



# Construction Management Plan (CMP)

Kambala

794 -796 New South Head Road, Rose Bay

Revision	Date	Section	Revision Details
1	27 July 2020	All	For SSDA
2	21 October 2020	All	Response to DPIE comments

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## 1.0 INTRODUCTION

This CMP supports a State Significant Development Application (SSDA) submitted to the Department of Planning, Infrastructure and Environment (DPIE) pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act), for the proposed redevelopment of the sports precinct of Kambala School at 794 -796 New South Head Road, Rose Bay.

This application is SSD by way of clause 8 and schedule 1 under *State Environmental Planning Policy (State and Regional Development) 2011* on the basis that the development is for the purpose of an existing school and has a Capital Investment Value of more than \$20 million.

This report has been prepared having regard to the Secretary's Environmental Assessment Requirements issued for the project by DPIE, ref no SSD-10385 issued on 24 November 2019.

The table below considers the relevant items raised in the SEARs during the preparation of this Construction Management Plan (CMP)

SEAR's KEY ISSUE	CMP REFERENCE
7. Transport and Accessibility - details of on-site car parking and access arrangements of construction vehicles, construction workers to and from the site, emergency vehicles and service vehicle;	Refer to Appendix A – Site Establishment, Access, Material Handling Plan & Section 4.1.7 Contractor Parking Section 6.6 Emergency Access
7. Transport and Accessibility - details of any crane locations and road closures	Refer to Appendix A – Site Establishment, Access, Material Handling Plan
19. Sediment, Erosion and Dust Controls	Refer to Appendix B – Sediment Control Plan
20. Waste	Refer to Appendix E – Waste Management Plan
21. Construction Hours	Refer to Section 4.1.5 Site working hours

### 1.1 Background

#### Need for a Campus Masterplan

Kambala is an independent day and boarding school for girls up to 18 years. Kambala also has an early learning centre catering for approximately 70 girls and boys aged between 6 months and 5 years. The school was established in the late 1800s and moved to the current campus in 1913. The campus has evolved in an organic and ad-hoc manner over the last 100 years as the school and its demands have grown.

A new campus-wide planning approach offers the opportunity to strategically plan for the future in a sustainable and effective manner and to preserve the unique aesthetic and heritage qualities of the campus. The preparation of a campus-wide planning approach is also consistent with the School's 2019 - 2023 Strategic Plan which identified the need for a broader strategic plan to coordinate renewal and development in a feasible and staged manner.

## 1.2 The Site

Kambala is located at 794 -796 New South Head Road, Rose Bay and is within the Woollahra Council local government area (LGA). Situated in the eastern suburbs of Sydney, the School is approximately 8km east of the Sydney CBD. The School is located on New South Head Road which is a classified road connecting the City with the eastern beaches. The School is surrounded by predominantly residential uses.

The campus is bound by New South Head (to the east), Bayview Hill Road (to the north) and Tivoli Avenue (to the west). Fernbank Boarding House is located at 1A -3 Bayview Hill Road opposite the Kambala School grounds. No works are proposed to this part of the campus in this DA. The locational context of the School is illustrated at **Figure 1**. **Figure 2** provides an aerial map of the School and its immediate surrounds.

The School campus slopes down from New South Head Road in the east to the west and comprises a series of existing buildings in the western part of the campus that range in height and age. The south western and north western part of the campus accommodates much of the school's existing built form, while the eastern part has the school's sporting fields and courts.

The Kambala School building known as Tivoli House is in the heart of the campus. The house, its interiors, gateposts, gates and flanking walls with railing facing Tivoli Avenue, as well as 2 Norfolk Island Pines are listed as a heritage item in Woollahra Local Environmental Plan 2014 (WLEP 2014).

Within the School campus, the site of this SSDA is illustrated in **Figure 3**. The site proposed for new buildings is on top of the existing sports field and music building, as shown in green. The site proposed for demolition works and associated façade redevelopment and landscaping works is shown in red and is limited to a portion of the existing Hawthorne Building and the Arts building. The site of new landscape works is shown in yellow and includes all external spaces connecting these works. It is anticipated that the construction works will be staged, so the construction site for any given stage will be smaller than the overall scope identified in **Figure 3**. The four key main buildings proposed are identified in **Figure 4**.

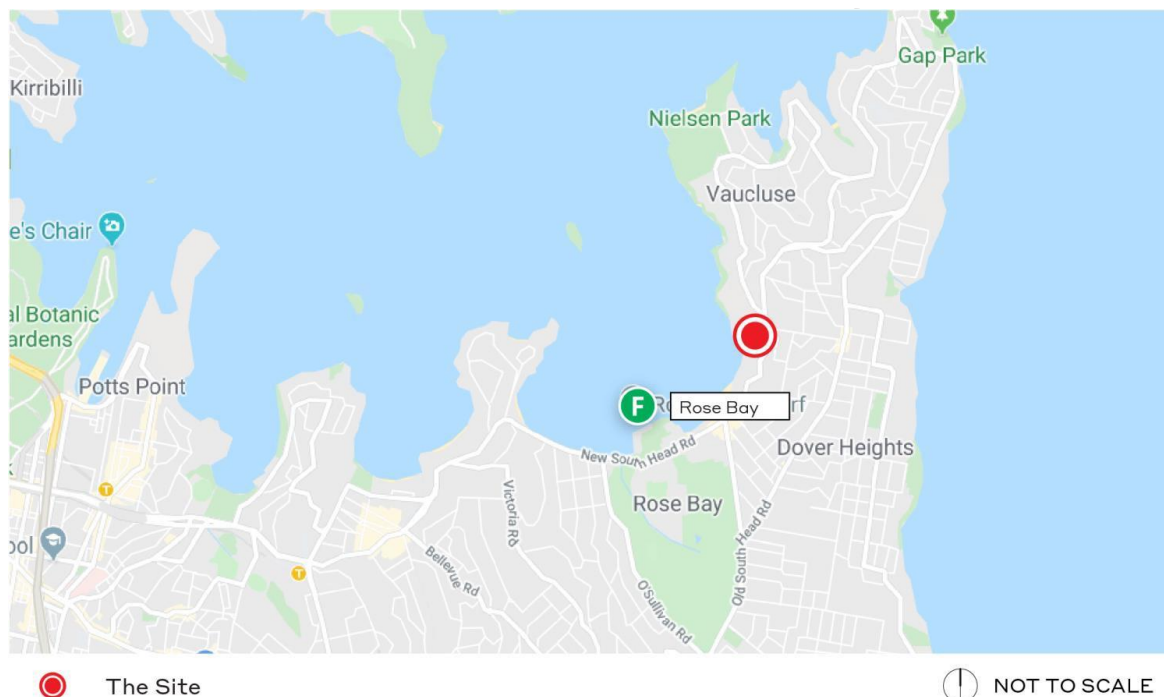
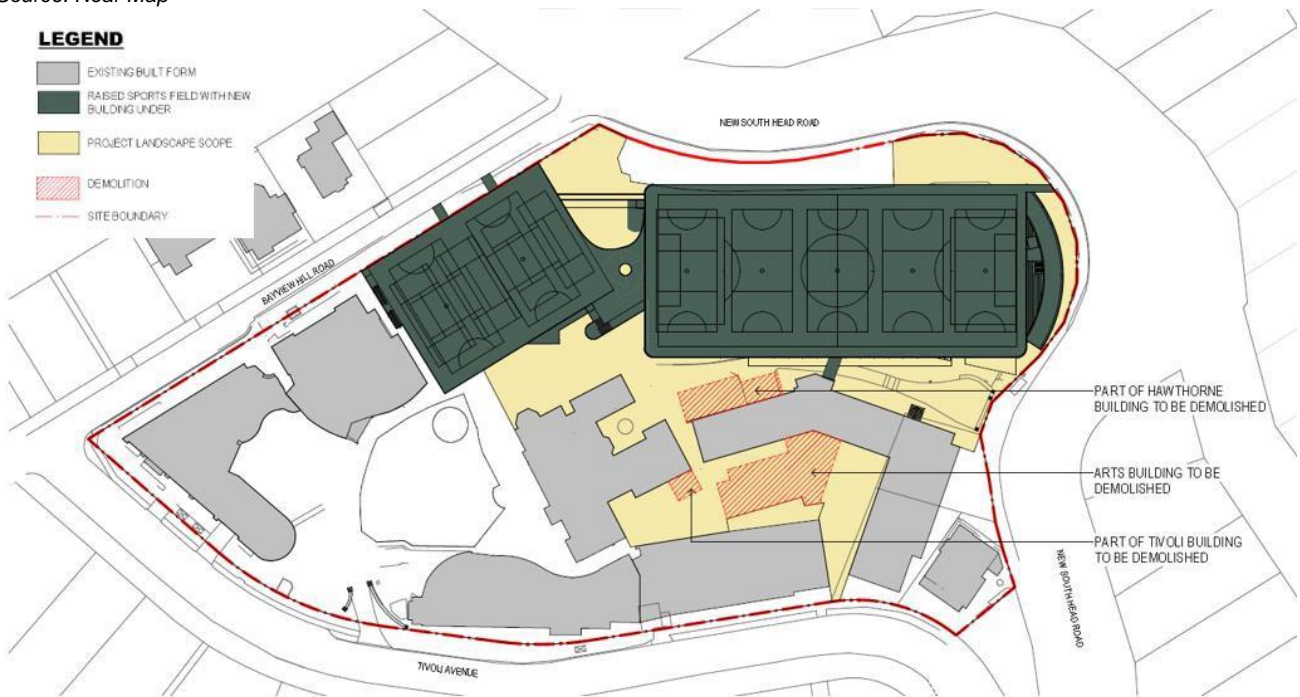


Figure 1 – Kambala School Location Context Plan



**Figure 2 – Aerial Map of the Kambala Campus**

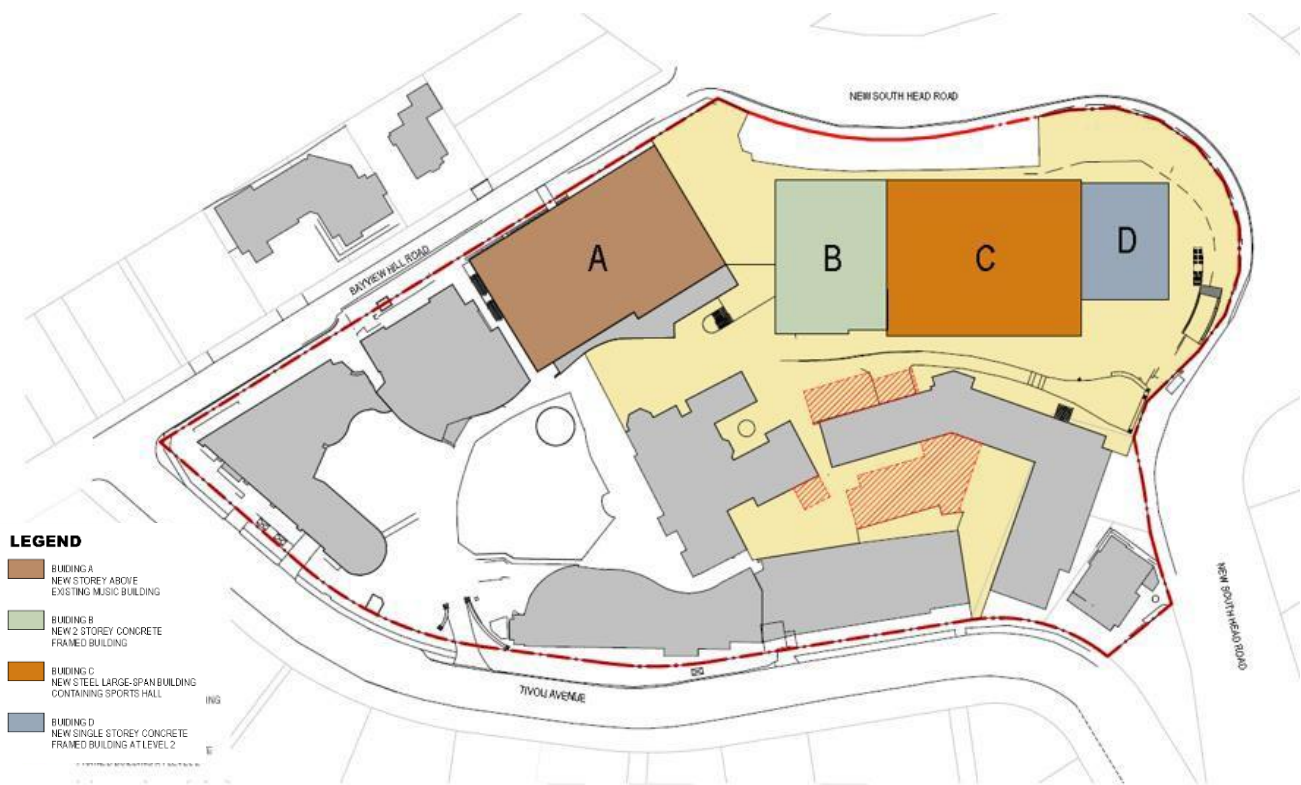
Source: Near Map



**Figure 3 – Project Scope**

Source: AJC





**Figure 4 – Key Plan**

Source: AJC

### 1.2.1 Legal Description and Ownership

The campus comprises several allotments, the legal descriptions of which are provided in **Table 1** below. The existing campus has a site area of approximately 22511m<sup>2</sup>.

**Table 1 Legal Description**

Address	Lot	Plan
794-796 New South Head Road	Lot 67	DP 2538
	Lot C	DP 210074
	Lot 1	DP 1089403
3 Tivoli Avenue	Null	SP 64653
3 Bayview Hill Road	Lot 1	DP 175832
1A Bayview Hill Road	Lot 45	DP 2538
1 Bayview Hill Road	Lot 46	DP 2538



### 1.3 Overview of Proposed Development

This SSDA includes detailed plans for a new sport, wellbeing and senior learning precinct. Accordingly, consent is sought for the following:

- The excavation of part of the existing sports field to facilitate the construction of the following:
  - sports facilities including weights room and dance rooms;
  - indoor multipurpose sports courts for use by up to 1500 people;
  - innovative and flexible teaching and learning spaces;
  - amenities, storerooms, plant, circulation and ancillary spaces
  - reinstatement of the sports field surface on the roof (sports field and perimeter fencing)
  - spectator seating / bleachers;
- The removal of the tennis courts (currently on the roof of the music building), and the construction of the following:
  - a wellbeing centre, called the SHINE centre, to accommodate the Kambala SHINE program
  - a new staff centre, called the KITE centre, to accommodate staff workstations, meeting areas, staff development workshop rooms and amenities
  - reinstatement of the tennis courts, lighting and perimeter fencing on the new roof
- a new eastern forecourt for the school, new external landscaped areas and new courtyards;
- minor works to the existing music building to facilitate a new connection to the new courtyard;
- the partial demolition of the Hawthorne building and the construction of a new façade, roof and landscaping; and
- the demolition of the Arts building and the construction of new facades to adjacent affected buildings, and new landscaping to the footprint of the demolished building

### 1.4 Project Staging

#### Stage 1

- Demolition of existing metal shed and other minor elements
- Stormwater pipe & easement realignment
- New Sports Hall and Covered Outdoor Learning Areas (COLA's)
- New Multi-Sports Field and perimeter fencing above Sports Hall
- New stairs and lifts
- New PV array on existing roof of Alexander Building

#### Stage 2A

- Demolition of temporary hoardings and the south-east corner of existing Music Building
- New lift within Sports Hall
- New glass façade & fit out of GLA's and Lite SHINE Centre
- New Level 2 slab above GLA's and Lite SHINE Centre
- Fit out of Senior Learning Precinct on Level 2

#### Stage 2B

- Demolition of temporary hoardings
- New glass façade & fit out of east end PDHPE within COLA

#### Stage 2C

- Partial demolition of Hawthorne Building
- New façade to Hawthorne Building
- Original pitch and extent of Hawthorne Building roof to be reinstated

- Landscaping to forecourt, main spine and within Hawthorne Building footprint

#### **Stage 2D**

- Landscaping between Music and Tivoli buildings

#### **Stage 3**

- Partial demolition of Arts and Tivoli buildings
- New façade works to Arts and Tivoli buildings (make-good)
- Landscaping around Tivoli and Hawthorne Buildings

#### **Stage 4**

- Demolition of existing tennis courts and minor elements
- Structural strengthening works to Music Building
- Construction of new Level 3 slab over Music Building
- Fit out of SHINE and KITE centre on Level 2
- New Multi-Sports Courts, perimeter fencing and lighting
- New paths to Bayview Hill Road
- New bridge between Sports Hall and Minter Building
- New stormwater retention tank between Music and Tivoli buildings

Staging details are included with **Appendix F**

### **1.5 Ongoing School Operations**

School operations will be ongoing throughout the entire construction program. Revised pedestrian access notwithstanding, there will be minimal impact to normal school operations from the works.

Departments will be decanted as required from the areas being demolished and/or relocated into the new facilities upon completion. Activities at the areas undergoing demolition will be moved to other venues as required.

Fencing and barricades will be provided to segregate the construction works from live school areas, and signage will be provided to clearly identify any changes to pedestrian access during each stage of works. Appropriate security measures will be provided to deter and prevent access to the construction areas.

Acoustic and vibration minimisation strategies will be implemented to minimise the impacts on the staff and students at Kambala during construction.

## 2.0 PROJECT PROGRAM & MILESTONES

Construction works for the redevelopment of the sports precinct are anticipated to commence in 2021 and with project completion forecast in 2023.

Target milestone dates are listed below:

Project Milestones	Planned Completion Dates
Assumed SSDA Approval	End of 2020
Site Establishment	2021
Operational Milestone	2023

## 3.0 COMMUNICATION & CONSULTATION

Kambala School will establish an appropriate communication plan which ensures all neighbours and relevant parties remain informed about the development.

Part of this plan provisions for a construction team member to be included in the liaison team with the Kambala school building and property committee, surrounding community, and relevant authorities.

The consultation process makes provision for community complaints about construction activities to be submitted, tracked and responded to via a register which forms part of the Project Control Group's reporting structure.

Project updates will be issued on a regular basis to proactively inform the local community.

## 4.0 SITE ESTABLISHMENT, CONTROL & PROJECT STAGING

### 4.1 Site Establishment

For details, refer to **Appendix A - Site Establishment Plans**.

#### 4.1.1 Dilapidation Reporting

Prior to site establishment and construction commencement, Independent dilapidation reports of the surrounding structures, infrastructure and roads will be completed and issued to all relevant parties.

The report will include photographs and plans with location reference for ease of use. This report will form the basis for comparison with a dilapidation report that will be prepared after all construction works are completed.

#### 4.1.2 Site Fencing, Hoardings & Security

The site will be appropriately secured by solid fences (wire mesh or similar), hoardings and gates during the entire duration of the construction work. Gates will be installed to control access to the site.

Hoardings, gates and fences will be suitably lined to limit public viewing and ensure safe pedestrian flow. Attention will be paid to ensure service vehicles and pedestrian travel paths are not obstructed at any time.

Locations of fencing, hoardings and security will be adjusted as required to address each project stage. Refer to **Appendix A** for details.

#### **4.1.3 Signage**

Signage specifying all safety, security measures and key contact details shall be erected on the perimeter of the construction site (i.e. attached to the building, fence or hoarding).

A 24-hour contact name and phone number shall be provided.

Delivery signage will be posted at the site entrances to ensure deliveries are coordinated and entering the correct locations.

Locations of signage will be adjusted as required to address each project stage.

#### **4.1.4 Site Amenities**

Site amenities and facilities will be provided for work personnel including offices, toilets, lunchrooms, first aid rooms and change rooms. The attached Site Establishment Plans in **Appendix A** note these proposed positions.

#### **4.1.5 Site working hours**

To mitigate impacts on the surrounding school and neighbours the proposed work hours provide the greatest opportunity for the most efficient construction program as well as mitigating traffic impacts. Further consultation with the key stakeholders of CTPG will occur prior to project commencement to ensure minimal or nil impact is made to the schools operating hours to allow the appropriate project planning and programming if required.

The preferred working hours of the site are:

- 7.00am to 6.00pm Monday to Friday, (TBC in approval conditions).
- 7.00am to 5.00pm Saturday (TBC in approval conditions).
- No work on Sundays and Public Holidays. (TBC in approval conditions)

Peak school traffic volume (school drop offs) being:

- Mornings – 7.00am till 9.00am
- Afternoons – 2.00pm till 4.30pm

We would ensure all deliveries and vehicular site access to be outside of the above hours to reduce the impact on the operations of the school and to limit the impact on local traffic. This information would be included within our site-specific induction.

Outside these hours, works, such as special delivery of materials / machinery / specific site works may be required to be undertaken outside the approved hours of operation for the site. This would be in line with the type of work, authority's requirements, or for safety reasons. For example, wide



delivery loads that are required to meet RMS restrictions on public roads may need to be delivered outside the approved site hours, or large concrete pours that require time to pour and cure the concrete before it can be finished may extend beyond the approved hours on limited occasions.

Communication with CTPG, relevant authorities and neighbours will be issued prior to these events occurring to all impacted stakeholders.

#### **4.1.6 Stakeholder Management**

CTPG will issue regular communication updates regarding the Project to relevant stakeholders, including local neighbours & relevant authorities. Stakeholders will have an open line of communication to the school project team in order to address any issues and concerns if they arise.

#### **4.1.7 Contractor Parking**

The site is served by public transport with Bus stops on New South Head Rd approximately 40m from the site entry. Contractors will be encouraged to use public transport where possible. All site personnel when inducted to the project will be informed of this requirement, including details of available services.

#### **4.1.8 Site Inductions**

All site personnel will be site inducted prior to commencing work on site. The site inductions will be specific to the Kambala School site and Buildcorp safety protocols including site specific requirements including:

- ▼ Site Safety
- ▼ Site Access, Site Amenities & Site Emergency Procedures
- ▼ Travel, Deliveries & Parking
- ▼ Client & Neighbour Requirements including; personnel behaviour; dust, vibration & noise controls.
- ▼ Head Contractor Policies & Procedures.
- ▼ Environmental considerations and rules.
- ▼ Other Specific School requirements including school drop off times.

The head contractor and all sub-contractors must induct their employees into their safe work procedures. Induction register & copies of site SWMS will be available on site when required.

#### **4.1.9 Hazardous Materials**

For works that require hazardous and/or flammable products, secure and appropriate storage shall be provided on site. The storage area shall be appropriately located away from emergency exits, amenities, neighbouring properties & stormwater pits.

Storage and handling of materials shall be in accordance with each of the products manufactures recommendations and Material Safety Data Sheet, the Occupational Health & Safety Act 2011 and the Occupational Health and Safety Regulations 2011.

Procedures will be implemented to control chemical storage and clean up and any spills if they were to occur.

#### **4.1.10 Safety Inspections**

OH&S meetings will be held on a regular basis on site. These meeting will be conducted as per head contractor's OHS procedures.

An OH&S information board will be erected, and a copy of the OH&S policy will be prominently displayed on the board. Safety inspection audit results will also be displayed.

Sub-contractors will be required to submit their OH&S Plan / SWMS to the Contractor for review prior to commencement as per Buildcorp's policy & procedures. The sub-contractor is to incorporate any feedback from the Contractor and Superintendent into the OH&S Plan.

#### **4.1.11 First Aid Facilities**

First aid facilities will be provided and maintained as per OH&S legislative requirements. There will always be at least one qualified first aider on site whenever any works are taking place.

#### **4.1.12 Approved Plans to be on Site**

A copy of the approved consent plans, specifications and documents incorporating conditions of approval and certification shall always be kept on site.

#### **4.1.13 Public Domain**

All footpaths and bicycle paths surrounding the site will be kept unobstructed and free of tripping hazards from hoarding, fences or construction related items.

Any works required within the public domain shall be undertaken in accordance with relevant authority approvals as required.

Where any construction related materials temporarily extend over footpaths, they will be covered and fitted with a ramp to facilitate safe pedestrian access including access for persons with disabilities.

The public shall be protected from all construction activities including vehicle loading and off-loading within the public domain with the implementation of a Construction Traffic Management Plan and qualified traffic control personnel.

#### **4.1.14 Site Appearance**

No materials shall be stored within the Public Domain areas surrounding the site.

Materials stored on site shall be adequately secured, organised and stacked to prevent unnecessary and unsightly views from surrounding public areas.

All construction generated rubbish and waste shall be sorted and placed into skip bins located within the site which will be removed on a regular basis.

Trucks leaving the site shall be cleaned to ensure soil, mud and other site debris is prevented from spilling onto adjoining roads and footpaths.

All loads shall be covered to prevent the accidental spilling of materials on roadways.

#### **4.1.15 Site Personnel Behaviour**

The head contractor will ensure that all site personnel conduct themselves appropriately and consciously of the neighbouring environment. During the site induction personnel will be inducted to these protocols. The requirements will include use of acceptable language, appropriate clothing, reporting of any incidents and compliance with required consent conditions.

#### **4.1.16 Environmental Controls – sediment controls, tree protection & dust control**

Sediment and Erosional Controls: Refer to **Appendix B** for the sediment control plans applicable to each project stage. All sediment controls will be installed prior to works commencing. Auditing / inspection and maintenance of these controls will occur regularly throughout the project duration.

These controls include the installation of silt control fabric at the low points of the site, at stormwater pit lids.

Tree protection: Refer to **Appendix C** for the Arborist report. The report details trees of heritage significance and requiring protection for the duration of the works. The nominated trees will be protected as per the requirements of the report.

Dust Control: Adequate dust control measures will be put in place throughout the project to control wind driven dust. Control measures shall include the covering of stockpiled soil materials, implementation of dust suppression measures such as watering the site, and the covering loads when they leave / arrive on site.

#### **4.1.17 Site Access**

Construction access will vary during the construction cycle. Details of construction access points is detailed in the Construction Traffic Management Plan in **Appendix D**.

All project stages are expected to utilise the main entrance from New South Head Road for construction vehicle access, therefore it has been anticipated that this gate will be closed to all school staff, students and visitors for the duration of the construction works.

A key consideration is that the Eastbound bus stop on New South Head road outside the school entry gate will be temporarily restricted from use by the students. Instead the students will utilise the East bound bus stop on New South Head Rd opposite the Towns Rd intersection. This will provide a clear separation between the construction vehicles using the New South Head Rd construction entry gate and the students accessing the school.

All site access points shall be controlled for security and safety purposes.

Environmental controls as stipulated in the Construction Environmental Management Plan will be established and maintained throughout the project lifespan as identified in **Appendix B**.

#### **4.1.18 Existing services infrastructure**

Prior to commencement of works, a survey and scan of the site will ensure that all existing services on site are located and documented. This survey in conjunction with any as built information provided

by the Kambala School will be used by our site team and services manager to ensure all services are terminated and / or diverted in order to ensure services to adjoining buildings are maintained whilst undertaking the works.

Accurate documentation and as built surveying information allows us to confirm their location and mitigate the risk of exposure to live services and or interruptions to these services that would affect others.

## **4.2 Construction Sequencing Project Stage 1**

### **4.2.1 Demolition**

To commence construction of the new sports precinct, the extent of demolition is minimal. The sheds currently onsite in the location of the new sports precinct will be demolished to allow the works to commence. We expect the demolition of these to take approximately 1 week.

### **4.2.2 Excavation**

All excavation work will take place using large excavation plant and equipment with excess spoil transported off site.

Access for earthworks will be in accordance with the Site Establishment Plans and Construction Traffic Management Plan attached at **Appendix A** and **Appendix D**.

The duration to undertake these works will be approximately 20 weeks.

Access around the site is well serviced to allow the use of 'truck and trailers'. This will assist in reducing the number of truck movements for the earthworks phase by half.

At the time of writing this report it is envisaged that the spoil being removed off site would generally be transported to the outer regions of Sydney.

### **4.2.3 Foundation / Sub-Structure Phase**

Piles and structural footings will be engineered and constructed in such a way as to mitigate the risk of noise and vibration wherever possible. The works will be occurring concurrently with the detailed excavation phase noted above, and thus within the same duration of approximately 8 weeks.

### **4.2.4 Structure Phase**

With completion of the Foundations, the structure phase will commence.

This phase will consist of traditional concrete column and suspended concrete slab construction. Each level will take approximately 8 weeks to form, reinforce and pour and also allow for in slab services provisions.

Atop the building structure, the new sports fields will be installed.

The duration to undertake these works will be approximately 52 weeks.

Construction of the structure shall be via the use of the sites tower crane.



Traffic movements for this phase of work are identified in **Appendix D**

#### **4.2.5 Façade and Building Envelope Phase**

Following completion of the structure works, external facade and the building envelope works will commence.

The façade will consist of generally lightweight construction materials and components will be prefabricated where possible to limit the works on site.

The duration to undertake these works will be approximately 32 weeks.

Construction of the façade and envelope shall be via the use of the sites tower crane.

Traffic movements for this phase of work are identified in **Appendix D**

#### **4.2.6 Internal Fitout & Finishes Phase**

Following installation of the building facades and envelope elements, the internal fitout and finishes will commence.

Typically starting with the installation of required building services, followed by internal walls, ceilings, joinery and then finishes to walls, floors etc.

Construction of the internal fitout & finishes shall be via the use of the sites tower crane accompanied by an all-terrain fork.

The duration to undertake these works will be approximately 32 weeks.

Traffic movements for this phase of work are identified in **Appendix D**

#### **4.2.7 Connection of Services**

Occurring in parallel with construction activities within the building, wherever possible connection of the developments services to the infrastructure surrounding the site will take place.

Critically these connections must be in place upon completion of the building works to allow all systems to be tested and commissioned ensuring they work as designed.

Specific locations for supply connections (water, recycled water, gas, electricity, communications, sewer, etc.) have yet to be resolved and agreed with the respective infrastructure authorities. Upon receipt of the development consent these applications will be submitted and locations agreed.

Importantly it should be noted that all connections to the supply infrastructure will be done with little disruption to the public domain and service supply to surrounding residents.

Connections shall be undertaken via the use of small scale and specific excavation equipment where necessary.

Traffic movements for this phase of work are identified in **Appendix D**

#### **4.2.8 Landscaping & External Works Phase**

The landscaping and external works is expected to commence following completion of the façade/building envelope, removal of the perimeter scaffolding and completion of in-ground services works.

The landscape and external works surrounding the built form completes its integration with the property boundary line and streetscape.

Works shall be undertaken via the use of small-scale plant and construction equipment for material handling purposes now that the main site cranes etc have been removed.

Traffic movements for this phase of work are identified in **Appendix D**.

### **4.3 Construction Sequencing Project Stage 2**

#### **4.3.1 Demolition**

Partial demolition of Music & Hawthorne buildings will be completed during Stage 2 using specialist equipment which is suitable for structural demolition within a live environment.

Music Building will be partially demolished as part of the initial sequence in Stage 2A. We expect demolition to take approximately 2 weeks.

Hawthorn Building will be partially demolished following completion of the PDHPE fit out in Stage 2C. We expect demolition to take approximately 2 weeks.

#### **4.3.2 Structure Phase**

In parallel with partial demolition of Music Building, the structure phase for Stage 2 will commence.

Construction of a new Level 2 slab below the Multi-Sports Field for Lite SHINE and GLA's will consist of traditional concrete construction and is expected to take approximately 3 weeks to form, reinforce and pour and allow for in slab services provisions.

Construction of new structure shall be via the use of small mobile materials handling equipment and mobile cranes where necessary.

Traffic movements for this phase of work are identified in **Appendix D**

#### **4.3.3 Façade and Building Envelope Phase**

Following completion of the Stage 2A structure works, external facades and the building envelope works for Stage 2A and Stage 2B will commence. The duration to undertake these works will be approximately 6 weeks.

The façade will consist of generally lightweight construction materials and components will be prefabricated where possible to limit the works on site.

Construction of the façade and envelope shall be via the use of small mobile cranes.

Traffic movements for this phase of work are identified in **Appendix D**

#### **4.3.4 Internal Fitout & Finishes Phase**

Following installation of the building facades and envelope elements, the internal fitout and finishes for Stage 2A and Stage 2B will commence.

Typically starting with the installation of required building services, followed by internal walls, ceilings, joinery and then finishes to walls, floors etc.

Construction of the internal fitout & finishes shall be via small mobile materials handling equipment and mobile cranes where necessary.

The duration to undertake these works will be approximately 10 weeks.

Traffic movements for this phase of work are identified in **Appendix D**

#### **4.3.5 Landscaping & External Works Phase**

The landscaping and external works will be completed as Stage 2C and 2D.

Upon completion of all internal works and removal of the site material handling equipment, the landscape and external works surrounding the built form commences to integrate the works with the existing school campus.

These works will vary in design from footpaths and paved areas through to garden beds and grass areas.

