
8.3 Appendix 3 – Material Science Waste Recycling Report



CONSTRUCTION MANAGEMENT PLAN

Science & Engineering Building

The University of New South Wales

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1. Introduction

1.1 Purpose

The purpose of this Construction Management Plan (Plan) is to describe how the Project Management team shall implement and conduct its allocated site management responsibilities during the Construction phase of the UNSW Science and Engineering Project (the Project) to ensure all construction is properly facilitated, integrated and coordinated so as to deliver certainty to the objectives of the Project.

This plan forms part of Brookfield Multiplex Internal Control Framework and Management System which is accredited to:-

- » AS/NZS ISO 9001:2008 – Quality Management System,
- » AS/NZS ISO 14001:2004 – Environmental Management System, and
- » AS/NZS 4801:2001 – Occupational Health and Safety Management System.
- » Federal Safety Commission Accreditation Scheme

Copies of these certifications can be found on the Brookfield Multiplex Operating System (BOS) 'Document and Forms Library'

1.2 Scope of this Plan

This Plan provides a holistic approach that:

- » Advises how the project management team will comply with the requirements of the contract relating to construction
- » Defines the project objectives and targets of particular relevance to the construction phase
- » Describes constraints specific to the construction phase and the project in general
- » Describes the process for the identification and control of risks specific to the construction phase
- » Details the proposed strategy for the construction phase, with particular regard to establishment resourcing, site organisation and construction controls.

1.3 Abbreviations

The abbreviations used in this Plan are outlined in the table below.

ABBREVIATION	DESCRIPTION
AEG	Australasian Executive Group
BM	Brookfield Multiplex
BOS	Brookfield Multiplex Operating System
MSOP	Management System Operational Procedures
PCG	Project Control Group
WBS	Work Breakdown Structure
UNSW	University of New South Wales
CI	Capital Insight (Client side Project Manager)

Figure 2 *Abbreviations*

1.4 **Precedence**

Where ambiguity is detected between the procedures and requirements in this plan and the MSOPs located on BOS, then the procedures nominated in this Plan will take precedence.

1.5 **Interface with other Project Plans and Procedures**

This Plan should be read in conjunction with the MSOP and Management Plans detailed in Section 2.2 of this Plan. The MSOP referenced in this Plan are confidential documents, and as such, will not be issued outside of Brookfield Multiplex. However, they will be made available, for the purpose of surveillance and audit.

1.6 **Document Control**

This Plan will be monitored and necessary changes will be identified in the table over the page and communicated to all relevant personnel. Amendments and updates to this Management Plan will be made if the strategies and actions described in the plan no longer meet desired outcomes, or if improvements to existing measures can be made.

Electronic distribution of this Plan will be made to those detailed on the distribution listing on Aconex.

REVISION	DATE	DESCRIPTION	PAGE	REVIEWED BY	APPROVED BY
1	06.07.16	Initial issue	All	Iain Thomson, Mark Ciano	Luis Soares

Figure 3 *Revision Table*

2. Construction Management Approach and Framework

2.1 Approach to Construction Management

Brookfield Multiplex works with its clients to integrate quality controls and strategies at the earliest opportunity.

Brookfield Multiplex's approach to construction management is underpinned by a mature and disciplined culture which is embraced by its people and driven by what its leaders do and say. Brookfield Multiplex encourages its people to learn from each other's experiences and share best practice.

We take enormous pride in the buildings that we construct. Our teams are made up of highly skilled and enthusiastic individuals, who all want to produce an outcome that satisfies and where possible, exceeds the Client's requirements. We are judged by the quality of our product, not just on the day of completion, but in the years that follow, so getting it right is essential

Because our reputation rests on the quality and ongoing functionality of our buildings ensuring that they operate at a high level of quality in the years following completion is an imperative, not only for our clients' business but also for our business.

2.2 Management System Framework

Brookfield Multiplex has a management framework which is applied throughout the business and on all projects it undertakes. The construction management documentation forms part of this System Framework and maintained in electronic format on BOS.

The structure of the overall Management System is explained below.

ELEMENT	CONTENT
Internal Control Framework	<ul style="list-style-type: none"> » Operating Environment » Risk Assessment » Control Activities » Information and Communication » Monitoring Activities
Polices	<ul style="list-style-type: none"> » Work Health and Safety » Environmental » Quality » Risk » Drugs and Alcohol » Injury and Rehabilitation » Indigenous Engagement » Diversity
Operational Procedures	<ul style="list-style-type: none"> » Risk Management » Integrated Management » Quality Management » Design Management » Construction Management » Health and Safety Management » Environmental Management » Project Administration » Bid Management » Human Resources Management » Planning and Programming
Management Plans	<ul style="list-style-type: none"> » Project » Quality » Design » Work Health and Safety » Environmental » Emergency » Construction » Stakeholder and Communications » Risk » Commissioning and Testing
Risk Management	<ul style="list-style-type: none"> » Project Risks » Trade/Element Risks » Management and Trade Action Plans
Forms and Guides	<ul style="list-style-type: none"> » As per BOS Document and Forms Library

Figure 4 Management Framework

3. Responsibility and Accountability

The management structure and associated roles and responsibilities for Project are outlined in the Project Management Plan.

Similarly, specific roles and responsibilities pertaining to other management disciplines, such as health and safety and the like, are contained in the respective Management Plans.

4. Pre-Construction Planning

4.1 Site Working Hours

Monday to Friday	7.00am to 6.00pm
Saturday	8.00am to 5.00pm

4.2 Out of Hours Procedures

Brookfield Multiplex will consult with UNSW through the Campus Interface Meetings about any upcoming works that occur or will incur disruption outside the site boundary. Following the meeting, a formal Disruption Notice detailing the proposed works will be issued to Capital Insight and UNSW for approval. Upon approval, the works will be coordinated with Facilities Management (FM). In order to minimise the disruption to UNSW users, these works may be completed out of hours.

4.3 Dilapidation Survey

Upon award we will appoint and carry out a detailed dilapidation survey, which will be performed by an independent body, on all areas in close proximity to the project. Particular attention will be placed on the E10 Materials Sciences and Engineering Building to the East due to the heavy basement and atrium linking interface with the new Science and Engineering Building.

Buildings D9 & D10, being the Io Myers Studio and Studio 1 shall also be surveyed for general condition, however these buildings are to be demolished following the main construction works associated with the Science and Engineering Building (SEB).

Union Road, International Road, Third Avenue and Gate 2 Avenue will also need to be surveyed as all construction traffic will pass through these. Once dilapidation surveys are completed, copies of the reports will be lodged with the University through Capital Insight.

4.4 Surveys

A qualified survey team will be utilised throughout the project to ensure works are completed to within building tolerance. "As built" surveys will be completed for all components of the projects structure. These will be kept as a record for the project management team.

4.5 Heritage Requirement

There is no heritage requirement for this project.

4.6 Geotechnical

During the ECI phase a Geotechnical and Environmental report was undertaken to verify the ground conditions (Geotechnical Investigation Report, Rev 2 04/02/15 and Environmental Investigation Report, Rev 1 24/08/15). Additional deep bore logs were obtained in order to further validate the ground condition assessment. The asphalt and concrete surfacing (and immediate underlying fill) would classify as General Solid Waste (non-putrescible) for the purpose of off-site disposal. The natural soils located below the fill layer would be classified as VENM. Once awarded, further testing will be required to confirm the exact quantities of any other material classification that is on the site.

