

07.09.2020

Ref: SY200476-SR01-3

The General Manager
Bayside Council
PO Box 21
Rockdale NSW 2216

Dear Patrick Nash,

Re: Carmela & Vito Apartments - Structural Report
23-25 Church Avenue and 16-18 John Street, Mascot.

Northrop Engineers have been engaged by Da Vito Ferro Apartments to provide preliminary structural advice regarding the basement design and construction for the above project. This letter aims to summarise the proposed development, identify project risks and propose risk mitigation measures.

1. Project Description

The proposed project encompasses 23-25 Church Avenue and 16-18 John Street, creating a through-block with a public pedestrian accessway at ground level. The development consists of a three-to-four storey basement car park, a two-storey mixed-use podium and two 13-storey residential towers. An existing industrial warehouse will also be incorporated into the podium level.

Structural Summary

The proposed development will likely consist of post-tensioned concrete floor plates with reinforced concrete columns and core walls. Precast concrete walls will be used adjacent to the northern boundary. The main building transfer will occur on level 2 and will be approximately 600-800mm thick. The structure is proposed to be founded in rock, using deep foundation piles. The basement will be constructed using a shoring wall socketed into rock to provide a permanent cut-off for water ingress. This is discussed further in Section 2.

Geotechnical Summary

The site is underlain by the following subsurface layers:

Material	Depth from surface to top of layer (m)
Fill	0
Sand	0.9-1.4
Interbedded sand and clay	9.5-11.3
Residual clay	14.6-15.3
Shale (Class V)	17-20
Shale (Class IV – III)	27

Groundwater is expected to be encountered at depths between 1.7m-4.8m below existing ground level.

Adjacent Sites and Known Issues

The site is bounded by John Street to the south, Church Avenue to the north and residential developments to the east and west. Both developments have basements that are directly adjacent to the proposed basement at 23-25 Church Avenue, as shown below.

