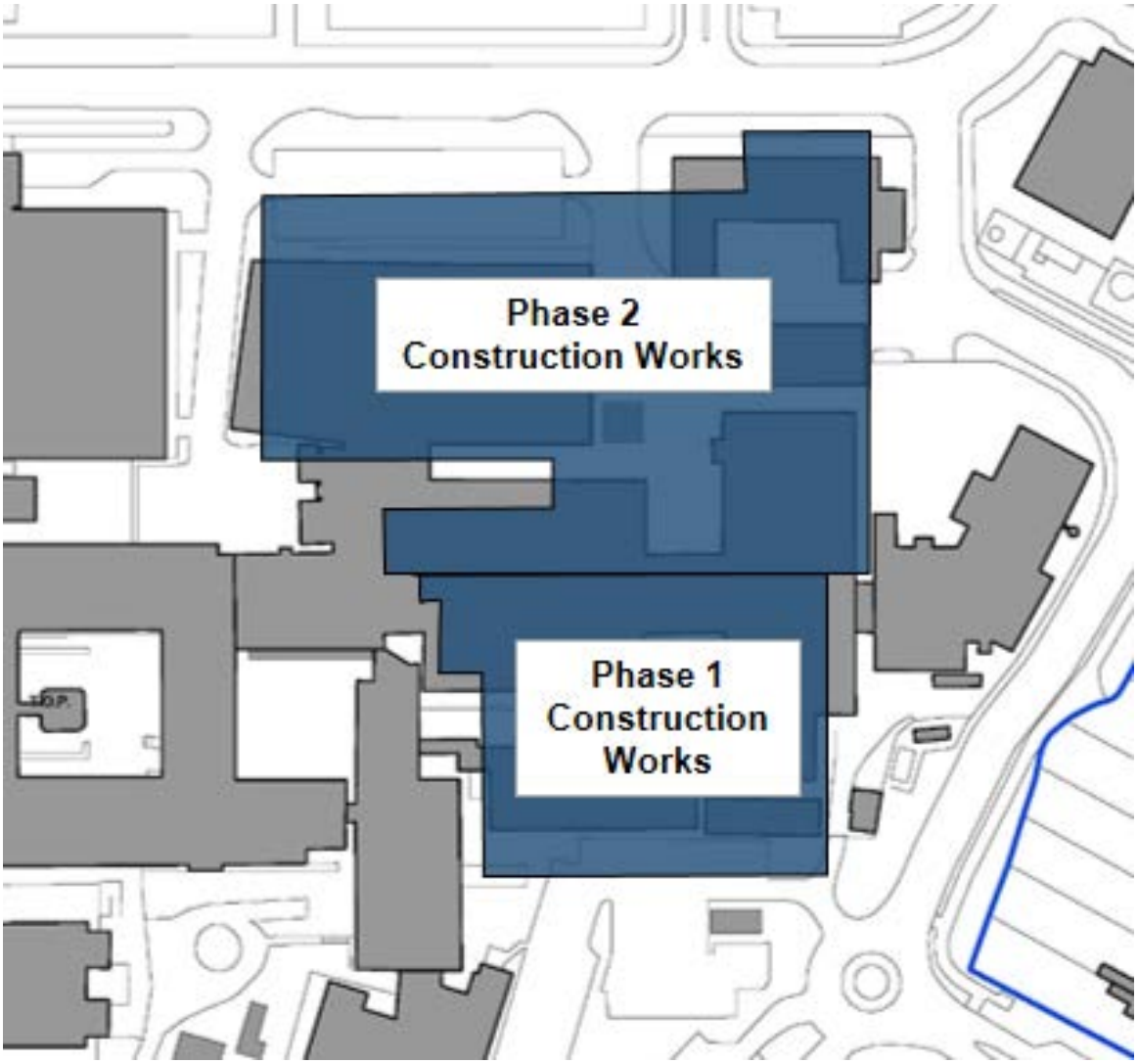
There are a number of constraints and requirements which have been carefully considered by the Project Team throughout the design process. This has led to the development of a phased approach for the works.

The project will commence with an Enabling Works phase which includes the following:

- Aspergillus protection
- Multi-storey car park extension
- Site infrastructure works
- Temporary accommodations

The Enabling Works phase will be followed by the Main Construction Works. These will be carried out under a single contract which are likely to be completed in two sequential phases as shown in Figure 1.

Figure 1 : Phasing of the Main Construction Works



The anticipated sequencing of the Main Construction Works phase is illustrated in Figure 2.

Figure 2 : Site Sequencing for Main Construction Works

Any reference to Main Contractor in this document refers to the Main Contractor for the enabling works and / or the Main Contractor for the main construction works.

3.3 Site Management

It is expected that there will be a gradual increase in the level of construction activities over the course of the development. The Enabling Works phase will be the least labour intensive and will therefore have the lowest demand for construction personnel. Phase 1 of the Main Construction Works will have a higher demand when compared with the Enabling Works, however, the peak demand is not expected until Phase 2 of the Main Construction Works. During this phase, it is envisaged the Main Contractor will have approximately 500 to 600 construction personnel on site during the most labour intensive phases of the construction programme.

The Main Contractor will be responsible for overall site management for the duration of the proposed works and will plan the works taking into account the prevailing weather and environmental conditions. Discussed below are a number of areas which the Main Contractor will be required to address during the works.

3.3.1 Health & Safety

Building on a live, functioning hospital campus of the scale of the proposed new National Maternity Hospital on St. Vincent's University Hospital campus presents specific hazards that do not occur, or have less significance, on other building projects. The primary aim of planning for safety on healthcare sites is ensuring the safety of patients, staff and visitors, and the continuity of all functions of the Hospital during the construction works.

The following are examples of some healthcare related issues that will have to be addressed during the construction of the proposed development:

- Identifying, diverting, maintaining and connecting to existing live services, including ensuring that St. Vincent's University Hospital Technical Services Department are fully involved with the planning and implementation of any such works;
- Implementation of St. Vincent's University Hospital Technical Services Department approved Hot Works Permits and Permits to Work on Live Services;
- Phasing the projects, including enabling works, to minimise interference with the function of the existing Hospital;
- Connection of new build elements to existing occupied buildings;

- Addressing aspergillus risk to adjacent Hospital Departments with at-risk patients;
- Deep excavations close to existing buildings; and
- Vehicular and pedestrian traffic management on the St. Vincent's University Hospital campus, and surrounding roads, for the duration of the construction works.

All Contractors will be required to progress their works with reasonable skill, care and diligence and, at all times, proactively manage the works in a manner most likely to ensure the safety, health and welfare of those carrying out construction works, other c
ampus users and interacting stakeholders.

Contractors are further required to ensure that, as a minimum, all aspects of their works and project facilities comply with legislation, good industry practice and all necessary consents.

Detailed Health and Safety requirements will be included in the final Main Contractor's Construction Management Plan and Construction Stage Health and Safety Plan required to be prepared by the Project Supervisor Construction Stage, prior to the commencement of works on site.

3.3.2 Hours of Work

The hours of work proposed for the project are as follows, unless otherwise advised:

- Monday to Friday – 7.00am to 6.00pm
- Saturday – 8.00am to 2.00pm
- Sundays and Bank Holidays – Any construction activity, with the exception of emergency works, will be limited to 8.00am to 2.00pm and will require the explicit permission of Dublin City Council

Due to the specific nature of some construction activities, or to mitigate disruption to the local environment, there may be a requirement for working outside these hours. Should this be required, the agreement of the appropriate authorities will be required. Special operations (such as large concrete pours) will require extensive pre-planning, programming and management of site operations.

3.3.3 Public Relations / Community Liaison

The site is located within a live and operational hospital campus in a residential area. The Main Contractor will be required to ensure that all Agents, Sub-contractors and Suppliers act in a manner to minimise disruption to both the campus and the surrounding locality. Construction staff will be encouraged to remove all personal protective equipment and use wash down facilities before leaving the site.

The Project Team recognises the importance of the community liaison role in ensuring the smooth running of activities and in relation to residents and public welfare. Important key issues in ensuring good relations are:

- Regular community meetings, leaflet drops, information briefings etc.;
- Correct points of contact and timely response to queries; and
- Good housekeeping in all aspects of the operations.

Keeping people informed of site operations will help create and maintain good relationships, fostering a co-operative atmosphere. A Liaison Manager will be appointed by the Main Contractor to prepare a liaison strategy. The Liaison Managers responsibility would include *inter alia*:

- Composition and distribution of a local newsletter;
- Regular briefings with neighbours on progress and issues;
- Liaison with Dublin City Council and emergency services as appropriate;
- Liaison with An Garda Siochana, particularly in relation to traffic movements and permits; and
- Preparation of reports for the site meetings on neighbourhood issues.

Efficient signage, maintenance and cleanliness of services and temporary facilities will be given high priority within the Liaison Strategy for the project.

Due to the nature of construction works it is essential to operate Good Neighbour Policies wherever possible. The key aspects of the Project Team's Good Neighbour Policy include:

- Early implementation;
- Good Client, Staff and Neighbourhood liaison;
- Reduction of nuisance factors;
- Clear access for neighbouring premises;
- Clear and concise information; and
- Designated Liaison Officer.

It is essential that the Good Neighbourhood Policy and any necessary procedures be in place before works commence on site.

3.3.4 Hoarding

The location of the proposed development, within the confines of a live operational hospital campus, necessitates the prompt and detailed establishment of a clearly defined site area. The overarching consideration in all elements of the site set-up will be to ensure the works can be undertaken in a safe manner for the Hospital, nearby properties, members of the public and the Main Contractor and his staff.

Following possession of the site, the Main Contractor will erect a suitably robust hoarding around the perimeter. The plan alignment of the hoarding will not remain constant for the entire works and will change to meet the particular requirements and constraints of each phase. The hoarding line will typically follow the site boundary where possible. Additional fencing / hoarding will be provided to protect trees to be retained. The hoarding will typically take the form of standard plywood hoarding to a height of 2.4m. The external face of the hoarding will contain project logos and images in places which will be provided by competent graphic designers / calligraphers. An indicative layout of the hoarding line for each of the main phases in indicated in Figures 3, 4 and 5.

