Letter

DATE	09/12/2021
TO	Sirius Development 120B Underwood Street Paddington NSW 2021
ATTN	John Green
RE	Sirius building – Tree 50 and 51 – Options for Basement Rectification Works.

Reference is made to the earlier SCP Report 21/09/2021 and the subsequent submission dated 24/11/2021. This report outlines options to stabilise or replace the existing retaining walls which have failed structurally, are unstable and do not comply to current Australian Standards.

The earlier report issued by SCP noted that:

- The existing trees T50 and T51 have caused damage to the existing retaining walls- cracking, induced lean and root penetration.
- The existing retaining walls adjacent to Trees T50 and T51 do not comply with current Australian Standards AS4678 and are non-certifiable to current codes for strength and stability.
- The new structural works including the SOHO works will de-stabilise the existing walls during the structural construction.
- The soil backfill will need to be removed to prevent potential failure of the walls as a result of their current instability.

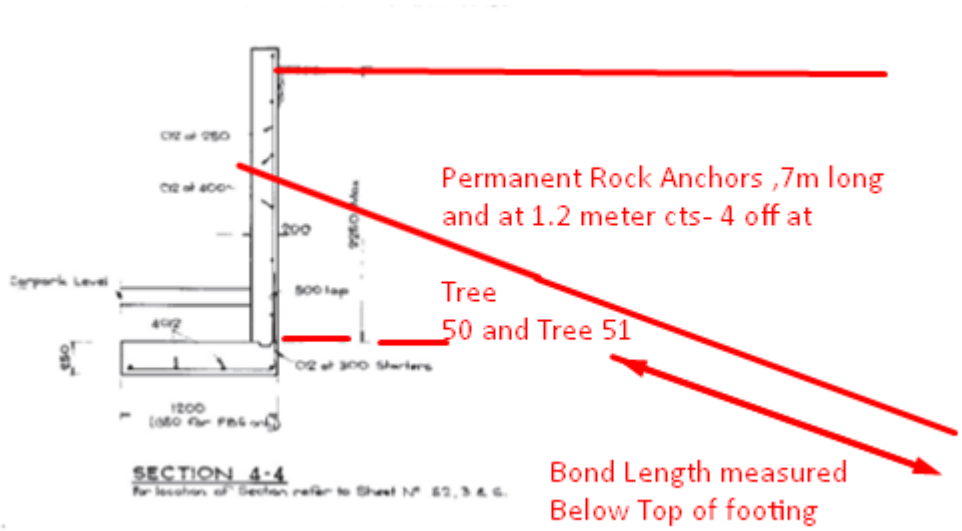
In response to point 1 of the DPIE request dated 18th November 2021 – "*Identify alternative options have been investigated to retain the existing plane trees"* our comments are as below.

We note that tree root pressure is substantial and Option 1 and 2 below require the existing walls to be re-supported to withstand up to 3 to 4 times the normal pressure compared to conventional retaining walls.

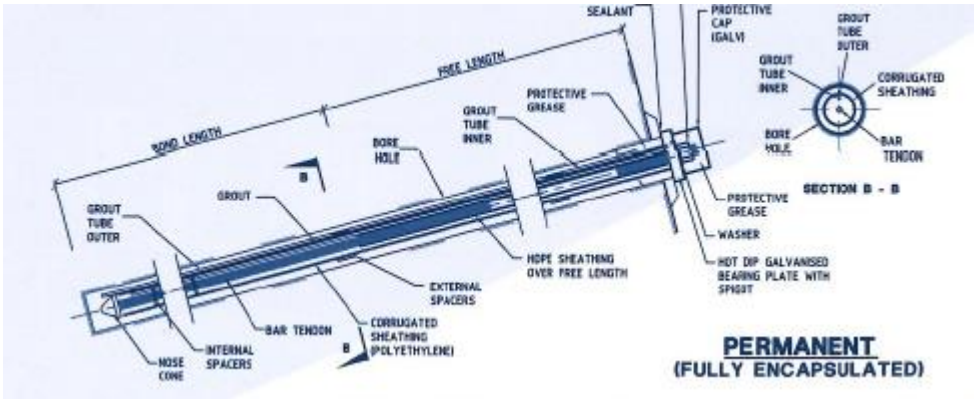
SCP advises the following options were considered as alternative solutions. We note that tree root pressures impose forces onto the retaining walls far greater than AS4678 require, and hence each of the following options need to be designed for these much higher pressures in addition to the AS4678 requirements.

Option 1: Install Rock Anchors into the Existing Retaining Walls at Tree 50 and 51

This retention option is proposed to have the wall remain in-situ with the existing restrained by permanent rock anchors behind the wall.



At each tree location permanent rock anchors at 1.2 metre intervals along a length of approximately 4 metres would be required to stabilise the existing retaining wall. Up to 4 permanent rock anchors would be required at each tree location.



Permanent Rock anchors are fully encapsulated and require full bond length to the rock below the footing.