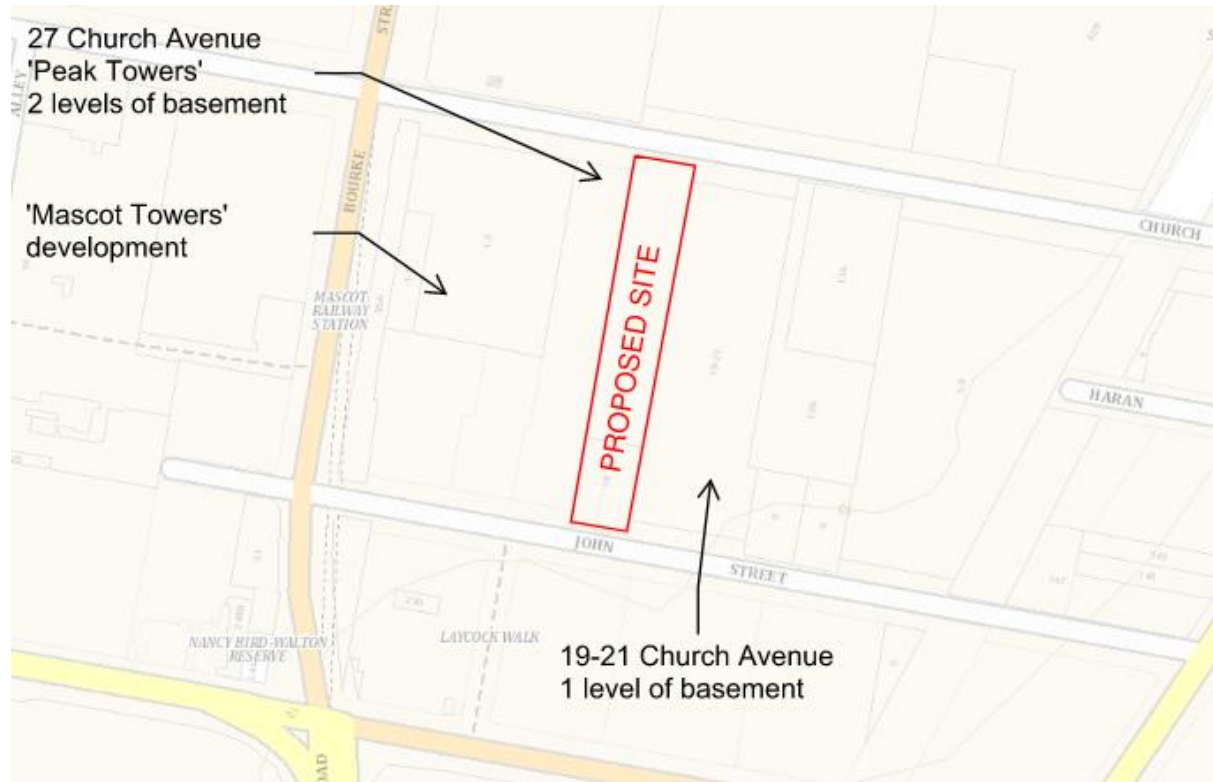


Figure 1: Adjacent Sites

Peak Towers is currently the subject of legal action from residents of Mascot Towers, its western neighbour. It is alleged that the excavation and related dewatering of the basement at Peak Towers has caused cracking in the basement of Mascot Towers. We acknowledge that this recent issue has caused concern in the community regarding excavation and water management for future construction projects in the local area.

2. Proposed Basement Construction

The proposed shoring wall system is a Cutter Soil Mix (CSM) wall, which is a 600-800mm wide concrete wall constructed in panels and reinforced with structural steel posts. It uses the existing soil combined with cement to produce a watertight wall. Compared to more traditional piled wall systems, its key advantage is that it can build walls to a high degree of accuracy and therefore low likelihood of any voids between panels.



Figure 2: Peak Towers basement construction

We note that the Peak Towers basement uses a secant piled wall, which relies on an interlock of piles to prevent water ingress. From the photo above taken during construction, it is apparent that there are many piles installed out of alignment.

Following the installation of the CSM wall, it is proposed to construct the basement using a 'top down' approach, where ground floor is constructed prior to excavation, with voids left out for removal of excavated material. This provides a restraint to the top of the wall, limiting movement of the wall, while the first basement level is excavated. B1 slab is subsequently installed before excavating to B2. This staged approach provides regular support to the shoring wall as well as removing the need for anchors through the walls.

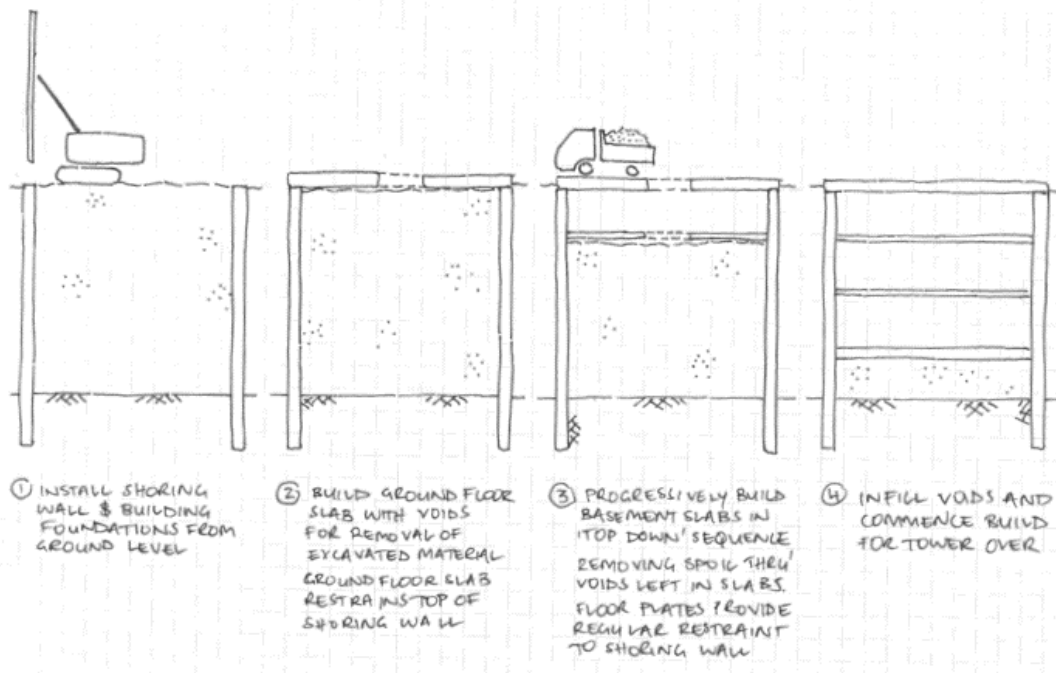


Figure 3: Top down construction sequence

3. Project Risks

Dewatering and Subsequent Ground Water Draw-down

As the water table is relatively high, the site must be dewatered to allow for construction of the basement. The basement must be tanked to prevent any water ingress in the permanent state.

