FPD Pty Ltd
File Planning & Development Services

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Department of Planning, Industry and Environment
4 Parramatta Square, 12 Darcy Street
Parramatta NSW 2150

Sirius Building (SD-10384-Mod-1) – Response to request for further information

Dear Amy,

I refer to your letter dated 23 December 2021 seeking further advice and a response to the comments from City of Sydney of 20 December 2021. These matters are addressed within this letter which is supported by the following documentation:

- Attachment A – Root mapping report prepared by GBG Group (15 April 2021)
- Attachment B – CCTV drainage survey
- Attachment C – Retaining wall survey (13 January 2022)
- Attachment D – Additional structural engineering advice from SCP Engineers (28 January 2022)
- Attachment E – Additional arborist advice from Landscape Matrix (27 January 2022) including root mapping undertaken 18 January 2022
- Attachment F – Construction methodology.

1. Undertake root mapping to provide an understanding of existing root activity and tree stability

Root mapping was undertaken in April 2021 using a Ground Penetrating Radar (GPR) across two 20m long stretches of Gloucester Walk adjacent to the respective trees. The report notes that GPR was unsuitable to be undertaken within the basement due to the reinforced concrete obscuring the subsurface. The garden areas along Gloucester Walk were also not surveyed due to presence of shrubs and other vegetation impeding the GPR signal. The GPR mapping identified a large number of roots that appear to emanate from the respective trees beneath Gloucester Walk.

Further investigation for the presence of tree roots within the basement adjacent to tree 50 was undertaken on 18 January 2022 via test pits, with images included in the additional arborist advice provided at Attachment E. The arborist notes that the roots in question are 25 to 70cm diameter roots of tree 50 which have grown under the existing retaining wall footings.

It is understood that further investigation via test pits was not feasible directly adjacent to Tree 51 due to existing site amenities sheds being located in the basement directly alongside the retaining wall. However, the arborist notes that he reviewed the in-pipeline videos (see CCTV survey at Attachment B) of the stormwater line running under the basement slab, along the eastern boundary in front of tree 51. The arborist advice notes that the videos show that roots have infiltrated the existing stormwater system and that it is it highly probable to be roots from trees 50 and 51 which are the cause of the blockages.

The Arborist considers that the roots from the trees have grown up to and along the wall and that the wall forms a crucial part of the trees structural support.

The Arborist has concluded that the Tree Root Mapping undertaken along Gloucester Walk, the CCTV Survey undertaken of the storm water lines within the existing basement and the test pits excavated within the vicinity of both trees 50 and 51 show that tree roots from both trees 50 and 51 are growing in an easterly direction across Gloucester Walk and are also growing in a westerly direction under the existing Sirius Building basement.

2. Provide any further evidence to support the statements that the wall is failing

Additional advice has been provided by SCP Engineers (Attachment D) which has been supported by a survey of the wall (Attachment C).

SCP note that in order for SCP (as the principal structural project engineer) to certify the project, all existing structure is required to be certifiable to current design standards and be of good order. Failure to achieve this requirement will not allow SCP to certify the completed project in its entirety. With reference to AS4678-2002 – Earth Retaining Structures code, the retaining walls as originally designed and constructed in the early 1980s are not certifiable to AS4678 and fail code strength and stability requirements.

Further, SCP advises that:

- "structural failure" does not signify collapse of the structure, but rather can be evidence of movement or cracking/yielding or footing bearing failure which is not in accordance with normal engineering principals or design intent
- The existing retaining walls at Tree 50 and 51 have failed in that the walls have undergone movement/rotation and exhibit cracking failure and/or root penetration
- Based on the above wall movement, cracking and tree root penetration, the existing walls are deemed to have failed and are not certifiable by SCP in their current state.

3. Consider alterative methods to demolish / reconstruct the wall

A number of alternative construction methods were explored in the response to submissions provided to DPIE in December 2021 and advice from SCP concluded that the wall could not be certified and that the only viable solution was to replace the existing wall with a newly constructed wall designed to AS4678 to allow certification of the building on completion. This would involve wall removal, battering the existing retained material behind the existing wall within the tree zone of influence, and rebuilding of the wall with a compliant design. The Arborist advised that rebuilding of the wall would almost certainly render the trees unstable and at risk of failure.