Works shall be undertaken via the use of small-scale plant and construction equipment for material handling purposes.

Traffic movements for this phase of work are identified in **Appendix D**.

### **4.4 Construction Sequencing Project Stage 3**

#### **4.4.1 Demolition**

Partial demolition of Tivoli & Hawthorne buildings will be completed during Stage 3 using specialist equipment which is suitable for structural demolition within a live environment.

We expect demolition to take approximately 4 weeks.

#### **4.4.2 Façade and Building Envelope Phase**

Following completion of demolition works, external facades and the building envelope make good works will commence. The duration to undertake these works will be approximately 4 weeks.

The façades will consist of generally lightweight construction materials and components will be prefabricated where possible to limit the works on site.

Construction of the façade and envelope shall be via the use of small mobile cranes.

Traffic movements for this phase of work are identified in **Appendix D**

#### **4.4.3 Landscaping & External Works Phase**

The landscaping and external works between Tivoli, Hawthorne, Minter and Alexander building will be completed following completion of façade make good works.

The landscape and external works replaces the demolished structures and integrates the works with the existing school campus.

These works will vary in design from footpaths and paved areas through to garden beds and grass areas.

Works shall be undertaken via the use of small-scale plant and construction equipment for material handling purposes.

Traffic movements for this phase of work are identified in **Appendix D**.

### **4.5 Construction Sequencing Project Stage 4**

#### **4.5.1 Demolition**

Existing sports courts will be demolished to allow the structural works to commence. We expect the demolition of these to take approximately 1 week.

#### **4.5.2 Structure Phase**

With completion of demolition, the structural strengthening works and new concrete structure will commence.

This phase will consist of traditional concrete columns and suspended concrete slab construction for the new SHINE and KITE centre. It is anticipated that the structural works will take approximately 6 weeks to form, reinforce and pour and also allow for in slab services provisions.

Atop the building structure, the new sports fields will be installed.

Construction of the structure shall be via the use of the sites tower crane.

Traffic movements for this phase of work are identified in **Appendix D**

#### **4.5.3 Façade and Building Envelope Phase**

Following completion of the structure works, external facades and the building envelope works will commence.

The façade will consist of generally lightweight construction materials and components will be prefabricated where possible to limit the works on site.

The duration to undertake these works will be approximately 8 weeks.

Construction of the façade and envelope shall be via the use of the sites tower crane.

Traffic movements for this phase of work are identified in **Appendix D**



#### 4.5.4 Internal Fitout & Finishes Phase

Following installation of the building facades and envelope elements, the internal fitout and finishes will commence.

Typically starting with the installation of required building services, followed by internal walls, ceilings, joinery and then finishes to walls, floors etc.

Construction of the internal fitout & finishes shall be via the use of the sites tower crane.

The duration to undertake these works will be approximately 10 weeks.

Traffic movements for this phase of work are identified in **Appendix D**

## 5.0 CONSTRUCTION MATERIAL LOGISTICS

Note – refer to **Appendix A** Site Establishment Plans

Materials handling involves the movement of material around the site to construct the building. The planning of this work upfront will allow the efficient construction of the building including safety, minimise double handling of materials and accelerate construction.

It is anticipated the main materials handling equipment will include:

- ▼ Forklifts to unload and relocate materials within the site compound.
- ▼ Cranes, both mobile cranes and tower cranes, to lift materials to relevant floor areas and install structure elements such as structural steel, formwork, reinforcement, precast concrete and façade panels.
- ▼ Concrete pumps for pouring concrete

**Appendix A** shows the planned locations of the above equipment applicable to each construction stage

Off-site prefabrication methods will be utilised to minimise the amount of work conducted on site. This also minimises the logistical requirements of coordinating all components of an element as separate deliveries, into a single delivery for complete elements.

Where possible, as the floors are constructed, they will be preloaded with bulk fitout materials such as gyprock sheets, wall framework, services componentry, joinery and the like. This will reduce smaller deliveries later in the project.

Concrete pumping will take place from both the work zone and from within the site to ensure minimum disruption.

## 6.0 CONSTRUCTION TRAFFIC MANAGEMENT

**NOTE: A detailed construction traffic management plan is included in Appendix D.**

### 6.1 Estimate of construction vehicles

Details of the estimated number of construction vehicles for each stage of the works are outlined with the **Appendix D** report.

To minimise impact on local traffic routes the following will be encouraged with incoming and outgoing deliveries:

- ▼ Prefabrication of elements and components where possible (will reduce the number of workers on site & number of deliveries (e.g. Structural Steel, Precast Concrete, Prefabricated Curtain Wall Facades, etc).
- ▼ Sub-contractors to log in deliveries with the project team to ensure that there is no back log of deliveries arriving at a similar time.
- ▼ Incorporate lay/waiting areas within the site for trucks to stand whilst waiting to be unloaded.
- ▼ Traffic control measures to be placed at entry points to control traffic.
- ▼ Sequences to the construction works so that trade activates that rely on several deliveries to do their work do not happen on the same day. For example, a large concrete pour and removal of spoil from site will not be programmed for the same day.
- ▼ Refer to attached TCMP - public transport & site personnel parking.

### 6.2 Construction vehicles site access

Due to the topography, number of buildings, design and concurrently occurring works to surrounding main roads and infrastructure during the construction cycle, construction vehicle access points will change to suit. This is further detailed under the Traffic Management section of this report.

**New South Head Road Access:** Predominantly the site access will be off New South Head Road. This access provides a gate for incoming and outgoing traffic.

### 6.3 Standing of Vehicles on Council Land.

The site establishment plan has been developed to ensure that generally standing of vehicles on public property not is required. All works, and vehicles will be contained within the site fencing line / boundary line wherever possible. Should standing of vehicles be required on council land, appropriate approvals will be sought.

### 6.4 Standing of Equipment on Council Land.

It is anticipated that there will be no need to stand construction plant or equipment on Council Property for most of the project duration. However, as the project develops, and available space is reduced there may be a need to stand some plant within Council land. If this is the case the then the necessary approvals to do so will be procured from the local Council. Such examples include:

- ▼ Dismantling of Materials Hoisting Equipment
- ▼ Dismantling of Tower Cranes
- ▼ Removal of Site Hoardings

## 6.5 Proposed road closures, temporary traffic routes and loss of pedestrian paths.

As noted above, the site establishment plan has been developed to ensure that generally standing of vehicles on public property not is required. All works, and vehicles will be contained within the site fencing line / boundary line. Given this no semi-permanent closure of roads, traffic routes or pedestrian paths is required for the primary development.

The following work activities may result in a short-term road closure or footpath closure. These will need to be confirmed as the design is finalised and await authority advice and advice from the relevant trade contractors:

- ▼ Construction of temporary and permanent laybacks and footpaths.
- ▼ Infrastructure services connections to the site. e.g. incoming high voltage power, sewer, telephone lines etc

Should any closures be required relevant authority paperwork will be submitted, including traffic control plans. From this any required conditions will then be put in place.

## 6.6 Emergency Access

Access to the construction area by emergency vehicles will always be available via the construction gates whilst the site is operational.

## 7.0 CONSTRUCTION WASTE MANAGEMENT

Refer to **Appendix E** for the detailed Waste Management Plan (WMP).

Additional information for the handling of waste is also contained in the Demolition & Construction Waste Management Plan prepared by Waste Audit.

For Excavation Waste, excavated materials shall be reused on the site wherever possible. Any surplus materials needing to be exported from the site will be sorted into separate soil classifications and managed according to EPA requirements. Any hazardous materials identified will be disposed of in accordance with statutory and EPA requirements.

For Primary Building Elements, they will be prefabricated offsite wherever reasonably practicable in order to reduce waste and increase construction efficiency.

For Site Generated Waste, it shall be sorted into relevant bins located within the site prior to being collected by a licensed waste removal company/contractor.

## 8.0 CONSTRUCTION NOISE MANAGEMENT

A Noise and Vibration Management Plan will be prepared by the CTPG acoustic consultant and head contractor once the project's design has been sufficiently detailed.

This summary assessment has been carried-out based on assumptions i.e. the types of equipment which would typically be used on similar projects. These typical sources of noise may be effectively controlled via:

- ▼ Appropriate hoardings around the site and strategically locating noisy items of plant away from sensitive receivers
- ▼ Selection of quieter construction methods wherever possible and appropriate, particularly for piling works
- ▼ Selection of low vibration construction work methods wherever possible and appropriate
- ▼ Vibration monitoring and management controls for heritage structures
- ▼ Coordination with the School and their relevant stakeholders / neighbours to minimise disruption wherever possible.
- ▼ Noise monitoring as required.

## 9.0 CONSTRUCTION NUISANCE MITIGATION MEASURES

The development site currently has neighbouring properties and as such mitigation measures will be adopted.

Adequate measures as nominated below are commonly implemented for sound Health and Safety reasons as well as nuisance prevention, thus in summary mitigation measures are as noted below.

Implementation of these measures shall be the responsibility of the Main Contractor.

Concerns	Mitigation Measure
1. Noise works e.g. rock hammering	<ul style="list-style-type: none"><li>▼ Construction equipment may be fitted with noise mitigation equipment where possible and reasonable.</li><li>▼ Noisy work will be identified and communicated to relevant stakeholders and neighbours, giving them sufficient notice.</li><li>▼ Noisy equipment to be located further away from the direction of closest residential neighbours wherever possible.</li></ul>
2. Dust	<ul style="list-style-type: none"><li>▼ Appropriate site fencing and hoardings will be provided around the site.</li><li>▼ Ensure construction vehicles have been appropriately cleaned before exiting the site.</li><li>▼ Ensure sufficient wetting-down is completed during excavation activities.</li><li>▼ Ensure stockpiles are sufficiently protected and covered.</li></ul>
3. Hazardous materials being encountered	<ul style="list-style-type: none"><li>▼ Hazardous materials survey conducted prior to works commencing on site.</li><li>▼ Appropriately licenced contractors engaged to remove any hazardous materials found.</li></ul>

	<ul style="list-style-type: none"> <li>Appropriate signage and exclusion zones maintained during applicable works if encountered.</li> </ul>
4. Sediment run-off entering the storm water system or surrounding streets	<ul style="list-style-type: none"> <li>Follow prescribed sedimentation and erosion control measures as provided by the Civil Engineer.</li> <li>Conduct regular visual inspections of silt socks and all other sedimentation controls to ensure integrity of the systems are always maintained.</li> <li>Provide dedicated wash-out facilities for use by relevant Subcontractors.</li> </ul>
5. Unauthorised entry to Site	<ul style="list-style-type: none"> <li>Appropriate site fencing and hoardings will be provided which separate all construction activities from the public.</li> <li>Signage appropriately placed to warn of hazards.</li> </ul>
6. Vibration during excavation, piling and structural works	<ul style="list-style-type: none"> <li>Maximise use of bored piles rather than driven piles.</li> <li>Saw cut rock where feasible to minimise rock breaking equipment.</li> <li>Applicable works will be identified and communicated to relevant stakeholders and neighbours giving them sufficient notice.</li> </ul>
7. Construction vehicles, plant and equipment on public roads (arriving / leaving the site)	<ul style="list-style-type: none"> <li>Traffic controllers to manage construction vehicle movements to/from the site as required.</li> <li>Safe public access routes to be pre-agreed and maintained.</li> <li>Site plan and access diagrams provided to delivery drivers before reaching site, to minimise the time spent on public roadways surrounding the site.</li> </ul>
8. Site personnel behaviour both inside and external of the site (e.g. language, rubbish left on streets, interaction with neighbours)	<ul style="list-style-type: none"> <li>Site inductions will include site requirements. These will include no inappropriate language, no throwing rubbish on streets, parking of vehicles legally and the requirement to wear appropriate clothing at all times etc.</li> <li>Weekly toolbox talks will reinforce requirements.</li> <li>Daily check of surrounding streets.</li> </ul>

## Appendix A – Site Establishment Plans

### Site Compound Establishment

The project will have a project office, meeting rooms, site amenities & storage facilities located on the existing sports courts for Project Stages 1, 2 & 3 and will be relocated onto the new Multi-Sports Field for Project Stage 4. All major site functions will be controlled from within this space, including all required site inductions that also are to be conducted within the site compound.

As the contractors will need to go through the standard security checks prior to coming on site, the team will conduct all inductions & checks of SWMS prior to any contractor commencing on site in accordance with the Buildcorp Contracting New South Wales (BCNSW) Safety system.

### Site Access

Site access is via multiple secure gates. Pedestrians from Bayview Hill Road for Project Stages 1, 2 & 3 and will be relocated to New South Head Road for Project Stage 4.

Vehicles will enter and exit using the main gate on New South Head Road.

Gates and access points may vary as the different construction stages are completed.

Heavy vehicle traffic is expected through the structure and façade enclosure construction sequences

### Material Storage

The way that materials come to site will also play a part in the speed of constructing the project. All materials must come to site in a packaged type of way - for example, bulk materials i.e. bricks will need to be in pallets wrapped in safety plastic to allow the quick loading & unloading.

The site will have dedicated lifting zones for materials going directly into the buildings. It will also have dedicated storage zones for materials being delivered prior to lifting into the building.

### Materials Handling

#### **Cranes;**

The predominant material handling and vertical lifting for Project Stages 1 and 4 shall be via Tower Crane and mobile cranes located around the site will be used as the primary material handling method for Stages 2 & 3 and may be used to supplement the tower crane in Stages 1 & 2 (refer attached plans). Cranes will vary in size and boom length as required to perform their ultimate lifting capacity functions, however coordination of the cranes shall occur via computer software-controlled systems to ensure at no time are there risks of striking each other.

#### **All Wheel Drive Forklifts;**

Where materials are requiring unloading and loading onto trucks, as well as moving horizontally across the site, these functions shall predominantly occur with the use of all terrain forklifts.

Forklifts are anticipated for all Project Stages.

**Material Hoists;**

Various materials also shall be moved to the required levels of the building via the use of material hoists. Typically, these materials are not suited to lifting via the sites tower cranes.

Hoists are expected to be required for Project Stages 1 and 4.

**See Attached Plans Identifying Site Amenities, Access and Material Handling Strategy**



## Appendix B – Sediment Control Plans

### Introduction

#### Purpose

This Stormwater and Sediment Control Plans describe how Buildcorp proposes to manage stormwater, prevent erosion, control sediment and prevent pollution.

#### Scope

This plan describes the stormwater and sediment control aspects of the project, which will need to be managed to achieve the desired outcomes, within the constraints imposed by legislative, regulatory and contractual requirements, so that the desired outcomes are achieved.

#### Objectives

To prevent contamination of, or damage to, stormwater drains and waterways and ensure sediment from the building site is retained on-site during construction work.

#### Project Site

The project site is identified in the forward section of this report.

#### Project Description

The project proposes the redevelopment of the Sports precinct over various stages as detailed in the forward sections of this report.

#### Site Specific Details

The construction site is located within 794 – 796 New South Head Road, Rose Bay, NSW as detailed in the forward sections of this report.

### Operational Controls

- ▼ Stormwater shall be prevented from entering adjoining properties or into the sewerage system.
- ▼ Stormwater shall be captured and filtered in sediment control points before entering the legal point of discharge from the site.
- ▼ Rumble grids shall be cleaned daily with consideration given to water saving measures including recycling. Water run-off from cleaning the grid must be filtered prior to entering the legal point of discharge from the site.
- ▼ Stockpiles shall be located away from drainage lines and street drains and gutters. Where possible, stockpiles shall be located on the highest part of the site clear of main activity areas.
- ▼ Designated truck/vehicle/ equipment wash down areas shall be located near the site entrance and be designed to capture and treat water prior to discharge into the stormwater system. A water recycling system shall be installed if wash down areas exceed 3,000 litres per day.
- ▼ Wherever possible, natural vegetation shall be retained to absorb water flows and to minimise dust. Revegetation shall occur as soon as possible after the completion of works
- ▼ Natural rainwater run-off shall be controlled to prevent sediment draining into the stormwater system. Upslope water shall be diverted to prevent it from travelling through the site. Downpipes

shall be connected as soon as a roof is installed on the site. Natural falls of the site shall be identified and sediment filters such as straw bales filters, gravel surface barriers, sandbags, pit baskets or geo-textile mesh screens shall be installed at runoff points.

- ▼ Sediment shall be trapped and controlled prior to leaving the site boundary.
- ▼ Straw bales/geo-textile mesh screens shall be inspected and replaced on a regular basis, so they remain effective.
- ▼ Sediment traps or filters shall be placed around any drain affected by construction works to prevent sediment entering the stormwater system. Sediment controls shall be checked regularly to ensure they are in place and operating properly. Additional inspections shall be undertaken immediately following or during heavy rain (10mm or more rainfall event) to confirm the operational adequacy of the facilities.
- ▼ Water shall not be discharged to the stormwater system if oil is visible on the surface, or if there is reason to suspect that the pit is contaminated with fuel, sewage or other contaminants. In this case the water shall be taken away to an oil separation facility (such as Lidcombe Liquid Waste Facility);
- ▼ Waste material, including liquid wastes such as paint, concrete slurries and chemicals, will not be discharged into a stormwater drain. Facilities shall be provided to enable paint brushes, rollers and spray equipment to be cleaned without any discharge of by-product into the stormwater system. Where possible, a depression or earth dam below brick, concrete or tile cutting shall be constructed. If this is not possible, site water shall be passed through a filtered pit.
- ▼ Buildcorp will monitor discharge from the sediment trap during design rain events (up to 5 year ARI) to ensure only visibly clean water is discharged from site. Additional measures such as the addition of flocculants to the sediment trap may be employed if necessary.
- ▼ Wastewaters which are still “dirty” or contaminated will not be discharged to stormwater systems, but instead collected and properly disposed.

### Water Saving Measures

Permanent water saving measures shall be used on site. These include:

- ▼ All hoses must be in good condition and fitted with a trigger nozzle.
- ▼ A high-pressure water cleaning unit is to be used for all washdown activities.
- ▼ Where infrastructure is available the use of recycled water for washdown activities is to be used.

**See attached Site Plans Identifying Control Measures**

## **Appendix C – Tree Protection Plan**

See attached arborist report detailing tree protection measures

## Appendix D – Construction Traffic Management Plan

During the construction of the proposed Project, Buildcorp shall engage the services of specialist Traffic Control Operators to ensure traffic and pedestrian flow is managed to the highest standards and with the utmost focus on safety. Buildcorp will allocate traffic controllers where required to direct all construction deliveries and to communicate changes to traffic conditions to the users of the precinct. All traffic control personnel will be certified as required.

Care will be taken to minimise any damage to the surrounding roads as a result of construction activity.

### Public Safety and Security

Safety of the public is the highest priority. In order to reduce the safety risks to public, all potential risks need to be identified and eliminated or controlled. In summary, practices that will be initiated for this project to assist with public safety will include:

- ▼ Hoardings/fencing to the perimeter of the site to be used to eliminate the chance of public gaining access and to reduce the visual impact of the construction zone by utilizing shade cloth on perimeter fencing.
- ▼ Gates to the sites will always be monitored by appropriate staff.
- ▼ Each entry point will be carefully signposted and monitored to reduce accidental public access. Refer to attached site establishment plan.
- ▼ Daily monitoring of all public access ways and repair if required as a result of construction activities will be conducted.
- ▼ Surrounding access paths will be cleaned daily in order to reduce the occurrence of slip risk.
- ▼ A clearly defined traffic management plan will be implemented to ensure all motor vehicle movements to and from the site as a result of construction activities, do not impede on the operations of the parking of the general public.
- ▼ With the public's safety as our primary concern we will ensure licensed traffic controllers and the traffic management plan is approved by Buildcorp Contracting NSW management and is implemented.

### Traffic Control Personnel

- ▼ Traffic control personnel and equipment will be established as required for the safe and effective control of traffic and pedestrians at all Gates leading into and from the site that interface with public space.
- ▼ Traffic control personnel will set-up roadside signage and equipment at the various locations specified and in accordance with guidelines stipulated by MUTCD.

### Statement of Quality Assurance Compliance

#### Traffic Management:

- ▼ Will be conducted in a professional manner to minimise delays to reduce inconvenience to the public by authorised traffic controllers.
- ▼ Will maintain the traffic control equipment as required for the safe and effective control of traffic for the duration of the roadwork.

## References

- ▼ Australian Standard AS 1742.3 - 1996
- ▼ MUTCD – Manual of Uniform Traffic Control Devices – Part 3
- ▼ Traffic Management Plan

## Ingress and Egress of Vehicles to the Site

Vehicles will approach the site from the South West along New South Head Road. The Gate provided will ensure all vehicles can always fully enter the site and not remain standing on public land. Area will be provided inside the site for vehicles requiring assistance unloading via any of the site material handling equipment. The vehicles will enter turning left into the site and leave turning left out of the site.

For further information, please refer to the Site Establishment Plans in **Annexure A**.

## Management of Loading and Unloading of Materials

Loading and unloading of materials shall occur in nominated “Delivery and Set- Down Zones”

Where any activities are anticipated to affect normal vehicular and/or pedestrian movement, appropriate traffic management shall be provided. Appropriate notification shall be provided for any large or significant deliveries which may result in disruptions.

## Numbers, Timing and Frequency of Vehicles Accessing the Site

The number of vehicles entering the site is to be restricted to deliveries wherever possible; no subcontractor parking will be permitted on site.

The anticipated number of vehicular access into the site is detailed in the enclosed report.

## Management Responsibility for Traffic Control

It is the responsibility of the senior traffic controller or nominated person on site to ensure that all traffic control equipment and its allocation is in accordance with the contract specifications and guidelines.

If required, Traffic delays will be kept to an “absolute maximum” of fifteen (15) minutes (as per MUTCD guidelines) for any single vehicle. Routine work delays to traffic flow shall be targeted to no more than sixty (60) seconds.

Any traffic delays shall be monitored on a regular daily basis and reported to the Site Supervisor. Areas of work under traffic control shall be programmed to achieve these times and other safety requirements. Any specified lengths of work under traffic shall be nominal distances only.

Queue congestion at closures will be monitored to ensure that any intersection and/or roundabout are not blocked at any time during the program unless unavoidable. Traffic Controllers and signage will direct traffic through the closure to ensure this is enforced and maintained.

## Responsibility and Authority

Appropriately qualified personnel will undertake direct traffic control. The minimum qualification shall be a current Traffic Controllers' ticket and General Safety (Blue Card) Induction Card. Traffic Controller's will be responsible for ensuring traffic is not unduly delayed and that safety of the general public and workers on site is maintained.

Each traffic controller is required to take corrective action and notify the Site Supervisor if a problem occurs. The relevant parties will communicate via two-way radio, mobile telephone or direct oral communication.

The Traffic Controller's on site, in consultation with Buildcorp Contracting NSW representative, will be responsible for the control of traffic.

The Traffic Management Plan is to be signed off by the representative prior to commencement of the project.

Personnel on-site will rectify any Non-Conformances immediately and the Operations Manager will respond to all necessary reports.

## Selection of Site Traffic Control Modes.

The following factors have been considered in selecting the appropriate site control modes:

- ▼ Minimising hazard risk to the public and workers on site:
- ▼ Minimising interaction between public traffic and work-site pedestrian / construction vehicles.
- ▼ Minimising traffic delays as specified in the Traffic Control at Worksites - 1998.
- ▼ Minimising the occurrence of any traffic stoppages.

## Specific Traffic Control Modes.

At the location/s outlined in the job specification, the traffic will be controlled by: -

- ▼ Traffic Controllers will maintain road/lane closures on the sections that are indicated as per Traffic Control Plan and/or contract details.
- ▼ A Buildcorp representative prior to the commencement of any road/lane closures will complete any applicable application for Road Occupancy/Closure [if applicable] and all other relevant permits for closures.
- ▼ Buildcorp – Traffic Control Plans / Traffic Management Plan.

## Public Notification

Notification will be by way of signage approved and installed by Buildcorp. Where appropriate written communication with surrounding residents may be utilised to notify of any major planned changes to traffic.

## Time Restrictions

Shall be implemented as per Development Consent conditions.

## Equipment List

Traffic Controller control personnel as required

All signage and equipment as required and as specified in the detailed Traffic Control Plans developed and approved for various scenarios.

## Pedestrians flow

- ▼ Main pedestrian access shall be segregated from the vehicle entry points to the site.
- ▼ Pedestrians will be required to follow the same directions/detour as vehicles.
- ▼ No unauthorised personnel shall be allowed within the construction zone.
- ▼ All personnel (including authorised visitors) on site shall be required to wear as a minimum safety boots, hard hats and high visibility safety vests.



## **Appendix E – Waste Management Plan**



Level 4, 10 Mallett Street  
Camperdown NSW 2150  
Phone: 02 9565 0000

## Waste Management Plan

### ***Kambala School***

794 – 796 New South Head Road,  
Rose Bay

Approved by:

Manager	Date
Mike Currie	14 February 2020

### Record of revisions of HSE Waste Management Plan

Edition Revision	Date	Page	By	Revision Details
A	01 April 2020	First issue	KK	Preliminary Issue


### Controlled Copies / Distribution List

No.	User	Position	Issue Date
01	SSDA Issue	BDM	01 April 2020

## Introduction

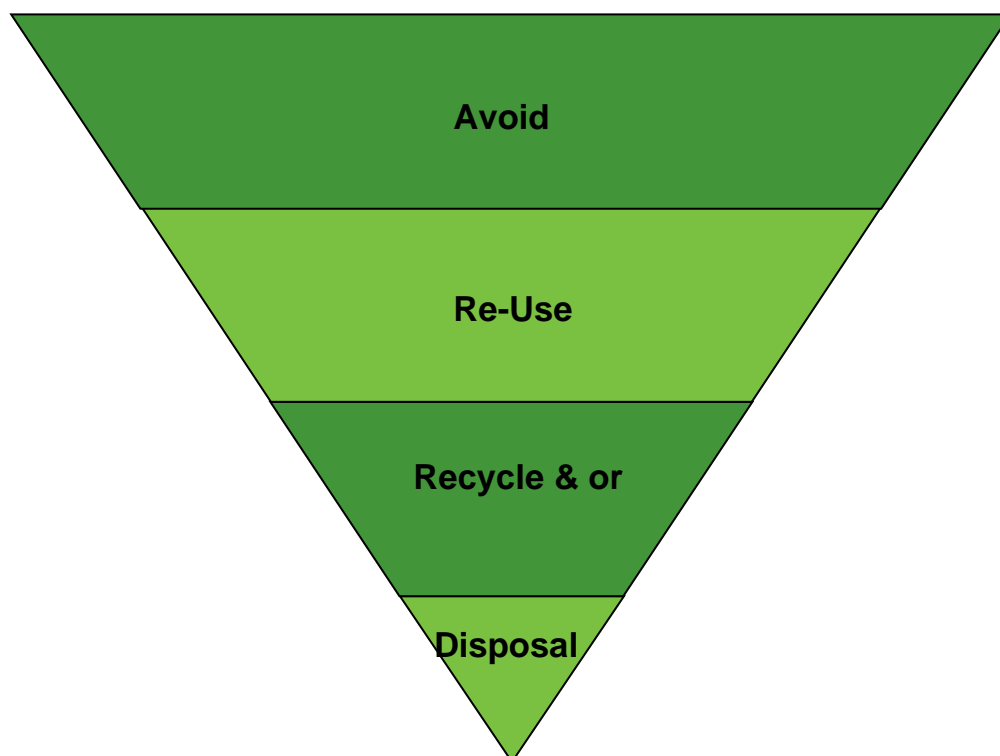
This Waste Management Plan outlines Buildcorp's strategy to minimise the generation of waste, maximise reuse and recycling and ensure waste is disposed of at a licensed EPA waste disposal facility. The purpose of this plan is to:

- Establish the specific procedures to ensure waste generated by project activities are minimised and waste is appropriately recycled.
- Provide a consistent and uniform approach that assures the required standards relating to waste are attained and maintained for the project works to achieve minimum recycling / reuse target of 80% of waste by weight minimising the amount of waste going to landfill.
- Establish waste management strategies for the construction stages from demolition, building construction through to commissioning.
- Establish provision for on-site monitoring of wastes generated with details of each material, disposal destinations (tracking) and receipts.
- Define the appropriate waste disposal measures to be undertaken for materials that pose an environmental risk such as soils, concrete, contaminated water, paints etc

## Waste Management Hierarchy

Buildcorp have prioritised waste management by adopting a waste management hierarchy as follows:

1. **Avoiding Waste** (identify demolition and construction waste to minimise packaging and over ordering of materials)
2. **Re-Use Materials** (pallets and storage containers)
3. **Recycle and Reprocess Materials**
4. **Disposal of Waste**



## Waste Minimisation Controls

The following controls will be implemented on site to ensure waste is minimised on the project:

- Main subcontractors are asked to submit waste minimisation details in their SWMS including the following:
  - i. Avoiding over-ordering materials
  - ii. Minimising the use of un-recyclable packaging materials
  - iii. Reviewing with suppliers, the potential for reusable packaging, such as cloth bags, blankets, pallets or containers for materials and equipment
  - iv. Buying environmentally-approved and recycled-content products where possible
- Waste management training is provided as part of Site Induction, ensuring that subcontractors and site visitors are aware of the materials on-site (in particular any hazardous wastes) and waste disposal requirements.
- Buildcorp will utilise the services of a Waste Sub-Contractor whose facilities and waste procedures have been audited by our sustainability management team for stringency and accuracy. They should need also meet the following requirements:
  - i. Be appropriately licensed under the POEO Act (1997) and associated regulations to transport, store, recycle, reprocess and/or dispose of wastes removed from the site;
  - ii. Provide waste containers and transport vehicles suitable for storage and carriage of waste types to be generated at the site;
  - iii. Can provide EPA licenses of the appropriate landfills that are licensed to accept the waste which is generated on site
  - iv. Provide accurate written documentation including tracking documentation and disposal receipts to Buildcorp in a prompt manner following the disposal of waste from the site to comply with regulatory and Buildcorp contract requirements;
  - v. Remove and transport all waste for disposal to a facility lawfully able to accept the waste;
  - vi. Securely load and cover all vehicles/bins and containing waste prior to exit from the site to minimise the risk of waste spillage, dust generation etc during transport.
  - vii. Facilitate recycling of appropriate materials.
- Prior to commencing work on site project personnel (including subcontractors) are to be informed through the site induction process of the importance of waste, recycling, spills or incident impacts on the site and adjacent areas. Site supervisors are to discuss waste management issues at toolbox and other meetings as required.
- All work areas are to be maintained in a clean and tidy manner. A weekly (or more frequent if required) sweep of the entire site will be completed by the contractor to remove loose waste and/or litter present within the site to appropriate waste/recycling storage facilities in the loading dock.
- Daily inspections are to be conducted to ensure that the worksite is left in a rubbish-free state and that no rubbish has been “trapped” against site fencing
- Regular management audits are to be carried out to ensure that the Waste Management Plan is being adhered to

## Waste Management

The table below represents the expected waste types that will be generated during the works and describes how each will be managed on-site, collected and the waste management outcome ranked from the most to least preferred.

Waste Type	Waste Management Outcome				
	Most Preferred		Least Preferred		
	Avoid/Reduce	Reuse	Recycle	Recover	Treat &/or Dispose
Plasterboard					
Paper & Cardboard					
Steel, Scrap Metal etc...					
Timber					
Plastics and Foam					
Insulation Material					
Excavated Fill					
Glass					
Concrete and Bed Mix					
Residual					
Hazardous					
Food and General Waste					

### Notes;

1. Waste is collected in "general construction waste" bins and is sorted at a resource recovery facility using mechanical and manual sorting techniques that remove wastes such as plasterboard, timber, metal, cardboard and plastic for recycling.
2. Residual waste refers to construction waste other than those listed as a waste type.
3. Waste Management Definitions:
  - *Re-use*, means the activity of using waste materials in their current form (i.e. not altering their chemical or physical state)
  - *Recycling*, means the activity of processing waste materials to form new products
  - *Recovery*, means the activity of processing waste materials for the purpose of recovering energy (e.g. incineration)
  - *Disposal*, means the activity of depositing waste materials in landfill

### Demolition

Parts of the Hawthorne, Alexander and Tivoli Buildings will be demolished. Given the age of these buildings the materials that can be recycled will be and the remaining items will be disposed of.

### Excavation Fill Material

Any fill materials identified requiring excavation within the site footprint should be reused, where suitable, on the site as part of the site engineering or landscaping work. Excess or contaminated excavation fill is to be removed off site and classified in accordance with relevant guidelines. To ensure the fill is being taken to the correct landfill the subcontractor transporting the waste should provide details of the landfill site, the EPA licence details and confirmation that landfill is authorised to receive that waste. Trucking docket records are to be kept on site to check that fill is going to the nominated landfills.