Risk: lowering the water table of the surrounding area can lead to ground settlement, and subsequent settlement of any buildings founded in the affected substrate

Recommended mitigation measures:

- The shoring wall must be designed to provide an effective 'cut-off' and the base socketed into rock to minimise water ingress into the site during construction. A CSM wall is recommended as the most appropriate system for mitigating water ingress through the wall. If properly constructed, the risk of water table draw down and subsequent settlement would be neglectable.
- Dewatering to commence only after all four sides of the shoring wall have been installed, and logs reviewed by the project structural and geotechnical engineers. If designed and installed correctly, the wall will prevent water ingress from adjacent sites and ensure impact to local water table is minimal
- Geotechnical engineer to locate current ground water levels and monitor these levels before and during construction. Geotechnical engineer to provide guidance on acceptable changes in water levels and 'stop work' points for the contractor
- Geotechnical engineer to undertake site investigations including a minimum of 6 bore holes across the site to identify any variances in the subsoil profile, and provide advice regarding the appropriate rock layer to socket the proposed shoring wall into. This advice should include bearing capacities as well as permeability and likely rate of water ingress
- Developer to undertake dilapidation inspections of neighbouring buildings prior to works commencing, including a survey of the boundary wall between 25-27 Church Avenue
- Waterproofing consultant to be engaged to ensure permanent basement works are adequate for long-term prevention of water ingress
- Permanent concrete lining wall and membrane recommended to mitigate risk of long-term water ingress

Impacts to Adjacent Shoring Walls and Building Foundations

Due to the close proximity of the proposed basement to existing basements on its eastern and western boundaries, the design of the new basement must consider how these basements have been built and any load that will be acting on the new shoring walls.

Risk: building new shoring walls and excavating next to existing basements could undermine the neighbouring foundations and cause further settlement.