Figure 3 : Indicative Site Hoarding Layout for Multi-Storey Car Park Works

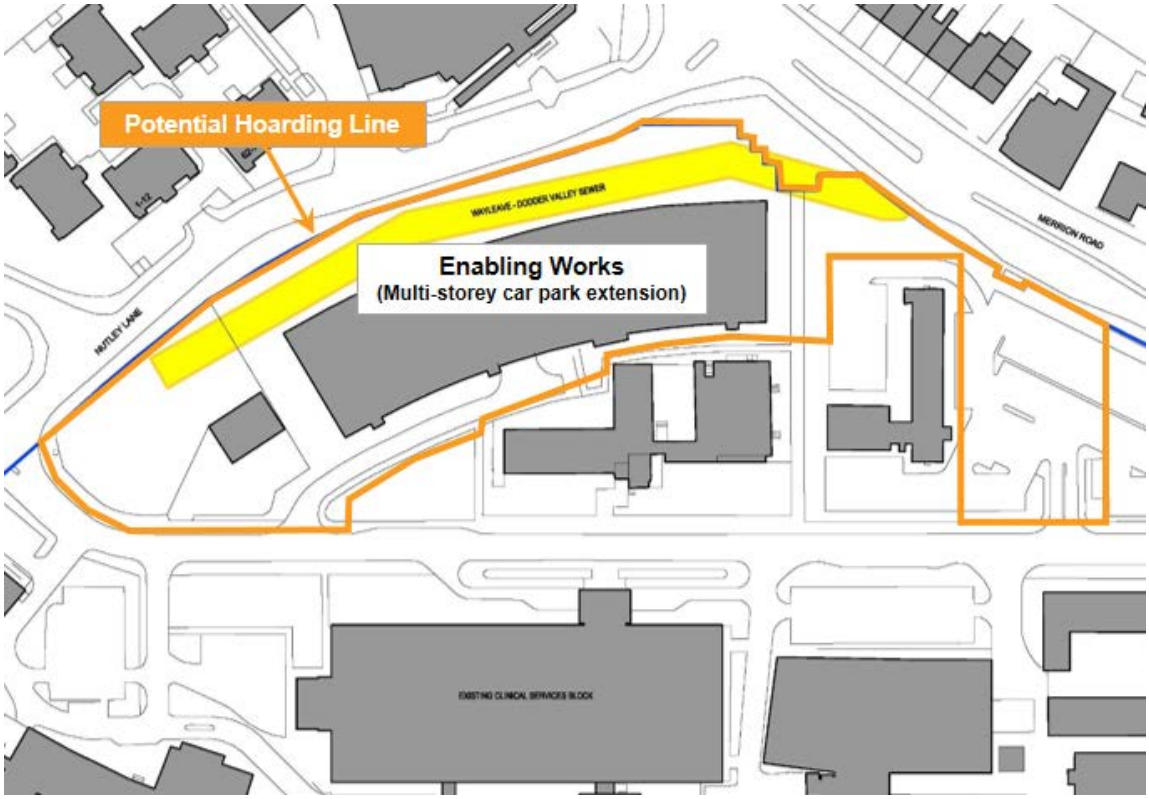


Figure 4 : Indicative Site Hoarding Layout for Phase 1 Construction Works

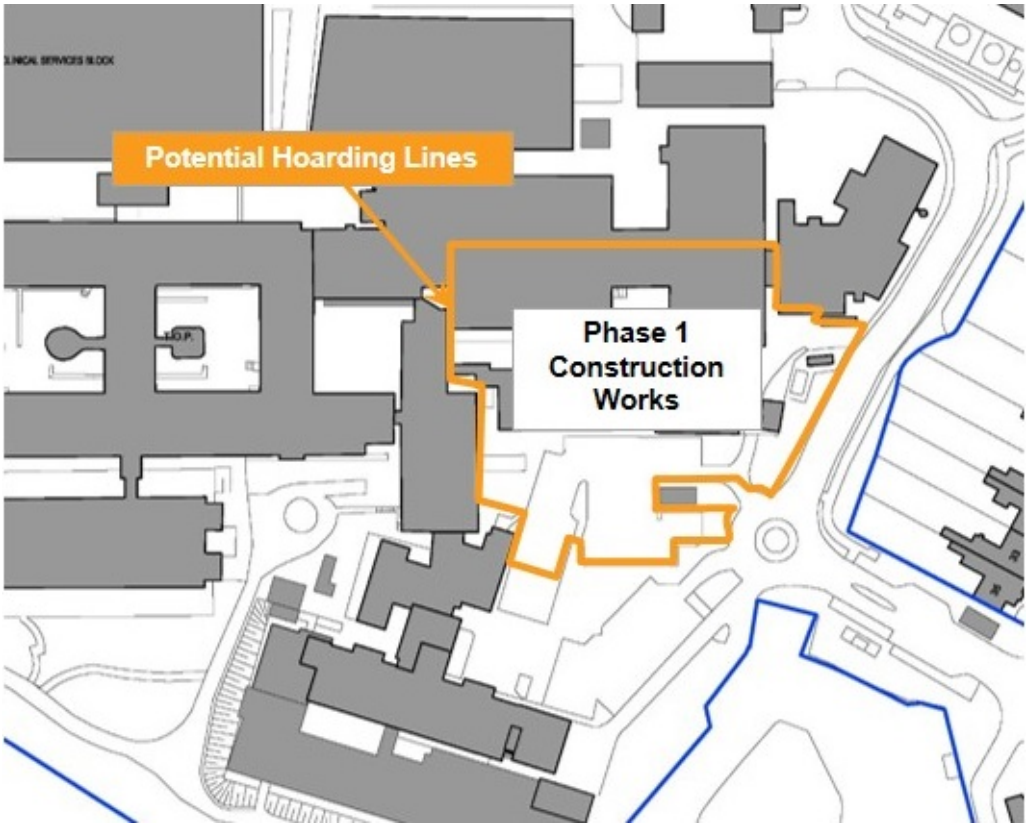
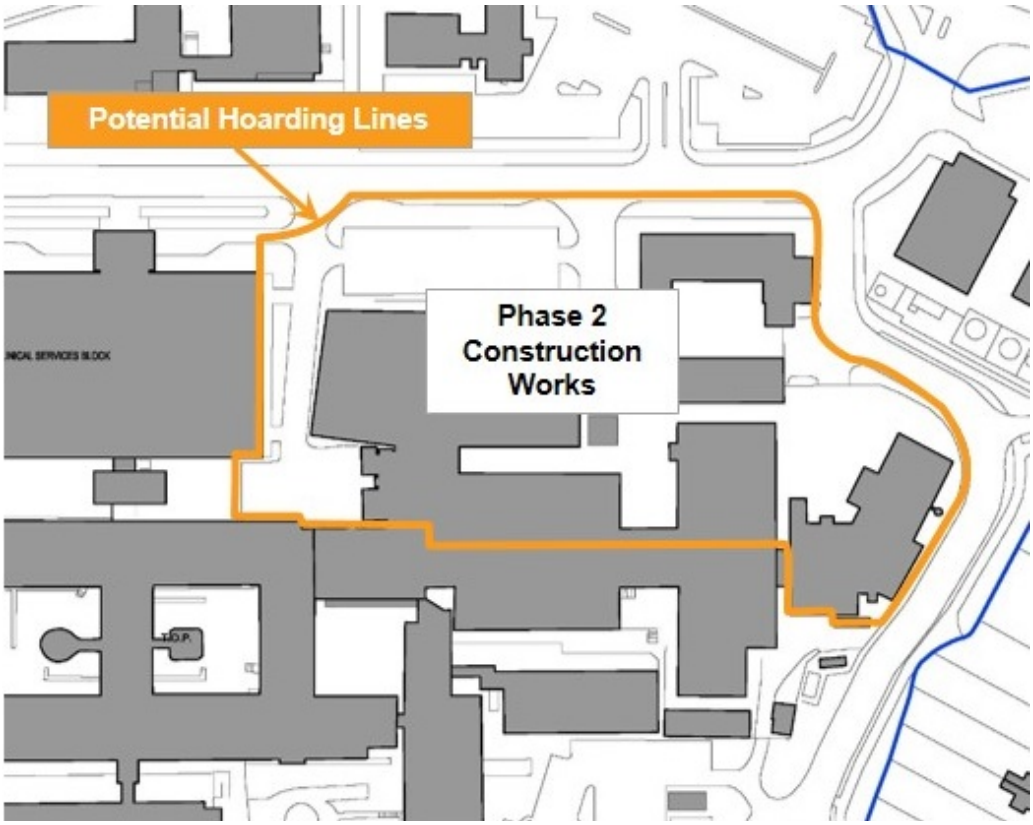


Figure 5 : Indicative Site Hoarding Layout for Phase 2 Construction Works



It is also noted that certain work phases or activities, such as site-wide enabling works and service tie-ins, may be required to be undertaken outside the general hoarding line with appropriate localised protection measures, such as heras fencing, adopted for the duration of these activities.

3.3.5 Site Security

The Main Contractor will be responsible for the security of the site for the duration of the works. All reasonable precautions will be taken to prevent unauthorised access to the site, the works and adjoining property. Adequate safeguards will be put in place to protect the site, the works, products / materials, plant and any existing buildings affected by the construction works from damage, theft and trespass.

As part of their site security responsibilities, the Main Contractor will be required to:

- Install and maintain adequate site hoarding to the site boundary with adequate controlled access and egress points;
- Maintain site security at all times;
- Install access security in the form of turnstiles and gates for staff;
- Ensure restricted access is maintained to the works; and
- Monitor and record all deliveries to site and materials / waste taken off site.

All staff will be made fully aware of their individual responsibilities with regard to security and will undertake their work in accordance with such guidelines. All staff and operatives will be fully inducted into the security, health and safety and logistic requirements on site.

3.3.6 Site Compound

The extent of compound and facilities required by the Main Contractor will vary throughout the duration of the works.

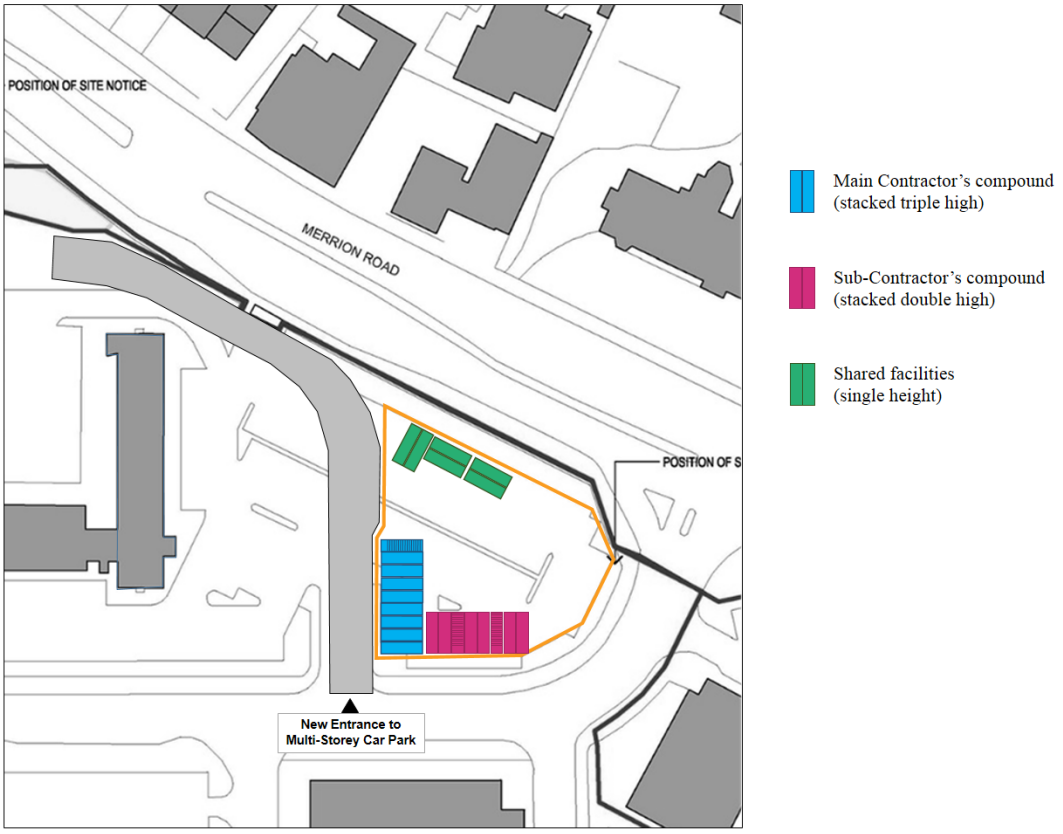
For the Enabling Works, the Main Contractor will likely require a small-scale compound and facilities likely to be located along the boundary with Elm Park golf course, within the campus.

When the Phase 1 construction works commence, the Main Contractor will require a larger compound and facilities area. The compound and facilities may be located in the existing St. Rita's surface car park, with material storage located on site.
A limited amount of contractor parking may be provided in the compound area to assist in mitigating against overspill into the surrounding areas and to limit the impact on the existing campus.

The Phase 2 construction works are likely to require a further enhancement of the compound and facilities. There may be an opportunity for the Main Contractor to use a temporary pedestrian footbridge over the main campus road to link the compound and the Phase 2 site. This would assist in avoiding conflict between workers and campus users.

An indicative layout of the Main Contractors compound for the Phase 2 works is shown in Figure 6.

Figure 6 : Indicative Site Compound Layout



The construction of the site compounds will necessitate interventions to the existing ground conditions to facilitate appropriate foundations and associated drainage works. These interventions will be relatively minor in nature and the ground will be reinstated to an appropriate finish on completion of the works.

3.3.7 Storage of Materials

Construction materials will be generally stored within the confines of the site. The Main Contractor's compound area may also be used to store construction materials however this is expected to act as a secondary storage space.

Any materials stored on the campus will be stored in a safe manner. Any fuels or chemicals stored on site should be clearly marked and contained so that seepage cannot occur. A local fuel filling point may be set up on site with all plant brought to this point for filling. Further details on the storage of dangerous substances on site is contained in section 3.3.16 below.

3.3.8 Water Supply

The Main Contractor will require a water source for the duration of the works. Water will be required for:

- Main Contractor's welfare facilities;
- Wheel wash and vehicle wash down (using recycled water where feasible);
- Dust suppression (primarily during demolitions and excavations);
- Curing of concrete in warm weather; and
- General construction cleaning materials / equipment etc.

It is proposed that the Main Contractor will make use of the existing water connection to the campus for water supply during construction in agreement with St. Vincent's University Hospital Technical Services Department and Dublin City Council Water Division / Irish Water.

3.3.9 Craneage

The construction works will require the use of multiple tower cranes on site. It is envisaged that cranes with jib lengths of up to 70m will be employed to provide the necessary site coverage. These cranes will be required for the moving of building materials on site such as formwork for concrete, reinforcement, precast concrete, steelwork, façade elements, plant and general building materials. Mobile cranes will also be utilised to assist in some elements of the construction development.