Consideration has been given to the further options presented by City of Sydney in its letter dated 20 December 2021, along with further consideration of the rock anchor option presented previously.

<u>Rock anchor option</u>

The additional advice from SCP confirmed that based on the potential risk and engineering limitations, this option cannot be considered as summarised below:

> *The anchor option is not feasible as the upper limit of the anchor requirement is 7m. This is based on the anchor size, its load, bond length and free length requirements. This effectively renders the anchor and location through or at the rear of the brick facing wall on the east side of the rock. This in combination with the required jet grouting and cleaning will likely damage the rock and brick facing on the east side of the Gloucester Walk.*

Based on this advice the option would result in a significant risk to the rock face which forms part of the Rocks heritage conservation area, as well as a safety risk to adjacent buildings and publicly accessible spaces. It is also understood that as a result of these risks that Place Management NSW will not support the location of rock anchors under Gloucester Walk which is within their ownership.

City of Sydney Option A – construct a new wall outside the site

SCP have reviewed this alternative option and have advised the following:

- The option is outside the site boundary and would require a new wall to be constructed on PMNSW land
- The exiting footing cannot be undermined during construction of this option
- The tree is located 470mm behind the existing wall so the new concrete wall would clash with the tree. In order to construct the new retaining wall, it would be necessary that the tree trunk and back fill behind the existing wall be removed for 2m behind the existing wall.
- In order to retain the tree trunk in place and avoid any undermining of the existing footing the new footing can only be constructed with the available 250mm width and this is inadequate to receive reinforcement from a new wall over and is structurally deficient in its geometry.

Based on this advice there would be inadequate space to enable the new wall and footing to be constructed, whilst retaining the trees.

City of Sydney Option B – construct a new footing and wall within the basement

SCP have reviewed this alternative option and have advised:

- The required footings to meet AS4678-2002 would destroy the tree roots beneath the basement
- The removal of the slab to install a new footing would render the existing wall further unstable
- Based on on-site measurements, the allowable footing depth below the existing basement slab is only 180mm and this is inadequate depth to offer the new wall stability to AS4678 or receive wall reinforcement over.

Based on this advice the option would not be feasible and would not enable the trees to be retained.

Further to consideration of the options outlined above, the Arborist has advised that:

- *The proposed retaining wall works will have a significant impact on the trees and will almost certainly render the trees unstable and at risk of failure in the short term. In this respect, I am of the opinion there is not a practically achievable and arboriculturally acceptable method to stabilise the trees in the short and longer term using mechanic measures such as braces etc.*
- *Given the high levels of target (human) activity in the immediate vicinity of the trees their removal, prior to commencement of works, is the only option if the works are to proceed as proposed.*

On the basis of the information provided above it is considered that the options presented by City of Sydney would not be feasible and that all potential options have been exhaustively explored.

4. Provide details of the construction methodology which would be used both with and without the trees

The requested construction methodologies have been prepared by Richard Crookes Construction (RCC) (Attachment F). RCC in accordance with the Workplace Health and Safety Regulations 2017 have undertaken a risk assessment for the works and implemented a hierarchy of control measures to ensure the safety of the works employed within the construction sites they are responsible for, and for members of the public surrounding their construction sites.

RCC have identified two major safety hazards.

1. Collapse of existing soft ground material inwards resulting in significant injury or death to workers.

2. Instability of tree roots results in overturning of tree over Gloucester walk and the public below.

RCC believe that should the works proceed without the removal of the trees and an incident occurred which caused injury or death, then a court of law would confidently argue that in hindsight it was reasonably practicable to remove the trees and eliminate the risk of collapse occurring. It could be determined that RCC and others were in breach of the WHS Regulations and is not a position which RCC supports.

Consider whether a performance solution could be implemented to certify the retaining wall in accordance with the National Construction Code.

