From: "Kevin Bogie"
Sent: Tue, 6 Aug 2019 13:21:10 +1000
To: "Nicholas Idziak" <nidziak@wollongong.nsw.gov.au>
Cc: "Jon Griffiths" <JGRIFFITHS@wollongong.nsw.gov.au>;"Peter Tobin (ptobin@wollongong.nsw.gov.au)" <ptobin@wollongong.nsw.gov.au>
Subject: GT19.271 Helensburgh Community Hall : subfloor drainage investigation : TR-671
Attachments: GT19.271 Helensburgh Community Hall.pdf

Hi Nick, please see attached report as requested.

wollongong
city of innovation

Kevin Bogie
Geotechnical Engineer
Post Locked Bag 8821 Wollongong DC NSW 2500
Phone +61 2 4227 8106
Email kbogie@wollongong.nsw.gov.au ● **www.wollongong.nsw.gov.au**

PLEASE QUOTE
Ref: KB
Ext: 8106
File No: GT19.271
TR-671

Memo to be Filed ☐

Monday, 5 August 2019

To: WCC Design: Mr Nick Idziak
Mr Jon Griffiths

Re: HELENSBURGH COMMUNITY HALL
GEOTECHNICAL INVESTIGATION
INTERNAL REPORT ONLY

1.0 PROJECT OUTLINE

I refer to a request from your office regarding conducting a geotechnical investigation of the above site with a view to providing information regarding the presence, cause and rectification of subfloor moisture affecting the amenity of the building.

Structural drawings[1] were supplied to our office on 23rd July 2019 and have been instrumental for interpreting the existing construction.

A geotechnical investigation was completed on the 29th July 2019

This report contains commentary probably not suitable for release outside of Council. A redacted copy can be made for tendering purposes, if required.

2.0 GEOLOGY

Reference to the 1:250,000 scale geological maps supplied by the Department Of Mineral Resources indicate the site lies above Triassic Age Hawkesbury Sandstone bedrock (Rh), composed mainly of quartz sandstone with some minor shale interbeds.

[1] Job no 1014 by Sydney G Hirst and Kennedy Architects, October 1977

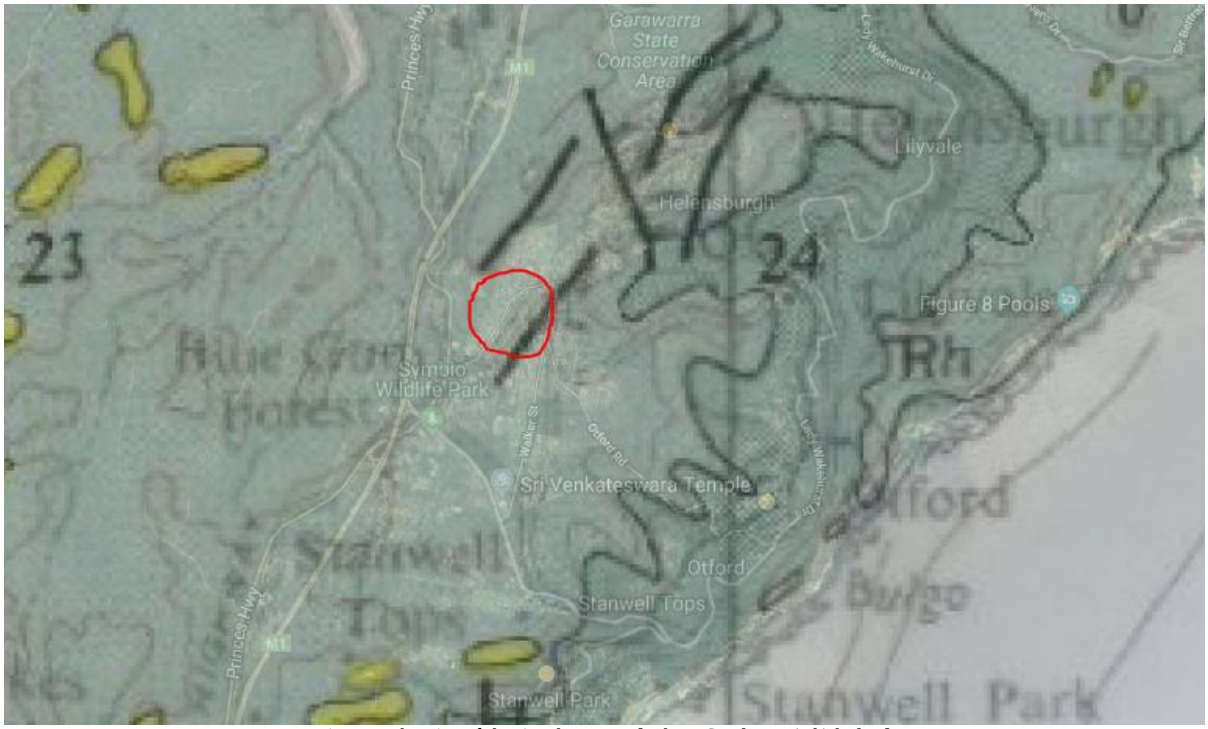


Figure 1 : location of the site above Hawkesbury Sandstone (Rh) bedrock

Residual soils above rock are typically thin sandy and gravelly clays, commonly with perched groundwater. Manmade fills are expected across this site in the formation of service trenches, embankments and general site levelling.

3.0 METHOD

The subfloor is musty and confined, with reported mould growth and some asbestos (ACM) fragments present. In order to eliminate our exposure to the subfloor confined space, we undertook all our investigations remotely using a long reach inspection camera and DCP probes through the floor grates in the hall, and through the new air grates under the youth centre.