## Construction Waste

The construction waste generated on site is to be placed as follows;

- in mixed waste skip bins, meaning that all waste is deposited in the one skip bin and segregation into the appropriate waste streams occurs offsite.
- Where site room allows and subject to waste type quantity sorted into the appropriate waste bins and will be removed and where applicable recycled off site by the waste generating contractor.

## Food and general waste

Food scrap/ general waste bins are provided in the vicinity of site offices and amenities. It is sorted into general waste, cans/bottles and paper/cardboard. Buildcorp site sheds have paper bins and printer cartridge bins (for staff to return to head office for recycling).

## Hazardous Materials

Contaminated waste will be disposed of to an EPA licensed facility which is able to take the waste. Contaminated waste will be stored within designated storage areas on site. Records of disposal of the waste should be maintained with site records.

## Hazardous Substances

Any subcontractors handling, using or disposing of harmful or toxic chemicals or substances are to ensure they follow appropriate manufacture requirements and legislation requirements in disposal. No chemicals or substances are to be disposed of down any drains, sewer etc on- site.

If a spillage of a hazardous substance occurs staff are appropriately trained in spill kit procedures to clean up spills immediately. Spill kits are located adjacent to the areas where hazardous substances are stored on site. Once the substance has been cleaned up it will then be disposed of to the appropriate EPA licensed facility. Records of disposal and the clean up methods of the spill are to be maintained with site records.

## Waste Water/Wash Out Areas

Wash out facilities for finishing trades including concrete and paint waste are to be minimised and water recycling for these activities are encouraged. If a wash out facility is utilised it will not be plumbed to any building services or drain to stormwater.

The wash out area will have sediment controls and should be clearly signposted. The location of the wash down area is shown on the sites layout plan and everyone is made aware of this location during the site induction. Refer to the Sediment control section.

The wash out area and sediment controls should be emptied of all solid residues regularly in order for it to catch waste water. Solids which are caught by this process should be disposed of in a bin going to a licensed waste facility.

### Anticipated Waste Quantities

Anticipated waste quantities associated with the demolition of existing site structures, and construction of the proposed new development are outlined below;

	Demolition	Construction
Type of Material	Estimated Waste Volume (m <sup>3</sup> ) or Area (m <sup>2</sup> )	Estimated Waste Volume (m <sup>3</sup> ) or Area (m <sup>2</sup> )
Excavation Material	33,400 m <sup>3</sup>	100m <sup>3</sup>
Misc. General Waste	100 m <sup>3</sup>	10 m <sup>3</sup>
Bitumen	60 m <sup>3</sup>	N/A
Metal Roofing, Walls	60 m <sup>3</sup>	5 m <sup>3</sup>
Paving	50 m <sup>3</sup>	N/A
Vegetation	40 m <sup>3</sup>	N/A
Bricks	40 m <sup>3</sup>	N/A
Carpet	20 m <sup>3</sup>	N/A
Ceiling Tiles	20 m <sup>3</sup>	N/A
Cardboard Packaging (from deliveries)	20 m <sup>3</sup>	20 m <sup>3</sup>
Concrete	20 m <sup>3</sup>	5 m <sup>3</sup> (excess)
Electrical Wiring, fixtures	12 m <sup>3</sup>	N/A
Window Glass	12 m <sup>3</sup>	5 m <sup>3</sup> (excess)
Metal Fixtures, Fencing (from tennis courts)	10 m <sup>3</sup>	N/A
Mixed Recyclables	N/A	15 m <sup>3</sup>
Timber Offcuts	N/A	5 m <sup>3</sup>
Plasterboard Offcuts	N/A	5 m <sup>3</sup>
Floor Coverings	N/A	5 m <sup>3</sup>

## Site Management Roles and Responsibilities

To manage waste generation on site the following roles and responsibilities have been set for all contractors to follow and ensure the waste recycling targets can be met. The table below represents a summary of the waste management roles and responsibilities for the works on the Kambala sports precinct redevelopment.

Responsibility	Project Task
<b>Site Operation</b>	
Base building management	<ul style="list-style-type: none"> <li>Ensuring that waste is segregated and collected in accordance with this Plan</li> <li>Ensuring that Duty of Care documentation is obtained and maintained in the site file (e.g. copy of waste transporters licence, waste collection receipts, waste transport certificates)</li> <li>Updates to the Plan and Building Management approvals</li> <li>Supervising the collection of waste by the waste contractor (where practical)</li> <li>Maintaining site records of waste types and approximate quantities collected from site</li> </ul>
<b>Waste Sorting</b>	
All Contractors	<ul style="list-style-type: none"> <li>It is the responsibility of all contractors to be inducted into this plan and put waste into the correct bins on site for appropriate disposal off site</li> <li>Contractors are to use the designated bins on site and not dispose of any materials expect within designated bins on site</li> <li>Minimise the generation of wastes through appropriate behaviour on site through site measurement and ongoing management of works</li> </ul>
<b>Waste Collection &amp; Management</b>	
Waste Contractor & Buildcorp Project Manager	<ul style="list-style-type: none"> <li>Supply of bins, according to agreed approach &amp; ongoing site requirements</li> <li>Collection &amp; disposal of waste, as agreed &amp; according to ongoing site requirements</li> <li>Weighing and sorting of all wastes generated on site for disposal off site</li> <li>Ensuring that the waste collected is managed in accordance with the relevant legislation and the identified wastes are re-used, recycled or recovered</li> </ul>
<b>Reporting</b>	
Buildcorp Project Administrator	<ul style="list-style-type: none"> <li>Tracking of wastes generated</li> <li>Reporting of all waste data</li> <li>End of Project reporting of waste data to confirm % recycled / reused and wastes to landfill</li> <li>Preparation of final waste report for the site</li> </ul>

## Monitoring, Conformance and Reporting

The Buildcorp (BC) approved Waste Contractor will provide monthly recycling and waste minimisation reports. These reports are audited to ensure that we are reaching our set targets. Records of the total waste generation and disposal to landfill or recycling are retained on site by Buildcorp contractor site staff.

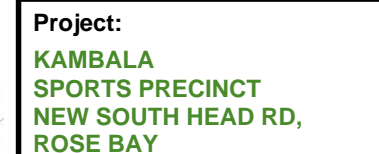
Any subcontractor found to be inappropriately acting will be issued with a non-conformance and rectification notice immediately by BC. The procedure for environmental non-conformances is as follows:

- i. Site issue is identified
- ii. BC investigates and issues a response to all subcontractors
- iii. BC issues non-conformance/rectification notice to party responsible
- iv. Subcontractor to clean up immediately to relevant legislative requirements
- v. BC notifies external parties as required and final notice to subcontractor

Audits are to be conducted on waste generated to ensure it is being disposed of as per the procedures set out in this Waste Management Plan.

## **Appendix F – Project Staging Details**

See attached architectural sketches detailing the project staging



**Legend:**

- Site security fence
- Vehicle movements
- Pedestrian movements
- Washdown area
- Hydrant
- Site sheds
- Tower Crane
- Access road
- Existing built form
- New Works
- Demolition
- Project Landscape
- Site Boundary
- Extent of live School enviroment

Bus stop on eastern side of NSHR to be used by students and construction workers

Works zone on NSHR

Site security  
fencing including  
dust and sediment  
control measures

Indicative  
tower crane  
jib radius

## Delivery and materials set down zone

Bus stop on eastern side of NSHR to be temporarily closed

Construction  
vehicle  
access. Left  
turn in and left  
turn out only

Personnel stair access to site  
offices and amenities from  
Bayview Hill Road

Site offices and amenities  
on existing sports court

New stair to access existing sports court

Stair access  
to/from amenities

New Multi-Sports Field  
and Sports Hall below

All staff and student access to School via Tivoli Avenue

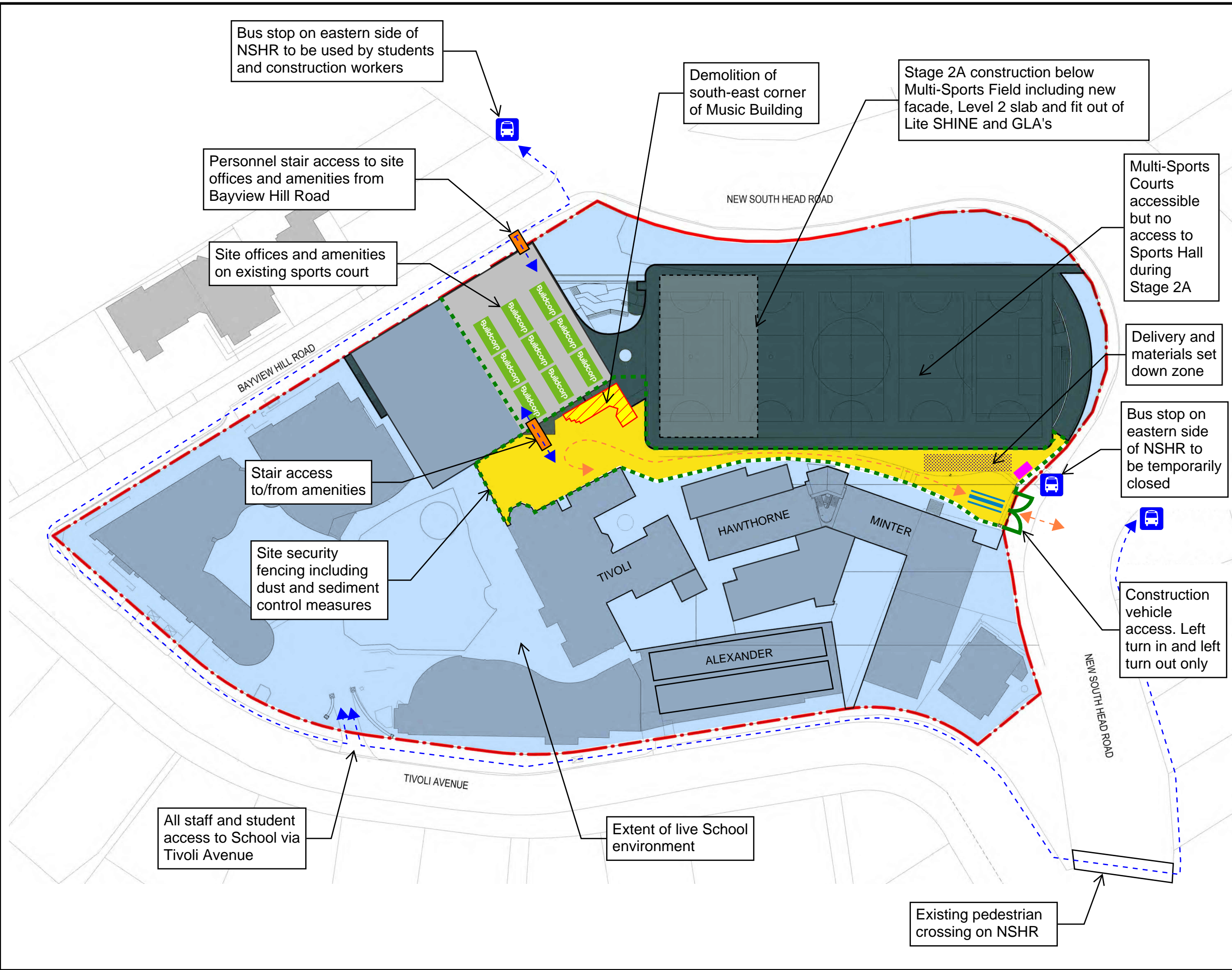
Extent of live School environment	
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New PV array on  
roof of existing  
Alexander building

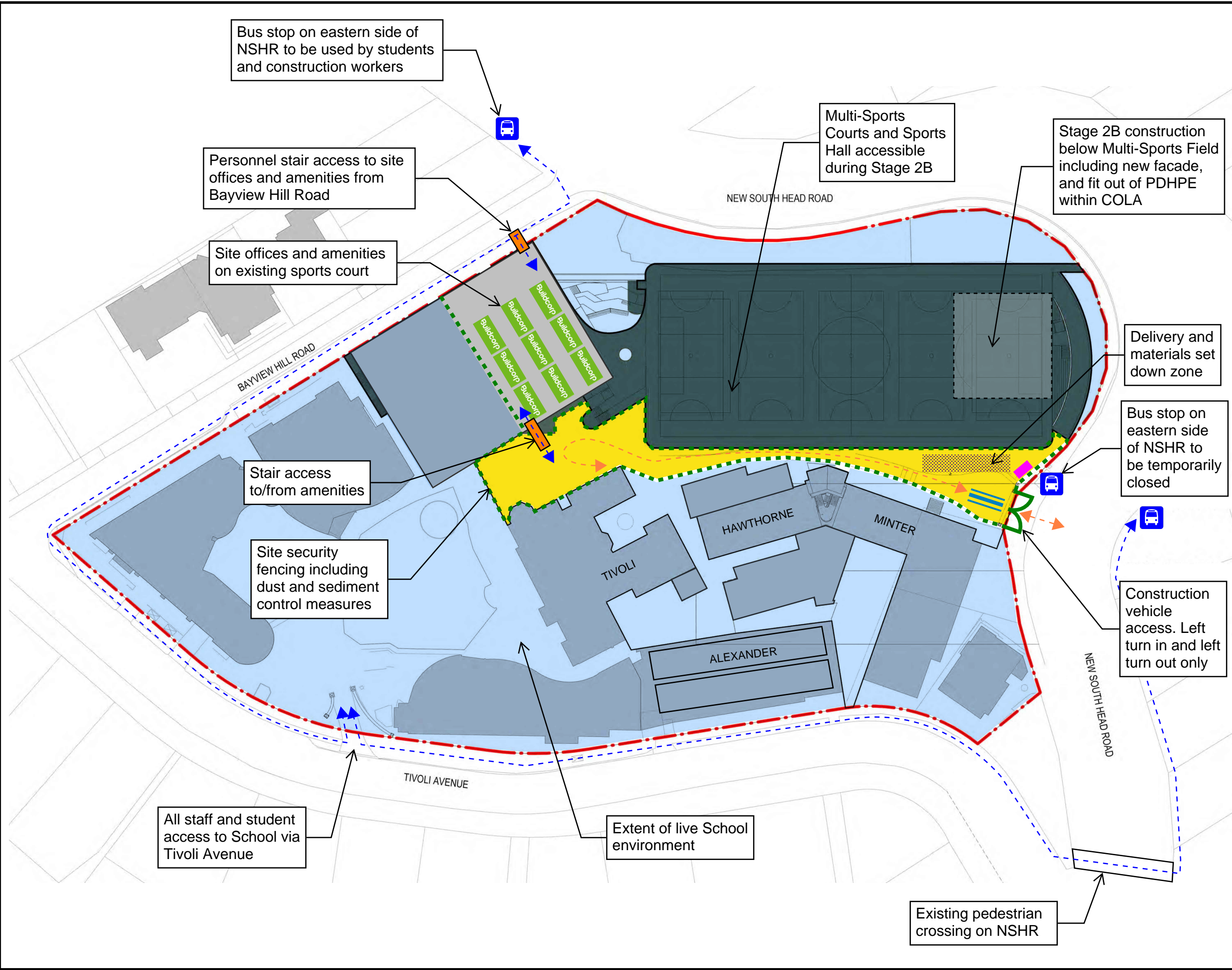
Existing pedestrian crossing on NSHR
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- Legend:
- Site security fence
  - Vehicle movements
  - Pedestrian movements
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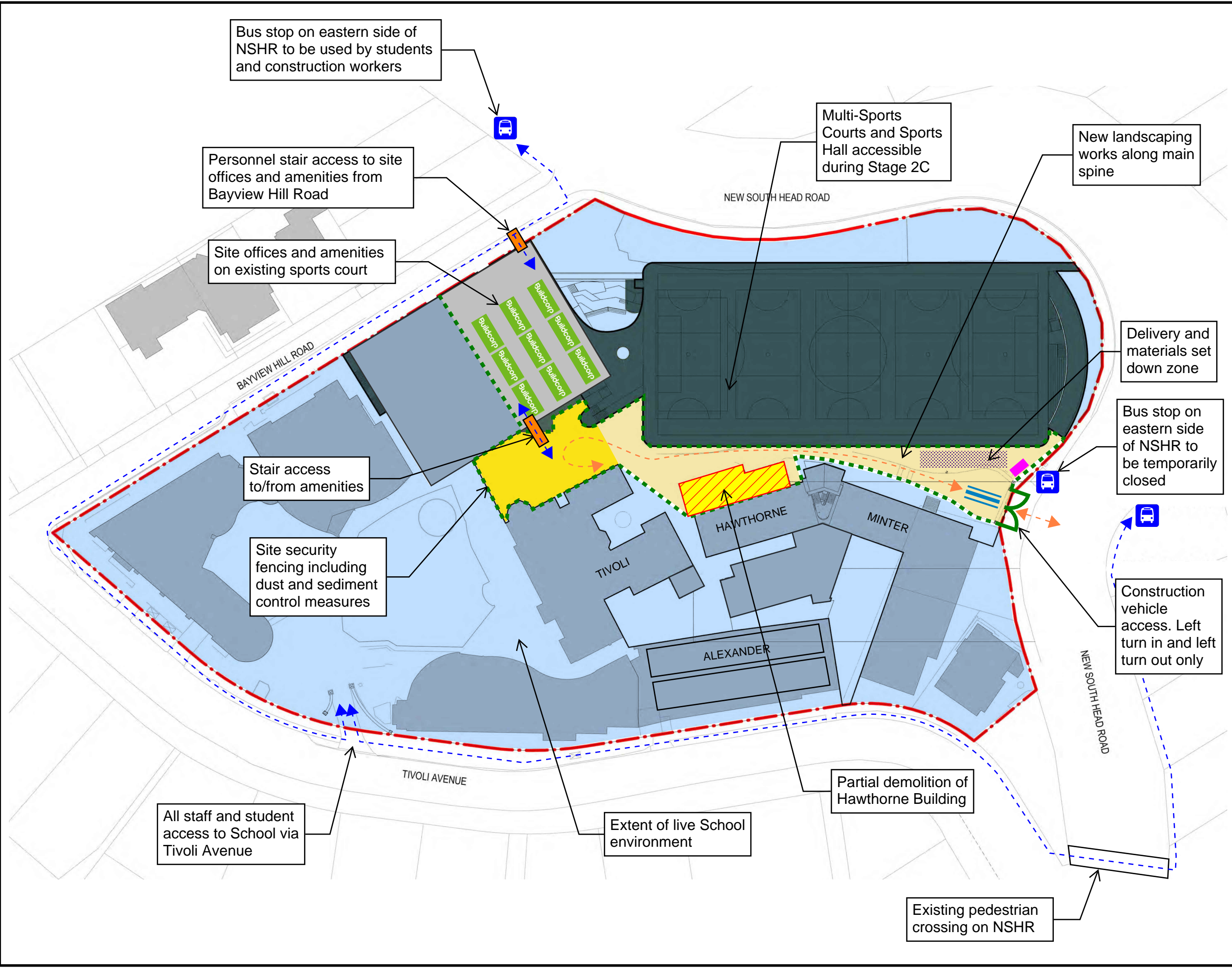


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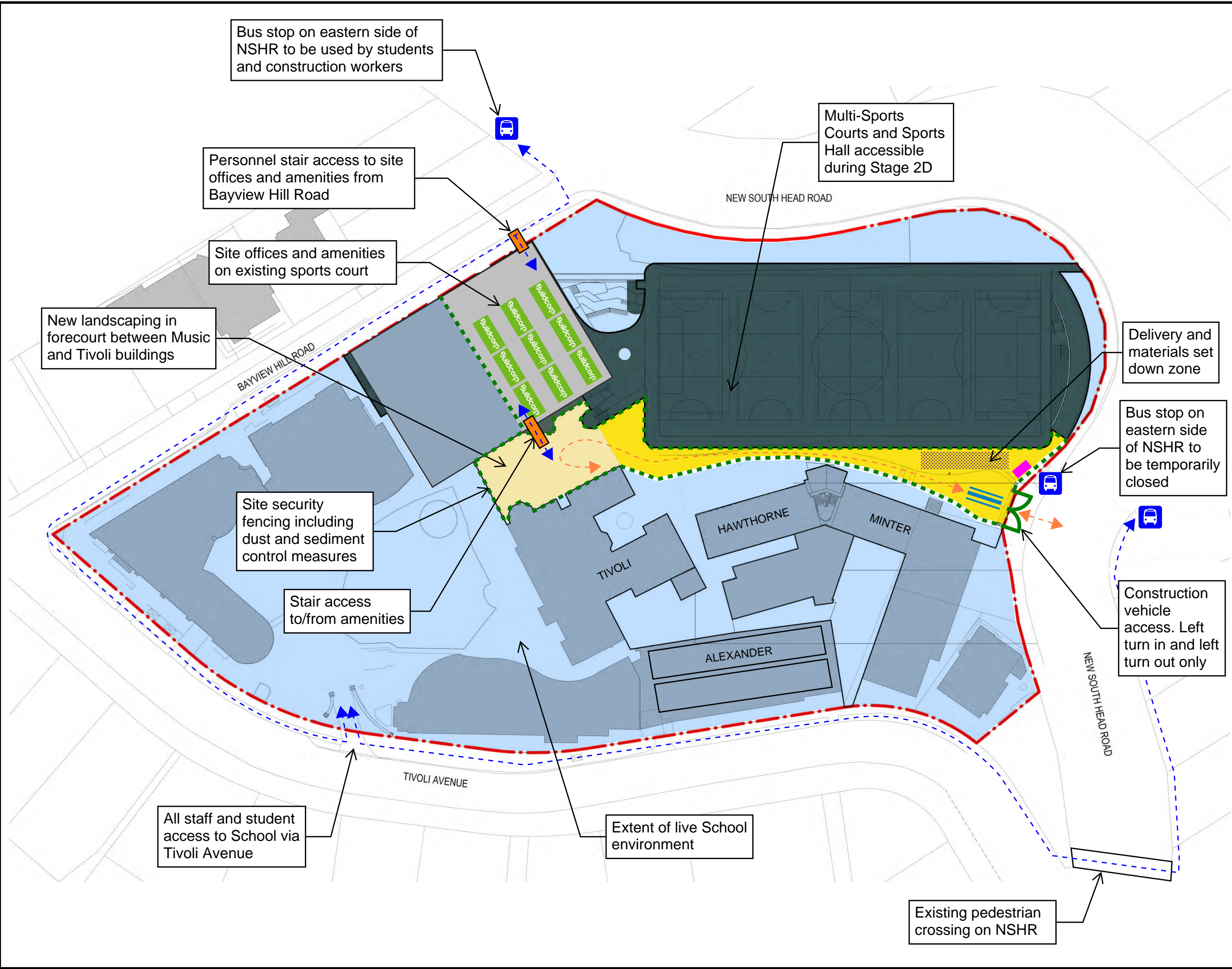




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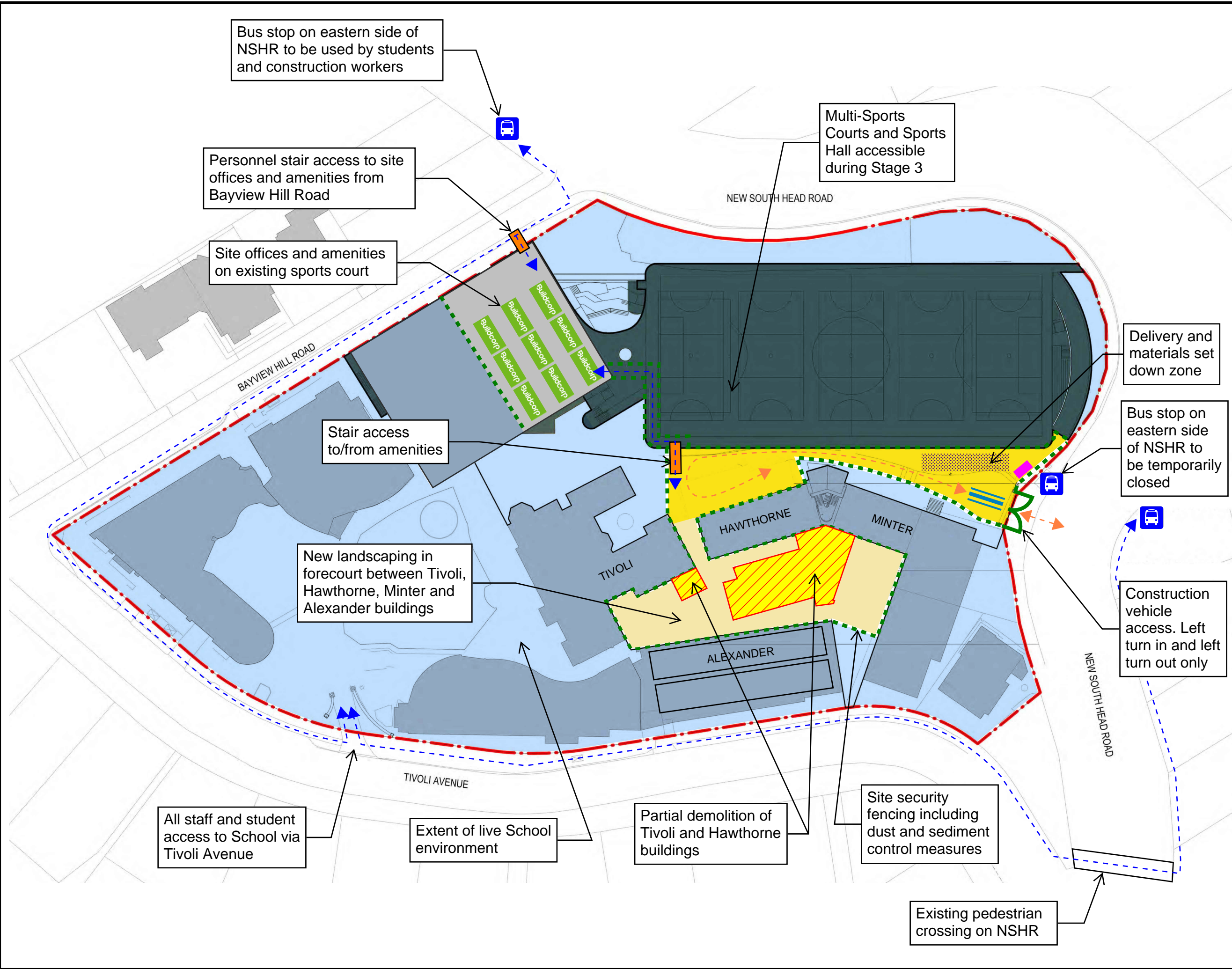


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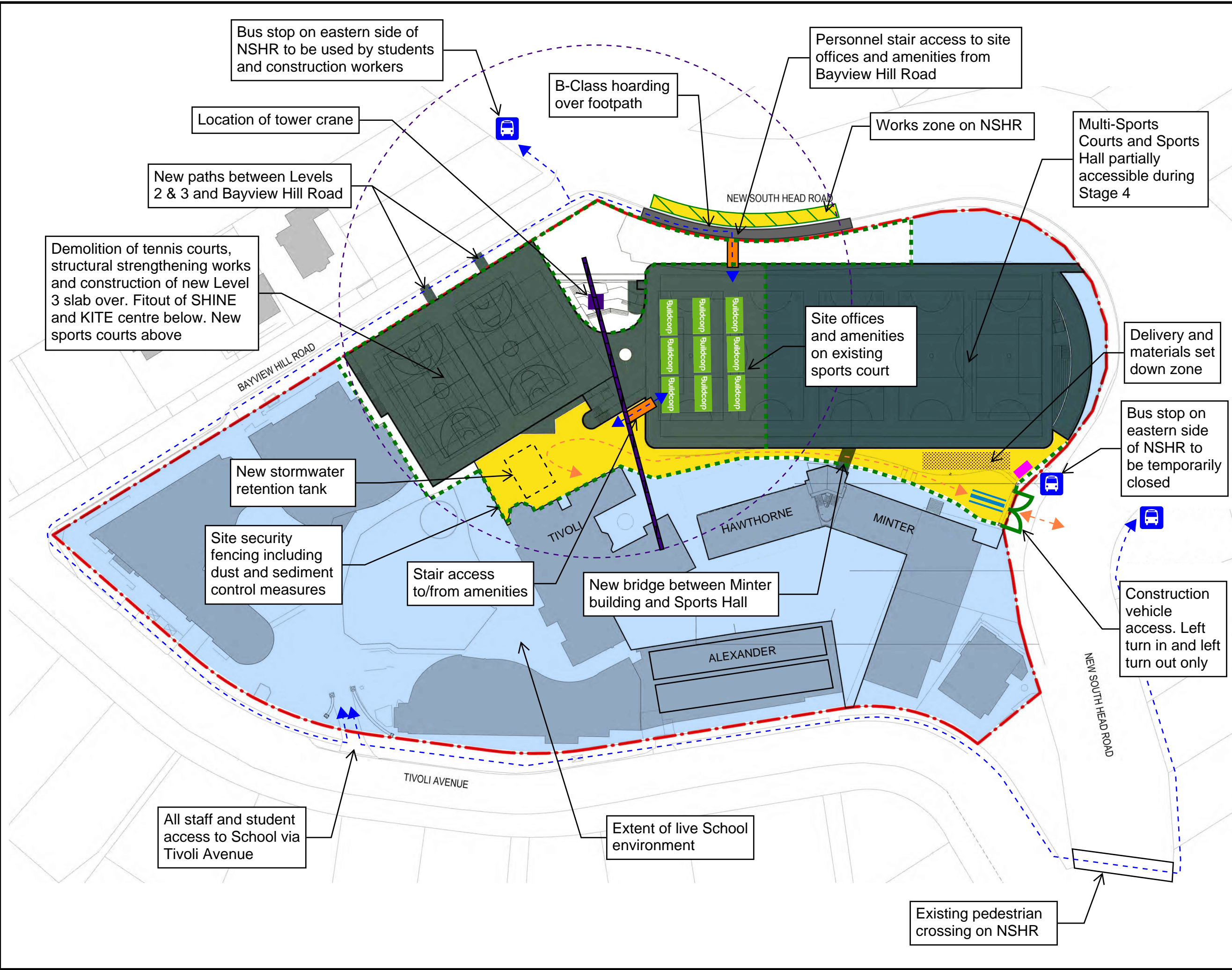


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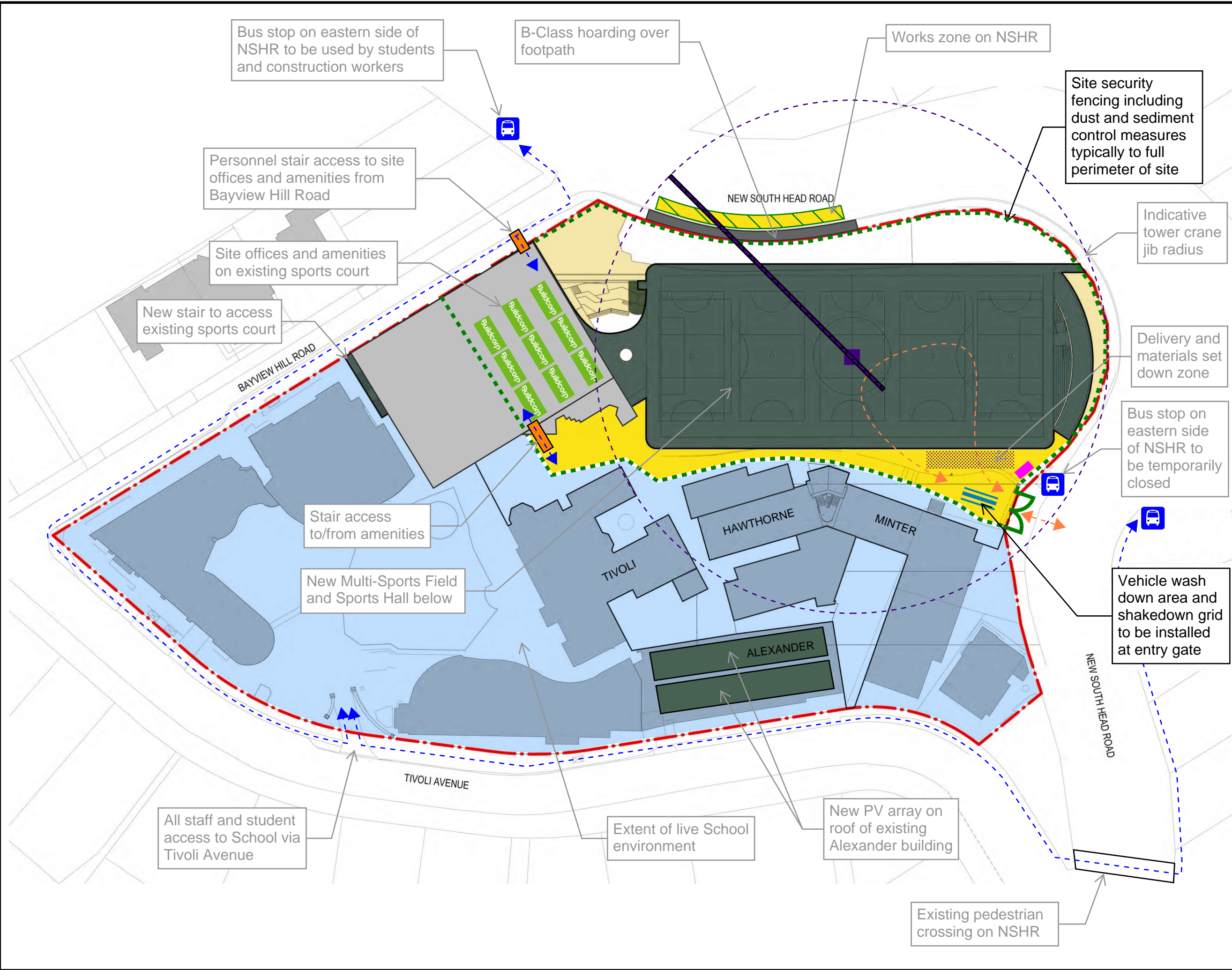