In areas where site access is particularly constrained, such as the multi-storey car park, the use of large mobile cranes may be preferred over tower cranes due to their added versatility.

The layout of cranes to achieve maximum coverage of the site will be finalised by the Main Contractor. However, an indicative crane layout for each Phase is shown in Figure 7, 8 and 9.

Figure 7 : Possible Crane Layout for Multi-storey Car Park Extension

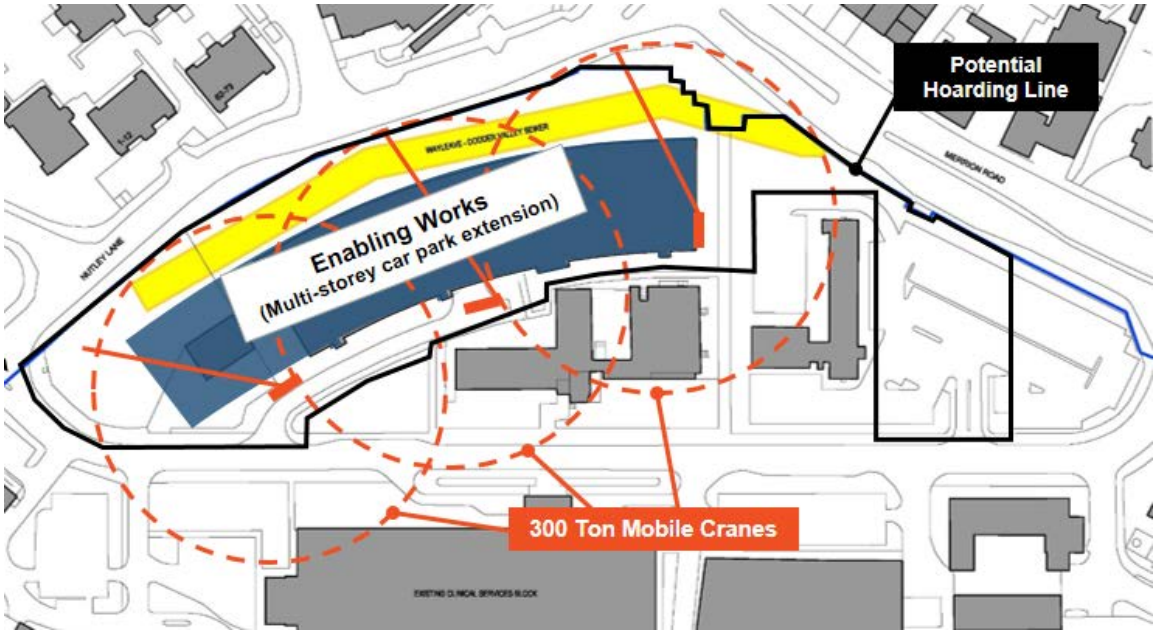


Figure 8 : Possible Crane Layout for Phase 1 Construction

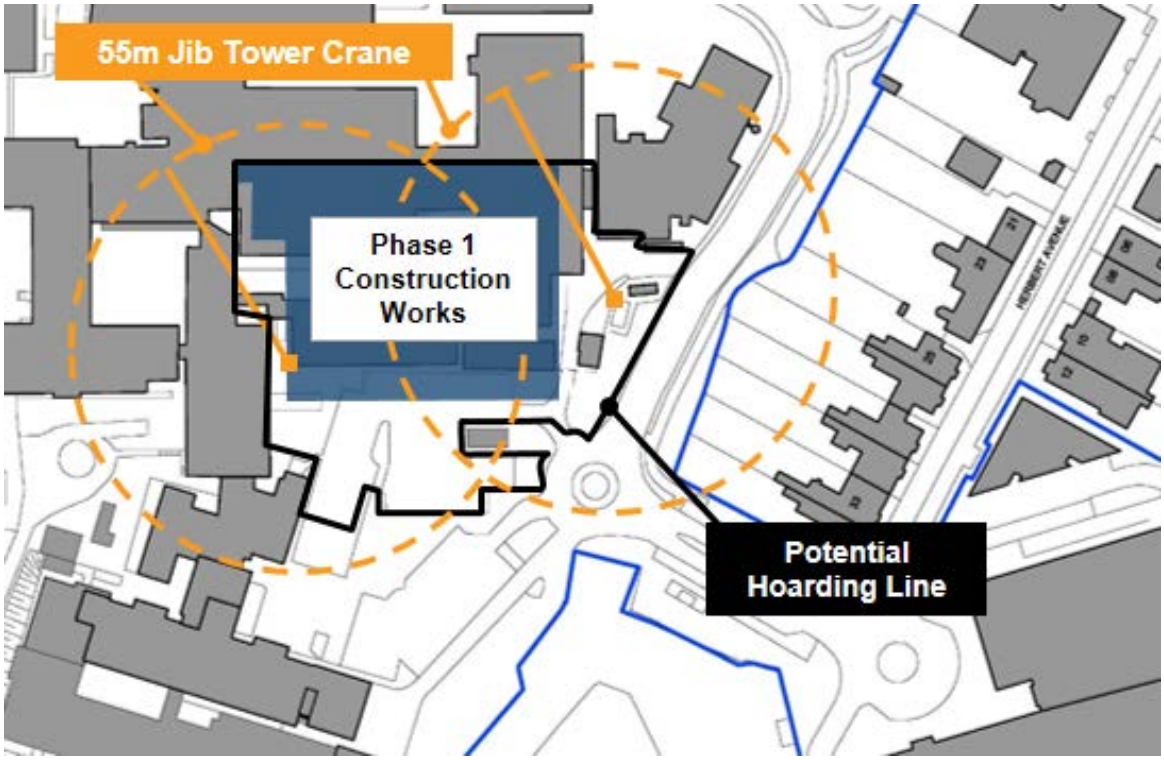
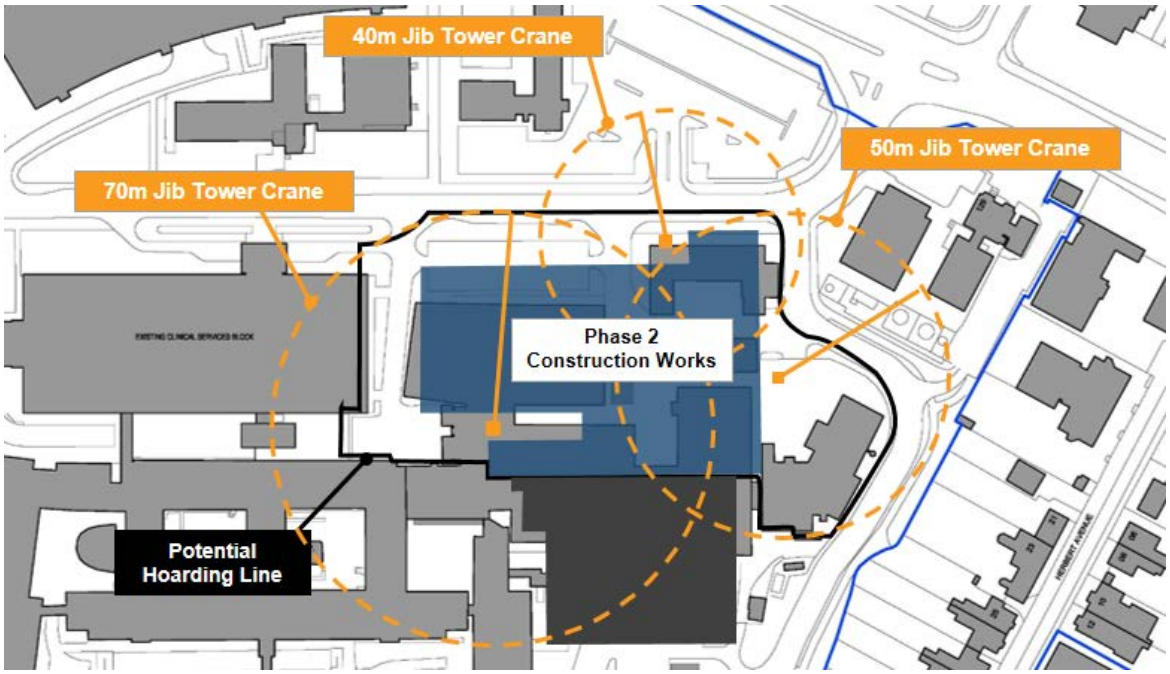


Figure 9 : Possible Crane Layout for Phase 2 Construction



3.3.10 Groundwater Control

The groundwater level on site has been estimated at +6.00m OD based on an assessment of existing data for the campus and a site specific ground investigation. The basement construction will require excavations to approx. +0.00m OD and as such groundwater control measures will be required. Given the geological conditions, it is likely that water filled gravel lenses and artesian pressures may be present on the site.

A secant pile cut off wall has been identified in the design as a suitable method of controlling groundwater during construction. Any seepage / infiltration through the vertical face of the wall, together with surface ponding will be collected locally to facilitate pumping with subsequent discharge, under licence, to the local sewerage network in agreement with St. Vincent's Hospital Technical Services Department and Dublin City Council Water Division / Irish Water.

Prior to discharge from the site, all groundwater will be passed through silt traps, settlement tanks, oil interceptors and a shut-down valve. This will facilitate the separation of sediment from the water prior to its discharge and will ensure that the water is of adequate quality before it enters the Local Authority sewerage system.

Pumped concrete will be monitored to ensure no accidental discharge. Mixer washings and excess concrete will not be discharged to existing surface water drainage systems. Concrete washout areas will be located remote from any surface water drainage features, where feasible, to avoid accidental discharge to watercourses.

The use of silt traps and interceptors will be supplemented with proper housekeeping and control measures such as regular site testing and monitoring of the water quality to ensure compliance. The monitoring programme during construction will include a detailed chemical analysis of ground water before pumping. The sampling regime will be agreed with Dublin City Council's Drainage Division.

3.3.11 Environmental Management / Sustainability

The appointed Main Contractor will be required to be accredited with ISO 14001 Environmental Management Systems.

The development will be assessed under the BREEAM International 2013 Assessment methodology. The primary aims of BREEAM are:

- To mitigate the negative impacts of the building on the environment;
- Improve the positive social and economic impact of the building over its lifetime;
- To enable the building to be internationally recognised according to its sustainable qualities; and
- To provide a credible environmental label for the building.

The Main Contractor will be required to support and contribute to the achievement of the target BREEAM rating for the development. The target BREAAM rating is to be achieved at both the Design Stage (Interim Certification) and Post Construction Stage (Final Certification).

At all times the Main Contractor is responsible for completing sufficient and relevant evidence within their specialist discipline. Where evidence has been collated from any source, the Main Contractor shall validate this information and produce any additional supporting documentation required to satisfy the BREEAM credit requirements.

The Main Contractor shall be responsible for obtaining credits under the following criteria:

- Man 02 – Responsible Construction Practices
- Man 03 – Construction Site Impacts
- Wst 01 – Construction Waste Management.

The Main Contractor will in addition contribute to such credits that require their specialist input.

3.3.12 Noise and Vibration

3.3.12.1 Noise and Vibration Management

In order to reduce the noise and vibration impact to nearby noise sensitive areas, the Main Contractor shall finalise the details of a Noise and Vibration Management Plan. This plan will incorporate all the mitigation measures for the construction phase identified in Chapter 11.0 Noise and Vibration which will eliminate or reduce potentially significant noise and vibration impacts, and cumulative noise and vibration impacts from the construction works. The Plan will define noise and vibration monitoring and reporting. The Noise and Vibration Management Plan will also include detailed method statements for each phase of the works, the associated specific measures to minimise noise and vibration in so far is reasonably practicable for the specific works covered by each plan and a detailed appraisal of the resultant construction noise and vibration generated.

The Main Contractor will ensure proactive community relations and will notify the hospital, public and vibration sensitive premises before the commencement of any works forecast to generate appreciable levels of noise or vibration, explaining the nature and duration of the works. The Main Contractor will distribute information circulars informing local residents and business people of the progress of works and any likely periods of significant noise and vibration.

With regard to potential mitigation measures during construction activities, the standard which the Contractor will comply with will be as follows:

> *"During the construction and demolition phases, the proposed development shall comply with British Standard 5228 'Noise Control on Construction and open sites Part 1. Code of practice for basic information and procedures for noise control'."*

BS5228 includes guidance on several aspects of construction site mitigation measures, including, but not limited to:

- Selection of quiet plant;
- Control of noise sources;
- Screening;
- Hours of works;
- Liaison with the public; and
- Monitoring.