This is addressed in the additional advice provided by SCP Engineers which has been supported by a survey of the wall as summarised below:

- *With reference to AS4678-2002 – Earth Retaining Structures code, the retaining walls as originally designed and constructed in the early 1980s are not certifiable to AS4678 and fail code strength and stability requirements.*
- *The retaining walls at Tree 50 and 51 as constructed fail the AS4678-2002 stability requirements. This is true even before the added pressure of the tree root balls is considered and therefore the walls are not certifiable to AS4678-2002 Earth Retaining Structures.*
- *The walls inherent non-compliances render the existing retaining walls non-repairable.*
- *A performance solution cannot be employed in this case as the fundamental engineering principals or stability and strength cannot be justified to conventional engineering calculations. That is, the wall as built geometry does not provide sufficient stability to resist the overturning forces from the retained soil and the additional tree root pressure (200+% overstress). The wall has already exhibited movement cracking and integrity failure which is consistent with the insufficient stability and strength capacity requirements highlighted.*

The comments received from City of Sydney are largely addressed under the headings above but for completeness have also been considered and addressed in the table below.

Issue	Response
The structural engineer states that the wall has already failed, however, the trees are still standing, and no information of root plate instability has been reported. It is likely that tree roots are deflecting along the back of the wall (potentially stabilising the soil). Given the site constraints (west retaining wall) it is likely that the majority of the tree's roots are growing east (away from the retaining wall). This means that the removal of the retaining wall (west) is less likely to cause whole tree failure towards the east	As previously discussed in this letter, the Arborist has advised that the root mapping undertaken supports the position that that the roots from the trees have grown up to and along the wall and that the wall forms a crucial part of the trees structural support. The arborist has concluded that the Tree Root Mapping undertaken along Gloucester Walk, the CCTV Survey undertaken of the storm water lines within the existing basement and the test pits excavated within the vicinity of both trees 50 and 51 show that tree roots from both trees 50 and 51 are growing in an easterly direction across Gloucester Walk and are also growing in a westerly direction under the existing Sirius Building basement.

Issue	Response
Without carrying out root mapping, the current site conditions have not been fully assessed, therefore the proposed designs have not been fully informed by existing site conditions and constraints and the City is unable to support the removal of the trees.	Root mapping has been undertaken to address Council's concerns.
The letter prepared by SCP dated 9 December 2021 states that the minimum rock anchor length required is 6 metres and that the maximum length available is 6m. This could be a viable option if further explored and accurate measurements were considered.	This is addressed above under Heading 3 above. The option cannot be supported by SCP structural engineers due to the risk to damage of the rock face, and would further not be supported by PMNSW as the landowner of Gloucester Walk.
The City requested consideration of the following options: • Constructing the new wall and footing in front of the existing wall and footing without the use of large machinery. The existing retaining wall would be maintained with a new retaining wall and footing located within the carpark. • Undertake non-invasive root investigations to understand tree root activity, tree stability and to inform the proposed design. • Sensitively and selectively remove and construct small sections of the wall without damaging structural roots.	The alternative options presented by City of Sydney have been considered by SCP and are deemed to not be feasible as outlined under heading 3 of this letter. Root investigations have been undertaken and the Arborist has advised that he is of the opinion that: *The proposed retaining wall works will have a significant impact on the trees and will almost certainly render the trees unstable and at risk of failure in the short term. In this respect, I am of the opinion there is not a practically achievable and arboriculturally acceptable method to stabilise the trees in the short and longer term using mechanic measures such as braces etc.*

Based on the advice of SCP Engineers, Landscape Matrix and the Work Health and Safety risks identified by Richard Crookes Construction all options to retain trees 50 and 51 have been fully explored and deemed to be not suitable. We are of the view that all issues raised by DPIE and City of Sydney have been fully addressed.

Resolution of this matter is crucial to ensure the long-term safety of the site and surrounding area and to ensure the building is able to be certified on completion.

We look forward to meeting with you and your technical specialists soon to discuss these matters. Please contact me if you require any further clarification in the meantime.

Regards,

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