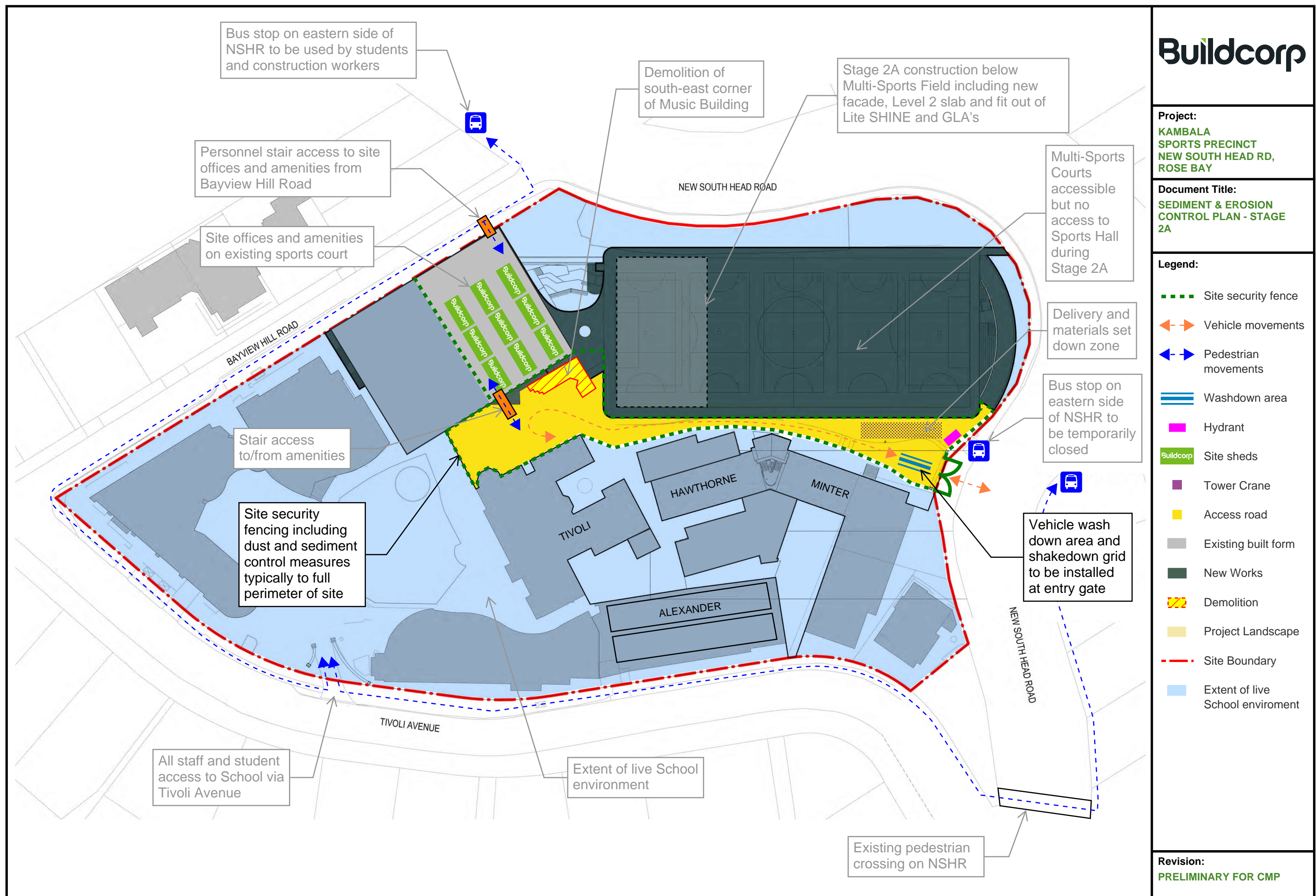
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SPORTS PRECINCT  
NEW SOUTH HEAD RD,  
ROSE BAY

Document Title:  
SEDIMENT & EROSION  
CONTROL PLAN - STAGE 1

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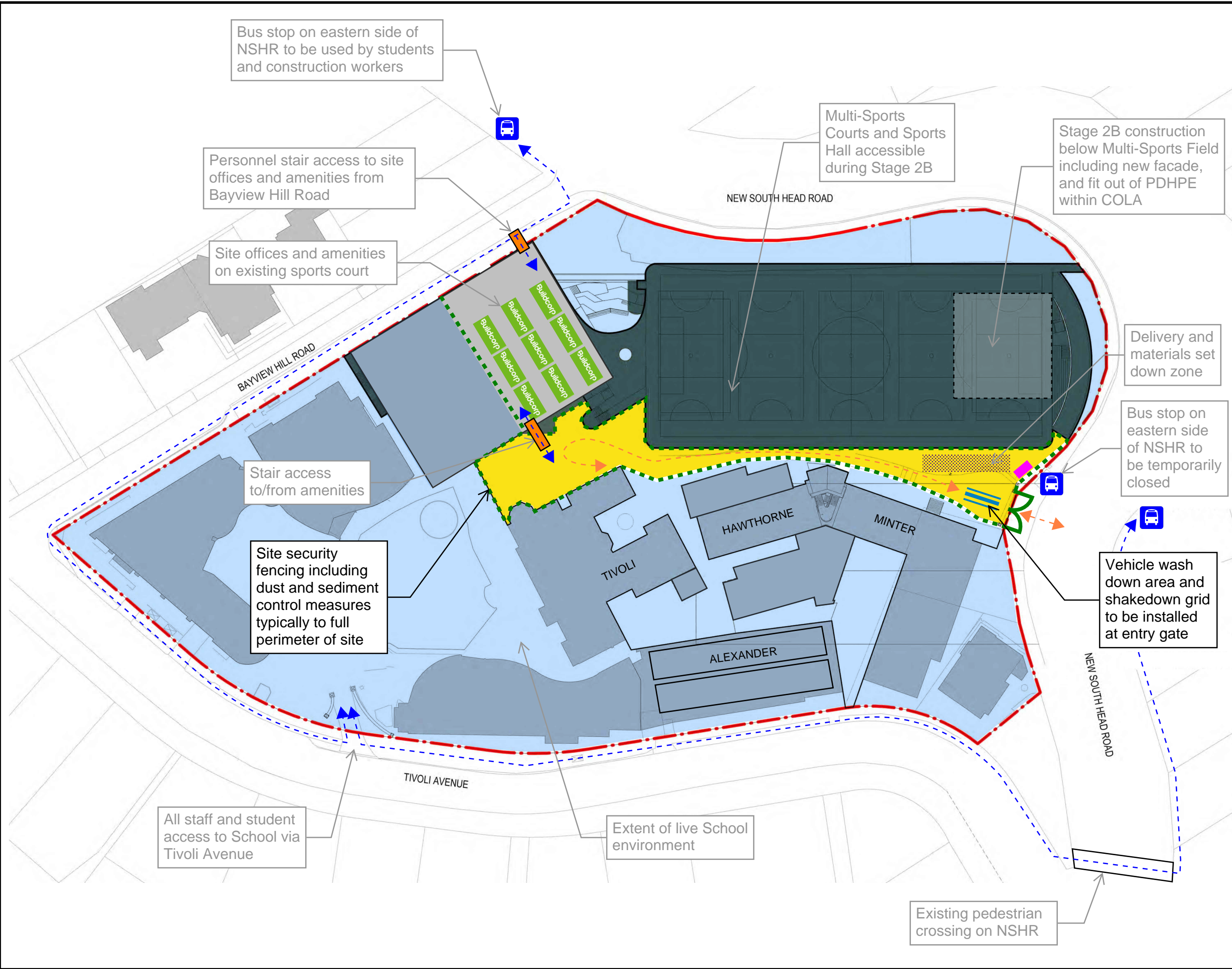
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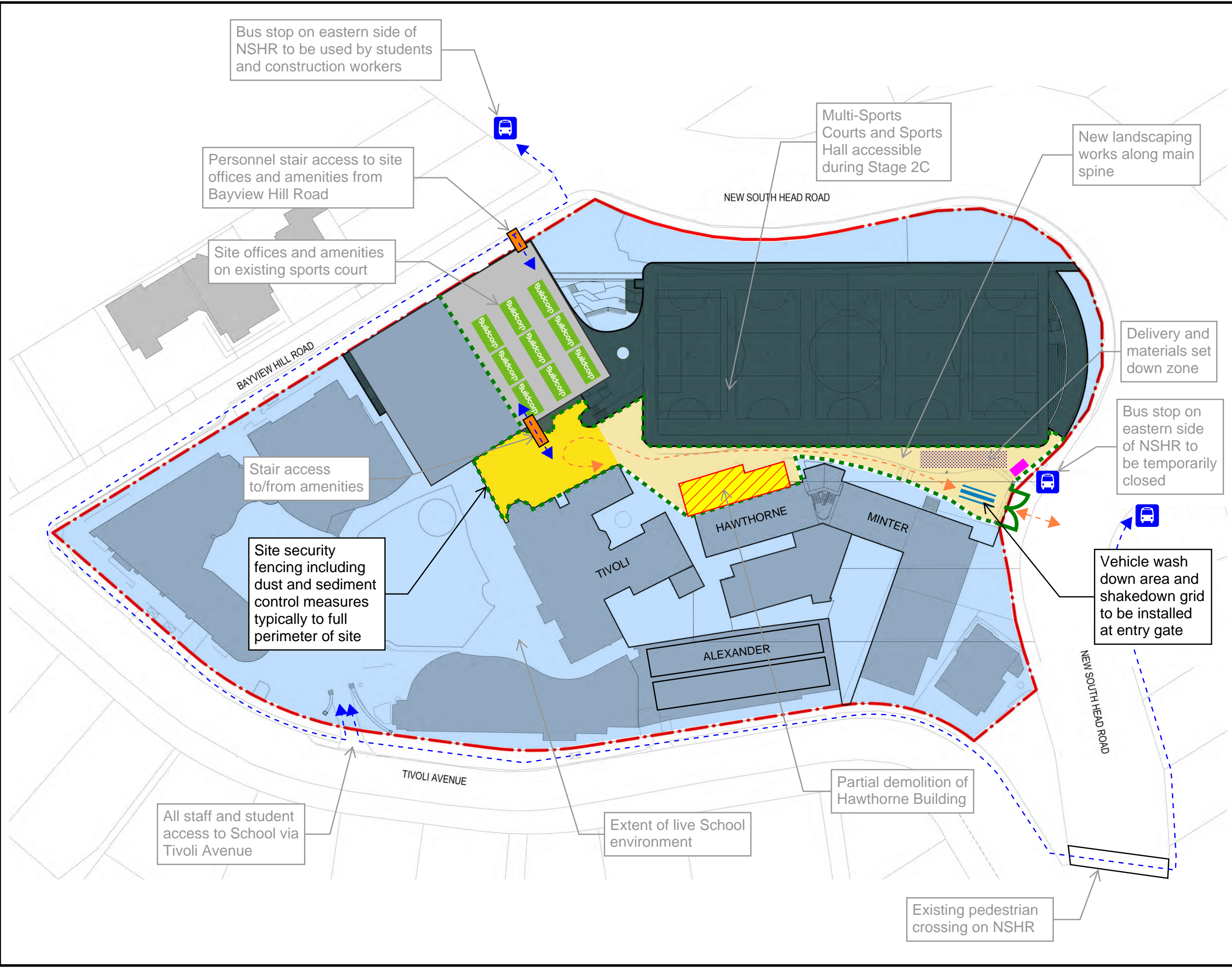




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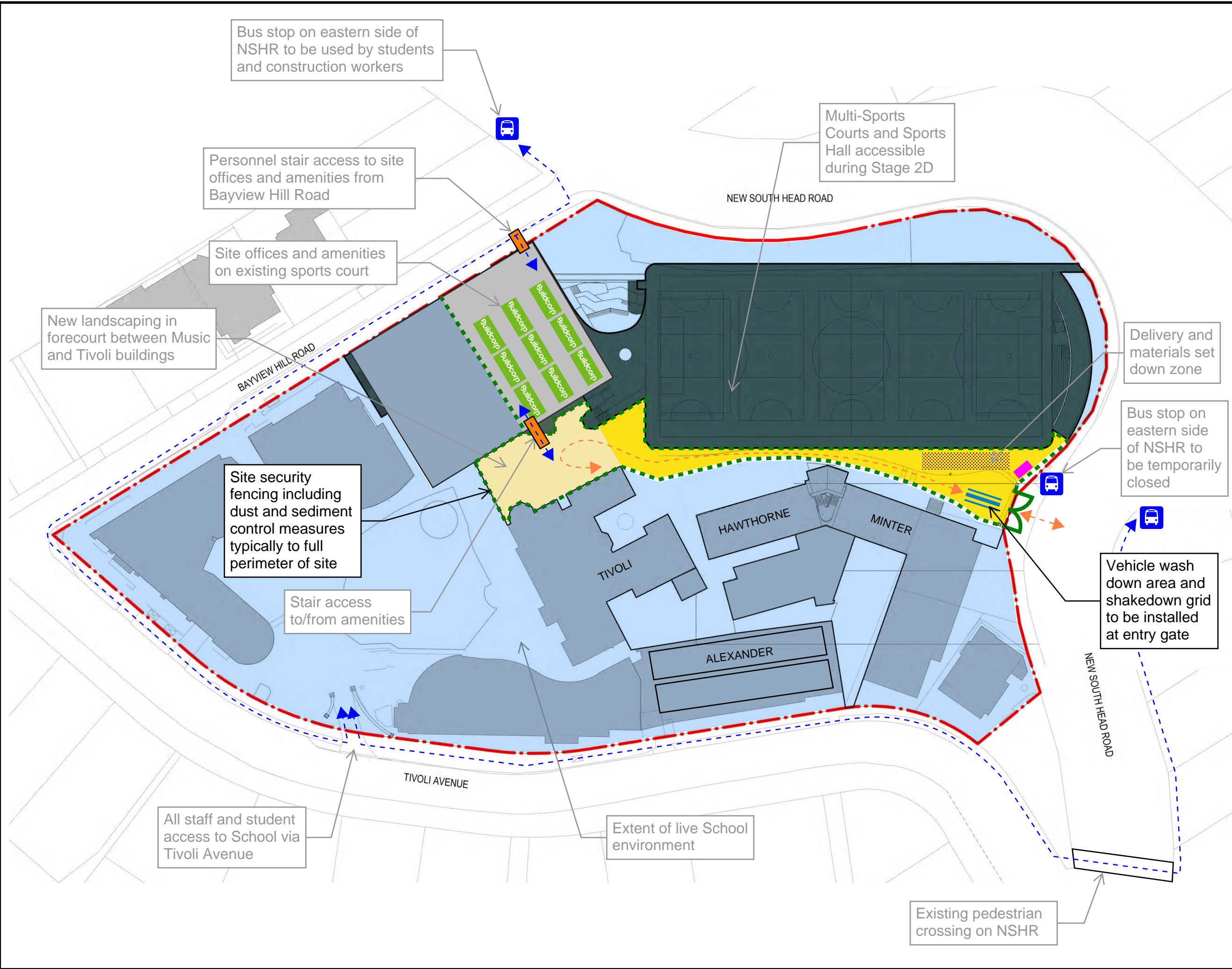


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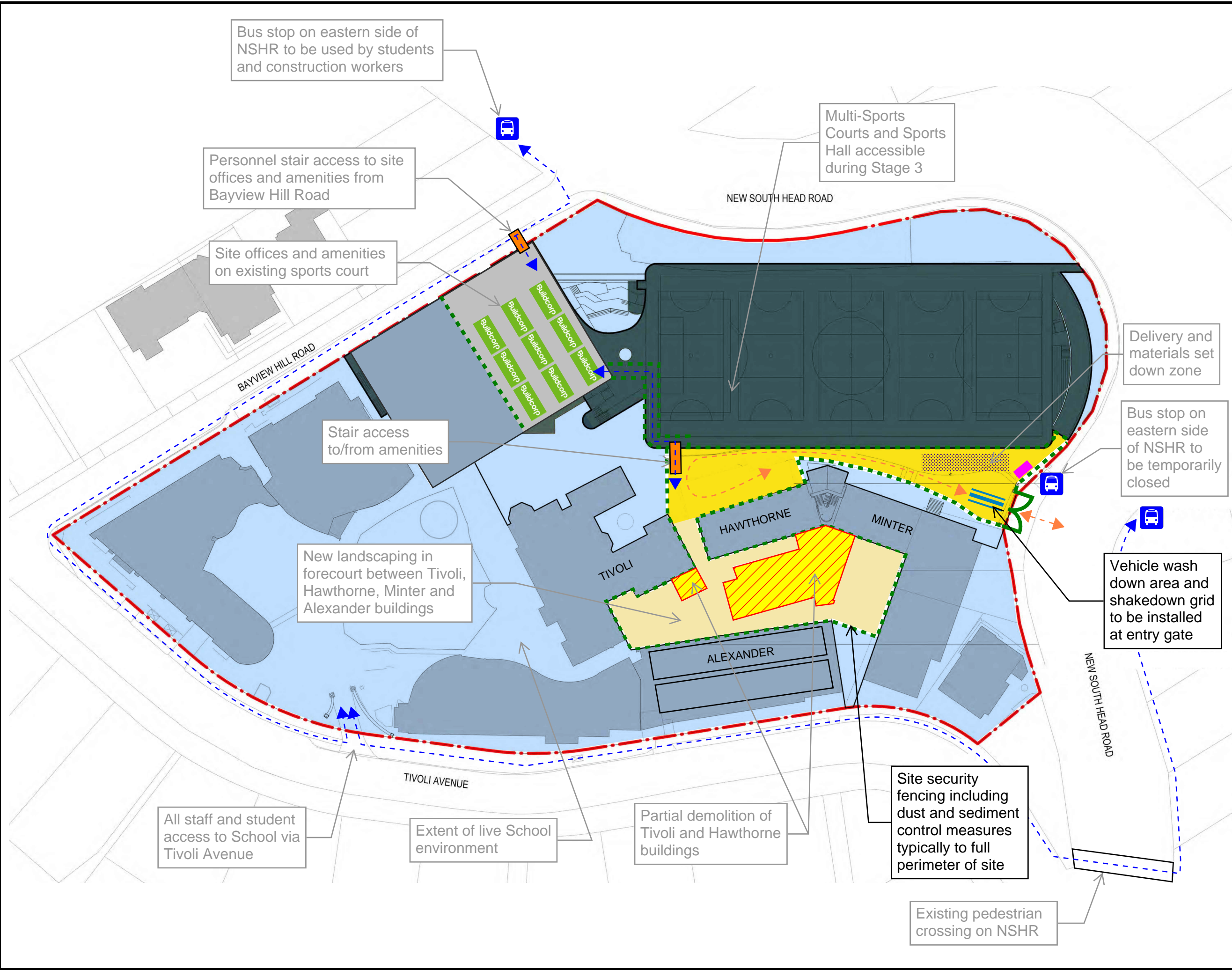




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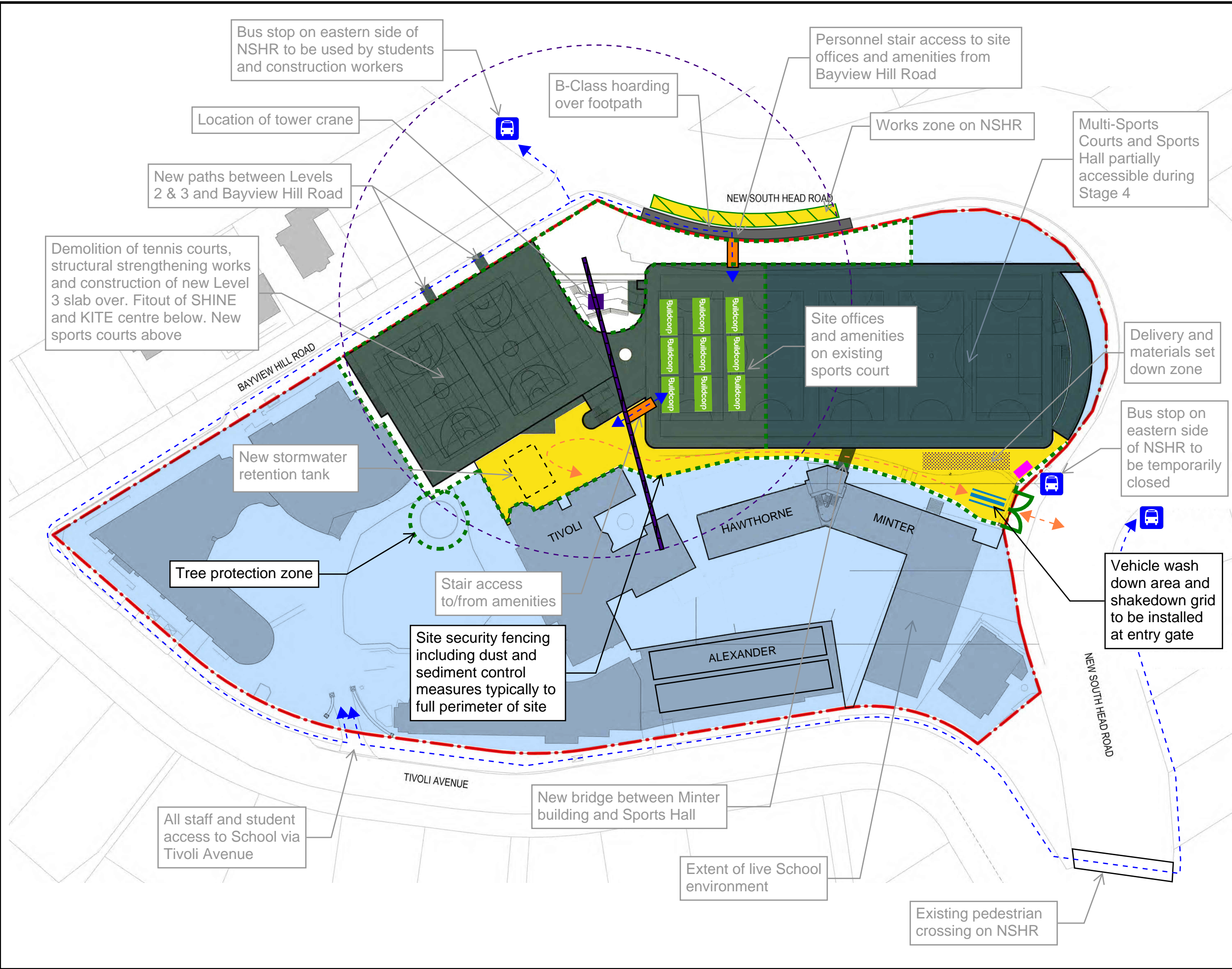


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# ARBORICULTURAL IMPACT ASSESSMENT

KAMBALA GIRLS HIGH SCHOOL, ROSE BAY



28/4/2020

CLIENT: CARMICHAEL TOMKINS PROPERTY GROUP

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Mobile: 0405 095095 ABN: 27 625 983 379

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## 2. INTRODUCTION

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This report supports a State Significant Development Application (SSDA) submitted to the Department of Planning, Infrastructure and Environment (DPIE) pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act), for the proposed redevelopment of the sports precinct of Kambala School at 794 -796 New South Head Road, Rose Bay.

This application is SSD by way of clause 8 and schedule 1 under *State Environmental Planning Policy (State and Regional Development) 2011* on the basis that the development is for the purpose of an existing school and has a Capital Investment Value of more than \$20 million.

This report has been prepared having regard to the Secretary's Environmental Assessment Requirements issued for the project by DPIE, ref no SSD-10385 issued on 24 November 2019.

## 3. BACKGROUND

---

### **Need for a Campus Masterplan**

Kambala is an independent day and boarding school for girls up to 18 years. Kambala also has an early learning centre catering for approximately 70 girls and boys aged between 6 months and 5 years. The school was established in the late 1800s and moved to the current campus in 1913. The campus has evolved in an organic and ad-hoc manner over the last 100 years as the school and its demands have grown.

A new campus-wide planning approach offers the opportunity to strategically plan for the future in a sustainable and effective manner and to preserve the unique aesthetic and heritage qualities of the campus. The preparation of a campus-wide planning approach is also consistent with the School's 2019 - 2023 Strategic Plan which identified the need for a broader strategic plan to coordinate renewal and development in a feasible and staged manner.

## 4. THE SITE

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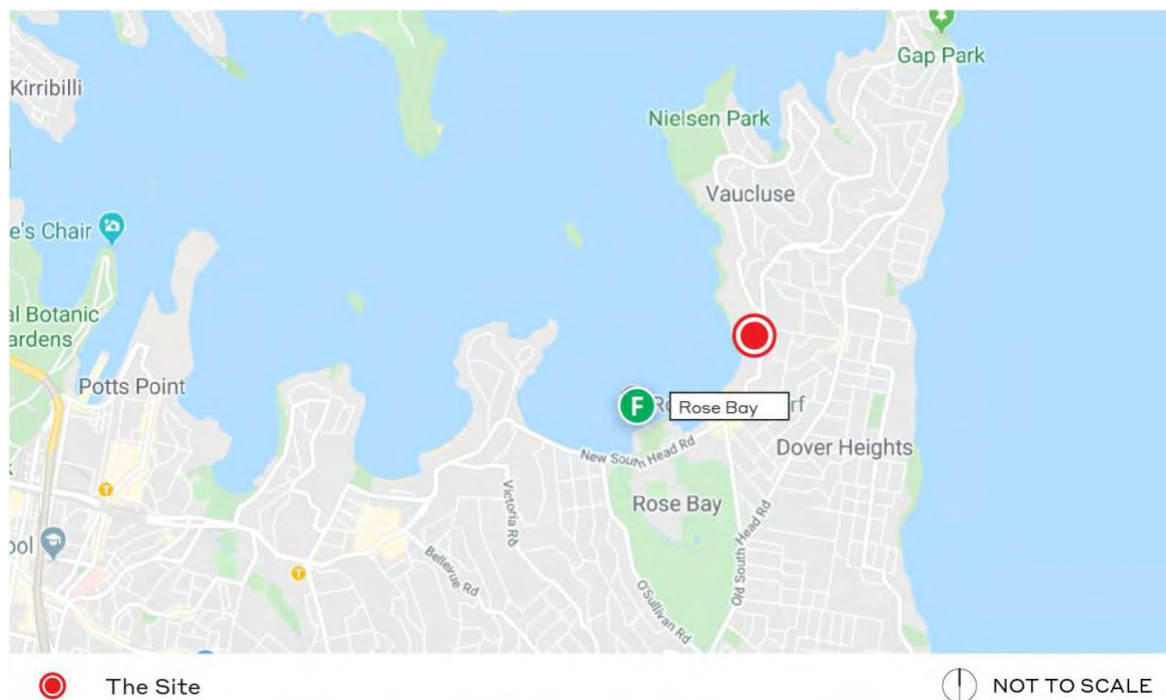
Kambala is located at 794 -796 New South Head Road, Rose Bay and is within the Woollahra Council local government area (LGA). Situated in the eastern suburbs of Sydney, the School is approximately 8km east of the Sydney CBD. The School is located on New South Head Road which is a classified road connecting the City with the eastern beaches. The School is surrounded by predominantly residential uses.

The campus is bound by New South Head (to the east), Bayview Hill Road (to the north) and Tivoli Avenue (to the west). Fernbank Boarding House is located at 1A -3 Bayview Hill Road opposite the Kambala School grounds. No works are proposed to this part of the campus in this DA. The locational context of the School is illustrated at **Figure 1**. **Figure 2** provides an aerial map of the School and its immediate surrounds.

The School campus slopes down from New South Head Road in the east to the west and comprises a series of existing buildings in the western part of the campus that range in height and age. The south western and north western part of the campus accommodates much of the school's existing built form, while the eastern part has the school's sporting fields and courts.

The Kambala School building known as Tivoli House is in the heart of the campus. The house, its interiors, gateposts, gates and flanking walls with railing facing Tivoli Avenue, as well as 2 Norfolk Island Pines are listed as a heritage item in Woollahra Local Environmental Plan 2014 (WLEP 2014).

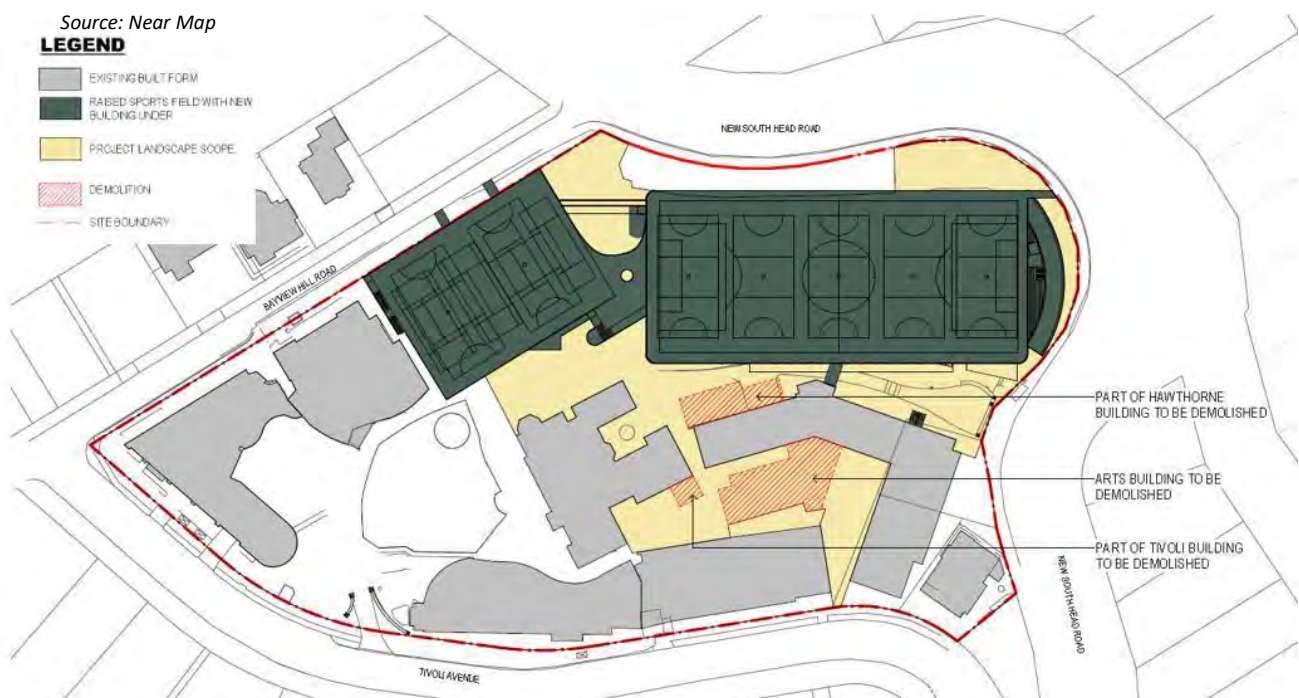
Within the School campus, the site of this SSDA is illustrated in **Figure 3**. The site proposed for new buildings is on top of the existing sports field and music building, as shown in green. The site proposed for demolition works and associated façade redevelopment and landscaping works is shown in red and is limited to a portion of the existing Hawthorne Building and the Arts building. The site of new landscape works is shown in yellow and includes all external spaces connecting these works. It is anticipated that the construction works will be staged, so the construction site for any given stage will be smaller than the overall site identified in **Figure 3**. The four key main buildings proposed are identified in **Figure 4**.