Confirmation of pile size and depths will be ascertained in collaboration with the piling contractor.

4.7 Services Identification, Temporary Connections and Diversion

UNSW are presently undertaking the Lower Campus Infrastructure Works, as a separate project. It is understood that as part of these works, the services for the Science and Engineering Building shall be generally suitable for the Science and Engineering Building, to connect without further significant works or impact to surrounding buildings or campus infrastructure. There are two exceptions to this, being the high voltage and sewer connection to the campus infrastructure. Brookfield Multiplex will allow sufficient time with UNSW and relevant authorities to ensure that the required connections are seamless.

4.8 Traffic and Pedestrian Management

4.8.1 Pedestrian

As per the Pedestrian and Traffic Management Plan, all access for the site will be from High Street via Gate 2 Avenue and then along the existing footpath into the site via Construction Gate 1a. Public access to the University will continue to be from High Street down Gate 2 Avenue. They will continue between buildings D9 and D10 and disperse through to the campus surrounds. During the structure and the façade install, pedestrians will be protected by a B Class Hoarding along International Road as this will become a major campus thoroughfare, at the completion of the Lower Campus Infrastructure Works. (**Refer to Appendix 2 – SK-MW-008a**)

4.8.2 Vehicular

Vehicles will access the site from the High Street traffic lights. They will proceed down Gate 2 Avenue, turn west on Third Avenue and will be unloaded in one of the three construction zones established on either Third Avenue, International Road and Union Road. Once unloaded all vehicles will travel east along Union Rd and turn north onto Third Avenue and proceed to Gate 2 Avenue and onto High Street.

Contractors will need book in their deliveries on a daily basis and will only bring their deliveries to site during their allocated time for delivery. If due to an unforeseen event we have additional truck deliveries that cannot be contained within the site boundaries they will be queued on High Street in our construction zone and called in by traffic control when required. (**Refer to Appendix 2 – SK-MW-008b and SK-MW-008c**)

4.8.3 Emergency Access

Access for all emergency vehicles and personnel will be from High Street via Gate 2 Avenue. They will be allowed to enter the site from either one of the site gates pending status of works on site.

4.8.4 Car Parking

There will be no car parking available to the workers onsite. There is parking available in surrounding streets and the University has a small amount of paid parking under the Gate 2 Student accommodation building. There is also the High Street, Barker Street and Botany Street parking stations available with paid parking. Workers will be encouraged to utilise the public transport system to minimise the effects of traffic on the local community.

4.8.5 Buildings D9 (Io Myers) and D10 (Studio 1) Demolition

Buildings D9 and D10 are set to be demolished at the completion of construction for the new (Science and Engineering Building (SEB).

The pedestrian access shall be re-arranged (from that described in section 4.8.1) at this point in time to utilise the newly constructed/completed public domain areas.

Similarly, the vehicular paths for the demolition of Buildings D9 and D10 shall be generally in line with the above (Section 4.8.2) and it anticipated that this works shall be undertaken with a separate compound being established.

Emergency Access and Car Parking shall be generally consistent with the main SEB construction works.

A separate and more detailed demolition/construction management plan shall be developed for the demolition of D9 & D10 towards the completion of SEB, which responds more appropriately to the stakeholder requirements and surrounding environs than is possible at this stage.

4.9 Public and Property Protection

Extensive coordination and consultation will be required with the adjoining property owners and precinct partners throughout the project. The protection of all University infrastructures including trees and existing services will be managed to ensure that all infrastructure will be retained in the same condition at the completion of the project.

The following protection procedure will be adopted:

1. Ensuring all existing services are identified, and terminated as appropriate, a dial before you dig survey will be completed prior to construction works commencing to ensure all existing services are identified and located.
2. Ensuring movement or placement of construction plant does not damage infrastructure
3. Ensuring any overhead cables are protected in an approved manner
4. At the beginning of construction we will advise adjoining and nearby properties of commencement date, possible disruptions and approximate construction time.

The construction site will extend approximately 6m south onto Union Road from the Material Science Building, approximately 4m east through MSEB western colonnade to IO Myers Studio, south side gutter line to Third Ave and east gutter line on International Rd. All boundary lines will be secured with an A Class timber hoarding. The north and south boundary lines currently do not have a pedestrian footpath and hence there is no foot path to protect. The western site boundary has been sufficiently set back, under the MSEB western colonnade, to allow for the MSEB and SEB. On the western side of the site, a B class hoarding will be used as this will be maintained as a pedestrian way, allowing for construction works to progress above.

4.10 Protection of New Work

Contractual requirements will be agreed for all subcontractors to ensure they will take all steps necessary to protect their own completed works for the duration of the project. Furthermore contractors are to be made aware that they are liable for the damage they cause to other trades' work.

4.11 Authority/ External Conditions and Approvals

4.11.1 Council Permits

As the site is wholly contained on University Crown land and no works will be performed from any of their roads, there will be a minimal number of permits required from Council. Applications will need to be made for the proposed construction zone located on the north side of High Street, following further consultation with TfNSW and the CBD Coordination Office in relation to impacts around the CBD and South East Light Rail works. (**Refer to Appendix 2 – SK-MW-008c**)

4.11.2 Services Authorities

All Services with the UNSW campus will be controlled by UNSW. Brookfield Multiplex will make application to Facilities Management for all connections to the existing network. The one exception is the sewer connections, where a Section 73 Certificate will be obtained prior to the works commencing.

4.11.3 Road and Transport Authorities

Prior to the commencement of any works on the Subject Site, a Traffic and Pedestrian Management Plan prepared by a suitably qualified person shall be submitted to the PCA. The Plan is to be prepared in consultation with the relevant stakeholders, particularly TfNSW and the CBD Coordination Office to coordinate with the CBD and South East Light Rail project.

4.11.4 Environmental

Prior to the commencement of any works on the Site, an Environmental Management Plan (EMP) shall be submitted to the PCA and Council.

4.11.5 SACL/CASA

The site has an Obstacle Limitation Surface of a maximum of RL60.00. Currently the designed building height is RL75.75. With this in mind, the tower crane will need to stand at an overall height of RL101.00 in order for it to be efficient. Both the building and crane applications have been lodged for approval.

The building envelope has been approved and the tower crane has been referred to the (Federal) Department of Infrastructure and Regional Development for their determination/approval. Based the referral and our previous experience on site, we anticipate approvals shall be granted. (***Refer to Appendix 2 – SK-MW-009b***)

4.12 Adjoining Owners / Stakeholders

4.12.1 Adjoining Owners Approval

Key project adjoining owners/stakeholders that will be contacted and works coordinated with include:

- » Capital Insight
- » UNSW Facilities Management
- » UNSW Security
- » UNSW user groups
- » University Terraces (B8)
- » UNSW Village (B10)
- » Io Myers Studio (D9)
- » UNSW Materials Science (E10).
- » UNSW Roundhouse (E6)
- » UNSW International House (C6)
- » UNSW law (F8)

4.12.2 Services Interruptions and Impairment

The continued operation of existing services is a key objective to the project however, Brookfield Multiplex understands that the dynamic nature of construction can lead to unplanned interruptions. Prior to site establishment, emergency procedures and action plans will be developed to ensure all project team members understand their responsibilities in the event of an unplanned interruption.

