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Dear Greg

UTS CENTRAL PRECINCT- Section 96 Application S96(1A)
Structural Statement

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AECOM Australia Pty Ltd has been appointed by the University of Technology, Sydney (UTS) to carry out Structural Engineering design for the proposed UTS Central project.

This Structural Statement outlines the proposed structural works associated with the proposed UTS Central project and has been prepared for UTS to assist in the project S96(1A) Application.

1.0 Introduction

On 23 September 2016, the NSW Department of Planning and Environment granted development consent for State Significant Development 7382 for the University of Technology Sydney (UTS) Central Precinct. The consent was granted for the construction and use of an education building, including:

- site preparation works, including demolition of existing Building 2 to ground level and associated tree removal;
- construction of a new 15 storey Building 2, including a part five storey podium and one level of plant, above an existing two level basement;
- construction of a four storey extension of podium of Building 1 along Broadway;
- public domain improvement works;
- landscaping works;
- staged construction of the two buildings; and
- extension and augmentation of physical infrastructure/utilities.

UTS are now seeking to submit a Section 96 (1A) application to modify the above consent (SSD_7382). The application seeks approval for the following:

- adjustment of the Broadway and Jones Street façade;
- adjustment of the Jones Street entry near Broadway;
- provision of a pedestrian awning and activated space on the Broadway frontage;
- relocation of the collaborative learning theatres;
- adjustment and increase in the number of skylights;
- provision of laboratory exhaust flues on the roof of the Level 17 Plantroom;
- addition of Superlab on Level 1;
- adjustment to open roof terrace extent;

- adjustment of the level of the podium roof slab (Level 8 Terrace) on the Broadway frontage;
- reconfiguration of vertical circulation; and
- landscape adjustments including removal of a tree on public land (Jones Street).

The Broadway Precinct of the UTS City Campus is located entirely within the Sydney Local Government Area on the southern edge of the Sydney Central Business District.

The Broadway Precinct of the UTS City Campus has frontages to Broadway, Thomas, Wattle and Harris Streets, and the Ultimo Pedestrian Network. Jones Street and Harris Street intersect the precinct. It is less than 700 metres from Central Railway Station.

The UTS City Campus occupies approximately 42,000m^2 of land within the Ultimo Cultural and Education Precinct (UCEP) which includes, among others, the Sydney Institute of TAFE, the Powerhouse Museum and the ABC.

As shown in **Figure 1**, the subject site is referred to as UTS Central and consists of:

- UTS Building 1 (CB01) – Podium Extension.
- UTS Building 2 (CB02) – Building site of former Faculty of Engineering and Information Technology.