Further information on noise and vibration management is contained in Chapter 11.0 of the EIS *'Noise and Vibration'*, with Construction Noise and Vibration Mitigation Measures appended to same, see Appendix 11.3.

3.3.12.2 Noise Limits

The Main Contractor is required to monitor the baseline noise levels at the site prior to commencement of the works, with a noise monitoring regime being implemented for the duration of the construction works on site as part of the Noise and Vibration Management Plan. The Main Contractor shall implement measures to minimise noise levels during construction. Specifically, noise levels shall be kept below those levels specified in Chapter 11.0 of the EIS – *'Noise and Vibration'*, or further limits if imposed by the Local Authority. The limits for residential developments in the vicinity of the development site are identified in Table 1.

Table 1: Summary of Construction Noise limits at Residential Dwellings

Period over which criterion applies		Noise Impact Criterion ($L_{Aeq, 1hr}$)
Monday to Friday	Day: 07.00 to 18.00	65 dB
	Evening: 18.00 to 22.00	55 dB*
	Night: 22.00 to 07.00	The higher of 45 dB or the ambient level*
Saturday: Day: 08.00 to 14.00		65 dB
Sundays and Bank Holidays Sundays: Day: Noise Limit Criteria 08.00 to 14.00		60 dB*

Note: * Construction activity during these times, other than that required for emergency works, will require the approval of Dublin City Council.

In addition, an internal noise limit of 45dB $L_{Aeq,1hr}$ will be required for construction noise intrusion in all Hospital and clinical buildings.

3.3.12.3 Vibration Limits

A Specialist Sub-contractor shall be engaged by the Main Contractor to monitor, collate and report on vibration results for the duration of critical work activities, as part of the Noise and Vibration Management Plan.

Vibration monitoring stations should continually log vibration levels using the Peak Particle Velocity parameter (PPV, mm/s) in the X, Y and Z directions in accordance with British Standard ISO 4866:2010: '*Mechanical vibration and shock – Vibration of fixed structures – Guidelines for the measurement of vibrations and evaluation of their effects on structures*'. Vibration monitors, of both aural and visual type, with real time outputs are to be located at agreed points.

Traffic light system to be in place consisting of:

- **Green** – vibrations below all threshold limits – OK to proceed;
- **Amber** – Vibrations exceed first threshold limit – Stop and check;
- **Red** – Vibrations exceed second threshold – Stop and action.

The vibration limits for the duration of the works are set out in Chapter 11.0 of the EIS – '*Noise and Vibration*', and reproduced below.

Table 2 sets out the vibration criteria to be adopted at nearby soundly constructed buildings to avoid cosmetic damage.

Table 2: Allowable Vibration during Construction Phase for Soundly Constructed Buildings

Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration		
Less than 10 Hz	10 to 50 Hz	50 to 100 Hz (and above)
15 mm/s	20 mm/s	50 mm/s

Due to the proximity of the development to clinical services within the existing Hospital, it is also considered appropriate to monitor the vibration performance within certain buildings during construction to mitigate the potential impact on normal functioning of the facilities. The potential impact of particular vibration inducing activities will be assessed and a monitoring regime agreed with St. Vincent's University Hospital Technical Services Department and Clinical Teams.

3.3.13 Dust

A Dust Minimisation Plan will be finalised by the Main Contractor for the construction phase of the project. The Main Contractor shall put in place a regime for monitoring dust levels in the vicinity of the site during works using the Bergerhoff Method (German Standard VDI 2119, 1972). The TA Luft limit value is 350mg/(m^2*day) during the monitoring period between 28 to 32 days. The Main Contractor shall monitor dust during construction to ensure the limits are not breached throughout the project.

Particular measures will be implemented to prevent the spread of air borne aspergillus spores as described in Section 4.2 below. The Main Contractor will be required to liaise closely with the St. Vincent's Hospital Infection Prevention and Control Team for the duration of the works in this regard.

The level of monitoring and adoption of mitigation measures will vary throughout the construction works depending on the type of activities being undertaken and the prevailing weather conditions at the time. These mitigation measures shall include:

- Storage of sand and other aggregates in bunded areas;
- All trucks will have a built-on tarpaulin that will cover excavated material as it is being hauled off-site and wheel wash facilities will be provided at all site egress points;
- Use of water misting or sprays for particularly dusty activities and / or during dry and windy periods;
- Delivery of bulk cement and other fine powder materials in enclosed tankers and storage in silos with suitable emission control systems to prevent escape of material and overfilling during delivery;
- Soft strip inside buildings to be demolished (retaining walls and windows in the rest of the building where possible to provide a screen against dust);
- Avoidance of dust generating activities such as explosive blasting and concrete scabbling; and
- Minimising stockpiling of excavated material on site with immediate removal of excavated materials envisaged for the majority of the works.

Further information on dust and dirt management is contained in Chapter 12.0 of the EIS *'Air Quality'*, with a Dust Minimisation Plan appended to same, see Appendix 12.3.

3.3.14 Dirt

Given the volumes of traffic generated by aspects of the construction works, particularly during the bulk excavations, it shall be a requirement that the Main Contractor shall ensure, where appropriate:

- A sufficient number of wheel wash facilities are provided at each egress point from the site. The wheel wash will be a drive through type and all vehicles will be required to pass through the wheel wash facility before exiting the site to the campus and public road network. The wheel wash must be kept in place and used throughout the critical dirt generating activities of the construction works. Where feasible, water supplies servicing the wheel wash will be from recycled sources. All waters shall be drained through appropriate filter material prior to discharge.
- Specific measures to prevent the release of sediment over baseline conditions to Dublin Bay during the construction work, which will be implemented as the need arises. These measures include, but are not limited to, the use of silt fences, silt curtains, settlement lagoons and filter materials. This is particularly important when undertaking any works/upgrading to the surface and foul water drainage networks at the proposed re-development site.
- Provision of exclusion zones and barriers (e.g. silt fences) between earthworks, stockpiles and temporary surfaces to prevent sediment washing into the existing drainage systems and hence the downstream receiving water environment.
- Provision of temporary construction surface drainage and sediment control measures to be in place before earthworks commence.
- Road sweepers (suction type) are retained for the duration of the works with an increase in cleaning during the critical dirt generating works. Regular road drain clearing will be implemented.
- Inspections are carried out on the haul routes with records of the inspections and subsequent actions recorded in a site log book. These inspections should include monitoring of trucks and road surfaces.
- Vehicle speed is restricted to an appropriate level in areas where there is potential for dust generation.

Further information on dust and dirt management is contained in Chapter 12.0 of the EIS *'Air Quality'*, with a Dust Minimisation Plan appended to same, see Appendix 12.3.

3.3.15 Surveys

3.3.15.1 Condition Surveys

Buildings adjacent to the proposed works, or those which will be connected to the new development, will be subject to a condition survey by the Main Contractor prior to the works. It is not envisaged that condition surveys of adjacent properties outside the campus boundaries is required.

Where surveys are undertaken, the Condition Report will record the current condition of the building / structure / services using photographs and sketches.

The Main Contractor's final construction methodology may necessitate further condition surveys of localised areas which may be affected by the works.

3.3.15.2 Other Surveys

Before commencing works on site, the Main Contractor will validate the available survey information. The Main Contractor may also carry out additional surveys for items to inform the construction methodology.

Such surveys may include:

- Ground penetrating radar survey with targeted slit trench investigations as required to validate the location and detail of all existing services on the site;
- CCTV survey of existing drainage services traversing and adjacent to the site
- Surveys to determine hazardous materials within the works area.

3.3.16 Dangerous Substances

Dangerous substances shall only be stored on site if they are required for use in the construction works. The following mitigation measures shall be adopted to prevent any spillages that may result in soil and groundwater quality issues and / or health implications for people:

- All drums containing harmful substances should be quality approved and manufactured to a recognised standard. If drums are to be moved around the site, they will be secured and transported on spill pallets. Only competent and trained personnel with appropriate equipment will load and unload drums;

- All containers that contain potential harmful substances shall be securely stored in a dedicated internally bunded chemical storage cabinet unit or inside a concrete bunded area;
- All containers and drums shall contain clear labelling so that appropriate remedial measures can be taken in the event of a spillage. Spill facilities shall be provided across the site;
- Where mobile fuel bowsers are used, they shall be fitted with locks and secured when not in use. All bowsers shall carry a spill kit and operatives must have spill response training; and
- All fuel containing equipment such as portable generators shall be placed on drip trays.

Other dangerous substances that may be encountered during the construction works are contaminated soils and asbestos. Measures for the handling and disposing of these substances are described in Chapter 10.0 of the EIS – *'Waste Management'*, with a project specific Construction and Demolition Waste Management Plan appended to same, See Appendix 10.1. A summary of the waste management plan for these items is also included in Sections 3.5.3 and 5.2.3 of this text.

3.4 Construction Traffic Management

3.4.1 Introduction

The planning of the development of the National Maternity Hospital at the St. Vincent's University Hospital campus has been sensitive to the fact that traffic and transportation impacts for both the campus and the surrounding local residential community are to be kept to a minimum during the construction stage.

The traffic management issues considered and proposed by the Project Team during the construction phase are set out below.

3.4.2 Construction Access and Egress Routes

3.4.2.1 External Road Network

Dublin City Council operates a Heavy Goods Vehicle (HGV) restriction within Dublin City Centre where 5-axle HGVs are banned within the City Centre from 07:00 – 19:00 every day. Any 5-axle HGV wishing to access the restricted zone has to apply for a permit and is also obliged to use the designated HGV routes within the restricted zone. St. Vincent's University Hospital campus lies immediately outside the restricted zone, therefore only HGV

movements to and from the north will be affected by the restrictions. The Main Contractor may make applications for HGV permits based on the logistics of their supply chains and their construction management plan.

It is expected that the route along the R138 (formerly the N11) and Nutley Lane will be used to access / egress the hospital campus for HGVs which are travelling to and from destinations in the south and west. It is expected that the route along Merrion Road and Strand Road will be used to access / egress the Hospital campus for HGV's which are travelling to and from destinations in the north.

3.4.2.2 Hospital Campus

The main consideration in the provision of construction access and egress into and through the hospital campus is to ensure that the existing hospital campus access arrangements are carefully and safely managed during the works. Access for pedestrians, cars, cyclists, delivery vehicles and emergency service vehicles will be required to be maintained into and through the campus from Nutley Lane and Merrion Road.

During the Enabling Works phase, the Main Contractor will require access through the existing Nutley Lane entrance to reach site areas such as the multi-storey car park. In line with previous campus development works, vehicles may also enter the site via a new dedicated temporary construction access point off Nutley Lane that will be formed to the south of the existing Mortuary Building. During this phase, vehicles will require intermittent use of the main hospital campus road, however use of this road will be kept to a minimum.

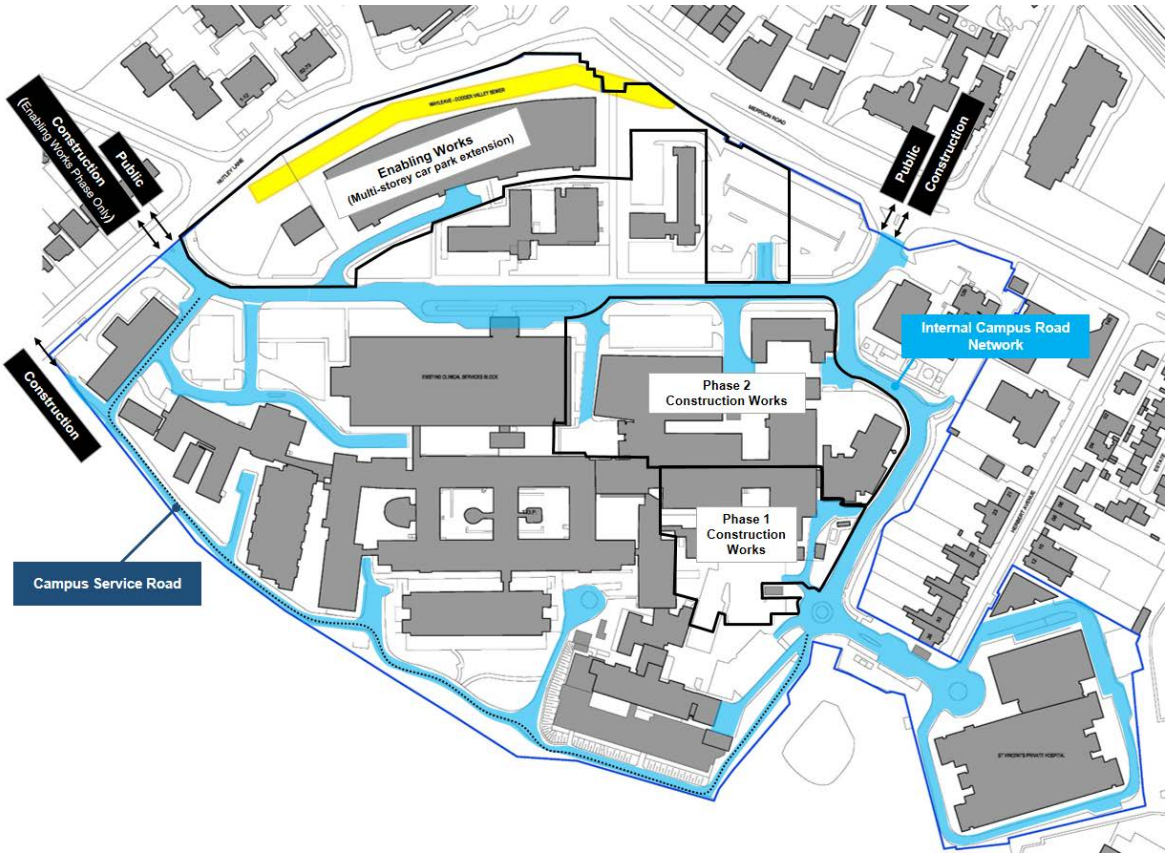
For the Phase 1 construction, it is envisaged that the Main Contractor will operate a one-way system for construction vehicles travelling through the campus. In line with previous campus developments, and as described above, vehicles will enter the site via a new dedicated temporary construction access point off Nutley Lane that will be formed to the south of the existing Mortuary Building. They will then travel to the construction site along the existing service road which runs along the southern perimeter of the campus. A number of temporary vehicle lay-bys will be provided along the service road to ensure that access for emergency service vehicles is maintained at all times. Once they have completed their operations on site, vehicles will continue along the campus road and exit onto Merrion Road.