The primary object of this Emergency Management Plan is to ensure that all team members are prepared to rapidly respond to and effectively manage all emergency situations in order that:

- » Safety and wellbeing on the site and the general public is protected
- » Damages, losses and the duration of the disruption are minimized
- » Recovery tasks are coordinated to ensure that the project is restored to normal operation as soon as possible
- » The extent of the emergency is limited
- » An appropriate public relations strategy is implemented when necessary to ensure a positive public perception of the project is maintained.

The Emergency Management Plan will be communicated to the client's representatives to ensure fast and effective methods of communication are adopted. Brookfield Multiplex will establish an on-site emergency team headed by an emergency team leader. Immediate notification will be made via the Brookfield Multiplex Project Manager to the UNSW representatives and Capital Insight.

4.13 Waste Management

4.13.1 Waste Disposal

Brookfield Multiplex will seek to reduce, recycle, and reuse a minimum of 80% of construction waste from the site. We aim to maximise the quantities of materials diverted from landfill by avoiding, reusing, recycling, reprocessing and recovering. We are also committed to the on-going monitoring, tracking and reporting of waste and waste emissions reduction. It is part of the Brookfield Multiplex philosophy that a tidy site is a safe site, and this principle will be maintained throughout the contract. Rubbish bins will be centrally located within the site.

A specific Waste Management Plan will be developed in accordance with the Brookfield Multiplex Environmental Management System to ensure optimum waste management initiatives are implemented.

Every subcontractor will be required to recycle, return, re-use, and reduce the waste materials produced as a result of the Project.

They will be required to provide bins on the floors and to clear their rubbish as it accumulates. These bins will be brought down the building in the construction hoists and loaded via forklift into the large skips, housed within the site compound area, for removal from site. In addition, all subcontractors are responsible for removing their own packaging and other re-useable items such as pallets from site; this policy promotes recycling by subcontractors and suppliers and removes unnecessary packaging at the source rather than at site. In this way, the amount of rubbish being sent to landfill will be minimised. It is a condition of all our subcontracts that subcontractors working for Brookfield Multiplex adhere to these principles.

Methods involving off-site fabrication and assembly of certain construction elements will be developed and initiated where ever possible on the project.

The Science and Engineering Building draws strong parallels to the existing Material Science and Engineering Building (MSEB) in terms of its overall size, building usage and construction methods and materials utilised throughout construction. Therefore, the waste composition, in terms of source and quantity is anticipated to strongly reflect the profile of the recently completed (adjoining) Materials Science and Engineering Building (MSEB) Project. The waste records from MSEB are provided for reference and as the detailed forward projection of waste generated for SEB. **(Refer to Appendix 3 – SK-MW-014)**

Our waste management contractor will provide monthly reports detailing the overall percentage of rubbish being recycled from this project. This information will enable us to monitor the effectiveness of the implemented waste management strategies and take appropriate steps to improve if necessary.

4.13.2 Dust Control

By its very nature the construction process will at times create inconvenience in the form of dust. In keeping with the requirements of the tender documents Brookfield Multiplex will take steps to ensure that instances of inconvenience are minimised. A dust mitigation strategy will be put in place during construction activities. We will minimise the dust created by our construction activities by utilising suppression methods such as;

- » Encapsulating our work zones through the construction of plywood hoardings and bulkheads within the work zone
- » Wetting down to suppress local dust-generating activities
- » Reviewing all work methods prior to commencing to ensure dust-generating works are managed accordingly
- » Being diligent in our approach to general housekeeping and rubbish removal.
- » Reviewing tool and plant selection in an attempt to select plant with local vacuum extraction system fitted if suitable
- » Reviewing the option of off-site manufacturing of finished elements to reduce dust-generated construction related works onsite
- » Keeping stockpiles of excavated materials wet or covered to prevent dust being blown off- stockpiles.

- » Progressively removing excavated materials and using high-pressure water sprays during the loading of trucks to suppress dust.
- » Progressive mechanical sweeping of hardstand areas to clear debris and dust.
- » Monitor weather conditions and cease excavation works if the above controls cannot control the dust especially during windy times.
- » A road sweeper will be employed to reduce the dust and debris from any site vehicle accessing or exiting the site.

4.13.3 Erosion and Sediment Control

Prior to commencement of construction works, a sediment control management plan will be submitted. The plan shall be prepared considering the measures outlined in “Managing Urban Stormwater – Soils & Construction Volume 1 2004(Landcom)”. Sedimentation controls are anticipated to include:

- » Establish silt fence on all down gradient boundaries. The silt fence will be constructed from a geo-textile fabric and posts. The geo-textile will be dug into the ground for a depth of 200mm and the supporting posts are to be no further than 3m apart.
- » Existing stormwater inlets on the site are to be maintained and protected using geo-textile fence as above.
- » Inspect all vehicles for residual mud and remove before leaving site.
- » Road sweeper to be employed to reduce sediment on roads.
- » All stockpiles are to be located away from drainage areas.
- » Weekly inspections are to be carried out and recorded to ensure control measures are effective and maintained.
- » Kerb side drains are to be protected through the use of geo-textile sausage filled with blue metal
- » Any material that is inadvertently dragged on to the road is to be cleaned up immediately

5. Site Layout and Logistics

5.1 Hoardings and Overhead Protection

We have developed an appropriate Internal Street Hoarding Plan to maintain public safety whilst providing a secure perimeter along the various street frontages. These hoardings will be constructed to suit the needs of the development and that of the construction programme. (*Refer to Appendix 2 – SK-MW-001b*)

The construction site will extend approximately 6m south onto Union Road from the Material Science Building, approximately 4m east through MSEB western colonnade to IO Myers Studio, south side gutter line to Third Avenue and east gutter line on International Rd. All boundary lines will be secured with an A Class 2.4m height timber hoarding. The north and south boundary lines currently do not have a pedestrian footpath and hence there is no foot path to protect. The western site boundary has been sufficiently set back, under the MSEB western colonnade, to allow for the MSEB and SEB. On the western side of the site a B class hoarding will be used as this will be maintained as a pedestrian way, allowing for construction works to proceed above.

5.2 Site Access and Egress

Site access and egress will be from Gate 2 Avenue off High Street and through Construction Gate 1a pedestrian gate. In the later stages of the project an additional access point, Construction Gate 3, will be used for accessing the final building loading Dock, off Union Road.

BM will engage a licensed security firm to provide site access control services and to record movements of every person who enters and exits the site.

5.3 Site Security

5.3.1 Site Security Resources

5.3.1.1 Static Guarding

A fully compliant and professional static security officer will be on site during construction. It is BM's standard operating procedure to engage a security firm to provide security services from 6am to 6pm. The guards provide protection to the building site as well as monitoring the entry and exit of all people on site. As construction progresses, we will employ additional security measures to ensure completed areas are not entered or damaged.