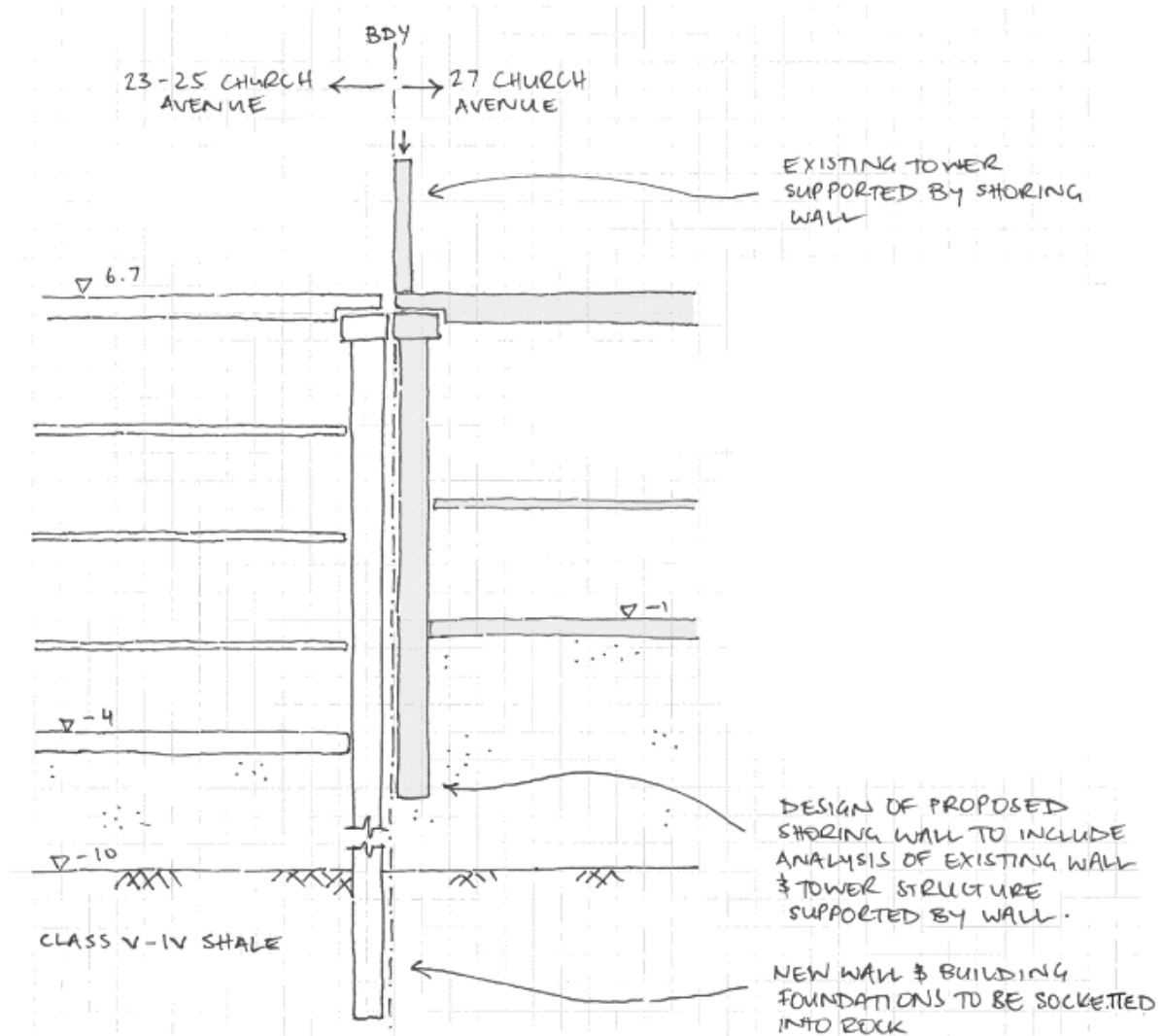


Figure 4: Section through boundary with 27 Church Ave.

Recommended mitigation measures:

- Geotechnical engineer to undertake Finite Element Analysis (Plaxis or similar) to determine stresses imposed on proposed shoring wall by existing buildings
- Structural engineer to incorporate stresses from above analysis into shoring wall design.
- Structural engineer to design proposed shoring walls to limit movements of the walls to mitigate subsequent settlement of the adjacent buildings.
- Contractor to develop and implement survey and monitoring plan with appropriate 'stop work' points where movements exceed values nominated by the structural engineer
- Survey of existing basement walls to be undertaken to ensure they do not encroach into the proposed site. If they are found to trespass across the common boundary, new basement walls must be set-back to ensure no damage occurs to existing shoring walls.
- Geotechnical engineer to advise safe levels of vibration and monitoring. Contractor to develop and implement vibration and monitoring plan.
- Contractor to develop a shoring wall installation and sequencing method, which may involve staggered panel installation

We note that the above measures do not require underpinning of the adjacent structure, nor is this recommended.

Quality of Design and Construction

The critical nature of the shoring wall design and construction requires a significant QA process to ensure that all risks have been considered.

Risk: design not adequate, or construction quality poor – and risks noted above are not effectively mitigated

Recommended mitigation measures:

- Geotechnical investigation through be undertaken along the perimeter to determine depth of rock and identify any potential unevenness of voids in the bedrock stratum.
- Shoring wall to be designed by specialist contractor and co-certified by project structural engineer.
- Basement design including shoring wall to be peer reviewed by chartered structural engineer with experience in similar basement construction types. Peer review to include inspection of shoring walls and hydrostatic slab.
- Qualified structural engineer to supervise construction of perimeter cut-off wall and piles

Conclusion

The role of the project geotechnical engineer in understanding the project risks and providing expert advice regarding groundwater and related settlements is critical in developing the proposed basement design.

Subject to the approval of a professional geotechnical engineer, we, Northrop engineers, being professional structural engineers, see no reason why the proposed basement design and construction methodology should impact the stability of the adjacent buildings. The recommended mitigation measures must be incorporated into the basement design and form part of the proposed peer review.

References

Architectural drawings for proposed development prepared by Squillace dated August 2020 issued for Development Application

Shoring drawings for 27 Church Ave. prepared by ACE dated Oct. 2017 issued for Construction Certificate

Geotechnical Review 'E24340.G01_Rev1' for proposed development prepared by eiaustralia dated Sept. 2019

Yours sincerely,

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Disclaimer: this report has been prepared for Da Vito Ferro Apartments Pty Ltd relating to the proposed development at 23-25 Church Avenue and 16-18 John Street only and is not to be used by any other party.

Date	Rev	Issue	Author	Verifier
17.08.2020	1	For Review	I. Duffy	T. Halliday
27.08.2020	2	For Review	I. Duffy	T. Halliday
07.09.2020	3	For Review	I. Duffy	T. Halliday