Flag men located at critical points along the hospital / public road network will manage and marshal truck movements in a safe and controlled manner.

The construction access arrangements will be similar for Phase 2, however it is likely that some construction vehicles will also use the Merrion Road entrance to access the site, as this minimises the length of campus roadway shared by construction and public vehicles.

The proposed construction access and egress points are shown in Figure 10.

Figure 10 : Construction Access Points into St. Vincent's University Hospital Campus



3.4.3 Deliveries to Site

A 'just in time' approach will be implemented for the delivery of particular materials such as concrete formwork and reinforcement due to the limited space available for storage of materials on site. That is to say, deliveries of materials will be planned and programmed to ensure that the materials are delivered only as they are required on site. Works requiring multiple vehicle deliveries to site, such as concrete pours, will be planned well in advance with no queuing of trucks allowed or permitted on the public roadways around the campus or on the main internal campus road network.

3.4.4 Removal of Materials from Site

Demolitions of existing buildings and excavations for basements and foundations will be the most intensive periods for removal of materials off site. Similar to the deliveries, removing materials off site will need to be managed effectively to mitigate the potential of trucks queuing on the public roadways around the campus or on the internal campus road network. All trucks will have a built on tarpaulin that will cover excavated material as it is being hauled off site and wash wheel facilities will be provided at all site egress points.

3.4.5 Traffic Management Plan

3.4.5.1 Introduction

A construction phase Traffic Management Plan will be prepared by the Main Contractor. Discussed below are a number of issues which shall be included in the Traffic Management Plan as set out by Dublin City Council document *'Directions for the Control and Management of Roadworks in Dublin City'*.

3.4.5.2 Contents of Traffic Management Plan

Health and Safety:

The Main Contractor will be required to demonstrate compliance with the requirements of the Health and Safety Authority.

Temporary Signage:

The Main Contractor will be required to provide appropriate signage which must conform to the requirements of Chapter 8 of the Department of Transport's *'Traffic Signs Manual'*. Signage will include adequate and appropriate warning of the site access points at any interfaces with the campus / public road system.

Temporary Road Markings:

The Main Contractor's Traffic Management Plan will include proposals for any proposed temporary road markings.

Temporary Road Closure:

There are currently no road closures proposed as part of the development.

Operation of a Contra Flow:

There are no proposals to operate a contra flow on public roads during the works. The use of managed contra flows may be utilised during some construction periods to mitigate Health and Safety hazards on the campus.

Temporary Traffic Signals:

There are currently no proposals for the use of temporary traffic signals.

Proposed Changes to Street Infrastructure to Enable Roadworks:

Any existing road signs or other street infrastructure which may be required to be moved to facilitate any part of the works will be determined by the Main Contractor with proposals developed, in consultation with St. Vincent's University Hospital and the relevant sections of Dublin City Council, as appropriate, to ensure that adequate road signage is always in place on the public roadways.

Arrangements for Local Access, Pedestrian and Cycle Routes:

Provision for pedestrian and cyclist access will be incorporated into the design of the temporary construction access roads and the permanent access road proposals. Localised alterations to existing routes may be required during the works, however, alternative routes will be provided.

Provision for Pedestrian Movements including any Special Provision required to facilitate the Mobility Impaired and Disabled:

All pedestrian movements will be reviewed and monitored in order to accommodate movements for mobility impaired and disabled. Localised alterations to existing routes may be required during the works, however, alternative routes will be provided.

Changes to On-street Parking Arrangements:

The loss of street car parking as a result of the construction works is not envisaged. There may be a loss of a number of on-street car parking spaces as part of the junction upgrade works. This is discussed further in Chapter 6.0 of the EIS – *'Traffic and Transportation'*.

Proposed Use of Barriers:

The use of barriers is to be referred to in the Main Contractor's Traffic Management Plan and the details of which are to be laid out in accordance with Chapter 8 of the Department of Transport's *'Traffic Signs Manual'*.

Proposed Lighting Arrangements:

Lighting will be provided at access and egress points into the site as well as along temporary construction access roads and permanent access roads. The lighting arrangements will be agreed with Dublin City Council prior to the works being undertaken on site.

Proposed Use of Flagmen:

Flag men will be deployed by the Main Contractor at critical campus junctions, including site access and egress points, to assist in the safe movement of construction vehicles to and from the site and their integration onto the campus and public road networks.

Traffic management personnel will be provided at all appropriate stages of the construction works to mitigate potential risks and disruption to traffic flows.

Arrangements for Informing Affected Parties:

A Community Liaison Manager will be appointed, whose duties will include keeping people informed of site operations, through regular meetings, mail drops and newsletters.

3.4.6 Construction Vehicle Traffic Generation

3.4.6.1 Introduction

The following sections set out a draft overview of the traffic inputs and some of the peak potential traffic generation for the construction phase of the project. It should be read in conjunction with Chapter 6.0 of the EIS – *'Traffic and Transportation'* for an assessment of the potential impacts of the proposed construction phase of the project on the existing traffic environment and proposals for mitigation measures.

Whilst it is envisaged that the Enabling Works phase will have peak construction vehicle numbers of 6 to 8 trucks per hour (12 to 16 two-way movements), the most intense period for construction vehicles will be during the Main Construction Works phase. It is for this reason that the Main Construction Works phase is the primary focus of the construction vehicle generation discussion.

3.4.6.2 Construction Vehicle Traffic Generation

Construction traffic will be generated for the duration of the works on site, with levels of vehicle movements varying throughout the construction period depending on the construction activities ongoing. The construction vehicle generation will be from a number of sources:

- Hauling of demolition and excavated material off site
- Deliveries of structural building materials such as concrete, concrete formwork, reinforcement, drainage goods, precast elements, steelwork, blockwork etc.
- Deliveries of façade panels, glazing and internal fit-out materials
- Deliveries of mechanical, electrical and plumbing plant and equipment
- Other miscellaneous goods; and
- Construction workers.

To mitigate some of the above, there will be opportunity for some limited parking for construction workers available on the campus. The construction of the extension to the multi-storey car park will necessitate the temporary provision of some off-site staff car parking for a period.

The levels of construction traffic during some of the most intensive construction activities are described below.

Demolitions:

The removal of materials off site for the demolition phase(s) will make use of the construction access road. Standard site management techniques, such as segregation of materials and use of concrete crushing, will be adopted to ensure that all vehicles exiting the site are as fully laden as possible to minimise the number of truck movements required. It is estimated that an average 20 trucks per day will be required to haul demolition waste off site.

Perimeter Piling:

The work for the secant pile wall to the perimeter of the basement is likely to commence immediately after the demolition works. Given the plan extent of the site and the required secant pile wall, it is estimated that there may be 2 rigs on site during the peak piling works. This would give rise to an average 30 trucks per day for secant pile wall installation.

Excavations:

The peak excavation volume will be associated with the Phase 2 construction works, which will require removal of approximately 50,085m³ of soil over a period of approximately five months of continuous working. It is estimated that an average of 50 trucks per day will be generated by the excavation works.

Concrete Pours:

Concrete slabs pours will present the largest demand for concrete trucks on site. A medium to large pour size for a suspended slab may be in the order of 400m³, to be completed in a working day.

It is estimated that this would result in an average 70 trucks per day on the day that the pour occurs. It is unlikely that two slab pours could occur simultaneously due to the layout of the site, phased nature of the construction and limited number of construction access points. Some other elements of the construction works are likely to be ongoing during this time but, save for excavation related movements, deliveries for same would be low in relative terms.

3.4.6.3 Peak Vehicle Movements

The construction work will proceed in a sequential manner and it is expected that, due to the nature of the site, there will little opportunity to overlap the demolitions, piling, excavations and concrete pours. The exception to this is the Phase 2 construction works where some overlap is feasible.

The assessment of construction vehicle numbers has identified the concrete pours as being the most intensive periods for vehicle movements on site. It is unlikely that vehicle numbers for concrete pour operations will be spread evenly over the course of a full working day. It envisaged that peak vehicle numbers of 12 trucks per hour (24 two-way movements) could be generated during this operation.

3.5 Waste Management

3.5.1 Introduction

The Project Team is committed to ensuring the highest standard of on-site segregation and on and off site reuse / recycling / recovery in terms of waste materials arising from the project. The potential impacts associated with waste management for the construction and operational phase are assessed and evaluated in Chapter 10.0 of the EIS – '*Waste*

Management', with a project specific Construction & Demolition Waste Management Plan appended to same, see Appendix 10.1. The following sections set out and discuss some of the demolition and construction related sources of waste and treatment of same.

The relevant requirements of the following legislative provisions will be adhered to in all works:

- Waste Management Act 1996, as amended, and all applicable waste-related secondary legislation made thereunder or made pursuant to the European Communities Act 1972, as amended.
- Planning and Development Act 2000, as amended.
- Environmental Protection Act 1992, as amended.
- Litter Pollution Act 1997, as amended.

3.5.2 Demolitions

It is noted that many of the buildings are currently occupied and at the time of submitting the application are not available for detailed inspection or intrusive investigations. Chapter 10.0 of the EIS – *'Waste Management – Appendix 10.1'* and Table 5 below presents estimates for the main types of demolition waste that will arise and their corresponding estimated quantum of reuse, recovery, recycling and disposal targets for the main waste types. As is common and best practice, pre-demolition surveys will be undertaken which will inform the refinement of these figures. Waste streams from both non-structural (soft strip) and structural demolition activities will be considered.

In order to maximise the materials suitable for reuse / recovery / recycling, a selective demolition Methodology involving a comprehensive 'soft strip' operation will be adopted. This Methodology complies with the objectives of the National Construction Demolition Waste Council to promote construction and demolition waste prevention, reduction, re-use of materials, recovery and recycling, which has been adopted as construction best practice and ensures minimum disposal to landfill.

This methodology also ensures minimum impact on the environment, in that it ensures that all waste streams are properly segregated at source and avoids cross-contamination of materials to be recovered from structural demolition at a later stage of the demolition sequence.

The approximate quantities of waste materials anticipated to be generated from demolition works are presented below along with indicative targets for reuse (off site), recovery, recycling and disposal.

Table 5: Estimated Off-site Reuse, Recycle and Disposal Rates for Demolition Waste

Demolition Waste Type	Tonnes	Reuse / Recover		Recycle		Disposal	
		%	Tonnes	%	Tonnes	%	Tonnes
Glass	291	0	0	85	248	15	44
Concrete, brick, tiles and ceramics	3612	30	1084	60	2167	10	361
Plasterboard	233	5	12	75	175	20	47
Metals	699	5	35	80	559	15	105
Timber/timber composite	757	10	76	40	303	50	379
Other	233	40	93	0	0	60	140
Total	5827		1299		3452		1075

Materials to be removed off site will make use of the construction traffic egress point at the Merrion Road. Materials will be removed from site in skips or using haulage trucks. It is anticipated that the majority of fixtures, fittings and 'soft' items will be removed from all the buildings as part of the decanting process and that demolition waste materials will comprise mainly of structural concrete, metal and timber/timber composite. Some waste asphalt will also be generated from excavation of existing access routes across the proposed development area.