5.3.1.2 Compliance Management

The security contractor will provide a Compliance Operator to operate the Smartek compliance system. The operator inputs all induction paperwork for each person entering the site and provides an ID card with passport style photograph once a person has been inducted. This card carries all the person's company and personal details including insurances, industry green card and induction details. This card is scanned each time that person enters the site which provides BM staff with a record of who has come to site as well as preventing anyone from entering the site without the necessary insurances. Plant and equipment is also documented in the same way with insurances and maintenance records entered in the system to ensure that all plant is suitable for working on the site.

5.3.1.3 Work Health & Safety

The security guards at the entry gate control the entry of subcontractors ensure those entering site are wearing the appropriate PPE. They will also issue PPE to visitors entering the site. In addition to this, the Compliance Management Smartek system provides a daily consolidated list of subcontractors, employees and visitors to the site. In the case of an emergency, we have a list of names to check off at the emergency evacuation point.

5.3.2 Site Fencing

Refer to Section 5.1 above.

5.3.3 Site Personnel Access and Egress

Refer to Section 5.2 above.

5.3.4 Lighting

All lighting on hoardings and access ways will be operational during non-daylight hours.

5.3.5 After Hours Security

In the early stages of the project there will be no after hour's security employed by Brookfield Multiplex. The University has their own security that performs external patrols around the campus and they will have our 24hr contact details. Nearing the end of the project it may require us to use 24hr security, but this will be reviewed later in the project.

5.4 Temporary Waterproofing

Temporary waterproofing will be undertaken on site as construction progresses. Initially, it is envisaged that the penetrations on levels 5 and level 8 Plant room will require to be temporarily waterproofed. In addition to the above, the concrete placement boom penetrations will need to be waterproofed, restricting rain water from entering areas so that finishes can proceed. External areas to lower ground will also need to be waterproofed for commissioning of the substation.

5.5 Emergency and Site Communications

In the early stages of construction, the evacuation system will be via an air horn that will be housed in the Brookfield Multiplex Security office. Once the tower crane is installed its horn will be utilised as an emergency siren. We have nominated an emergency evacuation point on the Alumni Park, adjacent to Building D10. We will utilise a wireless nurse call system which will be tested weekly to ensure its operation. A unit will be located on each level adjacent to the hoist location. These can be used in the event of an emergency to contact first aid and inform them of an emergency.

At all stages of construction the first aider can be contacted by two-way radio through any Brookfield Multiplex Supervisor. A two Channel radio is to be used for site communications. One channel will be used for site communication between staff and operatives. During works where the crane is used, the second channel will be utilised for materials handling communication.

5.6 Construction Zones, Material Lay Down and Storage Areas

5.6.1 Construction Zones and Material Lay Down

There will be a 3 construction zones established on the UNSW road network. One will be on Third Avenue and will predominantly be in use for the extended basement. The second will be located on International Road and will be in operation during the structure and will only be used for concrete pumping. The third will be located on Union Road and will be used for all crane and fork lift unloading. (**Refer to Appendix 2 – SK-MW-008b**)

An additional construction zone will be established on High Street for the mustering of construction delivery vehicles. This will predominantly be utilised for large events requiring excess vehicles i.e. on days of concrete pours. This will aid in the reduction of construction vehicle traffic congestion in the campus road ways. (**Refer to Appendix 2 – SK-MW-008c**)

5.6.2 Storage Areas

Lay down area and Storage areas will be limited due to the basement footprint and as such deliveries will be managed on a 'Just in Time' basis. This will mitigate the need for large on site storage areas as well as reducing the traffic congestion on the local road network supplying the university and local residents.

Once the basement podium slab has been constructed a small area in the north eastern corner of the site and will be used for all waste and minor storage.

5.7 Site Accommodation and Amenities

BM has estimated the total work force at peak programme to be 440 personnel. It is proposed that BM site accommodation will utilise the existing accommodation already established for the Lower Campus Infrastructure Works package, in the north east of the site, adjacent to The IO Myers Studio. An additional site accommodation compound will be established behind the site office on the Alumni Park and will be double stacked ensuring maximum space is utilised. The preliminary shed breakdown is as follows:

- » Security
- » Induction / Safety Committee
- » First Aid
- » Ablution/s (Male & Female)
- » Lunch
- » Change

The north eastern accommodation compound will cater for 18 people and will predominantly house the support operations amenities. The accommodation located on the Alumni lawn will house 308 people and when required and additional 100 person lunch and change facility will be constructed on the ground floor. (**Refer to Appendix 2 – SK-MW-002a-c**)

Access to the site accommodation compound will be via Gate 1a, located off Third Avenue. At this point, site personnel and visitors will be processed by site security to ensure that there is no unauthorised access.

The proposed location for the BM Site Office will remain in the current Lower Campus Infrastructure Works location. The site office will be increased in size to allow for a site team of approximately 25 people. (**Refer to Appendix 2 – SK-MW-006a**)

5.8 Truck Wash Facilities

A truck wash will be installed at Construction Gate 1 where trucks exit our site. This will be operated by the contractors whose truck are exiting and will be overseen by the traffic controller.

5.9 Concrete Placement Methodology

Initially, concrete to the footings and lower structure will be placed by the use of boom pumps. As the jump forms and slabs progress higher, line pumps will be used to carry the concrete to twin satellite placement booms. (**Refer to Appendix 2 – SK-MW-010a**)

A dedicated pumping zone will be established on International Road. International Road is a vital link road for the Roundhouse operations and as such, is to remain open at all times. Therefore, a single truck feed will only be achievable in this pumping zone. The traffic congestion within the UNSW road network will have to be carefully managed within the construction zone on High Street to ensure there is no queuing of vehicles. Materials Handling & Vertical Transportation. (**Refer to Appendix 2 – SK-MW-015a-b**)

5.10 Materials Handling & Vertical Transportation

We will be utilising a Tower crane, twin Alimak hoists and a road registered all terrain forklift for the materials handling and vertical transportation on the project.

5.10.1 Tower Crane

A single Liebherr 316EC-H electric hammerhead tower crane with a 60 m working radius will be used on the project. The crane was selected for the following criteria:

- » Electric to minimise noise to close proximity to University accommodation
- » Crane capacity. Assessing all known lifts

» Height - The hammerhead will minimise maximum height which will help with CASA approval.

The crane will be erected centrally on the north side of the building. Its foundation will consist of a pile and reinforced concrete footing. The footing will be constructed 500mm below the final surface levels, allowing for the soft-scape material to pass over the crane base and on removal of the crane.

(Refer to Appendix 2 – SK-MW-009a-b)

5.11 Mobile Cranes

With the use of the tower crane on the project, mobile crane use will be minimal, with spasmodic usage only. Early works, prior to the erection of the tower crane, will be undertaken by way of mobile cranes, as will the early stages of the northern basement and the delivery and installation of specific plant or equipment that is too heavy for the tower crane. These items will include mechanical and electrical plant and equipment. Erection of the curtain wall will be performed by way of a smaller crawler cranes located on the structure above, which will be supplied and operated by the relevant subcontractor.

Mobile will be required to erect and dismantle the tower crane, and these will be supplied and operated by the tower crane supply company.