**Figure 1 – Kambala School Location Context Plan**



**Figure 2 – Aerial Map of the Kambala Campus**



**Figure 3 – Project Scope**

Source: AJC



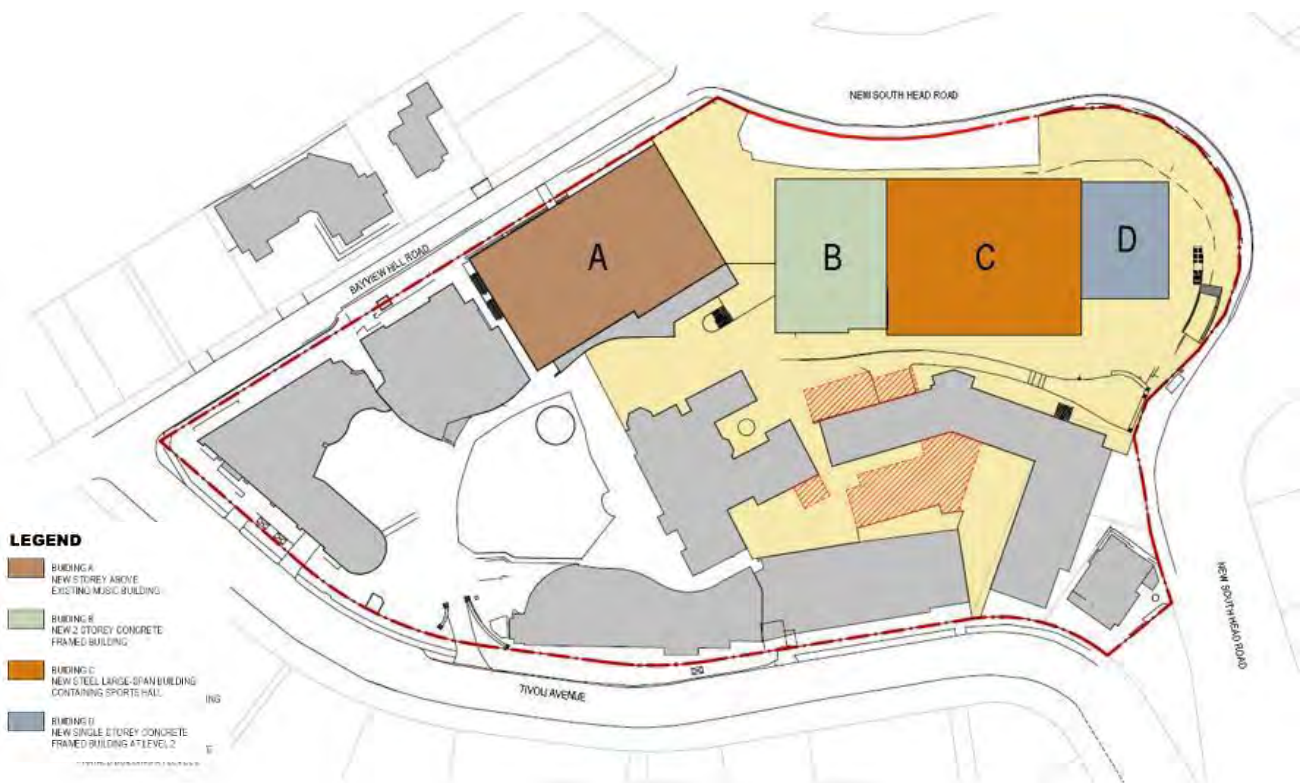


Figure 4 – Key Plan

Source: AJC

#### 4.1.1 LEGAL DESCRIPTION AND OWNERSHIP

The campus comprises several allotments, the legal descriptions of which are provided in **Table 1** below. The existing campus has a site area of approximately 22511m<sup>2</sup>.

**Table 1** Legal Description

Address	Lot	Plan
794-796 New South Head Road	Lot 67	DP 2538
	Lot C	DP 210074
	Lot 1	DP 1089403
3 Tivoli Avenue	Null	SP 64653
3 Bayview Hill Road	Lot 1	DP 175832
1A Bayview Hill Road	Lot 45	DP 2538
1 Bayview Hill Road	Lot 46	DP 2538

## 5. REPORT SUMMARY

---

### 5.1 OVERVIEW OF PROPOSED DEVELOPMENT

This SSDA includes detailed plans for a new sport, wellbeing and senior learning precinct. Accordingly, consent is sought for the following:

- The excavation of part of the existing sports field to facilitate the construction of the
  - sports facilities including weights room and dance rooms;
  - indoor multipurpose sports courts for use by up to 1500 people;
  - innovative and flexible teaching and learning spaces;
  - amenities, store rooms, plant, circulation and ancillary spaces
  - reinstatement of the sports field surface on the roof (sports field and perimeter fencing)
  - spectator seating / bleachers;
- The removal of the tennis courts (currently on the roof of the music building), and the construction of the following:
  - a wellbeing centre, called the SHINE centre, to accommodate the Kambala SHINE program
  - a new staff centre, called the KITE centre, to accommodate staff workstations, meeting areas, staff development workshop rooms and amenities
  - reinstatement of the tennis courts, lighting and perimeter fencing on the new roof
- a new eastern forecourt for the school, new external landscaped areas and new courtyards;
- minor works to the existing music building to facilitate a new connection to the new courtyard;
- the partial demolition of the Hawthorne building and the construction of a new façade, roof and landscaping; and
- the demolition of the Arts building and the construction of new facades to adjacent affected buildings, and new landscaping to the footprint of the demolished building

## 5.2 SCOPE OF WORKS

Arborlogix Pty Ltd has been contracted by the client to undertake an arboricultural impact assessment of a proposed new development at Kambala Girls High School, Rose Bay. The proposed new development is for a new multi-level sports precinct that will require the complete redevelopment of the central and north-eastern sections of the school right up to the retaining walls that run along Bayview Hill Road to the North and New South Head Road to the East. The majority of the proposed redevelopment works will be located within the current sports oval area and tennis courts, with only some minor redevelopment works on the central buildings in order to integrate with the design. Arborlogix Pty Ltd has been asked to assess the trees within this site, and on any neighbouring properties or council land, that have their TPZs (Tree Protection Zones) within 5m of the proposed development footprint or in areas that could be used as access points to the site for construction vehicles and materials. The numbering for trees surveyed in this report is taken from a previous Arboricultural Risk Assessment Report done by Sydney Tree Solutions Pty Ltd on 3/7/2019 (Ref: 1487 v1.0). Since this report was completed some of the trees have been removed so there may be some numbers missing but these numbers were kept consistent since all trees had already been physically tagged as well. This will prevent confusion in later stages of the project when trees need to be removed or retained and protected as required.

This report is only concerned with trees within the property that are large enough to be considered as potentially more than a low retention value tree. For this scope it was decided that all trees less than 7m in height would be excluded from the report since anything smaller could be replaced with new plantings post construction and would therefore only be considered as a low retention value tree. It does however include trees that are between 5m and 7m in height but have a canopy width greater than 7m since this could be potentially have some retention value to the site. All other trees that do not fall within these categories and all those in areas of the school that will not be impacted by the new development were excluded from this report. Therefore this report includes 35 trees that could be affected by the proposed development.

This report will assess these 35 trees for health, vitality, structural defects, form, pests and diseases, life expectancy, significance and retention value. An assessment will also be made of the likely impacts the proposed development will have on these trees. This will be used to aid with determining whether any of these trees would need to be removed for safety reasons or to accommodate the new development, or whether they should be retained and protected.

If the trees are to be retained this report will provide recommendations to any design modifications, construction techniques and the necessary protection measures that will need to be implemented prior, during and post development to ensure the health, vigour and longevity of these trees. Details of these protection measures will be based on local government regulations and protection measures outlined in AS-4970-2009 (Protection of Trees on Development Sites). Any pruning works that may be required to accommodate this development or improve the health and stability of these trees will also be outlined and detailed as part of the recommendations of this report.

## 6. SUMMARY OF RECOMMENDATIONS

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This arboricultural impact assessment of the proposed development site made the following recommendations.

1. Retention and Protection of Trees 1, 10-12, 14-17, 21, 22, 24, 27, 28, 30, 34-37 and 38 according to AS-4970-2009 (Protection Trees on Development Sites). No roots are to be pruned greater than 40mm diameter within any TPZ and no roots at all within any SRZ without the authorisation of the project arborist. Details of any TPZ encroachment and tree protection required are found in sections 11.1, 11.3, 11.4 and 11.5.
2. Tree 1 will require some minor encroachment for the installation of 2 piers for the tennis courts. This will have minimal impact on the health of the tree since it will involve only minor encroachment but it should be done in consultation with the project arborist. No excavations, storage of materials or root pruning is to occur within its TPZ without supervision or consultation with the project arborist. Some minor canopy pruning of the tips of some lower canopy branches may also be required for clearances of the proposed tennis courts but these can again be done in consultation with the project arborist. It will amount to less than 2% of canopy pruning if required.
3. Trees 28, 35, 37 and 38 will require major TPZ encroachment and some canopy pruning to accommodate the development. This will need to be done in consultation with the project arborist.
4. Removal and replacement of Trees 2-8, 18, 18a, 19, 20, 23, 25, 29, 31 and 39 will be required to accommodate the new development. Only one high retention value tree (Tree 7) and 4 medium retention value trees (Trees 19, 20, 23 and 29) that will require removal to accommodate the development. The details of the reasons for these removals and any replacement plantings required can be found in section 11.2.
5. Generally all activities involving soil level changes, excavation, storage, excavation, cleaning and refueling are prohibited (a full list is found in section 4.2 of AS-4970-2009) within the TPZ. Some activities may be authorized if required but only by the project arborist. Any additional mulching or irrigation required should be done at the discretion of the project arborist.
6. Branch and Truck protection, if required (only if access into TPZ needed), should be installed as detailed in section 12.2.2 of this report. All other tree protection measures required during construction and detailed in section 11 and 12 of this report are to be complied with.
7. Any tree removal works and tree protection measures should be carried out by an arborist with a minimum qualification of AQF level 3 and certified by the project arborist. The project arborist should have a minimum qualification of AQF level 5 or equivalent.
8. All works on-site should be carried out according to Workcover Authority NSW 2007, *Code of Practice Amenity Tree Industry*, NSW.
9. All works should be carried out according to AS-4373-2007 (Pruning of Amenity Trees) and AS-4970-2009 (Protection trees on development sites).

## 7. DISCLAIMER

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This document in its entirety is for the exclusive use of the client and Arborlogix Pty Ltd only. Arborlogix Pty Ltd will not be held liable for any use or interpretations from any other person or third party. This report remains the intellectual property of Arborlogix Pty Ltd and any individual or company must have written consent prior to its use for any other purpose.

All inspections and assessments were carried out using Visual Tree Assessment methods (VTA)<sup>1</sup> from ground level only and do not include the use of diagnostic devices. Although great care is taken to accurately diagnose the condition of the tree, using accepted industry practices; the arborist is limited in determining the exact structural integrity of the tree by interpreting mainly exterior features. There are multiple factors both physical and environmental such as extreme climactic events and conditions that could lead to possible structural failures in trees which would not have been possible to predict or identify from VTA methods and assessments.

Any protection or preservation methods recommended are not a guarantee of tree survival or safety but have been recommended to improve vigour and reduce risk only. Therefore Arborlogix Pty Ltd does not accept any liability for any future tree failure, illness, damage or injury caused by any undetected or unpredicted faults or failures in any tree or part thereof referred to in this document. Arborlogix Pty Ltd also accepts no responsibility for any failure, loss or decline, damage or injury caused by any tree covered in this document due to any meteorological or other unforeseen event.

It is the client responsibility to maintain ongoing inspections and assessments of trees covered in this document and obtain the services of a suitably qualified arborist to carry out the work where necessary. All work should be carried out according to AS-4373-2007 Pruning of amenity trees<sup>2</sup> and AS-4970-2009 Protection of trees on development sites<sup>3</sup>.



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<sup>1</sup> Mattheck, K and Breloer, H (2007). *The Body Language of Trees* – A handbook for failure

<sup>2</sup> Standards Australia (2007). *AS4373: Pruning of Amenity Trees*

<sup>3</sup> Standards Australia (2009). *AS4970: Protection of Trees on Development Sites*.



## 8. METHODOLOGY

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Tree Assessments were all carried out according to the following methods:

### 8.1 TREE ASSESSMENTS

- Visual Tree Assessment (VTA) method (Mattheck 2007)) (Appendix 1) was used from ground level to determine tree health, structural integrity and presence of any pests or diseases.
- Sustainable Retention Index Value (SRIV) Version 4 © (IACA 2010) (Appendix 3) is used to provide an index value corresponding to age, vigour and condition.
- The meanings and terminology used to describe and assess each tree are taken from the IACA Dictionary for Managing Trees in Urban Environments (2009). An extract is included as a glossary of terms in Appendix 5 of this report.
- No aerial (climbing) inspections, soil sampling or root excavations were conducted as part of these assessments.
- No additional specialised diagnostics equipment was used to quantitatively determine extent of any decay (i.e. resistographs or non-intrusive tomographic methods such as PICUS)
- All trees were identified using prior knowledge of the species and visual inspection of the subject trees at the time of inspection.
- A Lufkin 10m diameter tape was used to obtain the Diameter at Breast Height (DBH) as recommended at 1.4m unless otherwise stated due to variations in tree form (AS-4970-2009). Diameter at Root Crown (DRC) was also measured to enable calculation of Structural Root Zones.
- Canopy spread was estimated or paced out and the longest span was recorded as the spread.
- Height of each tree was estimated and then cross referenced with photographs.
- Any photographs were taken with an iphone xS (12MP).
- All map data was gathered using [www.nearmaps.com.au](http://www.nearmaps.com.au)
- All design work used in this report was completed using Adobe Illustrator and ArborCAD.

### 8.2 TREE PROTECTION ZONES

This report adopts Australian Standard AS4970-2009 *Protection of trees on development sites* as a point of reference and guide for the recommended minimum setbacks (Appendix 4) from the centre of a tree's trunk to development works. The distances may be increased or decreased by the author in accordance with AS4970 – Section 3.3.4 as a result of other factors providing mitigating circumstances or constraints as indicated by but not restricted to the following:

- Condition of individual trees,
- Tolerance of individual species to disturbance,
- Geology e.g. physical barriers in soil, rock floaters, bedrock to surface
- Topography e.g. slope, drainage,
- Soil e.g. depth, drainage, fertility, structure,
- Microclimate e.g. due to landform, exposure to dominant wind,
- Engineering e.g. techniques to ameliorate impact on trees such as structural soil, gap graded fill, lateral boring,
- Construction e.g. techniques to ameliorate impact on trees such as pier and beam, bridge footings, suspended slabs,
- Root mapping,

- Physical limitations - existing modifications to the environment and any impact to tree/s by development e.g. property boundaries, built structures, houses, swimming pools, road reserves, utility services easements, previous impact by excavation, or construction in other directions, soil
- level changes by cutting or filling, existing landscaping works within close proximity, modified
- drainage patterns,
- Extraneous factors e.g. potential future impacts from development on adjoining land when the tree is located on or near to a property boundary

### 8.3 TREE SIGNIFICANCE, SUSTAINABILITY AND RETENTION VALUES

Tree landscape significance rating was calculated using IACA Significance of a Tree, Assessment Rating System (STARS) © (IACA 2010) which is shown in appendix 2. Landscape significance not only takes into account the physical form of the tree but it also assesses other factors such as Heritage, Cultural and Environmental values. These Landscape significance ratings were then combined with the Estimated Life Expectancy values of each specimen to categorise each tree under the Priority Matrix of Retention Values.

This is used in combination with the value obtained from the Sustainable Retention Index Value (SRIV) Version 4 © (IACA 2010) (Appendix 3) to determine whether the tree should be removed for safety and sustainability reasons or whether it should be retained and what remedial works may be required. Tree Sustainability is an important factor since it takes into account not only the life expectancy but also the effect of other economical, social and environmental factors that need to be addressed as part of a tree management plan.

### 8.4 ISA TRAQ – TREE RISK ASSESSMENT QUALIFICATION

ISA TRAQ is a Qualitative risk assessment process that uses ratings of likelihood and consequences of an event to determine a risk level and evaluate the level of risk against qualitative criteria. The term *likelihood* is used rather than *probability* because probability would require actual quantitative odds. The ISA TRAQ method uses several risk matrix and arboricultural best practices to determine the likelihood of an event or failure (i.e. branch failure), the likelihood of it impacting a target (i.e. how often are there people underneath a tree) and the consequence of the failure impacting the target (i.e. human injury or asset damage) in order to determine an overall risk rating for the tree. The 2 tables below show the 2 main risk matrix that are used to determine an overall risk rating for the tree.

If there are more than one possible tree parts that could fail the part with the highest risk rating is used (i.e. Complete tree failure or failure of large dead branch – whichever event is more likely to occur and cause the most damage). Although it could be argued that the occupancy rate for a school could be considered *occasional occupancy* since for more than 12 hours of most days and most of the weekends and holidays the grounds are empty of students, it was determined that for the purpose of this report it will be considered as *frequent occupancy* in high traffic areas to ensure that above standard risk mitigation levels are met. A more detailed explanation of the evaluations used to categorise each of this various parameters can be found in Appendix 6.

LIKEIHOOD OF FAILURE	LIKELIHOOD OF IMPACTING TARGET			
	VERY LOW	LOW	MEDIUM	HIGH
IMMINENT	Unlikely	Somewhat likely	Likely	Very Likely
PROBABLE	Unlikely	Unlikely	Somewhat likely	Likely
POSSIBLE	Unlikely	Unlikely	Unlikely	Somewhat likely
IMPROBABLE	Unlikely	Unlikely	Unlikely	Unlikely

TABLE 2 - LIKELIHOOD MATRIX

LIKEIHOOD OF FAILURE & IMPACT	CONSEQUENCE OF FAILURE			
	NEGLIGIBLE	MINOR	SIGNIFICANT	SEVERE
VERY LIKLEY	Low	Moderate	High	Extreme
LIKELY	Low	Moderate	High	High
SOMEWHAT LIKELY	Low	Low	Moderate	Moderate
UNLIKELY	Low	Low	Low	Low

TABLE 3 - RISK RATING MATRIX

## 8.5 LOCAL GOVERNMENT DOCUMENTATION REVIEWED FOR ASSESSMENT.

In order to ensure all legal requirements are met when determining which trees can be retained or removed on this development site a number of Local Government Area (LGA) Policies and documents were reviewed:

- Significance Tree Register – Tree 1 is listed on Woollahra Significant Tree Register.
- Threatened/Endangered species or communities onsite – No listings for this site were found.
- Local Government Area (LGA) Tree Preservation Order – Woollahra Council

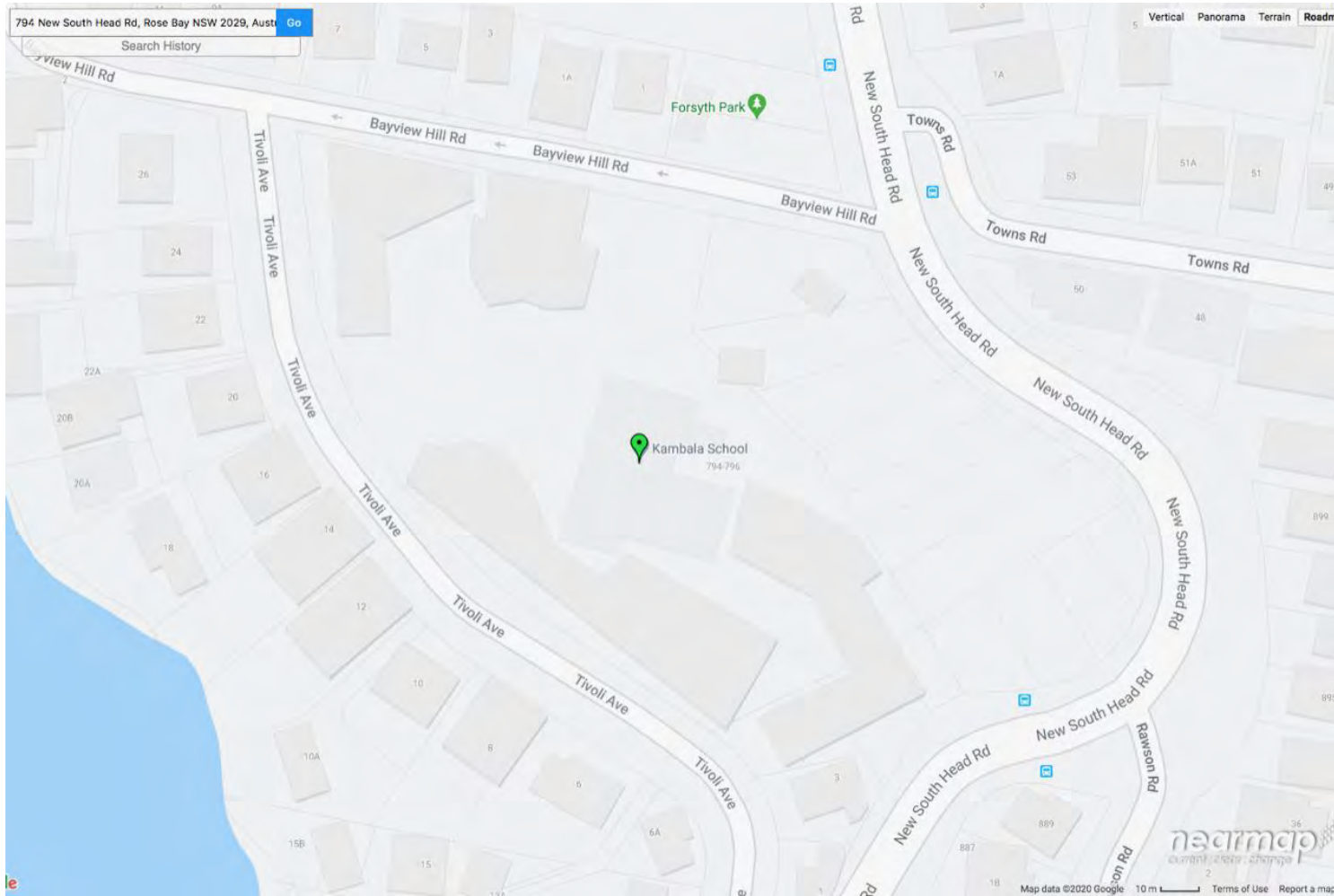
## 8.6 ADDITIONAL DOCUMENTATION USED TO COMPILE REPORT

The following documents were provided to Arborlogix Pty Ltd to aid with compiling this report.

- Arboricultural Risk Assessment – Sydney Tree Solutions Pty Ltd – 3/7/2019 – Ref 1487 v1.0
- Tree and Utilities Survey – RPS Australia East Pty Ltd – 5/2/2020 – DWG No: PR1 45951-DS-001-A
- Kambala Sports Precinct Proposed Designs – Allen Jack and Cottier – 24/4/2020 – DA2101, DA2102, DA2103

## 9. SITE LOCATION

### 9.1 MAP OF SITE



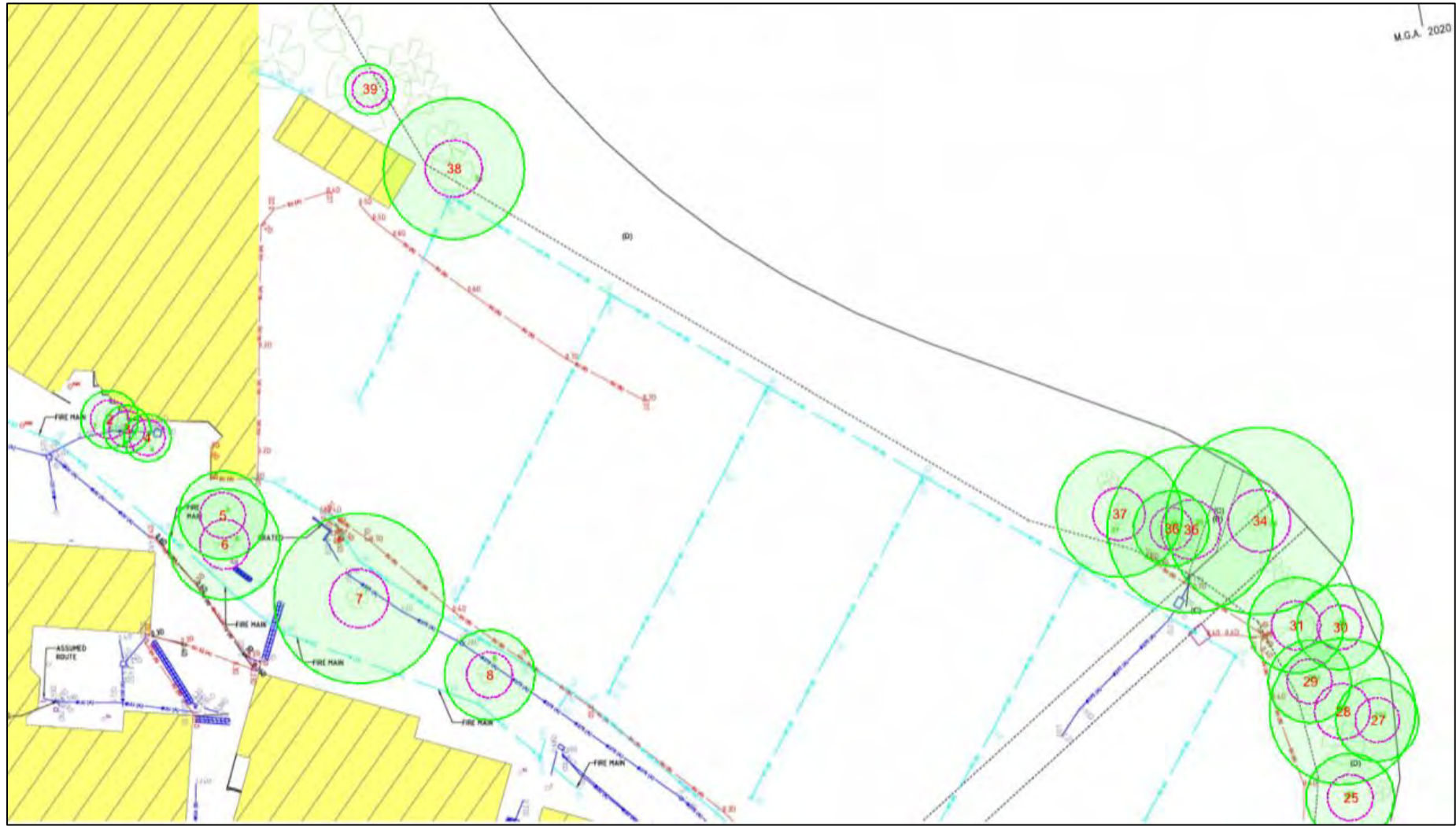


## 9.2 AERIAL PHOTO OF SITE SHOWING LOCATION OF TREES ASSESSED

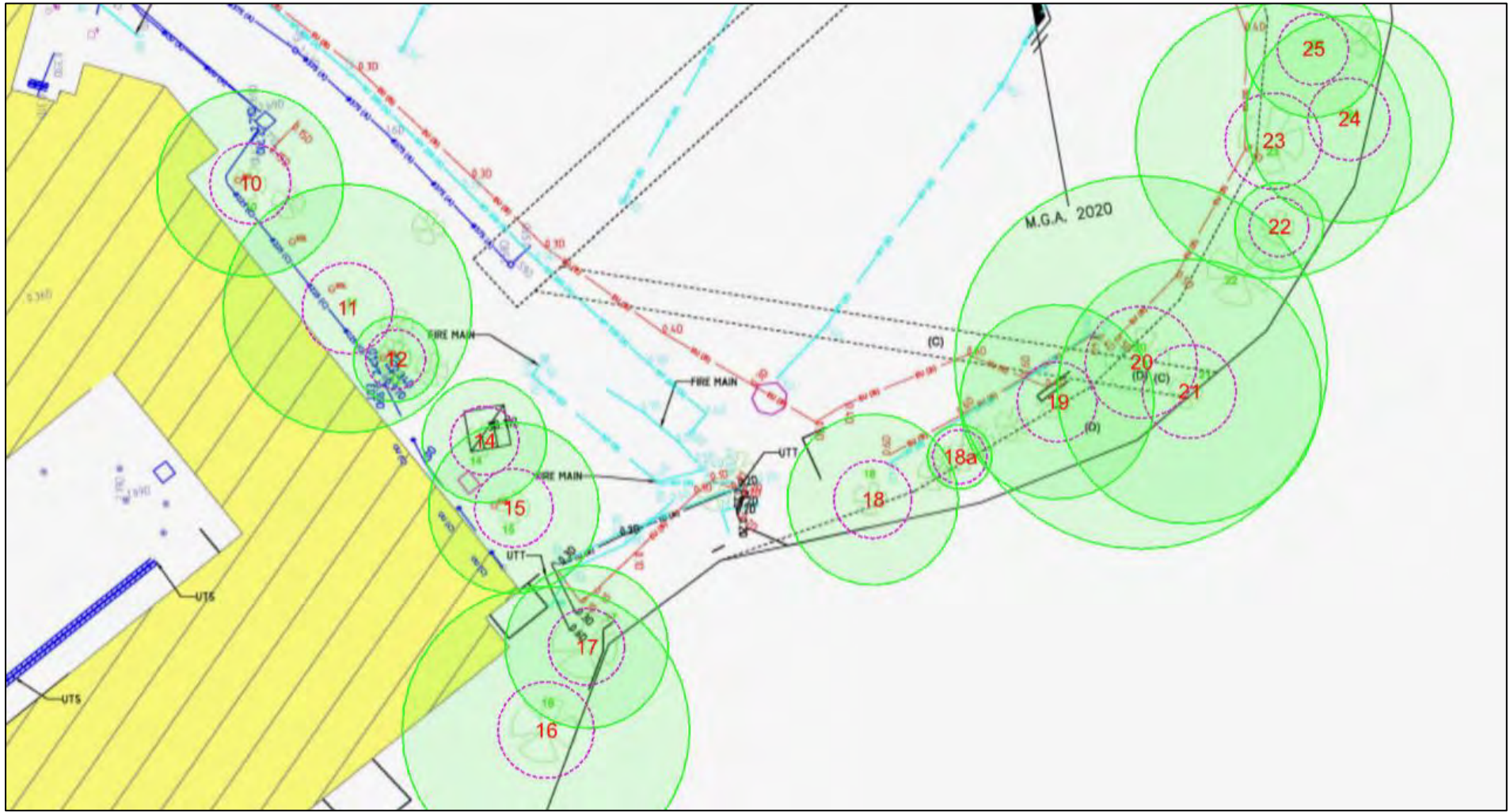




### 9.3 PLAN OF SITE SHOWING EXISTING SITE AND LOCATION OF TREES AND TPZs – NORTH SECTION OF OVAL



## 6.4 PLAN OF SITE SHOWING EXISTING SITE AND LOCATION OF TREES AND TPZs – SOUTH SECTION OF OVAL





## 6.5 PLAN OF SITE SHOWING PROPOSED DEVELOPMENT – LEVEL 3





## 10. TREE ASSESMENT

### 10.1 TREE SCHEDULE

KEY FOR TABLE:

**AGE** - Y = Young, M = Mature, OM = Over Mature D = Dead

**DBH** – Diameter Breast Height (mm)

**SRZ** – Structural Root Zone

**Risk Rating** – LOW, MEDIUM, HIGH, EXTREME (Colour Coded)

**HT** – Estimated Height (m)

**DRC** – Diameter above Root Crown (mm)

**Health/ Condition** – G = Good, F = Fair, P = Poor, D = Dead

**SRIV** – Sustainable Retention Index Value (Appendix 3)

**CS** – Estimated Crown Spread (m)

**TPZ** – Tree Protection Zone

**Defects/Comments** – NIL = Deadwood <20mm Diameter, Minor D = Minor Deadwood 20-70mm Diameter, Major D = Major Deadwood 70+mm Diameter

**Significance/Retention** – LOW, MEDIUM, HIGH (Colour Coded according to Retention Value)

**SULE** – H = High (40+ Yrs), M = Medium (15-40 Yrs), S = Short (5-15 Yrs), R = Remove, S/Y = Small or Young

No.	Botanical Name (Common Name)	Age	HT	CS	DBH (mm)	DRC (mm)	TPZ (m)	SRZ (m)	Health/ Cond.	SRIV	Defects / Comments	Risk Rating	SULE	Significance / Retention Value)	Recommendations
1	Araucaria heterophylla (Norfolk pine)	M	35	14	1470	1520	17.6	3.9	G/G	MGVG		LOW	M	HIGH / HIGH	Retain and Protect AS4970-2009
2	Archontophoenix cunninghamiana (Bangalow Palm)	M	9	5	230	250	2.8	1.8	G/G	MGVG	Recently pruned	LOW	M	LOW / LOW	Remove and replace
3	Archontophoenix cunninghamiana (Bangalow Palm)	M	8	5	190	220	2.3	1.8	G/G	MGVG	Recently pruned	LOW	M	LOW / LOW	Remove and replace
4	Archontophoenix cunninghamiana (Bangalow Palm)	M	8	5	190	210	2.3	1.7	G/G	MGVG	Recently pruned	LOW	M	LOW / LOW	Remove and replace
5	Syagrus romanzoffiana (Cocos Palm)	M	10	5	350	370	4.2	2.2	G/G	MGVG	Recently pruned. Exempt Species	LOW	S	LOW / LOW	Remove