All waste arisings will be transported off site by an approved Waste Contractor holding a current waste collection permit. All waste arisings requiring re-use, recycling, recovery or disposal off site will be brought to facilities holding the appropriate certificate of registration, licence or permit, as required.

There are a number of waste transfer stations in the region which are permitted / licenced to accept the aforementioned waste streams for recovery / recycling. These include (but are not limited to the following):

- WFP-DS-10-0005-06, The Hammond Lane Metal Company, Clondalkin;
- W0044-02, Thornton's Recycling Ltd., Ballyfermot;
- W0079-01, Starus Eco Holding Ltd. (Greenstar Ltd.), Tallaght;
- W0095-01, Greyhound Recycling and Recovery, Dublin 12;
- W183-01, Starus Eco Holding Ltd. (Greenstar Ltd.), Ballycoolin; and
- W0152-03, Oxigen Environmental Ltd., Ballymount.

3.5.3 Excavations

Excavations will be required throughout the site to facilitate the formation to basement levels, foundations and underground utilities. In total, an estimated 84,137m³ of made ground and clay material will be required to be excavated and removed off site.

Detailed sampling and testing of the made ground material has been undertaken, as discussed in Chapter 7.0 of the EIS – *'Soils, Geology and Hydrogeology'*. This testing has classified the materials to be removed and a summary of the findings is included in Table 6. All potentially contaminated material to be excavated is to be segregated and temporarily stockpiled in a contained manner and characterised by a competent professional through laboratory testing.

Table 6: Soil Classification of Made Ground Material at St. Vincent's University Hospital

Waste Category	Title	No. of Positive Samples out of Total Number Tested
Category A1	Inert Natural	0 out of 7
Category A2	Inert	3 out of 7
Category B	Non Hazardous	4 out of 7
Category C	Stable non-reactive Hazardous for disposal in Non Hazardous Landfill	0 out of 7
Category D	Hazardous	0 out of 7

None of samples tested have been classified as hazardous, however the presence of fuel tanks, service yards and energy centre on the footprint of the site, means there is a risk of localised ground contamination in these areas.

An assessment has been undertaken, as discussed in the Chapter 10.0 of the EIS – *'Waste Management'* – Appendix 10.1, of the potential locations for off site management of the above material. These include (but are not limited to) the following:

- Inert Natural Material (Category A1)

  This material could be used as a fill material in other construction projects or engineering fill for waste licenced sites. Recycling / recovery options include reinstatement of quarries and raising land for site improvement or development. Landfill disposal will only be considered as a last resort.
- Inert Material (Category A2)
  - Murphy's Environmental Limited, (W0129-02), Hollywood, The Naul, Co. Dublin.
- Non-Hazardous and Stable Non-Reactive Hazardous (Category B and C)
  - Bord na Mona PLC (W0201-03), Drehid Waste Management Facility, Cadbury, Co. Kildare.
  - Knockharley Landfill Ltd. (W146-02), Navan, Co. Meath.
  - Ballynaggan Landfill Ltd. (W165-02), Ballynaggan, Coolbeg and Kincandra, Co. Wicklow.
- Hazardous (Category D)
  - Afvalstoffen Terminal Moerdijk, Vlasweg 12, 4782 PW Moerdjik, Netherlands
  - Terracon GmbH, Hovestrabe 74, 20539 Hamburg, Germany

The Main Contractor will be responsible for securing agreements for acceptance of the surplus material in similar authorised and permitted / licensed facilities such as those noted above, in accordance with the acceptance criteria of each facility.

3.5.4 Main Construction Works

During the construction phase, waste will be produced from surplus materials such as broken concrete blocks or off-cuts of timber, plasterboard, concrete, tiles, bricks etc., waste form packaging (cardboard, plastic, timber) and oversupply of materials may also be generated. However, the Main Contractor will be required to ensure that oversupply of materials is kept to a minimum. Again, in a similar fashion to the demolition phase, waste materials will be segregated at source and placed in dedicated skips such as general waste, wood, mixed ferrous and concrete rubble on site to maximise the opportunity for reuse / recycling / recovery of materials.

Table 7 shows the predicted construction waste generation for the proposed development based on the current information along with the targets for management of the waste streams.

Table 7: Predicated On and Off-site Reuse, Recycle and Disposal Rates for Construction Waste

Construction Waste Type	Tonnes	Reuse / Recover		Recycle		Disposal	
		%	Tonnes	%	Tonnes	%	Tonnes
Concrete, brick, tiles and ceramics	170	40	68	40	68	20	34
Asphalt, tar and tar products	15	0	0	25	4	75	12
Metals	15	5	1	90	14	5	1
Other	62	10	6	40	25	50	31
Total	262		75		111		78

Note: Until final materials and detailed construction methodologies have been confirmed, it is difficult to predict with a high level of accuracy the construction waste that will be generated from the proposed works as the exact materials and quantities may be subject to some degree of change and variation during the construction process

4.0 Enabling Works

4.1 Introduction

The construction of the National Maternity Hospital at the St. Vincent's University Hospital campus site will involve a series of enabling works to be undertaken in a carefully managed sequence. The purpose of the enabling works is to:

- Protect patients from the effects of the proposed construction;
- Provide new car parking spaces on the campus to facilitate the main construction works;
- Relocate existing buildings / services that currently occupy the site to facilitate demolitions during the main construction works;
- Carry out advance works on the existing campus infrastructure to prepare the site for the main construction works; and
- Mitigate patient risks by removing critical infrastructure from the building site area.

4.2 Aspergillus Protection

An initial assessment of the potential risk of aspergillus to immuno-suppressed patients has been carried out across the campus which has identified a number of locations on campus which may be at risk during the proposed works. An appropriate strategy has been developed to identify specific measures to be implemented to mitigate these risks which fall into two categories:

i) Addition of new mechanical ventilation system with appropriate filtration to serve areas which are currently naturally ventilated.
ii) Upgrades to existing mechanical ventilation plant to provide the required level of filtration.

Additional mitigation measures will also be implemented by the Main Contractor to reduce the potential risks, which will include:

- Road washing and sweeping during the works
- Screening of the active construction site
- Locally dampen excavations and stockpiled materials to lower the dust generation
- Implementation of wheel wash facilities for trucks.

Once the agreed aspergillus measures have been put in place, the St. Vincent's University Hospital Infection Prevention and Control Team will implement a programme of air

sampling throughout the campus during the construction process.

4.3 Multi-storey Car Park Extension

The management of car parking on the campus during construction is a key part of the enabling works strategy. Existing car parking spaces that currently occupy the site of the new Maternity Hospital will need to be relocated elsewhere on the campus to facilitate the construction process.

Approximately 277 new car parking spaces will be required to meet the demands of the proposed new National Maternity Hospital along with approximately 149 existing spaces which shall be displaced from other areas of the campus.

It is proposed that additional car parking spaces will be provided by means of a horizontal and vertical expansion of the existing multi-storey car park building. The structural framing layout of the extended car park will mirror the existing car park building. The access / egress points to the enhanced car park will be reconfigured to facilitate an efficient use of the facility.

The construction of the multi-storey car park expansion has the following constraints:

- Maintaining the existing multi-storey car park operation
- Existing Nurse Education Centre building to the south
- Pedestrian boulevard and numerous below ground services to the east
- Dodder valley sewer way leave to the north of the multi-storey car park within the hospital campus
- Existing campus drainage infrastructure.

It is envisaged that the construction of the multi-storey car park expansion will be carried out in a phased manner to overcome the above constraints and to minimise the disruption to the operation of the hospital campus. An indicative sequence of works is as follows:

1. Initial site set-up (erect hoardings, construct site compound etc.).
2. Carry out service diversions to east façade of the existing multi-storey car park and construct the new car park entrance roadway on this side. Open up the new entrance roadway once complete.
3. Construct a new temporary road access to the existing multi-storey car park adjacent to the existing to facilitate taking ownership of existing multi-storey car park entrance roadway for use during construction of the new extension. Construct the new

horizontal extension to west façade of existing multi-storey car park. Open up new horizontal extension once complete.

4. Close top deck of existing multi-storey car park to facilitate construction of the vertical extension. Construct the new vertical extension and make required alterations to ramps, stairs and lifts.
5. Carry out landscaping works around the newly expanded multi-storey car park.
6. Site Clearance.

4.4 Campus Infrastructure Works

4.4.1 Temporary Construction Access Road

Similar to previous projects on the campus, construction vehicles will access the campus using a temporary access to the rear of the mortuary building. The controlled temporary access utilises the existing service road along the southern perimeter of the campus, which will be safely secured with gates. Access to the roadway will be restricted to construction vehicles, fire tender and delivery vehicles. The operation of the roadway will be managed by the Main Contractor and clear access for fire tender and delivery vehicles will be maintained. Local improvements to the road alignment will provide for safe vehicle lay-bys to ensure that emergency vehicles have unhindered access as required.

This access route has the benefit of being able to largely segregate construction traffic from the main campus vehicle and pedestrian routes as well as keeping construction vehicle volumes along the main campus road to a minimum, thereby mitigating the risks of conflicts between construction traffic and the public.

4.4.2 Junction Improvements

To aid the traffic flows from the local road network to and from the campus, a number of improvements to the existing junctions are proposed to be undertaken early in the construction stage.

4.4.3 Campus Infrastructure Service Diversions

4.4.3.1 Mechanical, Electrical and Plumbing Services

The text below describes the various existing mechanical, electrical and plumbing services that are affected by the works and require diversionary works:

- Medical gas:
  Oxygen Bulk storage to be relocated from current location to the service road along the southern boundary. Bulk liquid nitrogen storage to be relocated from existing site to new waste marshalling yard.

- Natural gas:
  Supply of natural gas to existing Clinical Services Building to be diverted off rooftop services rack to below ground supply. Supply to existing Energy Centre boilers to be diverted to new Energy Centre.

- Medium and low voltage:
  A new sub-station will be constructed adjacent to the rear of the Breast Check Clinic to replace the existing sub-station which is within the proposed site. Supply of medium voltage power from existing Energy Centre to the Clinical Services Building shall be diverted off rooftop services rack to below ground. Low voltage supply from existing Energy Centre shall be rerouted to below ground.

4.4.3.2 Civil Infrastructure

The text below describes the various existing watermain and drainage services that are affected by the works and require diversionary works:

- Watermain:
  Sections of the existing watermains will require to be diverted around the footprint of the new building with connections back into the existing ring main system north and south of the proposed development. This will maintain the supply to the existing Hospital and provide a service to the new building.
  These diversions will need to be undertaken in a careful and detailed sequence to maintain the integrity of supply to the existing Hospital at all times.

- Surface water drainage:
  Existing surface water drains traversing the site will require to be diverted by gravity around the new building footprint to the east of the site. These diversions will maintain discharges of surface water from roof and hardstanding areas and carry the run-off to the public drainage systems on Merrion Road. Detailed sequencing of the diversions will be required to ensure no surface water flooding occurs on the hospital campus during the works.

- Foul water drainage:
  Existing foul drainage traversing the site will require to be diverted by gravity around the new development to the east and west of the new building. They will maintain the integrity of the Hospital drainage systems and continuity of supply to the existing Hospital facilities.

4.5 Temporary Accommodations

A number of existing hospital functions shall be decanted to temporary accommodation to facilitate the construction of the proposed development. These include the provision of temporary facilities to replace the existing:

- Canteen;
- Catering changing facilities;
- Carpenters workshop;
- Hazardous medical waste store; and
- Household Services store.