5.12 Hoists

A Twin Alimak Scando 20/32 has been chosen for the project due to their capacity to carry both men and materials. Due to the high amount of craneage that will be required the hoists will be able to take some of the load with the smaller deliveries. The 20/32 is a low speed hoist that allows for all standard construction materials to be loaded and vertically transported. The maximum weight it can transport is two tonnes which makes it ideal for block-work and plasterboard.

The hoist will serve all levels and will be positioned on the northern elevation of the building, just west of the crane, allowing easy access for materials loading from the internal materials handling area. Basement footprint will be increased and a pit constructed, allowing the hoist to serve the basement level. **(Refer to Appendix 2 – SK-MW-0013a-b)**

The hoists will be progressively installed with the structure and will be commissioned once the structure reaches Level 2. The tower crane will erect and dismantle the hoists.

Upon installation of the permanent building lifts within the cores, the goods lift and passenger lift will be fitted out to be used as builder's lifts. This will allow for the removal of the hoists and the completion of the façade and impacted finishes. These builders' lifts will service all levels for the remaining works for both personnel and materials.

5.13 Concrete Handling

Refer to Section 5.9 above.

5.14 Rubbish Removal

A centrally located rubbish bin will be maintained in the main Rubbish Marshalling and Recycling area, located within the Materials Handling area. Small bins will be located on each of the floors that will be transported during the day via the construction hoist. Bins will be emptied into Rubbish Marshalling area located in the Materials Handling area.

5.15 Loading Platforms

Retractable loading platforms will be used across the project to assist with the materials handling process. The platforms will be used to either land material onto the desired floor or remove material off the desired floor. These will be strategically located to ensure minimal disruption is made to the construction activities. The loading platforms will have a maximum weight capacity of 3.8 tonnes.

The loading platforms will be positioned in the North West corner of the building ensuring the quickest cycle times with the crane unloading from the internal materials handling area. (**Refer to Appendix 2 – SK-MW-007a**)

5.16 Scaffolding, Screens & Edge Protection

5.16.1 Scaffolding

There are three main areas requiring scaffold with in the building, detailed below;

- » On the Northern end of the building there is an internal stair void inter-connecting to each level spanning from Basement level to level 7. This area will require a bird cage scaffold allowing trades to complete their works on removal of the formwork. (**Refer to Appendix 2 – SK-MW-004b**)
- » On the Eastern end of the building there is a linking bridge connecting the Material Science and Engineering Building and the Science and Engineering building. (**Refer to Appendix 2 – SK-MW-004a**)
- » The Western elevation of the building at the back face of the core will be clad in GRC panelling. The scaffold will be installed incrementally allowing for the installation of the required framing supports and panelling. (**Refer to Appendix 2 – SK-MW-004g**)

In addition to the above, there will be miscellaneous scaffold required on the top levels in plant rooms etc. during both construction of the structure as well as installation and fit-out of plant.

Other areas throughout construction may require catch scaffolds etc. These will be evaluated before the task and will be implemented if required.

5.16.2 Screens

Formwork screens will be progressively erected to the perimeter and internal sections of the building during the structure phase. This will ensure adequate edge protection during the structure phase and will be removed prior to the commencement of the façade installation. The precise requirements and layout of screens and scaffolding requirements will be derived from the detailing of the structure, façade and finishes elements of the project.

5.16.3 Edge Protection

Edge protection will be provided as outlined above in the Scaffolding and Screens descriptions (Sections 5.16.1 and 5.16.2), and will be addressed by every subcontractor where edge protection and access is a consideration. Structure, Roofing, and Façade trades will each develop a methodology/strategy for the installation of their works, and outline how other trades may be affected.

Internal safety fences will be erected to the perimeter of the building, by the structure trade, prior to the removal of the external formwork screens and scaffolds. A 'life line' will be installed by the façade contractor, for the installation of the façade panel system.

Edge protection during excavation and earthworks stages will be managed by the earthworks contractor, in accordance with the relevant Codes and Standards.

5.17 Site Temporary Service

Services which are either existing or newly upgraded during the Lower Campus Infrastructure Works will be utilised for the construction works. These services will enable the following systems to be supported:

- » Crane power
- » Site accommodation power
- » Hoists
- » Temporary sewer
- » Potable water.

Temporary construction power (approximately 1000 amps) will be enough to support the construction works. A temporary 240v single phase electrical supply will be provided at each floor level to which subcontractors may connect their own leads, equipment and task lighting.

Safety, access way and emergency lighting will be installed throughout the building and will be connected to the temporary site switchboard. The site will be adequately lit (both internally and externally) to ensure the safety of all site operatives and also to ensure the quality of workmanship is as per the required standard.

A temporary water supply will be provided with standpipes at strategic locations around the site and at each floor level within the building and adjacent the excavation, civil works and external areas.

5.18 Fire Control Measures

Fire control measures will be considered during all stages of construction and fit out of the project. Fire Extinguishers, suited to the relevant fire risk, will be located throughout site. In general, extinguishers will be located close to the temporary construction electrical distribution boards and Nurse Call stations.

6. Construction Methodology

6.1 Staging

The Science and Engineering Building shall have reduced staging requirements, as the following activities are being undertaken as part of the Lower Campus Infrastructure Works project:

- » Services diversions & demolition.
- » Site setup.

Further site setup for the Science and Engineering Building will entail the finalisation of the hoarding lines following the Lower Campus Infrastructure Works package, accommodation and dilapidation reporting.

- » Excavation
- » Structure
- » Facade
- » Fit-out
- » External Works
- » Relocation of the user groups.

6.2 Demolition

6.2.1 Buildings within the SEB footprint

The demolition works associated with the removal of existing buildings which are within the Science and Engineering Building footprint shall be completed as part of the Lower Campus Infrastructure Works. This also encompasses associated tree removal in accordance with arboricultural advice and reports.

6.2.2 Buildings D9 & D10

The Io Myers Studio (Building D9) and Studio 1 (Building D10) are proposed to be maintained throughout the construction works for the new SEB. Upon completion of the new building space, the current functions are anticipated to relocate into the new building, rendering the existing buildings redundant.

As such, it is proposed to demolish D9 and D10, following completion. A separate and more detailed demolition/construction management plan shall be developed for the demolition of D9 & D10 towards the completion of SEB, which responds more appropriately to the stakeholder requirements and surrounding environs than is possible at this stage.

The buildings shall be demolished in accordance with AS2601- 2001 Demolition of Structures, the WHS Act 2011, and relevant codes of practice and supplementary reports.

6.3 Excavation

The earthworks stage of the Project has been identified as a key activity in the successful programme delivery and will require detailed coordination and intricate planning. Commencement of earthworks can begin in later stages of the Lower Campus Infrastructure Works package (while the final building (D7) is being demolished).

After a sufficient run of pile wall has been completed, piles will be individually trimmed to the underside of the capping beam, and then the capping beam will be progressively formed, reinforced and cast.

The proposed methodology for the casting of reinforced concrete bored piles is to implement a Continuous Flight Auger (CFA) process. The CFA process ensures that during the drilling stage of the drilled walls, the sand remains supported by either the drill auger or the concrete fill material. The selection has been made to ensure minimum vibration and noise impacts on the existing operating campus.

Once these walls are complete, excavation will begin with the truck and dog trailers entering the site via construction Gate 1 from Gate 2 Avenue.