No.	Botanical Name (Common Name)	Age	HT	CS	DBH (mm)	DRC (mm)	TPZ (m)	SRZ (m)	Health/ Cond.	SRIV	Defects / Comments	Risk Rating	SULE	Significance / Retention Value)	Recommendations
6	Syagrus romanzoffiana (Cocos Palm)	M	10	5	440	460	5.3	2.4	G/G	MGVG	Recently pruned, Exempt Species	LOW	S	LOW / LOW	Remove
7	Ulmus parvifolia (Chinese Elm)	M	12	14	675	675	8.1	2.8	G/G	MGVG	Difficult to transplant such large tree.	LOW	M	HIGH / HIGH	Remove and replace
8	Callistemon sp. (Bottlebrush)	M	8	6	360	380	4.3	2.2	F/F	MGVF	Sparse canopy	LOW	M	LOW / LOW	Remove and replace
10	Melaleuca styphelioides (Prickly leaved Paperbark)	M	10	9	480	520	5.8	2.5	G/G	MGVG		LOW	M	MED / MED	Retain and Protect AS4970-2009
11	Melaleuca quinquenervia (Broad- leaved Paperbark)	M	10	8	640	680	7.7	2.8	G/G	MGVG	Co-dominant stem, low risk	LOW	M	MED / MED	Retain and Protect AS4970-2009
12	Howea forsteriana (Kentia Palm)	Y	8	4	220	250	2.6	1.8	G/G	MGVG		LOW	M	LOW / LOW	Retain and Protect AS4970-2009
14	Syagrus romanzoffiana (Cocos Palm)	M	10	5	320	350	3.8	2.1	G/G	MGVG	Recently pruned, exempt species	LOW	S	LOW / LOW	Retain and Protect AS4970-2009
15	Melaleuca styphelioides (Prickly leaved Paperbark)	M	10	7	440	480	5.3	2.4	G/G	MGVG		LOW	M	MED / MED	Retain and Protect AS4970-2009
16	Angophora costata (Sydney Red Gum)	M	20	16	740	780	8.9	3.0	G/G	MGVG	Crossing branches mid canopy	LOW	L	HIGH / HIGH	Retain and Protect AS4970-2009
17	Angophora costata (Sydney Red Gum)	M	11	10	420	450	5.0	2.4	G/G	MGVG	Suppressed form, crossing branches	LOW	L	MED / MED	Retain and Protect AS4970-2009
18	Robinia pseudoacacia (Robinia)	M	10	10	440	470	5.3	2.4	F/F	MGVF		LOW	S	LOW / LOW	Remove and replace

No.	Botanical Name (Common Name)	Age	HT	CS	DBH (mm)	DRC (mm)	TPZ (m)	SRZ (m)	Health/ Cond.	SRIV	Defects / Comments	Risk Rating	SULE	Significance / Retention Value)	Recommendations
18 a	Syzygium smithii (Lillypilly)	M	8	8	150	200	1.8	1.7	G/G	MGVG	Screening from street	LOW	M	LOW / LOW	Remove and replace
19	Lagerstromia indica (Crepe Myrtle)	M	20	6	500	500	6.0	2.5	G/F	MGVF		LOW	M	MED / MED	Remove and replace
20	Quercus robur (English Oak)	O	12	14	960	111 2	11.5	3.5	F/F	MGVF		LOW	M	MED / MED	Remove and replace
21	Grevillea robusta (Silky Oak)	M	18	12	680	730	8.2	2.9	G/G	MGVG	Lower limb included	LOW	M	MED / MED	Retain and Protect AS4970-2009
22	Magnolia grandiflora (Southern Magnolia)	Y	6	6	230	250	2.8	1.8	G/G	YGVG		LOW	L	MED / MED	Retain and Protect AS4970-2009
23	Jacaranda mimosifolia (Jacaranda)	M	15	15	710	780	8.5	3.0	G/F	MGVF		LOW	M	MED / MED	Remove and replace
24	Casuarina cunninghamiana (She Oak)	M	12	8	535	535	6.4	2.5	G/F	MGVF		LOW	M	MED / MED	Retain and Protect AS4970-2009
25	Glochidion ferdinandi (Cheese Tree)	Y	8	6	350	380	4.2	2.2	G/G	YGVG		LOW	M	LOW / LOW	Remove and replace
27	Eucalyptus saligna (Sydney Blue Gum)	Y	9	8	330	350	4.0	2.1	G/G	YGVG		LOW	L	MED / MED	Retain and Protect AS4970-2009
28	Casuarina cunninghamiana (She Oak)	M	12	20	580	600	7.0	2.7	G/F	MGVF		LOW	M	MED / MED	Retain and Protect AS4970-2009
29	Corymbia maculata (Spotted gum)	M	12	6	330	360	4.0	2.2	G/F	MGVF	Trunk has some recent aboriginal artwork	LOW	L	MED / MED	Remove and replace

No.	Botanical Name (Common Name)	Age	HT	CS	DBH (mm)	DRC (mm)	TPZ (m)	SRZ (m)	Health/ Cond.	SRIV	Defects / Comments	Risk Rating	SULE	Significance / Retention Value)	Recommendations
30	Agathis robusta (Kauri Pine)	Y	10	5	340	360	4.1	2.2	G/G	MGVG		LOW	L	MED / MED	Retain and Protect AS4970-2009
31	Corymbia citriodora (Lemon scented Gum)	M	10	6	380	440	4.6	2.3	G/P	MGVP	Recently lopped, storm damage	LOW	S	LOW / LOW	Remove and replace
34	Banksia integrifolia (Coast Banksia)	M	12	12	740	780	8.9	3.0	F/F	MGVF	Recently lopped for views, poor form	LOW	M	MED / MED	Retain and Protect AS4970-2009
35	Toona ciliata (Australian Red Cedar)	M	13	15	660	690	7.9	2.8	G/G	MGVG	Heavily lopped for views, poor form	LOW	M	MED / MED	Retain and Protect AS4970-2009
36	Eucalyptus microcorys (Tallowood)	M	9	6	300	320	3.6	2.1	G/P	MGVP	Poor form	LOW	S	LOW / LOW	Retain and Protect AS4970-2009
37	Glochidion ferdinandi (Cheese Tree)	M	8	9	500	520	6.0	2.5	G/F	MGVF		LOW	M	LOW / LOW	Retain and Protect AS4970-2009
38	Pinus halepensis (Allepo pine)	M	11	12	560	630	6.7	2.7	G/F	MGVF	Heritage Significance, Anzac Memorial Tree	LOW	L	HIGH / HIGH	Retain and Protect AS4970-2009
39	Strelitzia reginae (Stand of Strelitzia)	M	8	8	200	200	2.4	1.7	G/G	MGVG		LOW	M	LOW / LOW	Remove and replace

TABLE 4 - RISK RATING MATRIX

## 11. IMPACT OF PROPOSED DEVELOPMENT

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### 11.1 TREES TO BE RETAINED ONSITE AND ASSOCIATED PROTECTION ZONES

All trees that scored HIGH as priority for retention are good specimens and should be protected throughout any stages of development to ensure there are no detrimental effects to the health of the trees. Trees that have scored MEDIUM for retention should also be protected where possible without impacting the development. If it is not possible to construct the new development without seriously impacting the tree then those trees with MEDIUM retention value should be considered for removal. Trees with LOW retention value should be removed if required to accommodate the new development.

A review of the designs for the proposed development showed that there will be a need to remove at least 16 trees within the site to accommodate the development although there would only be one high retention tree and 4 medium retention trees that will require removal. The remaining 11 trees recommended for removal were all ranked as low retention trees. These are discussed further in the next section.

Of the remaining 19 trees surveyed onsite it should be possible to retain and protect them according to AS-4970-2009 (Protection of Trees on Development Sites) with some guidance from the project arborist despite some of these trees requiring major TPZ encroachments as determined by AS-4970-2009. This is primarily due to the topography of the site whereby the trees are located further up the slope from the proposed building footprint and the presence of the current retaining wall around the oval at the base of the slope that will have prevented a lot of the lateral root growth towards the oval and the proposed new development works. This coupled with the design of the sports field which has a cantilevered structure and piered construction for some of its footings and retaining walls will all limit the encroachment into the root zone for trees located around the north eastern side of the oval. There is likely to be a need for some canopy pruning in the form of crown raising of at least 20% canopy coverage for Trees 28, 35 and 37 to accommodate the proposed development. If Tree 37 requires too much pruning to maintain a good structure and form, or the root encroachment is significant, then this tree should just be removed and replaced since this tree is only ranked as a low retention tree.

All initial excavations with the TPZ should be done in consultation with the project arborist and using non-destructive techniques (air spade or hydrovac) to ensure no major roots will be damaged as part of the demolition or construction stages. Once it is apparent no roots are present in an area that requires further excavations then standard methods of excavation can be used. This is particularly important for Tree 38 that is a high retention value tree and will require some major TPZ encroachment. Tree 1 will require some minor encroachment for the installation of 2 piers for the tennis courts. This will have minimal impact on the health of the tree since it will involve only minor encroachment but it should be done in consultation with the project arborist. No excavations, storage of materials or root pruning is to occur within its TPZ without supervision or consultation with the project arborist.

With all trees to be retained and protected onsite, no roots greater than 40mm diameter are to be pruned within the TPZ and no roots at all within the SRZ without consultation with the project arborist. TPZ fencing for some trees can only extend to the edge of the proposed development footings or adjacent footpaths but all restrictions regarding activities within the TPZ still apply to any area within the distances listed below in Table 3 even though they may be outside the fenced area. Table 3 below lists the actual TPZ and SRZ radius's and any encroachments that will be required. The tree protection and removals plan shown in sections 11.3 and 11.4 below shows details of any encroachments and the location of each TPZ. TPZ fencing should run along the edge of the TPZ zones and take into account the space required for the proposed development footings. This should be setup in coordination

with the project arborist since the topography of the site may make the setup of regular TPZ fencing quite difficult. If access into the TPZs for construction traffic is required then the location of TPZ fencing and/or trunk protection and ground protection should be done in consultation with the project arborist.

Tree No.	Species	Canopy Spread (m)	DBH (mm)	DRC (mm)	TPZ radius (m)	SRZ radius (m)	TPZ Encroachment required
1	Araucaria heterophylla (Norfolk pine)	14	1470	1520	17.6	3.9	Minor TPZ encroachment required for pier locations of tennis courts. All excavations to be supervised or done in consultation with project arborist. No root pruning at all to occur without consultation project arborist.
10	Melaleuca styphelioides (Prickly leaved Paperbark)	9	480	520	5.8	2.5	No TPZ encroachment required
11	Melaleuca quinquenervia (Broad-leaved Paperbark)	8	640	680	7.7	2.8	No TPZ encroachment required
12	Howea forsteriana (Kentia Palm)	4	220	250	2.6	1.8	No TPZ encroachment required
14	Syagrus romanzoffiana (Cocos Palm)	5	320	350	3.8	2.1	No TPZ encroachment required
15	Melaleuca styphelioides (Prickly leaved Paperbark)	7	440	480	5.3	2.4	No TPZ encroachment required
16	Angophora costata (Sydney Red Gum)	16	740	780	8.9	3.0	No TPZ encroachment required
17	Angophora costata (Sydney Red Gum)	10	420	450	5.0	2.4	No TPZ encroachment required
21	Grevillea robusta (Silky Oak)	12	680	730	8.2	2.9	Minor TPZ encroachment required (<10%) – acceptable according to AS-4970-2009
22	Magnolia grandiflora (Southern Magnolia)	6	230	250	2.8	1.8	No TPZ encroachment required
24	Casuarina cunninghamiana (She Oak)	8	535	535	6.4	2.5	No TPZ encroachment required
27	Eucalyptus saligna (Sydney Blue Gum)	8	330	350	4.0	2.1	No TPZ encroachment required
28	Casuarina cunninghamiana (She Oak)	20	580	600	7.0	2.7	Major TPZ encroachment required (>10%) but slope should limit the lateral spread of roots. Initial excavations in TPZ done using non-destructive techniques. No roots to be pruned within TPZ without consultation project arborist.

Tree No.	Species	Canopy Spread (m)	DBH (mm)	DRC (mm)	TPZ radius (m)	SRZ radius (m)	TPZ Encroachment required
30	Agathis robusta (Kauri Pine)	5	340	360	4.1	2.2	No TPZ encroachment required
34	Banksia integrifolia (Coast Banksia)	12	740	780	8.9	3.0	No TPZ encroachment required
35	Toona ciliata (Australian Red Cedar)	15	660	690	7.9	2.8	Major TPZ encroachment required (>10%) but slope and retaining wall should limit the lateral spread of roots towards the oval. All initial excavations with the TPZ will need to be done using non-destructive techniques and done in consultation with project arborist. No roots greater than 40mm diameter pruned within the TPZ and no roots at all to be pruned within the SRZ without consultation with the project arborist. Approx 20% canopy reduction pruning required.
36	Eucalyptus microcorys (Tallowood)	6	300	320	3.6	2.1	Minor TPZ encroachment required (<10%) – acceptable according to AS-4970-2009
37	Glochidion ferdinandi (Cheese Tree)	9	500	520	6.0	2.5	Major TPZ encroachment required (>10%) but slope and retaining wall should limit the lateral spread of roots towards the oval. All initial excavations with the TPZ will need to be done using non-destructive techniques and done in consultation with project arborist. No roots greater than 40mm diameter pruned within the TPZ and no roots at all to be pruned within the SRZ without consultation with the project arborist. Approx 20-25% canopy reduction pruning required.
38	Pinus halepensis (Aleppo pine)	12	560	630	6.7	2.7	Major TPZ encroachment required (>10%) but slope and retaining wall should limit the lateral spread of roots towards the oval. All initial excavations with the TPZ will need to be done using non-destructive techniques and done in consultation with project arborist. No roots greater than 40mm diameter pruned within the TPZ and no roots at all to be pruned within the SRZ without consultation with the project arborist. Approx 15-20% canopy reduction pruning required.

TABLE 5 – TPZ FOR RETAINED TREES AND ASSOCIATED ENCROACHMENTS

## 11.2 TREES TO BE REMOVED ONSITE

The table below lists the trees onsite that have been recommended for removal together with reasons and any additional details. There was only one high retention value tree (Tree 7) and 4 medium retention value trees (Trees 19, 20, 23 and 29) that will require removal to accommodate the development. The remainder were all classified as low retention value trees. It should be noted that Tree 29 has some aboriginal art work on the trunk although this was done in recent years by a local artist and is the property of Kambala School.

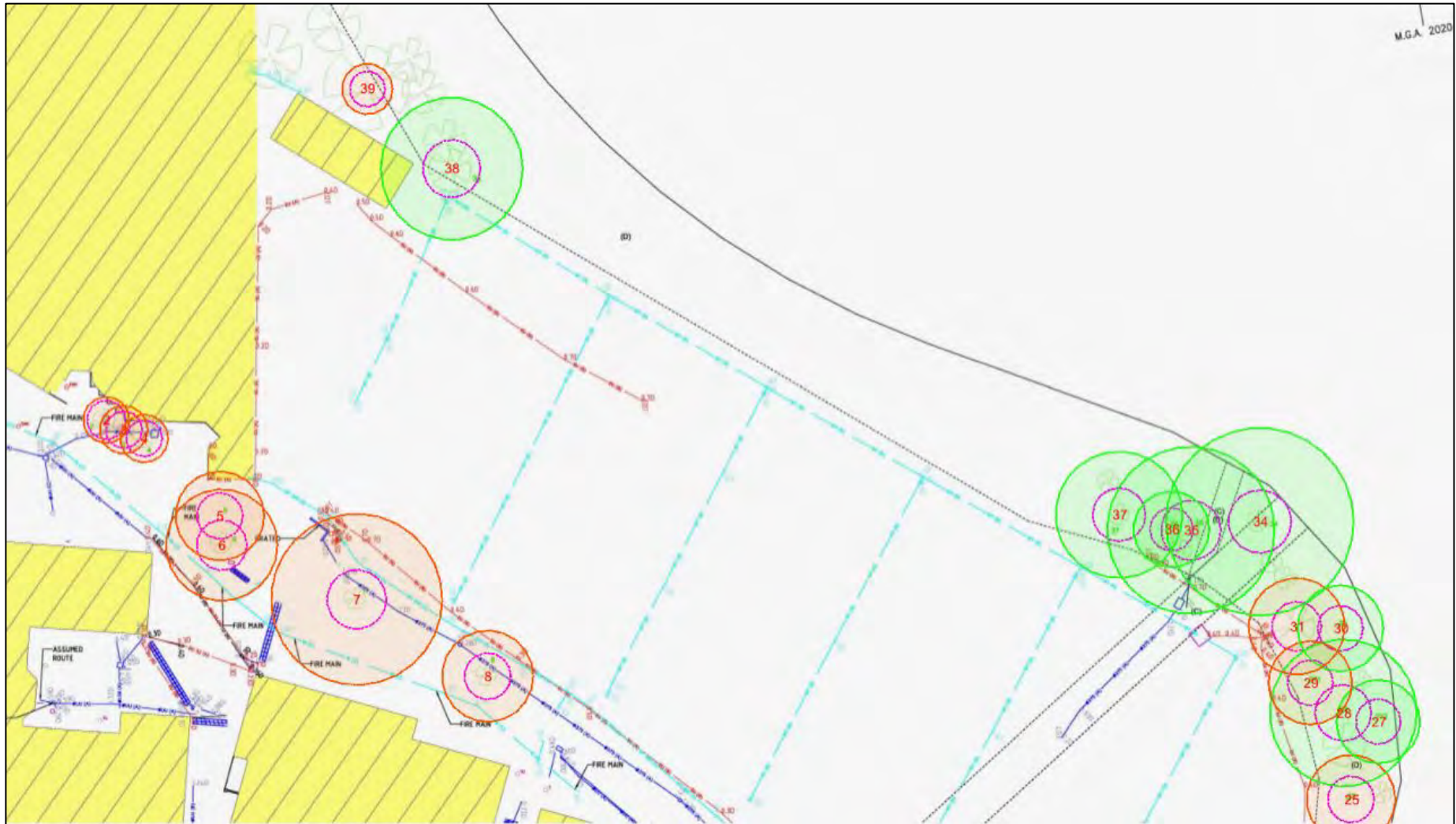
Tree No.	Species	Details / Specifications.
2	Archontophoenix cunninghamiana (Bangalow Palm)	Remove and replace. LOW retention value. Conflict with development.
3	Archontophoenix cunninghamiana (Bangalow Palm)	Remove and replace. LOW retention value. Conflict with development.
4	Archontophoenix cunninghamiana (Bangalow Palm)	Remove and replace. LOW retention value. Conflict with development..
5	Syagrus romanzoffiana (Cocos Palm)	Remove and replace. LOW retention value. Exempt Species. Conflict with development.
6	Syagrus romanzoffiana (Cocos Palm)	Remove and replace. LOW retention value. Exempt Species. Conflict with development
7	Ulmus parvifolia (Chinese Elm)	Remove and replace. HIGH retention value. Not possible to integrate with the new design.
8	Callistemon sp. (Bottlebrush)	Remove and replace. LOW retention value. Conflict with development
18	Robinia pseudoacacia (Robinia)	Remove and replace. LOW retention value. Conflict with development
18a	Syzygium smithii (Lillypilly)	Remove and replace. LOW retention value. Conflict with development
19	Lagerstromia indica (Crepe Myrtle)	Remove and replace. MEDIUM retention value. Conflict with development



Tree No.	Species	Details / Specifications.
20	Quercus robur (English Oak)	Remove and replace. MEDIUM retention value. Conflict with development
23	Jacaranda mimosifolia (Jacaranda)	Remove and replace. MEDIUM retention value. Conflict with development
25	Glochidion ferdinandi (Cheese Tree)	Remove and replace. LOW retention value. Conflict with development
29	Corymbia maculata (Spotted gum)	Remove and replace. MEDIUM retention value. Conflict with development. Aboriginal artwork by local artist on trunk of tree.
31	Corymbia citriodora (Lemon scented Gum)	Remove and replace. LOW retention value. Recent storm damage has resulted in lopping works. Conflict with development
39	Strelitzia reginae (Stand of Strelitzia)	Remove and replace. LOW retention value. Conflict with development

TABLE 6 – TREES TO BE REMOVED

### 11.3 TREE RETENTION AND REMOVALS PLAN – NORTH SECTION OF OVAL



PLAN OF SITE SHOWING TREES TO BE RETAINED (GREEN) AND TREES RECOMMENDED FOR REMOVAL (RED) TO ACCOMMODATE DEVELOPMENT.

#### 11.4 TREE RETENTION AND REMOVALS PLAN – SOUTH SECTION OF OVAL



PLAN OF SITE SHOWING TREES TO BE RETAINED (GREEN) AND TREES RECOMMENDED FOR REMOVAL (RED) TO ACCOMMODATE DEVELOPMENT.



## 11.5 PROPOSED DEVELOPMENT PLAN AND TREES TO BE RETAINED SHOWING TPZs / SRZs



PLAN OF SITE SHOWING TREES TO BE PROTECTED (TPZ OUTER GREEN CIRCLE, SRZ DASHED INNER CIRCLE) - TPZ FENCING INSTRUCTIONS IN SECTION 11.1.

## 12. TREE PROTECTION DURING DEVELOPMENT

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### 12.1 PROJECT ARBORIST

A project arborist with a minimum of 5 years experience within the arboriculture industry, demonstrated management of trees on construction sites and a minimum certification of AQF-Level 5 (Diploma Level) should be appointed to oversee all areas of the project regarding any activities that may occur close to or within any TPZs of tree that are to be retained.

They should be involved in all stages of early planning to prevent any damage to the trees to be retained and any unnecessary hold ups for the development if certain conditions and requirements have not been addressed.

The project arborist should complete regular inspections and monitoring of the site to ensure all tree protection measures are being adhered to, any additional protection measures are implemented if tree health appears to be in decline and all monitoring is documented for compliance certification.

It is very important that communications channels between planners, architects, builders and the project arborist are kept open to ensure that the trees are protected throughout every stage of the development. Remediation measures are far less likely to be successful than careful planning with regards to tree protection. All site personnel must be properly briefed before any work starts.

## 12.2 TREE PROTECTION WORKS – PRIOR TO DEMOLITION

All TPZs (Tree Protection Zones) will need to be constructed as shown in a Tree Protection Plan produced by the project arborist prior to any demolition. Any encroachments or setbacks required to accommodate the new development need to be done in consultation with the project arborist.

### 12.2.1 GENERAL TPZ – NO ACCESS AUTHORISED

The Protective fencing, signage and area within the TPZ should be constructed according to AS-4970-2009.

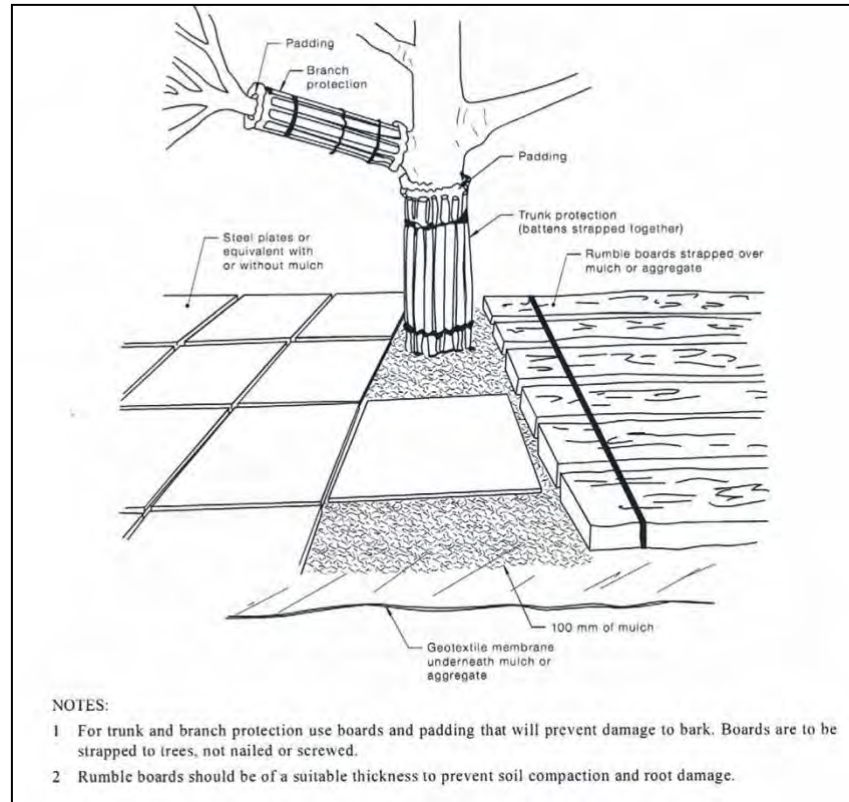
- Protective Fencing – The fencing delineates the boundary of the TPZ and should be positioned in accordance with Site Plan – Tree Protection zones and in consultation with the project arborist. Section 4, 4.3 of AS-4970 states “ Fencing should be erected before any machinery or materials are brought onto the site and before the commencement of works including demolition. Once erected, protective fencing must not be removed or altered without approval by the project arborist. The TPZ should be secured to restrict access. AS-4687 specifies applicable fencing requirements. Shade cloth or similar should be attached to reduce the transport of dust, other particulate matter and liquids into the protected area. Fence posts and supports should have a diameter greater than 20mm and be located clear of roots.
- TPZ encroachment – If encroachment is required to accommodate the building footprint then consideration should be given to the fact that the TPZ does actually extend outside of the fenced area and the rules regarding activities prohibited in the TPZ (Section 12.3) should apply to the distances presented in table 5 section 11.1 above and not just inside the fenced TPZ area.
- Signage – Signs identifying the TPZ should be placed around the edge of the TPZ and be visible from the development site.
- Mulching – Mulch installation across the surface of the TPZ should be carried out at the discretion of the project arborist. If required it should be applied to a depth of 100mm, consisting of approximately 75% leaf litter and 25% wood, and preferably from the same genus and species of tree to which they are protecting.
- Irrigation – At the discretion of the project arborist a timed drip irrigation system can be installed prior to any demolition works if it is deemed necessary.

### 12.2.2 ACCESS TO TPZ – TEMPORARY OR PERMANENT

The client has not detailed the exact location of logistical vehicular traffic and/or pedestrian traffic required during the construction phase. In general no access or any works are authorized inside a TPZ although pedestrian and vehicular access should still be allowed on roads and pavements already in place. If it is determined that entry into or through any of the TPZs are required then additional protection measures will be required. These are outlined in AS-4970-2009 in section 4.5 and listed below:

- Trunk and Branch Protection  
If access into the TPZ area is required for any scaffolding, or machinery, within 2m of the trees, then trunk and branch protection will need to be installed on limbs up to those above the height of tallest vehicle/scaffold. This should be installed by wrapping 2 layers of hessian (or similar material) around the branches and then securing hardwood battens (75x50x2000mm) at 100mm centers as shown in figure 9 below.





#### TPZ TEMPORARY ACCESS – PROTECTION MEASURES

- Ground Protection.

If machinery or pedestrian access is required within the TPZ then ground protection measures will be required to prevent any compaction or root damage. These measures require a permeable membrane such as geotextile fabric beneath a 100mm layer of mulch with rumble boards or steel plates laid above.

### 12.3 TREE PROTECTION MEASURES – DURING CONSTRUCTION

Some activities may be authorized by the project arborist but generally all activities involving soil level changes, excavation, storage, excavation, cleaning and refueling are prohibited (a full list is found in section 4.2 AS-4970). There are some additional guidelines that do allow certain activities within the TPZ during construction but all of these need to be supervised and determined by the project arborist.

#### EXCAVATION AND FILL IN TPZ

Guidelines for excavation within the TPZ:

- All works must be carried out under the supervision of the project arborist.
- Root mapping for any encroachment greater than 10% of the TPZ will need to be carried out by the project arborist to determine the extent of root growth within the area designated for development. All root mapping will need to be done with none destructive techniques such as an air spade, water laser, manual digging (taking care not to damage roots or bark) or ground penetrating radar. The root mapping exercise should determine the extend of woody structural roots greater than 50mm diameter within the proposed development footprint and determine the amount of root pruning that would be possible. When the project arborist identifies roots to be pruned (>50mm) they should be cut with sharp tools such as pruners or chainsaws and back to undamaged wood. No 'pruning' is to be done by machinery.
- Root protection during works – Some approved works such as regrading, installation of piers or landscaping may have potential to damage roots. Where roots are exposed within the TPZ, temporary root protection should be installed to prevent them drying out. This may include jute matting or hessian sheeting as multiple layers. This should be pegged in place and kept moist during period that the root zone is exposed.

Guidelines for adding fill within the TPZ:

- Any material used as fill should be approved by the project arborist and consist of a course, gap-graded material to provide aeration and infiltration to the root zone. Clays and any sort of fines should not be used since this will seriously impact the future health of the tree.
- No grade changes greater than 250mm should be done without approval of the project arborist and any compaction should be done with a non-vibrating roller.

#### DEMOLITION AND INSTALLATION OF STRUCTURES IN TPZ

- All demolition and installation of structures within the TPZ will need to be done under the instruction of the project arborist.
- Great care should be taken to ensure no roots are damaged as structures or surfaces are removed since roots are often very close to the surface. No heavy machinery is allowed within any TPZs and any removal of structures and surfaces should be done using appropriate hand and power tools to ensure roots are not damaged underneath the surface being removed.
- Installation of new surfaces should be semi permeable to allow water and gaseous exchange to the root zone underneath. There are several specialised surface materials and technologies that can allow for this whilst ensure adequate loading is still possible without any additional compaction. The project arborist will need to determine which of these will be suitable for the application.
- Installation of building structures within the TPZ may require piled supports that are located between the larger structural roots and enable the structure to be suspended. This is an engineering solution that will

require the collaboration of the project arborist and the architect to develop the correct designs. above the root zone and therefore limit the detrimental affects of the encroachment into this area.

- Installing underground services – If services must be routed through a TPZ they should be installed by directional drilling (at least 600mm deep) or in manually excavated trenches (supervised by project arborist)
- Scaffolding – When it is essential to erect scaffolding within a TPZ it should be designed to minimize any branch removal. Branches should be tied back or when unavoidable pruned as required according to AS-4373. These works may require authority from LGA. Ground protection as detailed in section 12.2 above may also be required.

### SOFT LANDSCAPING IN TPZ

Guidelines for Soft Landscaping within the TPZ:

- Soft landscaping involves the addition of soil, trees and plants, lawns and mulch. These all have the potential to be extremely damaging to trees if not done according to directions of the project arborist.
- No significant excavations, turfing, plantings, grade changes, soil addition or removal, addition of fertilisers or mulching should be done without consultation with project arborist
- Areas too close to tree trunks should not be have grade changes or be excessively mulched

### MONITORING DURING CONSTRUCTION

All the TPZs for the retained trees are to be monitored and maintaining throughout the construction phase of development. Areas that may require maintenance include:

- Mulching – mulch (if required) must be maintained to a depth of 50-100mm. Where the existing landscape within the TPZ is to remain unaltered mulch may not be required.
- Irrigation – Soil moisture levels may need to be monitored by the project arborist. Temporary irrigation or watering may be required within the TPZ upon discretion of project arborist.

The project arborist should monitor at regular intervals all construction works and excavations on site that are within the proximity of any TPZ to ensure that protection measures are being adhered to and no works are likely to affect the health of the protected trees.

## 12.4 POST CONSTRUCTION

At completion of all construction works the project arborist should assess the tree conditions and provide certification for tree protection with a condition that outstanding works or landscaping must not injure the trees. After this all tree protection measures should be removed from site.

Following the final inspection and completion of remedial works the project arborist should certify the completed works have been carried out in compliance with the approved plans and specifications according to AS-4970-2009. Monitoring documentation and any deviations should also be provided.