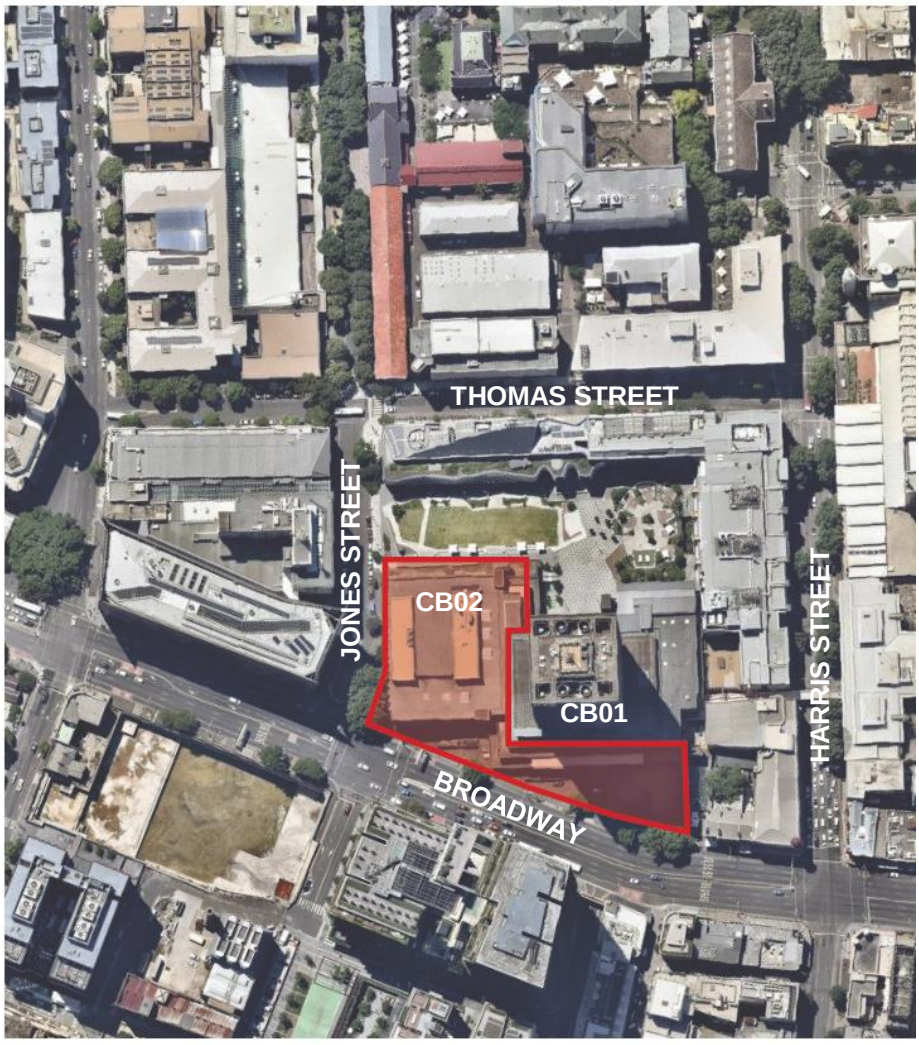

Figure 1 – Subject site (shown in red)
Source: FJMT Architects

2.0 Structure

Structurally, the project broadly consists of the demolition of the existing CB02 building from Level 03 to Roof (plus some areas of Levels 01 to 03), to allow construction of new podium and tower levels above, which are proposed to extend to Level 17. The proposed new levels will be podium levels up to Level 08 and tower levels from Level 09 to Level 17. The form of the tower levels above Level 08 rotates and steps away from Broadway resulting in a reduced floor plate area as the tower rises.

An assessment of the existing structure and foundations has been undertaken to determine their capacity to carry additional loads and to determine the extent of strengthening required to support the proposed new structure above.

2.1 Existing CB02 Building

The existing CB02 building was designed and constructed circa 1972 to 1978 and we are in receipt of copies of the original design drawings prepared by Messrs Bond, James, Laron & Reid and Messrs Wargon Chapman & Associates Pty Ltd.

The existing building has three basements, Levels L01, L02 and L03 (a partial basement due to the change in levels across the site) and five podium levels, Level 04 through Level 08, which forms the Roof Level.

The structural arrangement of the existing building typically comprises:

- Slabs on grade at Level 01, with suspended slabs in local areas over services typically
- Suspended Levels 02 to Level 07 are one-way reinforced concrete slabs and beams typically
- Roof Level includes precast pre-tensioned T-beams, spanning over the atrium space
- Vertical loads are supported on reinforced concrete columns and reinforced concrete lift and stair cores
- Footings are reinforced concrete pad footings typically, founded on rock
- Stability of the structure is provided by a combination of the existing reinforced concrete stair and lift cores; a number of reinforced concrete blade walls and by frame action. Lateral loads from wind and earthquake are transferred through shear and bending in the core, frame and blade walls
- Non-structural walls comprise a mixture of non-load bearing masonry and lightweight partitions

2.2 Structural Investigations

Initial Structural investigations have been carried out to assess the capacity of existing columns and footings.

Column concrete strength testing works included ultrasonic pulse velocity (UPV) and core sampling and testing on a number of columns within Levels 01 to 03 generally, with testing limited to levels where elements are proposed to be retained and support additional loading due to the building's expansion above. The concrete testing report provides representative concrete strengths for each concrete grade tested.

Geotechnical and footing investigations have been undertaken and included nine boreholes and nine test pits of representative footings. Test results provide dimensions and concrete strength of each footing tested and representative foundation design parameters.

Further investigations and testing will be carried out during later stages of the project, to confirm capacity of specific elements where required.