Trucks will Proceed through the site and after loading leave the site through Gate 1 onto International Avenue and then Third Avenue to High Street. All movements into and out of the site will be in a forward direction.

Entry and exit truck movements will be controlled by accredited traffic controllers to ensure the safety of all vehicles and pedestrians.

After bulk excavation is complete, detailed excavation to the top of the internal foundation piles and the underside of pile cap will be required to ensure piles are poured to the correct R.L, minimising the trimming of excess concrete. This will also allow for the deep pile caps to be effectively formed, due to the foundation material being comprised of sand. Due to the extent of the earthworks required for the structural adequacy of the building, the finalisation of the design and the effective site coordination of works will be critical to ensuring the construction programme is achieved. Finally with the completion of all piling, in-ground services and slab on ground works will follow suit.

6.4 Structure

6.4.1.1 Lift Cores

The structure will begin with the pouring of the lift pits and the commencement of lift core walls. Two Jump forms will then be used to construct the cores. This will help split the vertical elements from the slab pours and facilitate a quicker cycle time on the slabs. (**Refer to Appendix 2 – SK-MW-010b,c**)

6.4.1.2 Columns

Typical reinforced concrete columns have been designed. These columns will either be cast just prior to, or with the slab, over being cast.

6.4.1.3 Typical Floor Plate

Typically, the structure consists of slab and band beam construction with post tensioning cables cast within the slab. The floor plate layout, beam designs, slab dimensions and various depths of the current slab have been taking into account, and pour breaks have been developed for each floor. This will ensure concrete pours are not continuing late into the evening, given the location of adjacent residences.

LEVEL	NUMBER OF POURS
Basement	7
Northern Podium	5
Ground Floor – Level 8	4

(**Refer to Appendix 2 – SK-MW-010d-f**)

6.5 Façade

To ensure the successful completion of a high quality and water tight facade, extensive coordination and design workshops will be carried out with the Design and Construction teams.

The facade generally consists of a curtain wall system with large sunshade louvers attached to the outside. These are clad in Glass Reinforced Cement (GRC) to resemble insitu concrete elements. The lining to the western elevation backing on to the back of house areas has a similar lining as the louvers.

The curtain wall and louvers will be installed from the floors using a combination of electric pallet movers and Maeda cranes.

The cladding to the rear of the lift shafts will be installed off scaffold with it being progressively stripped as the cladding is installed top down.

The linking atrium between MSEB and SEB will consist of a curtain wall system with a framed glass roof.

6.6 Services and Finishes

Services installation and rough-in will progress from the basement to the plant rooms. The major works involved are the installation, testing and commissioning of:

- » Mechanical ventilation plant, vertical and horizontal duct work within the building
- » Four fully operational passenger lifts
- » One fully operational goods lift
- » Electrical system, data and security to the given specifications
- » Hydraulic system to the given specifications
- » Wet and dry fire system to the given specifications
- » Various specialised gas supplies
- » Future provisions for flexibility in churn of the internal fit-outs.

A project specific Commissioning and Building Services Management Plan will be created for the project.

Throughout the design coordination, we will actively incorporate the required sustainability features. Finishes will also commence on each level following the completion of structure works, and the first rough in of services. The ease of access for cleaning and maintenance will be considered. The major works involved in finishes for the project are as follows:

- » Stud wall systems using plasterboard and MDF skirtings
- » Sheeted ceilings and mineral fibre tiles
- » Internal balustrades and glazing
- » Laboratory fit-out and commissioning
- » Floor finishing system such as carpets, vinyl and tiled flooring
- » Joinery and kitchen units
- » Wet area finishes
- » Entry Lobby finishes
- » Internal painting
- » FF&E installation.

6.7 Roof

Completion of the roof works will be a key project milestone. These Works include installation of the insulated roof slab (to falls), structural steel framing with cladding, lift overrun, roof membranes, roof access maintenance system, plant room louvers and the plant room fit-out. It has been identified that this area of work requires extensive design development workshops with both the Design team and the Procurement subcontractor. This will ensure that these Works are effectively coordinated and interfaced with the surrounding building elements, as well as procured and undertaken in accordance with the construction programme.

6.8 External Works

External service connections will be made to connection points for sewer, stormwater, electrical, communications, potable water and gas. It is anticipated that all service connections will be located within the construction site boundary after the Lower Campus Infrastructure Works have been completed. The only exception to this is the sewer which is currently being designed.

Landscaping and external finishes will follow the completion of facade finishes, and will incorporate the re-instatement of planting zones, roadways and pedestrian crossings.

7. Programme

7.1 Head Contract Programme

Please refer to **Appendix 1** for the anticipated Head Contract Summary Programme for the Science and Engineering Project.

7.2 Construction Programme

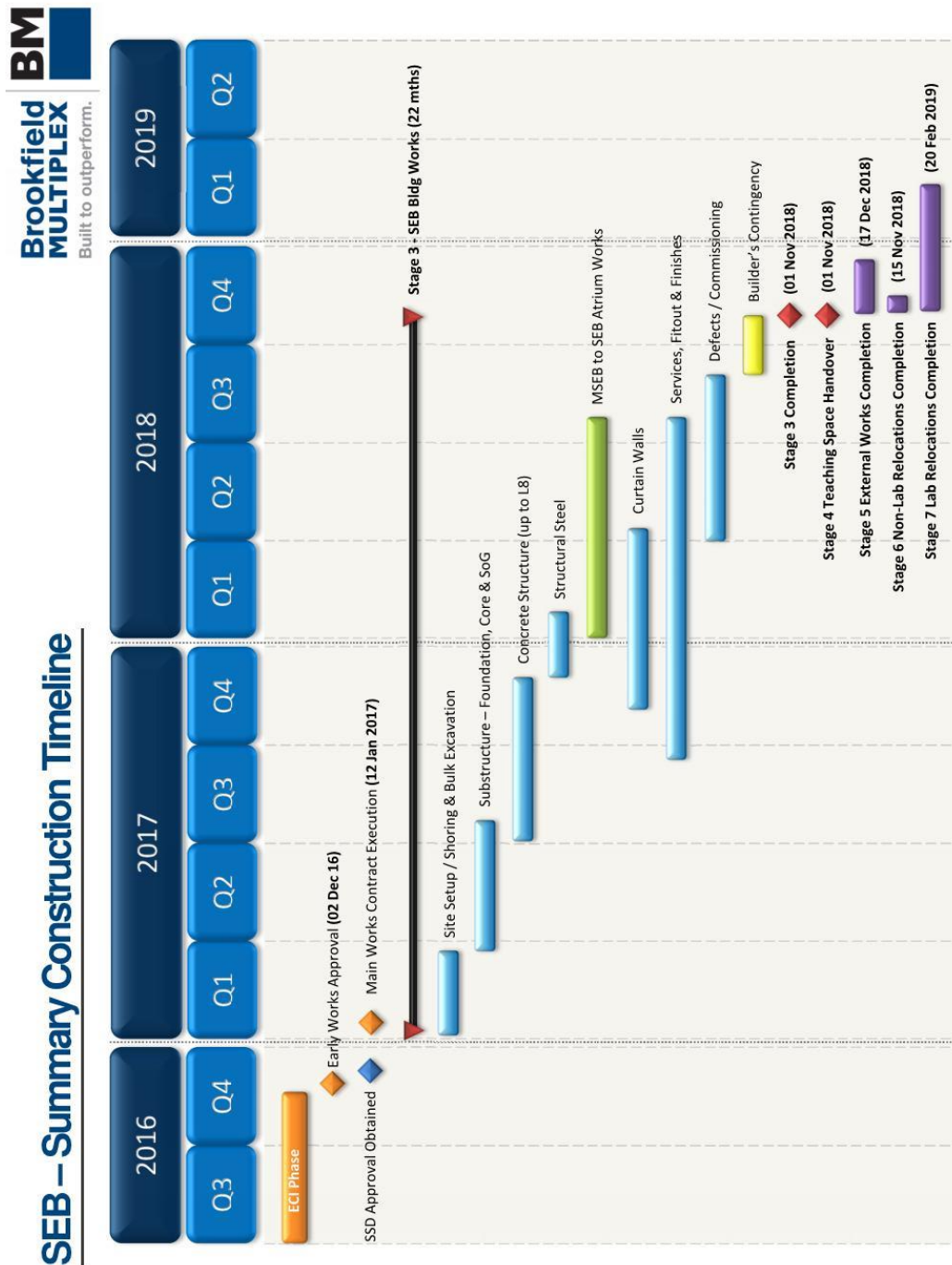
The Construction Programme for the Science and Engineering Project will be the Head Contract Programme minus suitable contingencies.