## 13. RECOMMENDATIONS

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This arboricultural impact report recognizes that as a consequence of development in some cases certain trees may need to be removed to accommodate new constructions despite some of the specimen trees being of good health. This report has based its recommendations on ensuring that all trees that can be retained and integrated into this future development will be protected throughout all stages of development. The recommendations of this report include:

1. Retention and Protection of Trees 1, 10-12, 14-17, 21, 22, 24, 27, 28, 30, 34-37 and 38 according to AS-4970-2009 (Protection Trees on Development Sites). No roots are to be pruned greater than 40mm diameter within any TPZ and no roots at all within any SRZ without the authorisation of the project arborist. Details of any TPZ encroachment and tree protection required are found in sections 11.1, 11.3, 11.4 and 11.5.
2. Tree 1 will require some minor encroachment for the installation of 2 piers for the tennis courts. This will have minimal impact on the health of the tree since it will involve only minor encroachment but it should be done in consultation with the project arborist. No excavations, storage of materials or root pruning is to occur within its TPZ without supervision or consultation with the project arborist. Some minor canopy pruning of the tips of some lower canopy branches may also be required for clearances of the proposed tennis courts but these can again be done in consultation with the project arborist. It will amount to less than 2% of canopy pruning if required.
3. Trees 28, 35, 37 and 38 will require major TPZ encroachment and some canopy pruning to accommodate the development. This will need to be done in consultation with the project arborist.
4. Removal and replacement of Trees 2-8, 18, 18a, 19, 20, 23, 25, 29, 31 and 39 will be required to accommodate the new development. Only one high retention value tree (Tree 7) and 4 medium retention value trees (Trees 19, 20, 23 and 29) that will require removal to accommodate the development. The details of the reasons for these removals and any replacement plantings required can be found in section 11.2.
5. Generally all activities involving soil level changes, excavation, storage, excavation, cleaning and refueling are prohibited (a full list is found in section 4.2 of AS-4970-2009) within the TPZ. Some activities may be authorized if required but only by the project arborist. Any additional mulching or irrigation required should be done at the discretion of the project arborist.
6. Branch and Truck protection, if required (only if access into TPZ needed), should be installed as detailed in section 12.2.2 of this report. All other tree protection measures required during construction and detailed in section 11 and 12 of this report are to be complied with.
7. Any tree removal works and tree protection measures should be carried out by an arborist with a minimum qualification of AQF level 3 and certified by the project arborist. The project arborist should have a minimum qualification of AQF level 5 or equivalent.
8. All works on-site should be carried out according to Workcover Authority NSW 2007, *Code of Practice Amenity Tree Industry*, NSW.
9. All works should be carried out according to AS-4373-2007 (Pruning of Amenity Trees) and AS-4970-2009 (Protection trees on development sites).

## 14. QUALIFICATIONS

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- **Master Science Degree (MSc Hons)** – Information Technology (Sheffield Hallam University, UK)
- **Graduate Diploma (Arboriculture)** – **AQF Level 8** - (University of Melbourne) – 1st Class Hons
- **Bachelor Science Degree (BSc Hons)** - Environmental Science (Leeds University, UK)
- **Diploma Horticulture (Arboriculture)** – **AQF Level 5** - (Kurri Kurri TAFE) – Distinction
- **Certified Tree Risk Assessor** –QTRA Certified and ISA TRAQ Certified Risk Assessor
- **Arboriculture AQF Level 3** – Horticulture (Arboriculture) (Ryde TAFE)
- Member Arboriculture Australia – 12 Years
- 20 years arboriculture industry experience - Tree contractor and consulting arborist

## 15. REFERENCES

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2. Matheny, N.P & Clark, J.R (1994). A photographic Guide to the Evaluation of Hazard Trees in Urban Areas. International Society Arboriculture (ISA)
3. Mattheck, K and Breloer, H (2007). *The Body Language of Trees – A handbook for failure analysis*.
4. Standards Australia (2009). AS-4970: *Protection of Trees on Development Sites*
5. Standards Australia (1996). AS-4373 – *Pruning of Amenity Trees*.
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7. Urban Forest Technical Manual. Newcastle council. 2012.
8. Tree Retention Values Table. A.Morton from: Couston, Mark and Howden, Melanie (2001). Footprint Green Pty Ltd, Sydney Australia.
9. City of Sydney Council Tree Preservation Order
10. IACA Significance of a Tree, Assessment Rating System (STARS) © (IACA 2010)  
<http://www.iaca.org.au/home/index.php/publications>
11. Sustainable Retention Index Value (SRIV) Version 4 © (IACA 2010)  
<http://www.iaca.org.au/home/index.php/publications>

## 16. APPENDICES

### 16.1 APPENDIX 1 – VISUAL TREE ASSESSMENT (VTA) METHOD THE PRINCIPLES OF RECOGNIZING PREDICTABLE TREE FAILURES

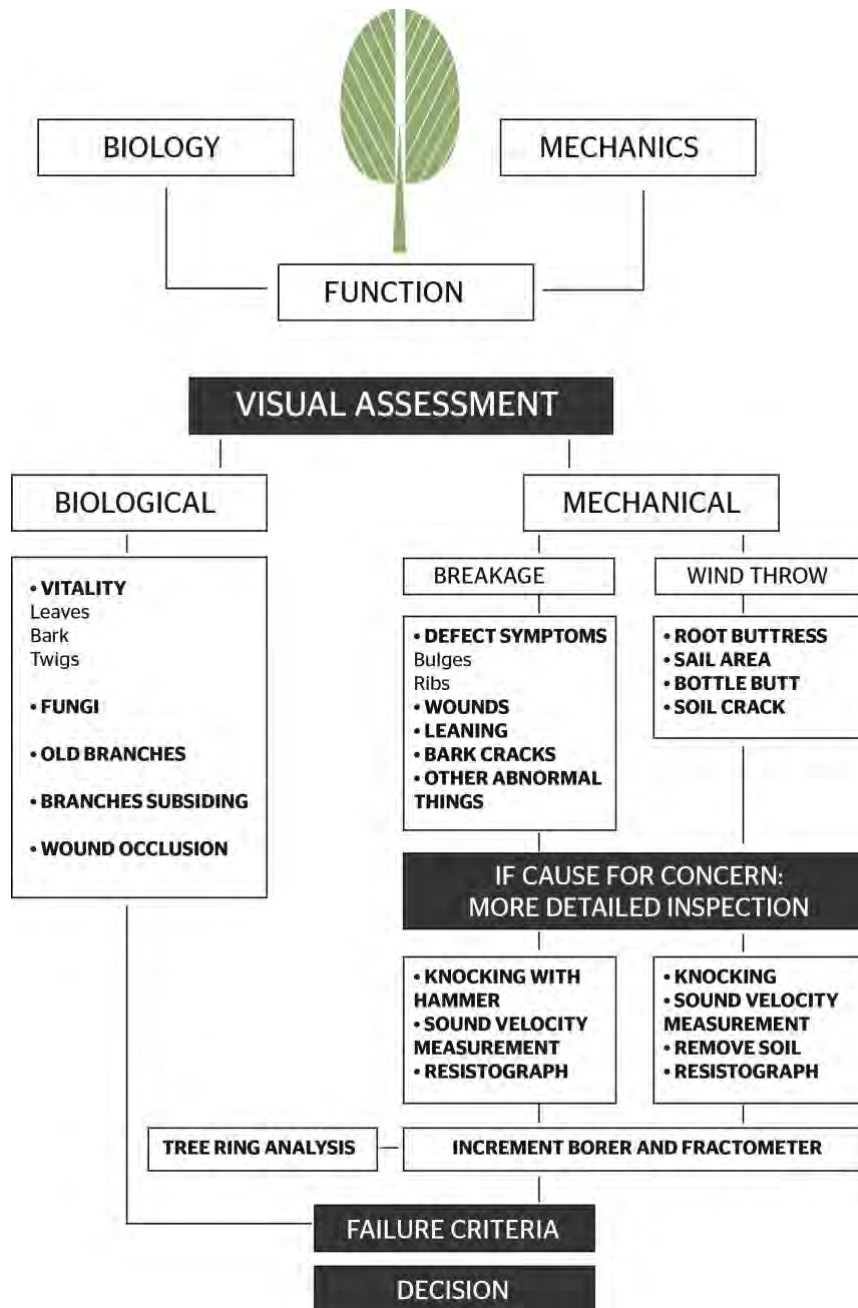


FIGURE 1 - SCHEMATIC REPRESENTATION OF THE PROCEDURE FOR EVALUATING A TREE WITH THE VTA SYSTEM

Source: Mattheck and Breloer "The body Language of Trees" 2007 p.196



## 16.2 APPENDIX 2 – (IACA 2010)© IACA SIGNIFICANCE OF A TREE, ASSESSMENT RATING SYSTEM (STARS)

Institute of Australian Consulting Arboriculturists, Australia, [www.iaca.org.au](http://www.iaca.org.au). In the development of this document IACA acknowledges the contribution and original concept of the Footprint Green Tree Significance & Retention Value Matrix, developed by Footprint Green Pty Ltd in June 2001.

The landscape significance of a tree is an essential criterion to establish the importance that a particular tree may have on a site. However, rating the significance of a tree becomes subjective and difficult to ascertain in a consistent and repetitive fashion due to assessor bias. It is therefore necessary to have a rating system utilising structured qualitative criteria to assist in determining the retention value for a tree. To assist this process all definitions for terms used in the *Tree Significance - Assessment Criteria* and *Tree Retention Value - Priority Matrix*, are taken from the IACA Dictionary for Managing Trees in Urban Environments 2009.

This rating system will assist in the planning processes for proposed works, above and below ground where trees are to be retained on or adjacent a development site. The system uses a scale of *High, Medium and Low significance* in the landscape. Once the landscape significance of an individual tree has been defined, the retention value can be determined.

### Tree Significance - Assessment Criteria

#### **1. High Significance in landscape**

- The tree is in good condition and good vigour; - The tree has a form typical for the species; - The tree is a remnant or is a planted locally indigenous specimen and/or is rare or uncommon in the local area or of botanical interest or of substantial age; - The tree is listed as a Heritage Item, Threatened Species or part of an Endangered ecological community or listed on Councils significant Tree Register; - The tree is visually prominent and visible from a considerable distance when viewed from most directions within the landscape due to its size and scale and makes a positive contribution to the local amenity; - The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group or has commemorative values; - The tree's growth is unrestricted by above and below ground influences, supporting its ability to reach dimensions typical for the taxa in situ - tree is appropriate to the site conditions.

#### **2. Medium Significance in landscape**

- The tree is in fair-good condition and good or low vigour; - The tree has form typical or atypical of the species; - The tree is a planted locally indigenous or a common species with its taxa commonly planted in the local area - The tree is visible from surrounding properties, although not visually prominent as partially obstructed by other vegetation or buildings when viewed from the street, - The tree provides a fair contribution to the visual character and amenity of the local area, - The tree's growth is moderately restricted by above or below ground influences, reducing its ability to reach dimensions typical for the taxa in situ.

#### **3. Low Significance in landscape**

- The tree is in fair-poor condition and good or low vigour; - The tree has form atypical of the species; - The tree is not visible or is partly visible from surrounding properties as obstructed by other vegetation or buildings, - The tree provides a minor contribution or has a negative impact on the visual character and amenity of the local area, - The tree is a young specimen which may or may not have reached dimension to be protected by local Tree Preservation orders or similar protection mechanisms and can easily be replaced with a suitable specimen, - The tree's growth is severely restricted by above or below ground influences, unlikely to reach dimensions typical for the taxa in situ - tree is inappropriate to the site conditions, - The tree is listed as exempt under the provisions of the local Council Tree Preservation Order or similar protection mechanisms, - The tree has a wound or defect that has potential to become structurally unsound. Environmental Pest / Noxious Weed Species - The tree is an Environmental Pest Species due to its invasiveness or poisonous/ allergenic properties, - The tree is a declared noxious weed by legislation. Hazardous/Irreversible Decline - The tree is structurally unsound and/or unstable and is considered potentially dangerous, - The tree is dead, or is in irreversible decline, or has the potential to fail or collapse in full or part in the immediate to short term.

**The tree is to have a minimum of three (3) criteria in a category to be classified in that group.**


Note: The assessment criteria are for individual trees only, however, can be applied to a monocultural stand in its entirety.

Table 1.0 below shows how to use the significance ratings to provide a value for the Tree Retention Value – Priority Matrix.

**Table 1.0 Tree Retention Value - Priority Matrix.**

		Significance				
		1. High	2. Medium	3. Low		
		Significance in Landscape	Significance in Landscape	Significance in Landscape	Environmental Pest / Noxious Weed Species	Hazardous / Irreversible Decline
Estimated Life Expectancy	1. Long >40 years					
	2. Medium 15-40 Years					
	3. Short <1-15 Years					
	Dead					

Legend for Matrix Assessment



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	<b>Priority for Retention (High)</b> - These trees are considered important for retention and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by the Australian Standard AS4970 <i>Protection of trees on development sites</i> . Tree sensitive construction measures must be implemented e.g. pier and beam etc if works are to proceed within the Tree Protection Zone.
	<b>Consider for Retention (Medium)</b> - These trees may be retained and protected. These are considered less critical; however their retention should remain priority with removal considered only if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted.
	<b>Consider for Removal (Low)</b> - These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
	<b>Priority for Removal</b> - These trees are considered hazardous, or in irreversible decline, or weeds and should be removed irrespective of development.

## REFERENCES


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Draper BD and Richards PA 2009, *Dictionary for Managing Trees in Urban Environments*, Institute of Australian Consulting Arboriculturists (IACA), CSIRO Publishing, Collingwood, Victoria, Australia.

Footprint Green Pty Ltd 2001, *Footprint Green Tree Significance & Retention Value Matrix*, Avalon, NSW Australia, [www.footprintgreen.com.au](http://www.footprintgreen.com.au)

## 16.3 APPENDIX 3 - IACA, 2010, SUSTAINABLE RETENTION INDEX VALUE (SRIV)©

The matrix is to be used with the value classes defined in the Glossary for Age / Vigour / Condition. An index value is given to each category where ten (10) is the highest value.

Age Class	Vigour Class and Condition Class 					
	Good Vigour & Good Condition (GVG)	Good Vigour & Fair Condition (GVF)	Good Vigour & Poor Condition (GVP)	Low Vigour & Good Condition (LVG)	Low Vigour & Fair Condition (LVF)	Low Vigour & Poor Condition (LVP)
	Able to be retained if sufficient space available above and below ground for future growth. No remedial work or improvement to growing environment required. May be subject to high vigour. Retention potential - Medium - Long Term.	Able to be retained if sufficient space available above and below ground for future growth. Remedial work may be required or improvement to growing environment may assist. Retention potential - Medium Term. Potential for longer with remediation or favourable environmental conditions.	Able to be retained if sufficient space available above and below ground for future growth. Remedial work unlikely to assist condition, improvement to growing environment may assist. Retention potential - Short Term. Potential for longer with remediation or favourable environmental conditions.	Retained if sufficient space available above and below ground for future growth. No remedial work required, but improvement to growing environment may assist vigour. Retention potential - Short Term. Potential for longer with remediation or favourable environmental conditions.	May be able to be retained if sufficient space available above and below ground for future growth. Remedial work or improvement to growing environment may assist condition and vigour. Retention potential - Short Term. Potential for longer with remediation or favourable environmental conditions.	Unlikely to be able to be retained if sufficient space available above and below ground for future growth. Remedial work or improvement to growing env. unlikely to assist condition or vigour. Retention potential - Likely to be removed immediately or retained for Short Term. Potential for longer with remediation or favourable environmental conditions.
(Y) Young	<b>YGVG - 9 Index Value 9</b> Retention potential - Long Term. Likely to provide minimal contribution to local amenity if height Retain, move or replace.	<b>YGVF - 8 Index Value 8</b> Retention potential - Short - Medium Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height Medium-high potential for future growth and adaptability. Retain, move or replace.	<b>YGVP - 5 Index Value 5</b> Retention potential - Short Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height Low-medium potential for future growth and adaptability. Retain, move or replace.	<b>YLVG - 4 Index Value 4</b> Retention potential - Short Term. Potential longer with improved growing conditions. Likely provide minimal contribution to local amenity Medium potential future growth and adaptability. Retain, move or replace	<b>YLVF - 3 Index Value 3</b> Retention potential - Short Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5m. Low-medium potential for future growth and adaptability. Retain, move or replace.	<b>YLVP - 1 Index Value 1</b> Retention potential - Likely to be removed immediately or retained for Short Term. Likely to provide minimal contribution to local amenity if height
(M) Mature	<b>MGVG - 10 Index Value 10</b> Retention potential - Medium - Long Term.	<b>MGVF - 9 Index Value 9</b> Retention potential - Medium Term. Potential for longer with improved growing conditions.	<b>MGVP - 6 Index Value 6</b> Retention potential - Short Term. Potential for longer with improved growing conditions.	<b>MLVG - 5 Index Value 5</b> Retention potential - Short Term. Potential for longer with improved conditions.	<b>MLVF - 4 Index Value 4</b> Retention potential - Short Term. Potential for longer with improved growing conditions.	<b>MLVP - 2 Index Value 2</b> Retention potential - Likely to be removed immediately or retained for Short Term.
(O) Over-mature	<b>OGVG - 6 Index Value 6</b> Retention potential - Medium - Long Term.	<b>OGVF - 5 Index Value 5</b> Retention potential - Medium Term.	<b>OGVP - 4 Index Value 4</b> Retention potential - Short Term.	<b>OLVG - 3 Index Value 3</b> Retention potential - Short Term. Potential for longer with improved conditions.	<b>OLVF - 2 Index Value 2</b> Retention potential - Short Term.	<b>OLVP - 0 Index Value 0</b> Retention potential - Likely to be removed immediately or retained for Short Term.

## 16.4 APPENDIX 4 ULE CATEGORIES

ULE categories (after Barrell 1996, Updated 01/04/01) The five categories and their sub-groups are as follows:

**Long ULE** - tree appeared retainable at the time of assessment for over 40 years with an acceptable degree of risk, assuming reasonable maintenance:

- a) Structurally sound trees located in positions that can accommodate future growth
- b) Trees which could be made suitable for long term retention by remedial care
- c) Trees of special significance which would warrant extraordinary efforts to secure their long term retention

**Medium ULE** - tree appeared to be retainable at the time of assessment for 15 to 40 years with an acceptable degree of risk, assuming reasonable maintenance:

- a) Trees which may only live from 15 to 40 years
- b) Trees which may live for more than 40 years but would be removed for safety or nuisance reasons
- c) Trees which may live for more than 15 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting
- d) Trees which could be made suitable for retention in the medium term by remedial care

**Short ULE** - tree appeared to be retainable at the time of assessment for 5 to 15 years with an acceptable degree of risk, assuming reasonable maintenance:

- a) Trees which may only live from 5 to 15 years
- b) Trees which may live for more than 15 years but would be removed for safety or nuisance reasons
- c) Trees which may live for more than 15 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting
- d) Trees which require substantial remediation and are only suitable for retention in the short term.

**Removal** - trees which should be removed within the next 5 years:

- a) Dead, dying, suppressed or declining trees because of disease or inhospitable conditions
- b) dangerous trees through instability or recent loss of adjacent trees
- c) Dangerous trees because of structural defects including cavities, decay, included bark, wounds or poor form
- d) Damaged trees that are clearly not safe to retain
- e) Trees which may live for more than 5 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting
- f) Trees which are damaging or may cause damage to existing structures within the next 5 years
- g) Trees that will become dangerous after removal of other trees for the reasons given in (a) to (f)
- h) Trees in categories (a) to (g) that have a high wildlife habitat value and, with appropriate treatment, could be retained subject to regular review

**Small, young or regularly pruned** - Trees that can be reliably moved or replaced:

- a) small trees less than 5m in height
- b) young trees less than 15 years old but over 5m in height
- c) formal hedges and trees intended for regular pruning to artificially control growth

## 16.5 APPENDIX 4 – EXTRACT FROM AUSTRALIAN STANDARD AS4970 2009

### PROTECTION OF TREES ON DEVELOPMENT SITES

#### **Section 3 - Determining the tree protection zones of the selected trees**

##### **3.1 Tree protection zone (TPZ)**

“The tree protection zone (TPZ) is the principal means of protecting trees on development sites. The TPZ is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable.

The TPZ incorporates the structural root zone (SRZ) (refer to Clause 3.3.5).”

##### **3.2 Determining the TPZ**

The radius of the TPZ is calculated for each tree by multiplying its DBH x 12

Where  $TPZ = DBH \times 12$

DBH = trunk diameter measured at 1.4 m above ground (DBH = Diameter at Breast Height)

Radius is measured from the centre of the stem at ground level.

##### **3.3 Structural root zone (SRZ)**

“The SRZ is the area required for street stability. A larger area is required to maintain a viable tree. The SRZ only needs to be calculated when a major encroachment into a TPZ is proposed. Root investigation may provide more information on the extent of these roots.”

Determining the SRZ

$SRZ \text{ radius} = (DRC \times 50) 0.42 \times 0.64$

Where

DRC = trunk diameter, in metres, measured above the root crown (DRC = Diameter Above Root Crown)

Note: The SRZ for trees with trunk diameters (DRC) less than 0.15 m will be 1.5 m (see Figure 1).

## 16.6 APPENDIX 6 – ISA TRAQ – INTERNATIONAL SOCIETY ARBORICULTURE TREE RISK ASSESSMENT QUALIFICATION

### Risk vs Hazard

In the past, arborists have often used the term *Hazard Risk Assessment* to describe the process of inspecting and evaluating the structural condition of a tree and the harm it could occur if it failed. The more accurate and appropriate term *Risk Assessment* is now becoming standard. A Hazard is a likely source of harm and in relation to trees it is the tree part that may fail. Risk is the combination of the likelihood of an event and the severity of the potential consequences. In assessing the likelihood there are many other factors to consider such as target type and occupancy rate, as well as the nature of the failure itself.

### Qualitative Risk assessment.

ISA TRAQ uses qualitative risk assessment. This is the process of using ratings of the likelihood and consequence of an event to determine the risk level and evaluate the level of risk against qualitative criteria. The term *likelihood* is used rather than *probability* because probability may imply quantitative odds. ISA TRAQ uses ratings combined in a matrix to categorise risk. This approach is a recognised and respected method of risk assessment used internationally by many governments and businesses.

### ISA TRAQ Risk Categorisation Details

In deriving an estimate of risk you must consider the targets, the likelihood of tree failure impacting a target and the consequence of the failure. In order to determine the likelihood of tree failure you must consider 2 factors.

1. Likelihood of tree failure occurring within a specified time frame.
2. Likelihood of failed part impacting the specified target.

Once we have determined these 2 factors we can then use the Likelihood matrix (see below) and the Risk Matrix (see below) to determine the risk category

### Likelihood of Tree Failure

The arborist uses expertise to determine significance of any defects, site conditions and response growth to determine likelihood of any failures. The matrix used to determine this is categorised using the following guidelines

**Improbable** – The tree or branch is not likely to fail during normal weather conditions and may not fail in many severe weather conditions within the specified time frame.

**Possible** – Failure could occur, but it is unlikely during normal weather conditions within the specified time frame.

**Probable** – Failure may be expected under normal weather conditions within the specified time frame.

**Imminent** – Failure has started or is most likely to occur in the near future, even if there is no significant wind or increased load. This is an infrequent occurrence for a risk assessor to encounter and may require immediate action to protect people.



### Likelihood of failed part impacting the specified target

Firstly we need to consider the occupancy rate of the specified target which could be a static target (i.e. buildings, powerlines) or a mobile target (i.e. people, vehicles).

**Constant Occupancy** – Target present at nearly all times, 24hrs a day, 7 days a week i.e. buildings, powerlines.

**Frequent Occupancy** – Target zone occupied for large portion of a day or week.

**Occasional Occupancy** – Target zone occupied by people or targets infrequently or irregularly.

**Rare Occupancy** – Target zone is not commonly used by people.

We then use these occupancy rates in combination with other site factors to determine the likelihood of the failed part impacting the target. The description of each categorisation used in the table is shown below.

**Very Low** – The likelihood of failed tree or part impacting the specified target is remote. This is the case in a rarely used site fully exposed to the assessed tree (rare occupancy, no protection) or an occasionally used site that is partially protected by trees or structures (occasional occupancy, moderate protection) e.g. rarely used trail or occasionally used area that is protected from failure by adjacent trees.

**Low** – It is not likely that the failed tree or part will impact the target. This is case in an occasionally used area that is fully exposed to the assessed tree, a frequently used area that is partially exposed to the assessed tree, or a constant target that is well protected from the assessed tree. e.g. little used service road next to assessed tree or frequent used public street protected by another tree between it and the assessed tree.

**Medium** – The failed tree or part is as likely to impact the target as not. This is the case in frequently used area that is fully exposed on one side to the assessed tree or a constantly occupied area that is partially protected from the assessed tree. e.g. suburban street next to assessed tree or a house that partially protected from assessed tree by an intervening tree.

**High** – The failed tree or part will most likely impact the target. This is the case when a fixed target is fully exposed to the likely failure (constant occupancy, no protection) or the likely failure is over a high-use road or walkway with an adjacent tree (frequent occupancy).



## Likelihood Matrix

After determining the likelihood of failure and the likelihood of impacting the target we can then categorise the possible tree failure into the likelihood matrix shown below.

LIKEIHOOD OF FAILURE	LIKEIHOOD OF IMPACTING TARGET			
	VERY LOW	LOW	MEDIUM	HIGH
IMMINENT	Unlikely	Somewhat likely	Likely	Very Likely
PROBABLE	Unlikely	Unlikely	Somewhat likely	Likely
POSSIBLE	Unlikely	Unlikely	Unlikely	Somewhat likely
IMPROBABLE	Unlikely	Unlikely	Unlikely	Unlikely

## Consequence of a failure

In order to determine the risk categorisation we next need to determine the consequence of a failure to the target. An explanation of these categories is shown below.

**Negligible** – Consequences involve low-value property damage or disruption that can be repaired or replaced: they do not involve personal injury e.g. branch striking a fence.

**Minor** – Consequences involve low to moderate property damage, small disruptions to traffic or a communications utility, or very minor injury e.g. temporary disruption traffic on neighbourhood street.

**Significant** – Consequences involve property damage of moderate to high value, considerable disruption, or personal injury e.g. medium sized part striking an unoccupied new vehicle from a high height.

**Severe** – Consequences involve serious injury or death, damage to high-value property, or disruption of important activities e.g. injury to a person that may result in hospitalisation.

## Risk Matrix

Now we can now finally categorise the overall risk of a whole tree failure or tree part failure by combining the result from the Likelihood matrix with that from the consequence of a failure categorisation shown above. The risk Matrix shown below is used to combine these 2 categories to provide a final risk assessment rating (Low, Moderate, High or Extreme).

LIKEIHOOD OF FAILURE & IMPACT	CONSEQUENCE OF FAILURE			
	NEGLIGIBLE	MINOR	SIGNIFICANT	SEVERE
VERY LIKELY	Low	Moderate	High	Extreme
LIKELY	Low	Moderate	High	High
SOMEWHAT LIKELY	Low	Low	Moderate	Moderate
UNLIKELY	Low	Low	Low	Low

## 13.7 GLOSSARY

From Dictionary for Managing Trees in Urban Environments  
Institute of Australian Consulting Arboriculturists (IACA) 2009.

### Age of Trees

**Age** Most trees have a stable biomass for the major proportion of their life. The estimation of the age of a tree is based on the knowledge of the expected lifespan of the taxa in situ divided into three distinct stages of measurable biomass, when the exact age of the tree from its date of cultivation or planting is unknown and can be categorized as Young, Mature and Over-mature (British Standards 1991, p. 13, Harris et al, 2004, p. 262).

**Young** Tree aged less than <20% of life expectancy, in situ. **Mature** Tree aged 20-80% of life expectancy, in situ.

**Over-mature** Tree aged greater than >80% of life expectancy, in situ, or senescent with or without reduced vigour, and declining gradually or rapidly but irreversibly to death.

### Condition of Trees

**Condition** A tree's crown form and growth habit, as modified by its environment (aspect, suppression by other trees, soils), the stability and viability of the root plate, trunk and structural branches (including structural defects such as wounds, cavities or hollows, crooked trunk or weak trunk/branch junctions and the effects of predation by pests and diseases. These may not be directly connected with vigour and it is possible for a tree to be of normal vigour but in poor condition. Condition can be categorized as Good Condition, Fair Condition, Poor Condition and Dead.

**Good Condition** Tree is of good habit, with crown form not severely restricted for space and light, physically free from the adverse effects of predation by pests and diseases, obvious instability or structural weaknesses, fungal, bacterial or insect infestation and is expected to continue to live in much the same condition as at the time of inspection provided conditions around it for its basic survival do not alter greatly. This may be independent from, or contributed to by vigour.

**Fair Condition** Tree is of good habit or misshapen, a form not severely restricted for space and light, has some physical indication of decline due to the early effects of predation by pests and diseases, fungal, bacterial, or insect infestation, or has suffered physical injury to itself that may be contributing to instability or structural weaknesses, or is faltering due to the modification of the environment essential for its basic survival. Such a tree may recover with remedial works where appropriate, or without intervention may stabilise or improve over time, or in response to the implementation of beneficial changes to its local environment. This may be independent from, or contributed to by vigour.

**Poor Condition** Tree is of good habit or misshapen, a form that may be severely restricted for space and light, exhibits symptoms of advanced and irreversible decline such as fungal, or bacterial infestation, major die-back in the branch and foliage crown, structural deterioration from insect damage e.g. termite infestation, or storm damage or lightning strike, ring barking from borer activity in the trunk, root damage or instability of the tree, or damage from physical wounding impacts or abrasion, or from altered local environmental conditions and has been unable to adapt to such changes and may decline further to death regardless of remedial works or other modifications to the local environment that would normally be sufficient to provide for its basic survival if in good to fair condition. Deterioration physically, often characterised by a gradual and continuous reduction in vigour but may be independent of a change in vigour, but characterised by a proportionate increase in susceptibility to, and predation by pests and diseases against which the tree cannot be sustained. Such conditions may also be evident in trees of advanced senescence due to normal phenological processes, without modifications to the growing environment or physical damage having been inflicted upon the tree. This may be independent from, or contributed to by vigour.

**Dead** Tree is no longer capable of performing any of the following processes or is exhibiting any of the following symptoms;

Processes

Photosynthesis via its foliage crown (as indicated by the presence of moist, green or other coloured leaves);

Osmosis (the ability of the root system to take up water);

Turgidity (the ability of the plant to sustain moisture pressure in its cells);

Epicormic shoots or epicormic strands in Eucalypts (the production of new shoots as a response to stress, generated from latent or adventitious buds or from a lignotuber);

Symptoms

Permanent leaf loss;

Permanent wilting (the loss of turgidity which is marked by desiccation of stems leaves and roots);

Abscission of the epidermis (bark desiccates and peels off to the beginning of the sapwood).

**Removed** No longer present, or tree not able to be located or having been cut down and retained on a site, or having been taken away from a site prior to site inspection.

**Deadwood**

**Deadwood** Dead branches within a tree's crown have been categorised into 3 categories for the purpose of this report:

**Nil** – There are no dead branches or they are less than 20mm in diameter so not significant.

**Minor** – Dead branches are 20-75mm in diameter.

**Major** – Dead branches are 75mm in diameter and above.

**Deadwooding** Removing of dead branches by pruning. Such pruning may assist in the prevention of the spread of decay from dieback or for reasons of safety near an identifiable target.

**Dieback**

**Dieback** The death of some areas of the crown. Symptoms are leaf drop, bare twigs, dead branches and tree death, respectively. This can be caused by root damage, root disease, bacterial or fungal canker, severe bark damage, intensive grazing by insects, abrupt changes in growth conditions, drought, water-logging or over-maturity. Dieback often implies reduced resistance, stress or decline which may be temporary. Dieback can be categorized as Low Volume Dieback, Medium Volume Dieback and High Volume Dieback.

**Low Volume Dieback** Where <10% of the crown cover has died. See also Dieback, High Volume Dieback and Medium Volume Dieback.

**Medium Volume Dieback** Where 10-50% of the crown cover has died.

**High Volume Dieback** Where >50% of the crown cover has died.

**Form of Trees**

**Crown Form** The shape of the crown of a tree as influenced by the availability or restriction of space and light, or other contributing factors within its growing environment. Crown Form may be determined for tree shape and habit generally as Dominant, Codominant, Intermediate, Emergent, Forest and Suppressed. The habit and shape of a crown may also be considered qualitatively and can be categorized as Good Form or Poor Form.

**Good Form** Tree of typical crown shape and habit with proportions representative of the taxa considering constraints such as origin e.g. indigenous or exotic, but does not appear to have been adversely influenced in its development by environmental factors in situ such as soil water availability, prevailing wind, or cultural practices such as lopping and competition for space and light.