The overall anchor length required to resist the forces imposed on the retaining walls by the tree roots would be 6 to 7m behind the wall based on the bond length of 3.5 to 4.5m required. The length is measured from below the top of the footing. We note Gloucester Walk is bounded along its western edge by the Sirius site and to the east it is a rock cliff face extending down to Atherden Street at 5 to 6m variable width from the face of the retaining wall.

To install these anchors, the process involves

1. Coring through existing wall at 1.2m from the base of the wall with a 102mm diameter core hole
2. Coring through the retained earth behind the wall (free length) and coring out the rock below the top to measuring 3.5 to 4.5 m below the top of the footing (bond length)
3. Jet washing the cored hole
4. Injecting encapsulating grout under pressure as shown above inside the core hole to provide bond and corrosion protection
5. Install anchor block to the face of the wall and stress anchor.

There are a number of geometric and engineering issues in relation to this option that render this option not feasible from an engineering standpoint:

i) The anchor length required is more than the overall width of Gloucester Walk. That is 6 to 7m of overall horizontal projection length is required and only 5 to 6m is available.

ii) The existing retaining wall does not have front face reinforcement (only rear face reinforcement is installed) thus stressing of the installed anchor can fail the existing wall at the base on the basement side causing a catastrophic failure of the existing wall.

The risk associated with the installation of the anchors to Gloucester Walk is

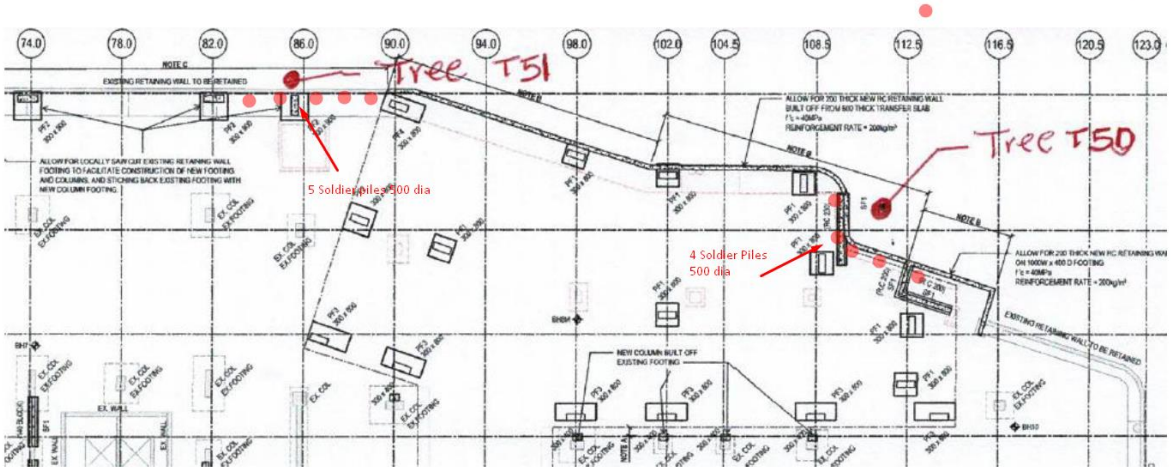
- Local failure of the rock under Gloucester Walk as a result of the anchor stressing process
- Damage to the tree roots as a result of the above coring and jet washing process.
- Grouting installed under pressure can migrate into the voids in the backfill behind the wall. There is also potential to damage the rock on the eastern side of Gloucester Walk as grout can ingress through rock defects or other voids in Gloucester Walk whilst being installed under pressure, causing potential blow out on the east side of the rock cliff face.

  Therefore, it was determined that as a result of the engineering limitations and the potential risks outlined above, this option cannot be considered.

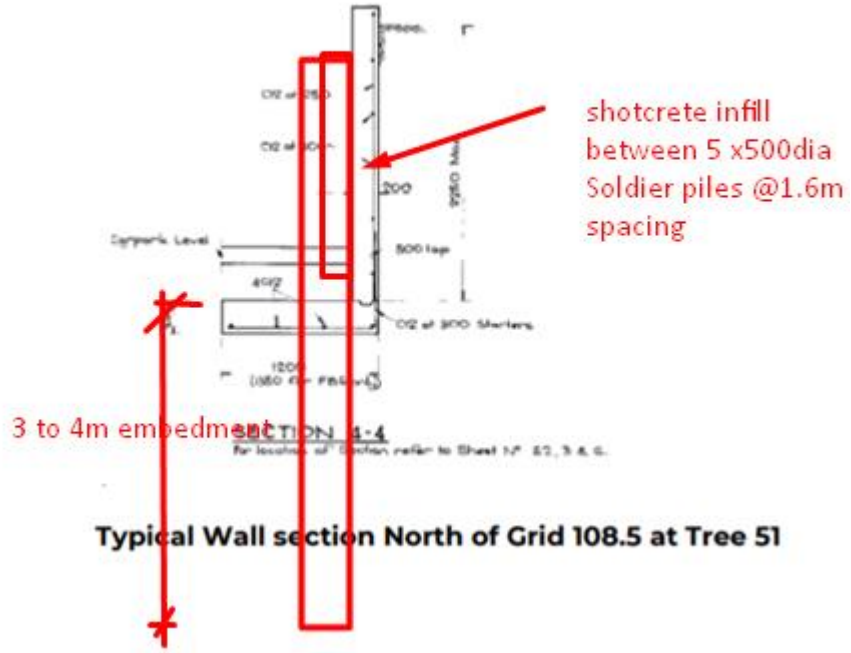
Option 2: Build New Solider Piled Wall in front of existing wall on the basement side

This option involves a soldier pile wall, up to 4.8m long built in front of the existing wall using 4 to 5 soldier piles at 1.6m centres through the existing footing and positioned in front of the existing wall to retain the wall.