7.3 Short-term Programmes

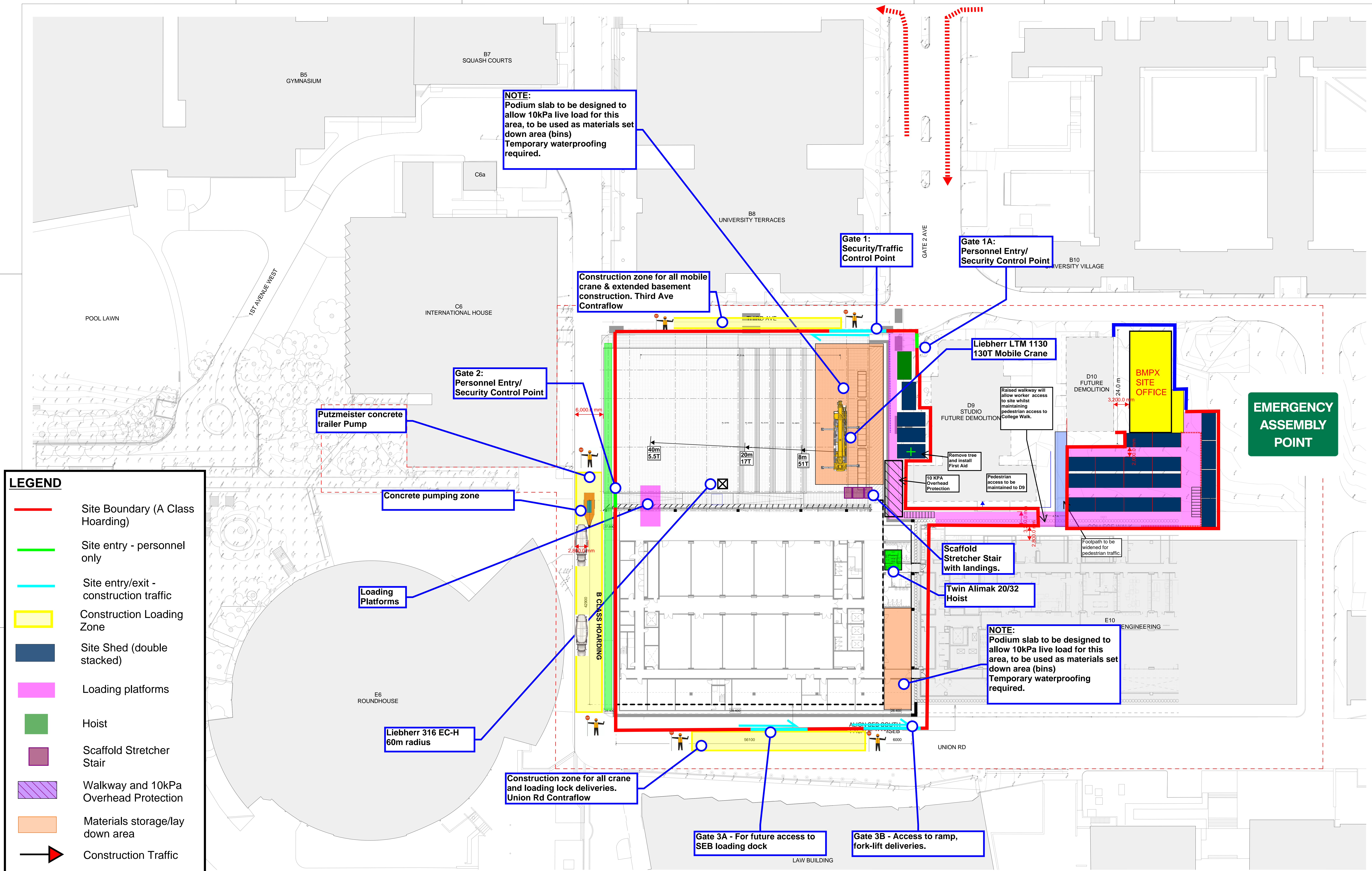
Short-term (three-weekly) target programmes will be developed throughout the project and presented at the weekly Subcontractor meetings.