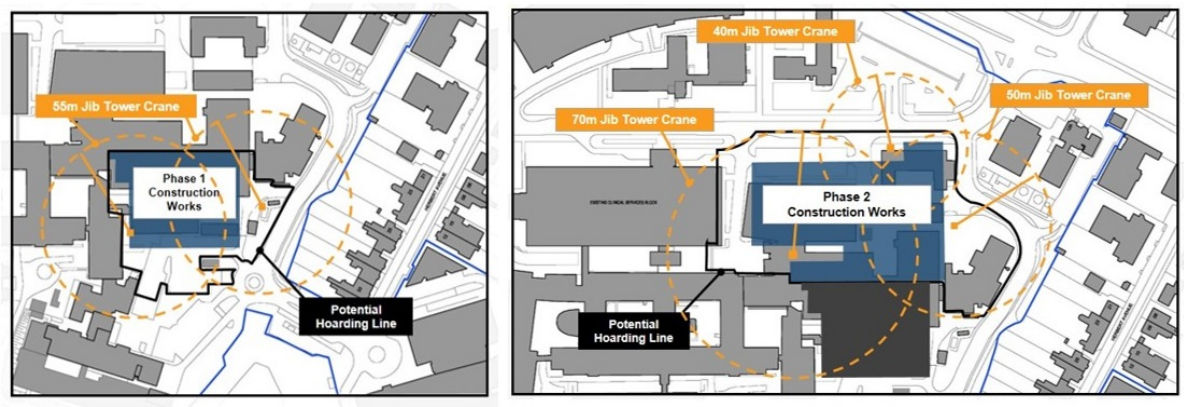
5.0 Main Construction Works

5.1 Introduction

The re-development of the National Maternity Hospital at St. Vincent's University Hospital campus will be constructed on a phased basis. The phasing strategy has been developed to minimise disruption to the operation of the existing hospital campus and to facilitate the construction of the new building given the various site constraints.

The construction works can be broadly sub-divided into two sequential phases as illustrated in Figure 11.

Figure 11 : Site Set-up for Main Construction Phases



The following Sections describe the works involved in main construction phases.

5.2 Decanting and Demolition Works

5.2.1 Introduction

The demolition of numerous existing buildings on the campus is necessary to facilitate clearing of the site for the proposed development. The following demolitions are proposed:

Phase 1

- Canteen
- Catering changing facilities
- Building currently housing the Pharmacy
- Transitional care unit
- Carpenters workshop; and
- Long life radioactive waste store.

Phase 2

- Dermatology;
- General stores;
- Waste marshalling yard;
- Energy Centre ;
- Kitchen;
- Medical records; and
- Temporary accommodations provided to facilitate the phase 1 construction works (described in Section 4.5).

The occupants and services within these buildings will be temporarily decanted or permanently moved to other areas on the campus in advance of the demolition works.

5.2.2 Pre-demolition Surveys

A detailed pre-demolition survey will be undertaken to provide sufficient information for the Main Contractor to prepare a detailed Demolition Plan, giving methodology and work sequences for the demolition phase.

This survey will inform the Design Team and Specialist Demolition Contractor of the structural framing, floor and wall construction and interface details with adjoining buildings, so that measures can be put in place at design stage, to ensure the safe deconstruction of each building and to avoid uncontrolled collapse of any part of the structure.

This survey will also provide information on all non-structural elements that will form part of the soft strip. This information will assist in the preparation of a detailed Waste Management Plan for these waste streams.

This survey will be accompanied by a detailed risk assessment to identify potential hazards.

5.2.3 Asbestos

An asbestos survey referred to as a *'Management Asbestos Survey'* was undertaken by About Safety Ltd. on behalf of St. Vincent's University Hospital and a Report was prepared to present the findings of the survey (Report dated February 2013). The presence of asbestos containing materials was confirmed (or presumed / strongly presumed) in a number of the buildings across the Hospital including some of the buildings which will be demolished as part of the enabling works for the development. A fully intrusive asbestos survey of these buildings will be undertaken prior to the commencement of the demolition

works in order to confirm these findings.

Prior to commencement of the demolition works, all asbestos containing materials identified will be removed by a suitably trained and competent person. Asbestos containing materials will only be removed from site by a suitably permitted Waste Contractor and will be brought to a suitably licenced facility. The Health and Safety Authority should be contacted in relation to the handling of asbestos and material should be dealt with in accordance with the Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2006, as amended, and associated approved Codes of Practice.

5.2.4 Soft Strip

All loose internal fixtures and fittings such as furniture, kitchen fittings and other unattached items shall to be removed by hand and segregated on site, where practical, into skips to allow for collection and transport by an approved waste carrier. The approved waste contractor will provide appropriate skips to facilitate on-site segregation of waste materials.

Fixed soft stripped material such as plasterboard, wood panelling and other waste materials will be removed by hand, brought to the segregation points and loaded into the skips and subsequently removed from site in skips or using haulage trucks. An exclusion zone shall be set up within the works area to provide a safe and operational area for skips and demolition waste and to prevent operatives from entering.

5.2.5 Structural Demolition

The strategy for structural demolition must ensure de-construction is undertaken in a carefully pre-planned sequence, using methodologies that ensure that buildings under demolition and any adjoining buildings are not affected in any way, weakened or de-stabilised during the works.

In order to comply fully with works specification, planning conditions, environmental and safety requirements and adhering to demolition best practice, the works should be undertaken by adopting a methodology that combines the following operations:

- Demolition by hand or using hand-held tools:
  This method will be adopted in all sensitive locations, particularly at interfaces with retained buildings. These works can be undertaken from existing floors, crash decks or from mobile elevated work platforms.
- Saw cutting and lifting:
  Again, these methods will be adopted in sensitive locations and at interfaces with

retained buildings. These works can be undertaken from existing floors, crash decks or from mobile elevated work platforms.

- Remote controlled mini excavators and breakers:
  The use of remote controlled mini excavators may be adopted in constricted locations around the site where larger machinery may not be appropriate.
- Use of long reach excavator fitted with specialist concrete munching equipment.
- Larger scale buildings on site may necessitate the use of munching / pulverising equipment fitted to a long reach excavator. All units will be fitted with water spray devices to aid in dust suppression during the works.
- Hydraulic concrete breaking equipment:
  The use of breaking equipment will be employed to break out ground floor slabs and any external areas of hardstanding. The breaker will typically be fitted to a 20T excavator but there may be some hand held tools utilised in isolated or constricted locations.

5.3 Basement Excavations

5.3.1 Installation of Secant Pile Wall

A secant pile cut off wall will be a key feature utilised to control groundwater during construction and acts as a retaining wall for the basement excavation. Prior to any piling works commencing on site, the following preparatory works must be undertaken:

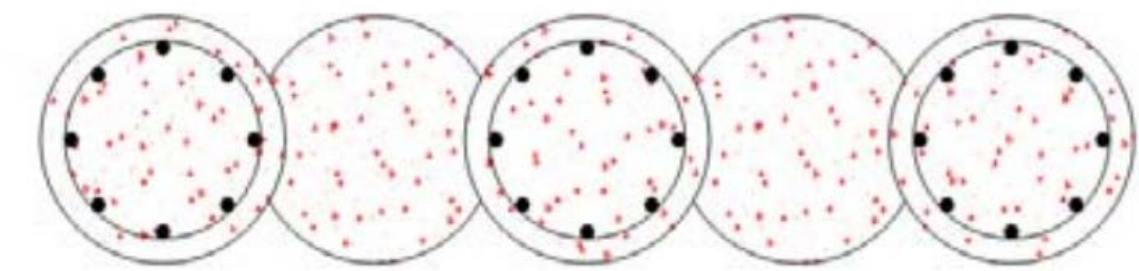
- Provision of vibration monitors, real time and both aural and visual type, on adjacent sensitive buildings. Traffic light system to be put in place consisting of:
  Green – vibrations below all threshold limits – OK to proceed
  Amber – Vibrations exceed first threshold limit – Stop and check
  Red – Vibrations exceed second threshold – Stop and action.
- Provision of a piling mat to provide safe means of accommodating the piling rig on site.

The construction of the secant pile wall will involve the installation of interlocking male and female bored piles. The pile wall is required to act in a temporary and permanent condition using a traditional hard-soft approach. The pile wall is likely to consist of 900mm diameter piles to achieve the necessary overlap or interlocking of piles. Inclinometer and tiltmeters will be provided on the secant pile wall once excavation works commence to monitor and ensure any directional movement is within acceptable levels.

The secant pile wall will be specified and designed based on specific ground conditions to ensure structural stability both in terms of the proposed construction and the surrounding overburden. The perimeter wall will control lateral groundwater ingress during construction.

A typical detail of the pile wall is shown in Figure 12.

Figure 12 : Secant Pile Wall Construction (Plan View)



The proposed secant pile wall is a tried and trusted method of facilitating excavations in Dublin City. It is a method that has been successfully adopted by the Project Team on a number of developments in Dublin including areas where excavations are required in close proximity to existing structures, protected structures and public areas. An example of a secant pile wall construction adjacent to an existing building is shown in Figure 13.

Figure 13 : Secant Pile Works in close proximity to Existing Buildings

5.3.2 Excavations to Required Formation Levels

The basement of the proposed new National Maternity Hospital consists of a single level. The excavations will be required to proceed to a formation level approximately 1m below the finished floor levels in some areas.

The construction of the basement and foundations will require the removal of approximately 70,209m^3 of made ground and clay material. A review of the site specific ground investigation approximates the soil stratification as:

Table 8: Approximate Soil Stratification

Age	Strata#	Average Thickness	Average Top of Strata	
		(m)	(m BGL)	(m OD)
Recent	Made Ground	1 to 2	0	6
Quaternary	Brown Boulder Clay^	2 to 3	2	4
	Black Boulder Clay^	9 to 20	5	1
Carboniferous	Limestone Rock		18 to 36	-12 to -30

Not all stratum encountered in all area

^ Includes lenses of sand and gravel.

5.4 Civil and Structural Works

5.4.1 Below Ground Services

The proposed development will require the construction of new drainage and watermain services below ground, in addition to the drainage and watermain diversions outlined in Section 4.4.3.2 above. The proposed drainage and watermain systems have been designed to meet the demands of the proposed new development with connections to the existing campus drainage and watermain systems. No new connections to the Local Authority or Irish Water system are required.

The drainage and watermain system is likely to be constructed in the following sequence of operations:

- Utility survey / ground penetrating radar scanning of the site in question to confirm area is free of other services
- Excavation of trenching
- Deep excavations will be undertaken with the use of trench boxes and trench sheeting
- Provision of suitable bedding material to pipes
- Laying of pipes followed by suitable surround material to pipes
- Pressure testing of new infrastructure
- Backfilling of trenches with approved material to formation level
- Appropriate surface reinstatement to the required finished level

5.4.2 Basement Construction

The extent of basement area under the building is outlined in the architectural drawings. The natural topography on the campus rises from north to south across the campus. The basement generally consists of a single storey below ground level.

Basement spaces currently contain a range of uses and functions including plantrooms, staff facilities, workshops and stores.

The results of the ground investigation indicate a groundwater pressure at approximately +6.0m OD, which will be used as the design level for all foundation and retaining structures.

For basement areas, the base slab will be integrated with the building foundations. Retaining walls will be supported at the base by a continuous strip footing and generally propped at the top by supported floor slabs. The basement slab and retaining walls will be designed to resist applied loads from retained soil, groundwater pressures, surcharge loading in the permanent case. If necessary, the provision of ground anchors in the basement slab may assist in resisting uplift forces from hydrostatic pressures.

To provide construction programme benefits, the perimeter retaining walls will be designed to facilitate early backfilling of the basement excavation. This will enable enhanced access to the building perimeter for facades and follow-on trades.

In addition to resisting the applied loads, the basement will require protection against water from the ground. The required level of water protection will depend on the usage of the area. A range of construction methods and technology exist to achieve the required internal environmental conditions, a number of which are outlined in Table below:

Table 9: Basement Grades and Potential Protection Measures

Basement Usage	Corresponding Grade (as per BS 8102)	Construction Method	Description
Mechanical plant rooms	2	Type B (structural integral) protection	• Reinforced concrete design to IS EN 1991-1-1 • Waterstops at construction joints • Concrete waterproofing additive (Caltite or similar)
Electrical / ICT plant rooms, staff facilities, administration support, workshops and stores	3	Type B (structural integral) protection plus Type C (drained) protection	• As per Type B above • Internal drained cavity system linked to the campus drainage system

5.4.3 Foundations

The building columns will be generally supported by pad foundations bearing on boulder clay. As described above, areas with a basement will have an integrated slab and foundation solution. Sections of the building without a basement will be founded on isolated pads. In this instance, excavation of the made ground and sub layers to reach a suitable bearing stratum in the boulder clay will be required.

Due to existing site constraints, there are specific areas of the site that require piled foundations due to their close proximity to existing structures, such as alongside the existing St. Vincent's Private Hospital tunnel.

5.4.4 Ground Slab

Two forms of reinforced concrete slabs will be provided at ground level. Suspended slabs will be provided over basement areas and ground bearing slabs will be provided in all other areas.

For areas where no basement is provided, approximately 2 – 3m of made ground will require excavation and disposal to facilitate the construction of the pad foundations and ground bearing slabs.

There are also a number of existing basement structures on site that will need to be removed during the demolition works.