The piles would be 500mm diameter and be required to be cored 3 to 4m below the basement level and cantilever above the basement level to the top of the existing wall.



New Works Plan showing new pad footings clashing with existing RW footings.

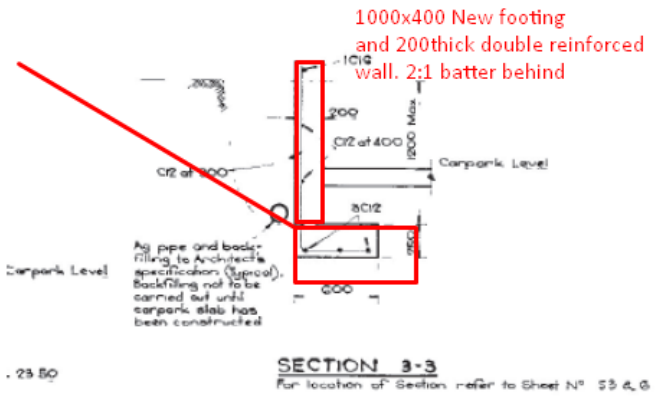


Typical Wall section North of Grid 108.5 at Tree 51

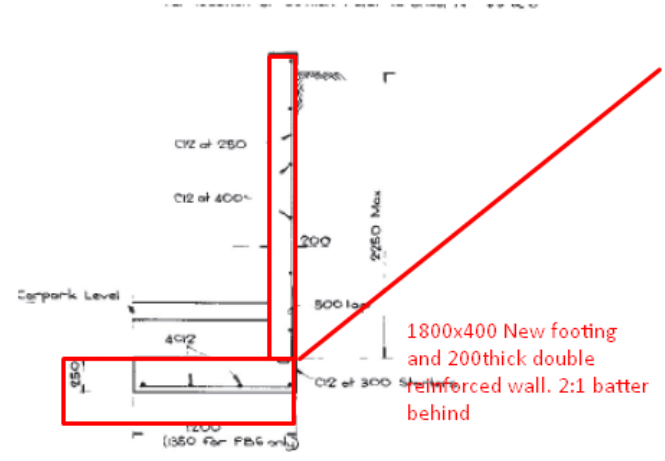
Richard Crookes Construction have provided supporting documentation to indicate that the machinery required to undertake the piling works cannot be positioned in place to undertake the work. There is insufficient room in the existing basement to manoeuvre the machine in place nor drill the piles due to the restricted head height within the existing basement.

Option 3: Remove and Re-construct the walls in the same location

SCP discussed this option previously. As the walls are currently unstable to the Australian Standard AS4678-Earth retaining structures, this option would involve the removal of the backfill, create a safe 2:1 working batter and re-construct the walls to current Australian Standards as shown below in red.



Typical Wall section South of Grid 108.5 at Tree 50



Typical Wall section North of Grid 108.5 at Tree 51

The removal of the backfill in order to construct the wall will render the existing trees unstable as per previous Arborist advice.

Summary

The wall in its current state is unstable due to original design, presence of the trees and the evident structural failure at Tree 51. The stabilisation options presented above are required prior to

site works to ensure safety to the public and the construction team and ensure the structural certifiability of the project when completed.

Option 1 using rock anchors is geometrically not achievable due to the narrow width of Gloucester Walk and the required 6 to 7m anchor length. The option also ensures there is a risk to the nature and integrity of the existing Gloucester Walk eastern cliff face, stressing of the installed anchor can fail the existing wall at the base on the basement side causing a catastrophic failure of the existing wall and damage to the tree root system during the course of trying to install the various anchors.

Option 2 is not achievable as Richard Crookes Construction have provided supporting documentation to indicate that the machinery required to undertake the piling works cannot be positioned in place to undertake the work. There is insufficient room in the existing basement to manoeuvre the machine in place nor drill the piles due to the restricted head height within the existing basement.

Option 3: The replacement wall option is feasible and can be implemented using temporary excavation and batters behind the wall. The replacement wall can then be designed to current code requirements and good modern building practice.

As noted previously **SCP is required to certify the completed project to current BCA** and as a result, non-certifiable items on the project such as the existing retaining wall at Tree T50 and Tree T51 are required to be demolished and rebuilt to current code requirements to ensure that SCP as certifying Structural Engineers can certify the completed structure as a whole.

We trust this report is as per your requirements.

Yours faithfully
SCP Consulting Pty Ltd

Paul Siewert
Director