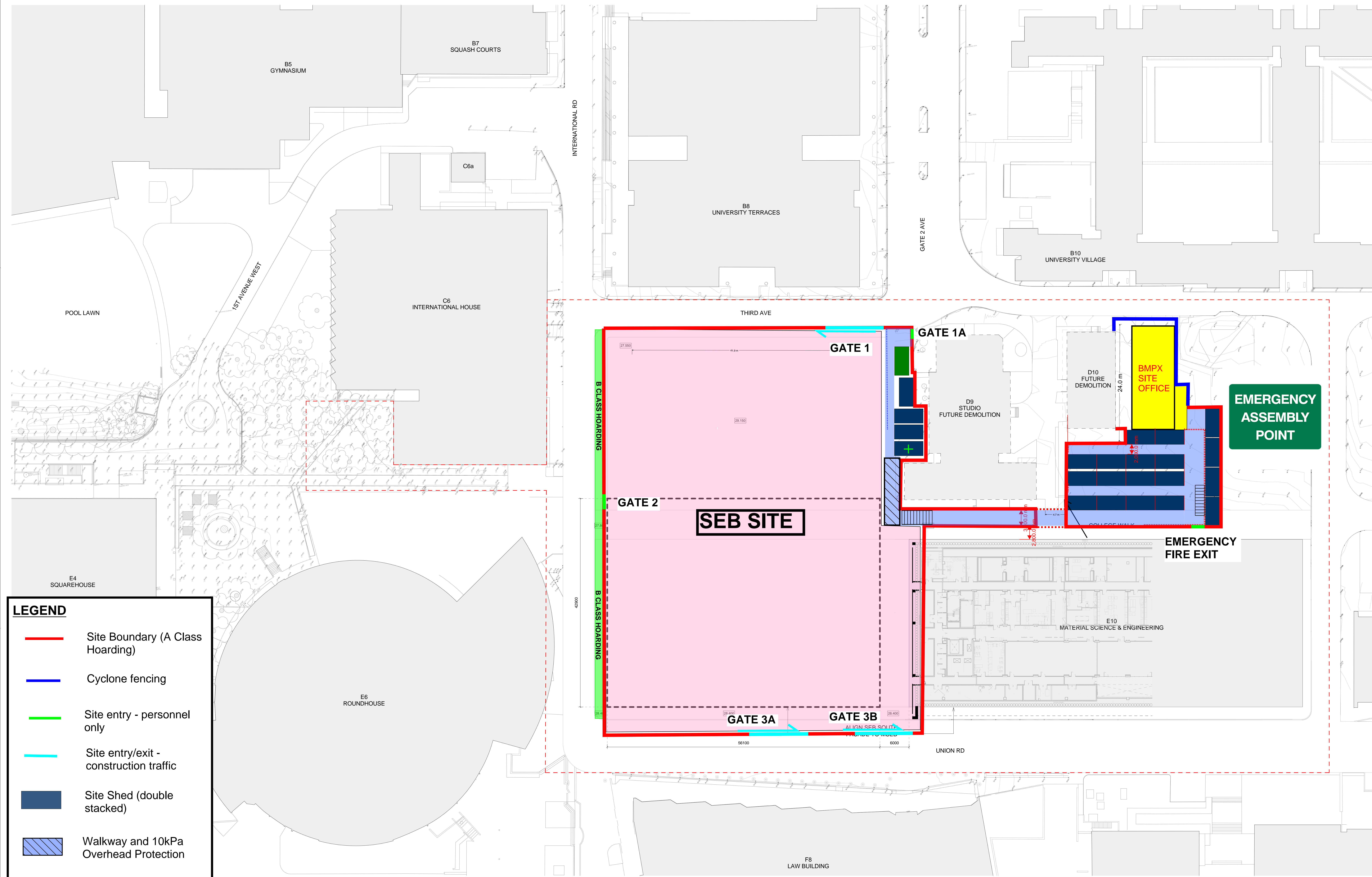
8. Appendices

8.1 Appendix 1 – Head Contract Summary Programme



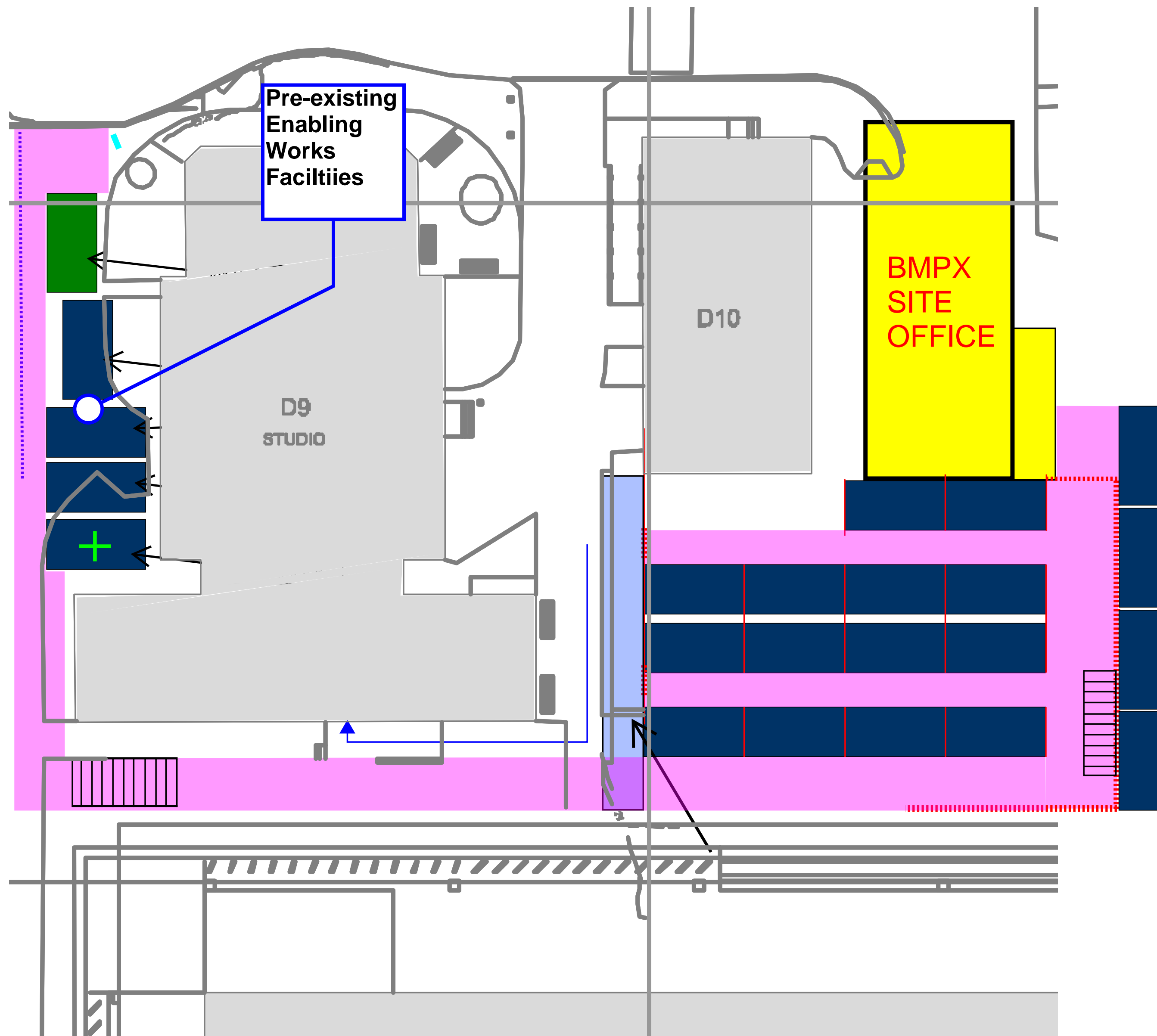
8.2 Appendix 2 – Site Set Up Plans





UNSW Science & Engineering Building Hoarding Plan

SK-MW-001b
Rev 02, 2.07.16



SEB Stage 1 Amenities:

ENABLING WORKS (pre-existing) 18 PAX:

- 1 x Lunch Sheds
- 1 x Change Room
- 1 x Ablution Block
- 1 x First Aid
- 1 x Security Shed

MAIN WORKS FACILITIES:

Lunch Sheds:

9 x (12x3m) - 36 per shed
TOTAL = 324

Change Sheds:

4 x (12x3m) - 72 per shed
1 x (6x3m) = 36 per shed
TOTAL= 324

Ablutions/Toilets:

3x (6x3m) Toilet Block (5 pan per block + Urinal)
1x (6x3m) Ablution Block (4 pan, 2 shower + urinal per shed)
TOTAL = 380

Sub-Contractor Offices:

3 x (6x3m) Sub-Contractor Offices -

STAGE 1 CAPACITY = 342 (inclusive of Enabling Works facilities)

UNSW Science & Engineering Building Site Amenities Layout - Stage 1