**Poor Form** Tree of atypical crown shape and habit with proportions not representative of the species considering constraints and appears to have been adversely influenced in its development by environmental factors in situ such as soil water availability, prevailing wind, cultural practices such as lopping and competition for space and light; causing it to be misshapen or disfigured by disease or vandalism.

**Crown Form Codominant** Crowns of trees restricted for space and light on one or more sides and receiving light primarily from above e.g. constrained by another tree/s or a building.

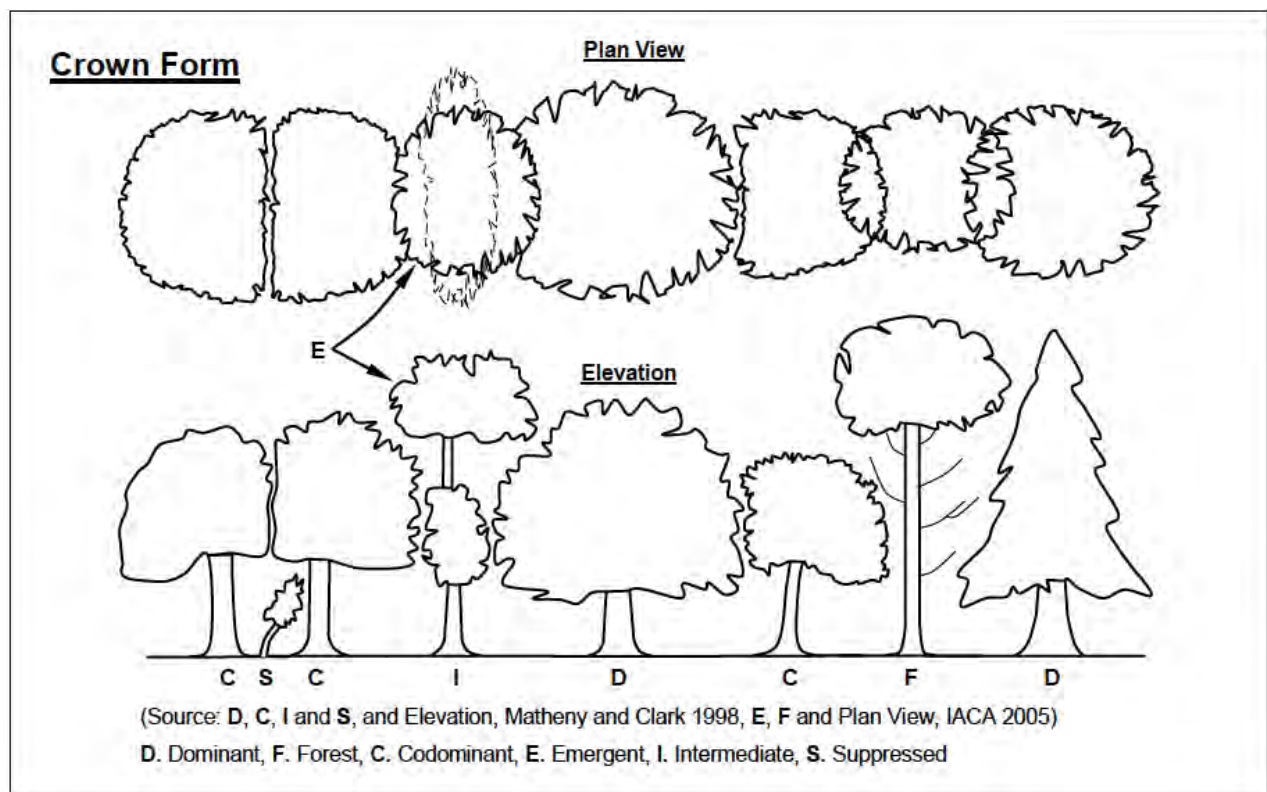
**Crown Form Dominant** Crowns of trees generally not restricted for space and light receiving light from above and all sides.

**Crown Form Emergent** Crowns of trees restricted for space on most sides receiving most light from above until the upper crown grows to protrude above the canopy in a stand or forest environment. Such trees may be crown form dominant or transitional from crown form intermediate to crown form forest asserting both apical dominance and axillary dominance once free of constraints for space and light.

**Crown Form Forest** Crowns of trees restricted for space and light except from above forming tall trees with narrow spreading crowns with foliage restricted generally to the top of the tree. The trunk is usually erect, straight and continuous, tapering gradually, crown often excurrent, with first order branches becoming structural, supporting the live crown concentrated towards the top of the tree, and below this point other first order branches arising radially with each inferior and usually temporary, divergent and ranging from horizontal to ascending, often with internodes exaggerated due to competition for space and light in the lower crown.

**Crown Form Intermediate** Crowns of trees restricted for space on most sides with light primarily from above and on some sides only.

**Crown Form Suppressed** Crowns of trees generally not restricted for space but restricted for light by being overtopped by other trees and occupying an understorey position in the canopy and growing slowly.



**Symmetry** Balance within a crown, or root plate, above or below the axis of the trunk of branch and foliage, and root distribution respectively and can be categorized as Asymmetrical and Symmetrical.

**Asymmetrical** Imbalance within a crown, where there is an uneven distribution of branches and the foliage crown or root plate around the vertical axis of the trunk. This may be due to Crown Form Codominant or Crown Form Suppressed as a result of natural restrictions e.g. from buildings, or from competition for space and light with other trees, or from exposure to wind, or artificially caused by pruning for clearance of roads, buildings or power lines. An example of an expression of this may be, crown asymmetrical, bias to west.

**Symmetrical** Balance within a crown, where there is an even distribution of branches and the foliage crown around the vertical axis of the trunk. This usually applies to trees of Crown Form Dominant or Crown Form Forest. An example of an expression of this may be crown symmetrical.

**Crown Spread Orientation** Direction of the axis of crown spread which can be categorized as Orientation Radial and Orientation Non-radial.

**Crown Spread Orientation Non-radial** Where the crown extent is longer than it is wide, e.g. east/west or E/W. Further examples, north/south or N/S, and may be Crown Form Codominant, e.g. **A** or **B**, Crown Form Intermediate e.g. **A**, or Crown Form Suppressed e.g. **B**, and crown symmetry is symmetrical e.g. **A**, or asymmetrical e.g. **B**.

**Crown Spread Orientation Radial** Where the crown spread is generally an even distance in all directions from the trunk and often where a tree has Crown Form Dominant and is symmetrical.

**Crown Projection (CP)** Area within the dripline or beneath the lateral extent of the crown (Geiger 2004, p. 2). See also Crown spread and Dripline.

**Dripline** A line formed around the edge of a tree by the lateral extent of the crown. Such a line may be evident on the ground with some trees when exposed soil is displaced by rain shed from the crown. See also Crown Projection.

**Epicormic Shoots** Juvenile shoots produced at branches or trunk from epicormic strands in some Eucalypts (Burrows 2002, pp. 111-131) or sprouts produced from dormant or latent buds concealed beneath the bark in some trees. Production can be triggered by fire, pruning, wounding, or root damage but may also be as a result of stress or decline. Epicormic shoots can be categorized as Low Volume Epicormic Shoots, Medium Volume Epicormic Shoots and High Volume Epicormic Shoots.

- **Low Volume Epicormic Shoots** Where <10% of the crown cover is comprised of live epicormic shoots.
- **Medium Volume Epicormic Shoots** Where 10-50% of the crown cover is comprised of live epicormic shoots.
- **High Volume Epicormic Shoots** Where >50% of the crown cover is comprised of live epicormic shoots.

**Trunk** A single stem extending from the root crown to support or elevate the crown, terminating where it divides into separate stems forming first order branches. A trunk may be evident at or near ground or be absent in acaulescent trees of deliquescent habit, or may be continuous in trees of excurrent habit. The trunk of any caulescent tree can be divided vertically into three (3) sections and can be categorized as Lower Trunk, Mid Trunk and Upper Trunk. For a leaning tree these may be divided evenly into sections of one third along the trunk.

- **Acaulescent** A trunkless tree or tree growth forming a very short trunk. See also Caulescent.
- **Caulescent** Tree grows to form a trunk. See also Acaulescent

## Leaning Trees



**Leaning** A tree where the trunk grows or moves away from upright. A lean may occur anywhere along the trunk influenced by a number of contributing factors e.g. genetically predetermined characteristics, competition for space or light, prevailing winds, aspect, slope, or other factors. A leaning tree may maintain a static lean or display an increasingly progressive lean over time and may be hazardous and prone to failure and collapse. The degrees of leaning can be categorised as Slightly leaning, Moderately Leaning, Severely leaning and Critically leaning.

**Slightly Leaning** – A leaning tree where the trunk is growing at an angle within 0-15 degrees from upright.

**Moderately leaning** - A leaning tree where the trunk is growing at an angle within 15-30 degrees from upright.

**Severely Leaning** - A leaning tree where the trunk is growing at an angle within 30-45 degrees from upright.

**Critically leaning** - A leaning tree where the trunk is growing at an angle greater than 45 degrees from upright.

**Progressively Leaning** – A tree where the degree of leaning appears to increase over time

**Static Leaning** A leaning tree whose lean appears to have stabilized over time.

## **Roots**

**First Order Roots (FOR)** Initial woody roots arising from the root crown at the base of the trunk, or as an adventitious root mass for structural support and stability. Woody roots may be buttressed and divided as a marked gradation, gradually tapering and continuous or tapering rapidly at a short distance from the root crown. Depending on soil type these roots may descend initially and not be evident at the root crown, or become buried by changes in soil levels. Trees may develop 4-11 (Perry 1982, pp. 197-221), or more first order roots which may radiate from the trunk with a relatively even distribution, or be prominent on a particular aspect, dependent upon physical characteristics e.g. leaning trunk, asymmetrical crown; and constraints within the growing environment from topography e.g. slope, soil depth, rocky outcrops, exposure to predominant wind, soil moisture, depth of water table etc.

**Orders of Roots** The marked divisions between woody roots, commencing at the initial division from the base of the trunk, at the root crown where successive branching is generally characterised by a gradual reduction in root diameters and each gradation from the trunk and can be categorized numerically, e.g. first order roots, second order roots, third order roots etc. Roots may not always be evident at the root crown and this may be dependent on species, age class and the growing environment. Palms at maturity may form an adventitious root mass.

**Root Plate** The entire root system of a tree generally occupying the top 300-600mm of soil including roots at or above ground and may extend laterally for distances exceeding twice the height of the tree (Perry 1982, pp. 197-221). Development and extent is dependent on water availability, soil type, soil depth and the physical characteristics of the surrounding landscape.

**Root Crown** Roots arising at the base of a trunk.

**Zone of Rapid Taper** The area in the root plate where the diameter of structural roots reduces substantially over a short distance from the trunk. Considered to be the minimum radial distance to provide structural support and root plate stability. See also Structural Root Zone (SRZ).

**Structural Roots** Roots supporting the infrastructure of the root plate providing strength and stability to the tree. Such roots may taper rapidly at short distances from the root crown or become large and woody as with gymnosperms and dicotyledonous angiosperms and are usually 1<sup>st</sup> and 2<sup>nd</sup> order roots, or form an adventitious root mass in monocotyledonous angiosperms (palms). Such roots may be crossed and grafted and are usually contained within the area of crown projection or extend just beyond the dripline.

## **Significance**

**Significant Tree** A tree considered important, weighty or more than ordinary. Example: due to prominence of location, or in situ, or contribution as a component of the overall landscape for amenity or aesthetic qualities, or curtilage to structures, or importance due to uniqueness of taxa for species, subspecies, variety, crown form, or as an historical or cultural planting, or for age, or substantial dimensions, or habit, or as remnant vegetation, or habitat potential, or a rare or threatened species, or uncommon in cultivation, or of aboriginal cultural importance, or is a commemorative planting.

**Sustainable Retention Index Value (SRIV)** - A visual tree assessment method to determine a qualitative and numerical rating for the viability of urban trees for development sites and management purposes, based on general tree and landscape assessment criteria using classes of age, condition and vigour. SRIV is for the professional manager of urban trees to consider the tree in situ with an assumed knowledge of the taxon and its growing environment. It is based on the physical attributes of the tree and its response to its environment considering its position in a matrix for age class, vigour class, condition class and its sustainable retention with regard to the safety of people or damage to property. This also factors the ability to retain the tree with remedial work or beneficial modifications to its growing environment or removal and replacement. SRIV is supplementary to the decision made by a tree management professional as to whether a tree is retained or removed (IACA - Institute of Australian Consulting Arboriculturists 2005).

## **Vigour**

**Vigour** - Ability of a tree to sustain its life processes. This is independent of the condition of a tree but may impact upon it. Vigour can appear to alter rapidly with change of seasons (seasonality) e.g. dormant, deciduous or semi-deciduous trees. Vigour can be categorized as Normal Vigour, High Vigour, Low Vigour and Dormant Tree Vigour.

**Good Vigour** Ability of a tree to maintain and sustain its life processes. This may be evident by the typical growth of leaves, crown cover and crown density, branches, roots and trunk and resistance to predation. This is independent of the condition of a tree but may impact upon it, and especially the ability of a tree to sustain itself against predation.

**High Vigour** Accelerated growth of a tree due to incidental or deliberate artificial changes to its growing environment that are seemingly beneficial, but may result in premature aging or failure if the favourable conditions cease, or promote prolonged senescence if the favourable conditions remain, e.g. water from a leaking pipe; water and nutrients from a leaking or disrupted sewer pipe; nutrients from animal waste, a tree growing next to a chicken coop, or a stock feed lot, or a regularly used stockyard; a tree subject to a stringent watering and fertilising program; or some trees may achieve an extended lifespan from continuous pollarding practices over the life of the tree.

**Low Vigour** Reduced ability of a tree to sustain its life processes. This may be evident by the atypical growth of leaves, reduced crown cover and reduced crown density, branches, roots and trunk, and a deterioration of their functions with reduced resistance to predation. This is independent of the condition of a tree but may impact upon it, and especially the ability of a tree to sustain itself against predation.

**Dormant Tree Vigour** Determined by existing turgidity in lowest order branches in the outer extremity of the crown, with good bud set and formation, and where the last extension growth is distinct from those most recently preceding it, evident by bud scale scars. Normal vigour during dormancy is achieved when such growth is evident on a majority of branches throughout the crown.



# STAGE 1

## Scope Summary:

Master-planning, elevate sporting fields, interim C.O.L.As in lieu of senior learning and sports science, new sports hall (and associated change rooms, foyer and plant room) and grandstand to new fields

LOOKOUT AT LEVEL 3 LIFT LANDING

LEVEL 2 - GLASS WALL TO HALL

PORTION OF LEVEL 2 SLAB ABOVE FOYER AND CHANGEROOMS.

TEMPORARY HOARDING WALL TO PORTION OF LEVEL 2 SLAB

SPORTS HALL - FULL FITOUT (WALL AND CEILING LININGS, SPORTS FLOORING, SPORTS EQUIPMENT, ETC)

TEMPORARY HOARDING WALL

COLA - WEST (COLD SHELL ONLY)

METAL SHED TO BE DEMOLISHED

EXTERNAL LIFT & STAIRS CONNECTING ALL 3 LEVELS

NEW BASIC FACADE TO EXPOSED WALL OF MUSIC BUILDING AND NEW CONNECTION TO COURTYARD

NEW STAIRS TO ACCESS EXISTING TENNIS COURTS

GRANDSTAND & SHADING STUCTURE

VEHICLE RAMP TO SPORTS FIELD

MULTI-SPORTS FIELD AND PERIMETER FENCING

CEILING AND SERVICES TO SPORTS HALL

PLANT ROOM AND STORE (INCLUDING TEMPORARY WALL TO COLA)

LIFT & STAIRS FROM LEVEL 2 TO SPORTS FIELD

COLA - EAST (COLD SHELL ONLY)

STORMWATER PIPE & EASEMENT REALIGNMENT

PV ARRAY ON EXISTING ROOF



# STAGE 2A

**Scope Summary:**  
Construction of two storey senior learning and "Lite SHINE" block

DEMOLITION OF TEMPORARY  
HOARDING WALLS AT LEVEL 2

GLASS FACADE TO PERIMETER

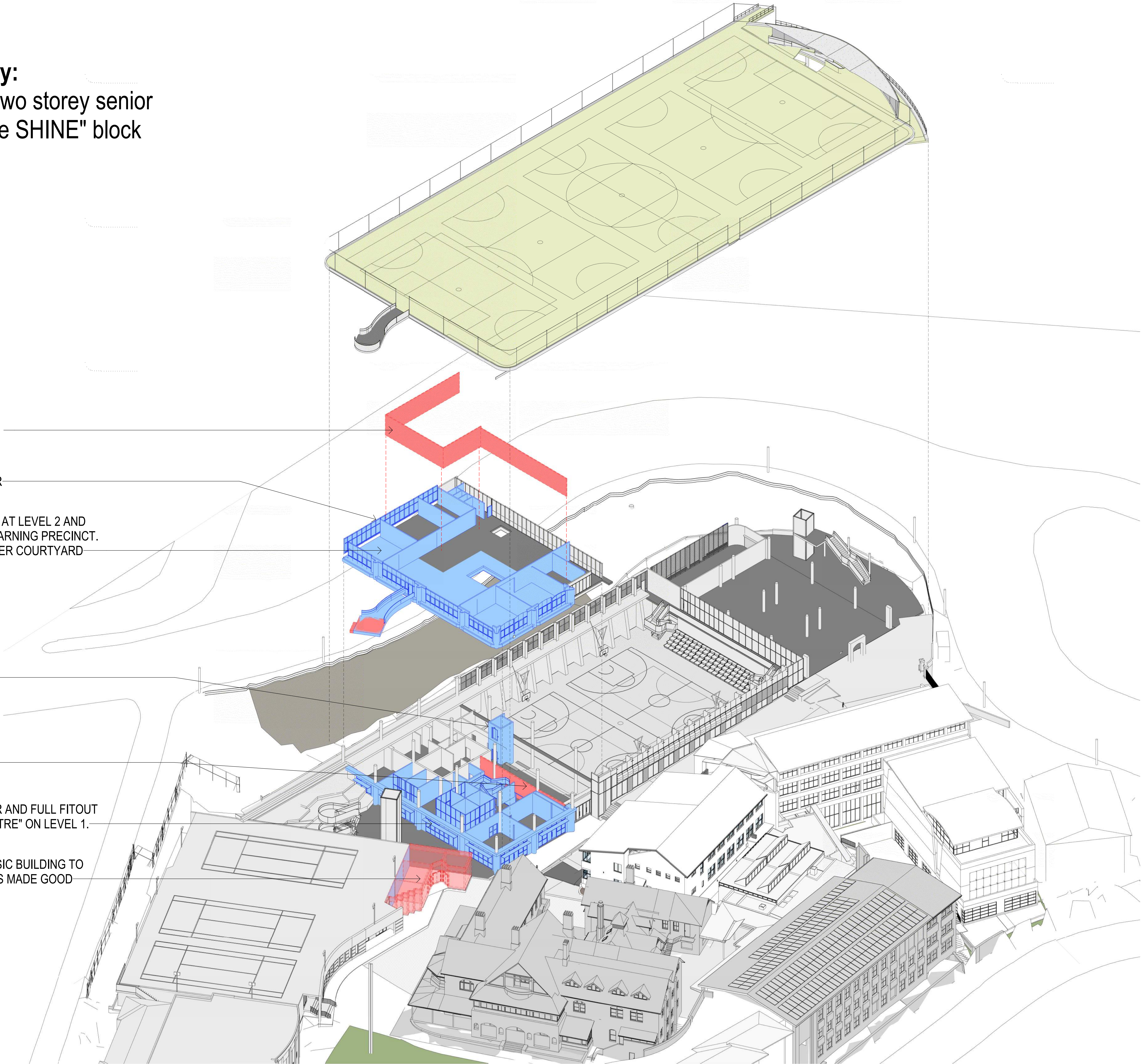
CONSTRUCTION OF NEW SLAB AT LEVEL 2 AND  
FULL FITOUT OF L2 SENIOR LEARNING PRECINCT.  
INCLUDES LEVEL 2 BRIDGE OVER COURTYARD

LIFT

DEMOLITION OF TEMPORARY  
HOARDING WALLS AT LEVEL 1

GLASS FACADE TO PERIMETER AND FULL FITOUT  
OF GLAs AND "LITE SHINE CENTRE" ON LEVEL 1.

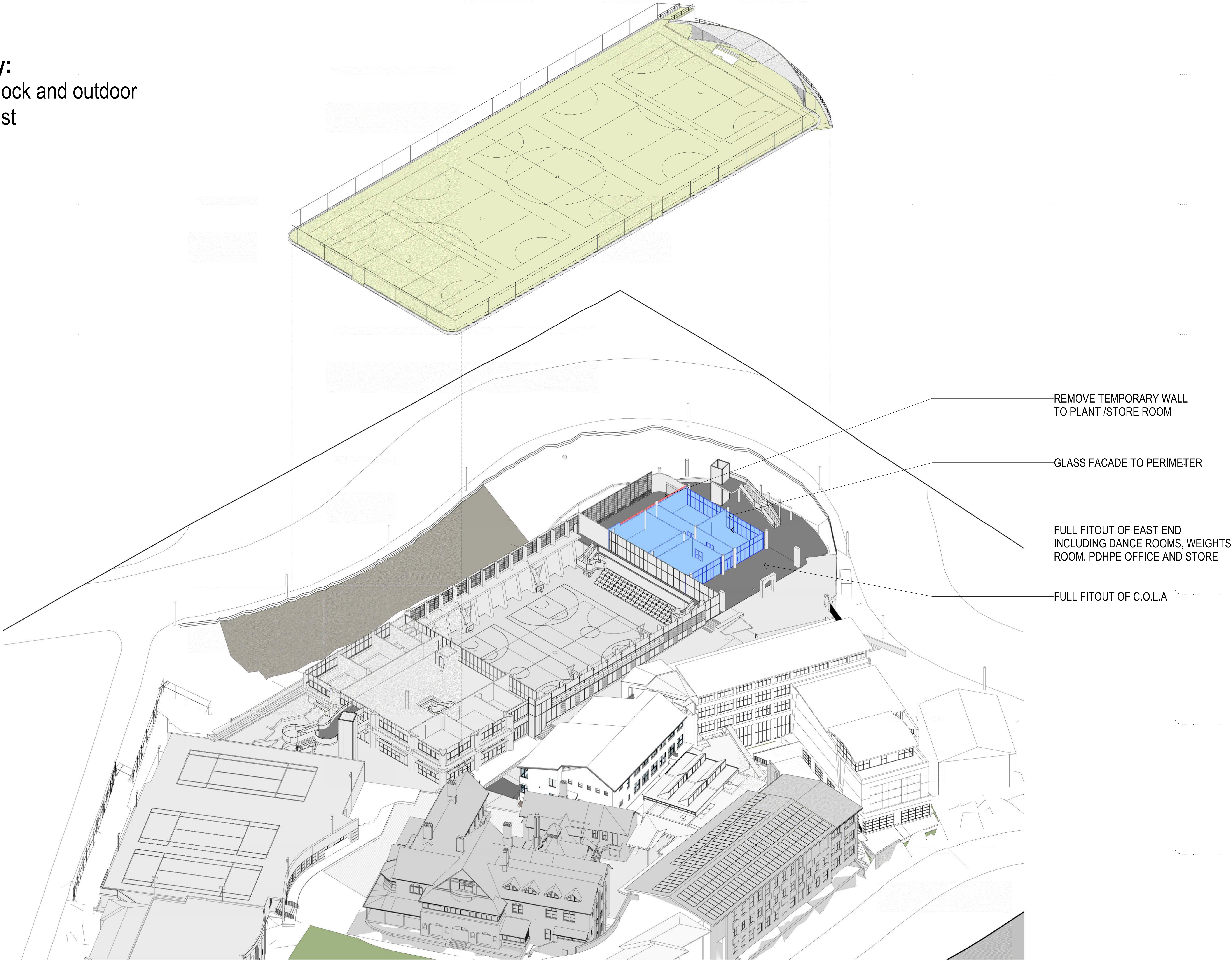
SOUTH- EAST CORNER OF MUSIC BUILDING TO  
BE DEMOLISHED AND FACADES MADE GOOD





STAGE 2B

Scope Summary:  
Sports science block and outdoor  
PDHPE to the east





# STAGE 2C

## Scope Summary:

Partial demolition of Hawthorne, new replacement facade and work to 'make good', landscaping to forecourt and all along main spine



PARTIAL DEMOLITION OF HAWTHORNE, NEW FAÇADE, NEW LANDSCAPE TO HAWTHORNE FOOTPRINT

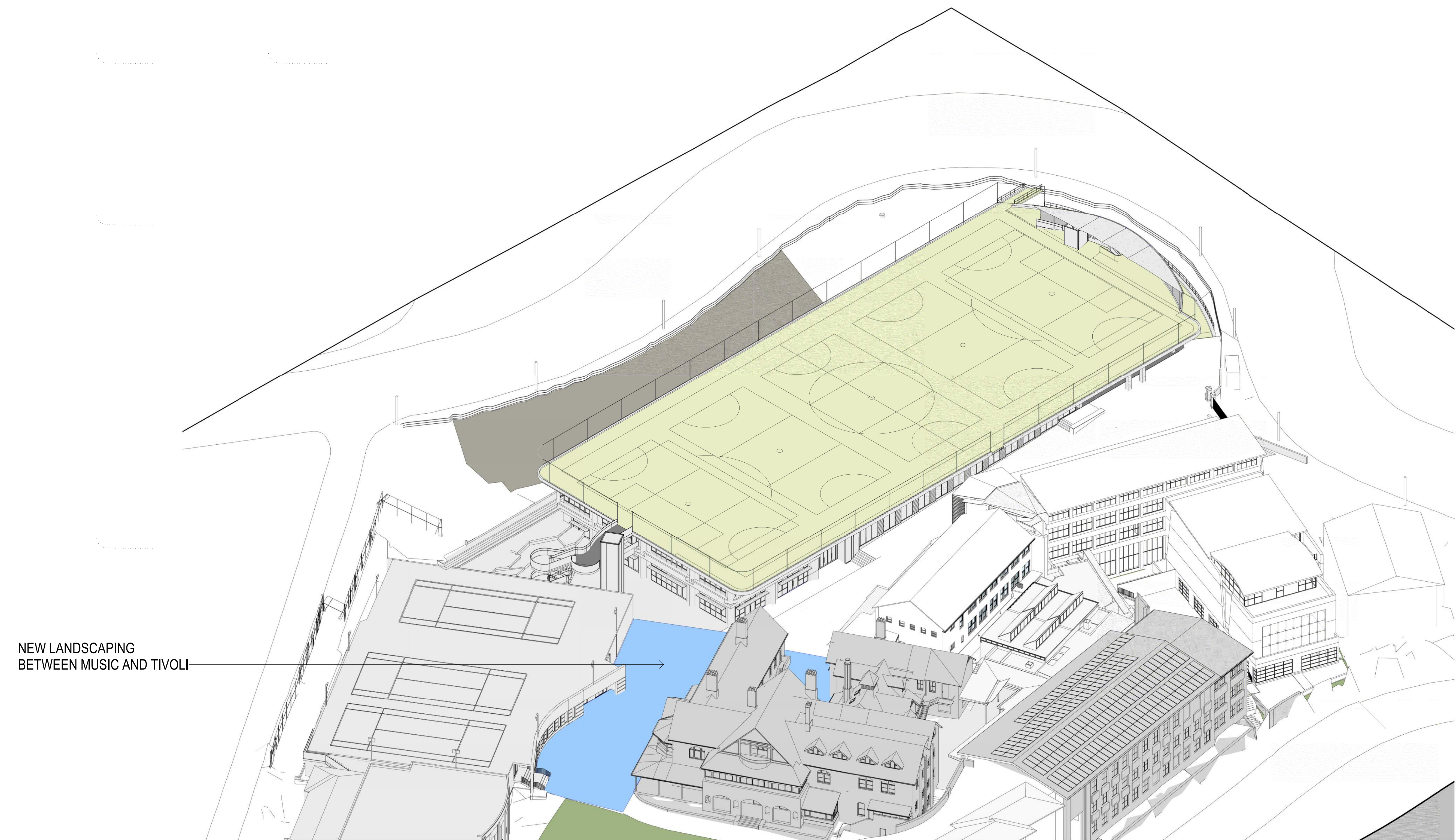
ORIGINAL PITCH AND EXTENT OF HAWTHORNE ROOF TO BE REINSTATED

LANDSCAPE TO FORECOURT AND ALL ALONG MAIN SPINE



STAGE 2D

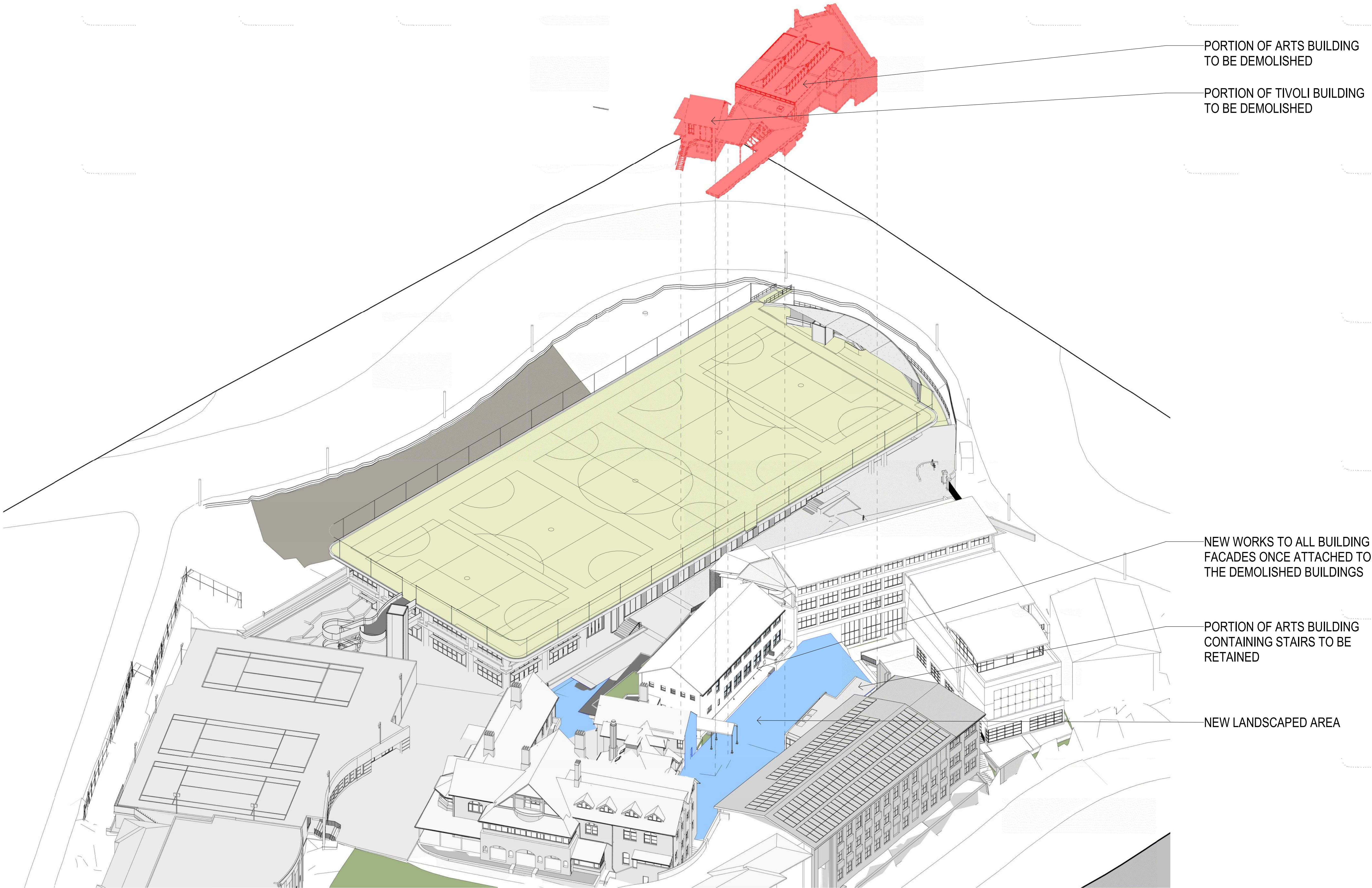
Scope Summary:  
Landscaping adjacent to music building





# STAGE 3

Scope Summary:  
Demolition of Art building & new courtyard





# STAGE 4

## Scope Summary:

Additions above existing music building including SHINE and KITE centre (and associated structural alterations to existing building), and upgrade of adjacent landscaping