2.3 Demolition Works

Demolition of the CB02 building existing Level 04 to Roof Level has commenced on site. Details of the demolition works have been developed by the Builder's Temporary Works Engineer (TWE). The Builder and the TWE have proposed the construction sequence and carried out assessments of temporary works, temporary stability, sequence of works, safety, preparation of Safe Work Method Statements, etc.

Additional studies of the building access and evacuation (open doors, waste handling, stairs and emergency exits); and serviceability (vibrations issues) shall be considered by the Builder in areas where the buildings is due to maintain operational during demolition.

2.4 Design Parameters

In accordance with the Building Code of Australia (BCA), the Design Life of the building is proposed to be 50 years and a Building Importance Level of 3 is nominated, to allow for auditorium areas required to accommodate large numbers of people and to suit the proposed building population.

The proposed design loads have been assessed in accordance with AS1170 Structural Design Actions and UTS requirements. Typical loading includes dead loads (total weight of all structural components), superimposed dead load of 1.5kPa to 2.0 kPa generally (finishes and self-weight of permanent and movable partitions) and a live load allowance of 5kPa generally to provide flexibility for UTS within the proposed new facilities. Lateral loads from wind and earthquake actions have been assessed based on AS1170.2 and AS1170.4 respectively.

2.5 Proposed Structural Arrangement

Building CB02 extension will comprise the reuse and strengthening (where required) of the existing structure on Levels 01, 02 and 03; and the construction of new structure for the additional levels from Level 04 to Level 17.

The proposed new structure typically consists of one way post-tensioned slabs, supported by post-tensioned band-beams, supported on reinforced concrete columns and walls. The building stability for lateral loads will be provided by the reinforced concrete walls of the main central core.

The form of the tower above Level 08 rotates and steps away from Broadway, resulting in different floor plate plan extents at each level and reduced overall areas as the tower rises.

Broadly, the structural approach to resolve the proposed architectural form is to employ vertical columns in internal areas; raking columns around the perimeter where possible to follow the changing slab outlines; and cantilever beams supported on vertical internal columns to accommodate the changing slab layout where necessary e.g. where raking columns on the perimeter are not feasible.

The raking columns induce lateral forces on the structure that will be transmitted through the floor as diaphragm forces and ultimately, resisted by the reinforced concrete core. These lateral forces will generate lateral displacements of the building under gravity loads and we have carried out analyses to understand the predicted short and long-term building movements. Our calculations have shown that the structural core walls will be adequate to resist the actions induced by the raking columns and to control lateral movements. The new core extends through the existing levels to found on rock below the existing Level 01 structure and it is stable without the need for any supplementary anchoring.

A number of solutions for the support of the new columns above L03 have been employed, dependent upon the specific location and loading of new columns and their layout relative to the existing structure, including:

- Introduction of new columns and footings by penetrating new columns through existing levels to the foundation;
- Align new columns with existing columns and support directly onto existing columns and strengthen existing columns where required;
- Build new transfer structure spanning between existing columns to support the new structure above and strengthen existing columns where required.

A detailed assessment of each existing column supporting new structure over has been carried out to determine if strengthening is required. A number of columns require strengthening and a steelwork strengthening solution has been adopted to augment the existing capacity.

Results of the geotechnical investigations indicate that the allowable bearing capacity of the founding material (high strength Class I rock generally) is significantly higher than the allowable capacity assumed in the original design. Assessment of the existing footings has shown that the existing footings do not require strengthening for the proposed loads.

2.6 Conclusions

Investigations of the existing structure have been carried out and calculations have been prepared to assess the capacity of the existing structure. We have identified a number of existing columns that require strengthening and have designed steel strengthening to support the proposed loads.

We have carried out structural modelling, analysis and design and provided structural design information to the Architect for inclusion in their S96(1A) scheme, including sizing and layout of all structural elements such as columns, walls, slabs and beams.

The proposed structural arrangement is feasible and will comply with relevant sections of the BCA and relevant Australian Standards. The information and practices/ standards noted above have formed the basis of the structural design which has been incorporated into the final design by FJMT.

Yours faithfully,

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