5.4.5 Building Superstructure

The building superstructure will typically consist of a reinforced concrete frame and flat slab solution. A limited number of local transfer structures will be required in areas where the primary structure does not align vertically.

Structural stability is provided by reinforced concrete walls located throughout the building; they will typically surround the main lift and stair cores and the large mechanical and electrical risers. The lateral loads will be transmitted by the façade to the concrete floor plates which will act as a diaphragm spanning between the designated stability walls and cores.
These elements will transfer the loads to the foundations.

The reinforced concrete flat slab will be designed to accommodate the applied finishes and support the applied loads.

The building will be separated into a number of structurally independent blocks based on the building size and geometry. A full height building movement joint will be required through all structure and architectural finishes along these interfaces to facilitate appropriate building movements.

There are a number of link structures which provide access between the various building elements. These range in span from circa 10m to 18.75m within the development and also circa 70m linking from the Clinical Services Block core to the proposed new National Maternity Hospital. Intermediate vertical supports will split the span of the link to the Clinical Services building to facilitate construction.

In general, the link structures will be constructed using concrete composite metal deck solution supported on steel structures spanning between the buildings.

5.4.6 Campus Civil Infrastructure

External retaining walls will be required in a number of locations on site due to differences between existing and proposed ground levels. These will include along the eastern boundary of the proposed facilities yard and the link area between the Clinical Services building and the proposed new National Maternity Hospital.

Alterations to the layout and location of the campus service delivery area and waste marshalling yard will also be undertaken to accommodate the development of The National Maternity Hospital on the St. Vincent's University Hospital campus. The existing St. Rita's surface car park will also be re-aligned to accommodate the new access to the multi-story car park.

5.5 Facade Installation

5.5.1 Description

5.5.1.1 Envelope and Roof

The envelope for The National Maternity Hospital will be formed with two types of façade treatment adding variety and texture to the buildings external envelope.

The more solid areas are finished in granite in dialogue with the granite walls of the neighbouring St. Vincent's University Hospital Clinical Services Building and St. Vincent's Private Hospital, while areas into the central courtyards and high level linkages are treated as an aluminium and glass curtain wall system.

The roofs will generally be constructed using a combination of metal decking and concrete slabs, based on an "upside down" construction. This involves the provision of insulation and roof membrane above the roof slab. The roof of each of the courtyards and terrace areas will also incorporate a roof garden situation.

5.5.1.2 Elevations: External Shell

The proposed external wall will be predominantly granite stone cladding panels. Deep recesses have been adopted throughout the facades to assist with solar shading. On the north, south and east facades of the eastern block, these have been splayed to one side to maximise views looking towards the coastline. The secondary framing or fixings for the stone cladding will be developed in collaboration with the Stone Supplier / Specialist. The double glazed units will be integrated within the stone façade, which will be openable

and sized accordingly to aid natural ventilation where applicable.

Vertical stone slats will be used in select areas within the stone facades. These will be comprised of granite and the secondary framing or fixings will be developed with the Stone Supplier / Specialist.

Aluminium louvres will envelope the majority of plant room areas.

5.5.1.3 Elevations: Select Areas within Courtyards / High Level Linkages

The proposed external wall areas will be aluminium and glass curtain wall system with openable windows incorporated. Vertical timber slats will be provided over the front face of select areas to provide solar shading and control views. Secondary framing or fixing will be provided and installed in accordance with the Window / Curtain Walling Manufacturer.

5.5.2 Installation

The installation of the envelope elements will commence from Lower Ground Level up once the structural works are sufficiently advanced above. Provision will be made within the superstructure design to allow for easy installation of any secondary framing or fixings required for the façade. The installation of the façade will be undertaken by individual elements being lifted externally and "offered up" to the structure before being secured in place.

5.6 Mechanical, Electrical and Plumping Fit-out and Commissioning

5.6.1 Plant and Distribution

The low energy ethos of the project has been a significant driver of plant strategy. The new National Maternity Hospital development has plant at basement level, roof level and ground level adjacent to the waste marshalling yard.

The basement plant accommodates all plant suitable for a basement location including water storage, boilers, hot water generation, power transformers and switchboards, standby power generators, medical air plant, vacuum and medical gases. Chilled water generation plant (air cooled chillers) are located at roof level in order to access fresh air for cooling. Chilled water pumps are located at roof level in close proximity for energy conservation reasons. Air handling plant is located at roof level to access fresh intake air,

exhaust air safely and minimise distribution ductwork (and energy) by their close proximity to areas served. Vertical service risers positioned at optimal locations, which may be modified for future felxibility, distribute services from plant locations to each floor. From risers, horizontal service routes deliver services to the various departments.

Exhaust flues associated with boilers, stand-by generators and the combined heat and power plant will discharge above the roof level.

5.6.2 Enabling Works

Critical site services which require diversions in order to clear the proposed site will be diverted on a phased basis in advance of construction of the building (refer to Section 4.4.3). This strategy will reduce risk to continuity of services and also minimise the amount of construction activities on the site during the main works.

5.6.3 Installation

First fix installation of services to the new building will be progressed in tandem with the groundworks and structure and will include the installation of primary mechanical and electrical services plant and distribution including plant, pipework, cable trays, bracketing and ductwork.

Second fix will commence as the building becomes weatherproof and sensitive equipment such as boilers, air handling units and switchboards can be installed without risk of damage from exposure to the elements. Secondary distribution pipework and cables will be installed at this stage and connected to the primary services and equipment. Medical gas and water services pipework will be installed from plant to point of use. Cabling for lighting, power, data, fire alarm and other electrical systems will be installed. Commissioning and testing will commence including pressure testing and pipework flushing.

Third fix will follow the installation of partition walls and ceilings and includes the final installation of sanitaryware, lights, switches, sockets, fire alarm and Building Management System control devices. Sensitive equipment such as Magnetic Resonance Imaging and Information Technology equipment will be installed at this stage to minimise risk of accidental damage or exposure to dust and dirt.

5.6.4 Testing and Commissioning

The building services systems will be tested as they are installed in relation to integrity including, in particular, pressure tests for all pipework and air leakage tests for ductwork.
A comprehensive Building Management System will be installed which will help to control and monitor all plant and equipment within the building to facilitate optimum control, diagnostics and energy management.

Once systems are fully installed a period of testing and commissioning will be undertaken prior to completion of each phase of construction (circa 3 months for Phase 1 works and circa 6 months for Phase 2 works). The systems will be set to work and set point parameters will be adjusted to achieve the design requirements. This will include sign off of key safety systems such as the fire alarm system and any safety interfaces through the proving of the "cause and effect" matrix, measurement of emergency lighting levels, testing of associated battery longevity, sound checks on fire alarm sounders, testing of disabled access, refuge and nurse call systems and baby tagging systems, anti-confusion testing for medical gas and hot and cold water systems etc., alongside more standard items such as ensuring the correct air rates flow through ventilation systems at the correct velocities and the water flows rates and temperatures are as per design.

Following testing and commissioning, systems will be left running to allow steady state operation to be observed prior to building occupation. This allows any glitches to be ironed out.

5.7 Internal Fit-out

5.7.1 Walls

The internal walls will typically be constructed of metal stud with gypsum and plywood boarding with acoustic absorption, humidity resistance, glazed panels and insulation as required. The construction of the walls will commence once the building has been sufficiently weatherproofed and will be co-ordinated with the fixtures and fittings for each individual room so that the necessary mechanical and electrical services can be integrated within the walling system.

5.7.2 Ceilings

Combination of proprietary suspended ceilings and skimmed gypsum board. Fire compartmentation to be achieved by structural elements and partitions closed to structural soffits as required. Ceilings will be installed on completion of second fix

Mechanical & Electrical Installation and this will be followed by the 3rd fix installation of lighting, fire alarm and other ceiling mounted fittings.

5.7.3 Finishes

The development consists of a variety of internal finishes depending on the nature of the area. Each finish will be provided and installed in accordance with the manufacturer's requirements for same. Finishes will only be applied once the works are sufficiently well advanced to ensure that there is no risk of damage from follow on trades.

5.8 Landscaping

5.8.1 Landscape Design

Landscape design proposals have been developed on a number of levels to address the integration of existing buildings, proposed architecture, access, infrastructure and context.

The spatial arrangement of the landscape plan relates directly to and is informed by the architectural proposals to create a unified whole and settle the proposed development into the site context. Movement patterns, orientation, context, prospect and microclimate have been considered in the design and detail of the scheme.

The open space requirements of the new maternity hospital comprise a north-facing main entrance plaza, an east-facing emergency entrance plaza, a central entrance courtyard aligned along the main approach, a series of secondary courtyards at ground floor level, a south-facing entrance plaza at level 1 and a series of roof gardens, external spaces, and play areas arranged throughout the upper floors.

External works to the site are made up of a number of differing soft and hard landscaping finishes.

Soft landscape finishes consist of:

- Earthworks grading and topsoil works
- Mitigation screen planting to site boundaries and services areas
- Extensive and semi-intensive green roof plantings of sedum etc.
- Tree shrub and perennial planting to entrance plazas, courtyards, roof gardens, terraces, footpaths, car parking and roadways
- Landscape fabric and bark mulch application to all planters.

Hard landscaping elements include:

- Roadways
- Natural stone paving, exposed aggregate concrete paving and hard compacting gravel
- Kerbs and edging trims to paving and soft landscape
- Drainage gullies
- Retaining walls, universal access ramps, steps and handrails; and
- Street furniture seating, litterbins, landscape lighting, and raised planters.

An automated drip-line irrigation system will be provided to all roof gardens and terraces located above built structures. This installation will include moisture sensors and a controlled timer system to reduce water consumption levels.

Hard landscape works for the site have been proposed to enhance the overall design; compliment the soft finishes and allow vehicular and pedestrian traffic to and around the site.

The landscape design includes for a variety of open spaces ranging from fully public to semi-private. The most prominent of these is the main entrance plaza which is proposed as a new civic space that accommodates drop-off but is principally pedestrian in nature. The entrance plaza incorporates tree planting, public art, signage and appropriate night time lighting. The design of the north-facing main entrance plaza and the east-facing access area to the Emergency Department has been treated in a careful considered fashion, with building entry highlighted by restorative spaces, and detailed in a universally accessible manner.

The main entrance and approach from the west is clearly signalled by the entrance plaza paving layout and planting to welcome patients and families from the set-down area nearby and the multi-storey car park to the north-west.

The other notable public spaces include the southern entrance plaza and the north-south aligned entrance boulevard and cycle route, which provides separate pedestrian and cycle access from the junction of Nutley Lane and Merrion Road through to the main entrance plaza.

Ground level courtyard spaces include the ‘Central Courtyard’, the ‘Consulting Courtyard’ and ‘Bereavement Courtyard’. The ’Hospital Street Courtyard’ is situated at

level -1, along the new pedestrian link corridor. Further courtyards and roof terraces are provided at Level 1, Level 2, Level 4 and Level 5.

5.8.2 Landscape Construction

The hard and soft landscape works shall be completed as part of the general construction works, with all trees and shrub planting implemented within the first suitable planting season after completion of the general construction works. The tender information for the works shall include for a minimum 12-month maintenance period and defects liability period.

Paving materials within the development have been specified with the intent of providing high-quality surface materials which will survive well over the long-term and require little maintenance.

All paving materials have been specified as level, with no changes in level across paving which might cause a slip, trip or fall, and are suitable for access by all abilities. The paving is to be laid with cross-falls on an appropriate sub-base.

The planting programme shall generally be carried out during the following periods;

- All root-balled trees 7 November – 31 March
- Bare root shrubs, whips etc. 7 November – 7 March
- Container grown shrubs perennials at any time.

Planting outside of the above periods must be agreed with the Landscape Architect, with appropriate container grown stock used and an additional watering programme enforced.

The remaining soft landscaping works will be undertaken following the completion of the main elements of construction.

The works to the soft landscaped areas will involve:

- Placing of topsoil
- Planting of trees and shrubs
- Seeding of grass.

The works to the hard landscaping areas will be undertaken following completion of the main elements of construction. These will include roadways, footpaths and paved areas and the works will involve:

- Placing and compacting of hardcore sub-base
- Casting of concrete kerbs and footpaths
- Laying of road surfacing
- Installation of paving.

5.9 Site Clearance

Following completion of the building construction works, the Main Contractor will progress a phased removal of compound, welfare facilities and site offices to facilitate the completion of external landscaping and building handover.

6.0 Construction Programme

The proposed works will be undertaken on a phased basis, with a total construction period of approximately 56 months. This period broadly aligns with a 12 month enabling works programme, followed by a 44 month main works construction programme. A detailed construction programme showing the duration of each element of the works will be prepared by the Main Contractor.