In all, five (5) vents were removed and inspected around the periphery of the hall. Although this is the best we could achieve given the site constraints, we consider this an incomplete investigation and further observations would help to complete our conclusions (below).

4.0 DISCUSSIONS

4.1 Structural Drawings and Initial Notes

The structural drawings supplied to us indicate construction in around 1978, consistent with a plaque on the wall in the hall. These drawings have some features of interest:

- A subsoil drain along the full length of the eastern curtain wall, with a drainage sump in the south east corner connecting to the roof water system
- Excavation in the west along Gibbons Lane below natural ground, for the formation of a subfloor space and pier construction.

- Construction of the entire floor of the hall on independent piers, inside a full masonry skin with engaged piers
- Notes on the structural drawings indicate 'underpinning to engineer's details' but there is no information to indicate underpinning was performed here.

4.2 General Site Observations

It is evident that subfloor drainage was a consideration at the design stage due to the inclusion in the drawings of the subsoil drain and sump system, and the use of open floor grates in the hall.

In recent years[2], further steps to reduce the effect of subfloor moisture have been taken via the installation of many 150mm PVC vent pipes (passive air drains) and five of 1m square grated portals through the eastern curtain wall into a storage space under the youth centre.

At the time of our investigation, the subfloor area smelled dank and musty, however we did not notice any free or flowing water and none was recovered on our test equipment, and we note that at present we are in a protracted (multiyear) dry period.

4.3 Evidence of High Level Moisture Under the Building

During our inspection through the floor grates with an inspection camera, we noticed evidence of high groundwater against the western and northern brick skin via crystal growth and efflorescence (an apparent 'high tide' mark). There was also evidence of periodic high water under the building on the eastern brick wall under the stage consistent with the suspected underperformance of the sump.

We have no evidence that a subsoil drain was used behind the western dwarf retaining wall, and it is not indicated on the drawings.

There are also anecdotal reports of a subterranean stream flow under the building, which may be intermittent with climatic activity. We did not find evidence of this type during our visit.

4.4 Drainage Sump

We observed an excavation behind the eastern curtain wall in the south corner consistent with the drawings showing a drainage sump at that location. We could not find the outlet, but did observe a 150mm diameter PVC pipe through the floor of the sump.

The PVC pipe extended underneath an engaged pier, which led us to believe that the pier was both shallow footed, and not founded on rock.

DCP testing in the sump showed that the floor of the sump is not founded on impervious material or rock and would be of little use in detaining free flowing surface water.

[2] Timing unknown, however the work appears reasonably recent

4.5 Footings and Settlement

Observations of the timber hall floor show that there has been significant peripheral settlement against the walls in between pier supports, and around 100mm of sag in the floor to the west near the basketball hoop. Throughout, the floor is springy between pier supports. We observed hardwood floor bearers about 150mm depth, but due to access could not determine the pier spacing accurately[3] however we believe that any of the following factors are contributory: the piers are too widely spaced, the bearers are undersized, and or some piers have differentially settled.

DCP tests in the western half of the hall (DCPs 3, 4 and 5) show that hard refusal on rock occurred around 0.1 to 0.4m from the start of the test, indicating shallow rock generally. In the east of the site, the depth of overburden soils increased significantly to 0.9m (DCP 1).

These DCPs are consistent with our speculation that the western hall subfloor space was cut to rock, with the eastern half on the natural stripped surface, with a transition somewhere around the middle of the hall. It is also probable that, considering construction practices of the day, that the eastern curtain wall does not extend the full 0.9m to bedrock throughout.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Due to access constraints, our conclusions have less than our usual level of confidence. We tentatively conclude that:

1. Not all internal piers are founded on bedrock and some have settled.
2. The eastern curtain wall is probably not founded on bedrock.
3. Intermittent water flows under the building, and may become trapped against the eastern curtain wall before dissipating slowly.
4. **We cannot rule out the possibility that free surface flow under the building may become significant enough to enter the youth centre storeroom.**
5. Vents in the hall floor probably contribute to the dank smells reported in the hall
6. Cuts to bedrock in the western half of the hall are very likely to have intercepted the periodic groundwater line, and there is no evidence of subsoil drains here.
7. Installation of the newer PVC air drains and subfloor grates would certainly be aiding subfloor ventilation; however their construction indicates passive extraction.
8. The presence of floor vents and existing ceiling exhaust fans provides an opportunity to reengineer the subfloor air drainage system.
9. **Use of the existing extraction fans in the roof particularly with the hall doors closed would pull dank air from the subfloor into the habitable building space.**

Based on the above, we recommend

1. Attending site again following a period of significant rain and observing any subfloor free water movement, if evident.

[3] Indicated on the structural drawing s to be 1.8m maximum centres

2. **Consideration of a positive pressure fan system to increase the efficiency of the air drains and reduce backflow into the hall.**
3. **Added extractive power can be applied to the existing PVC air drains if required.**

We note that the ceiling already has six large exhaust fans fitted. It may only require a modest refit to reverse the low speed flow to push air down the existing floor grates, and out the PVC air drains. Further air drainage can be driven by extraction from the western vents if need be, possibly economised by their interconnection.

There are possible major structural issues with the floor that require further investigation that are indicating structural under performance and or pier settlement, requiring rectification.

This document is issued on behalf of Wollongong City Council by

Authored

Kevin Bogie
Geotechnical Engineer
Project Delivery Division

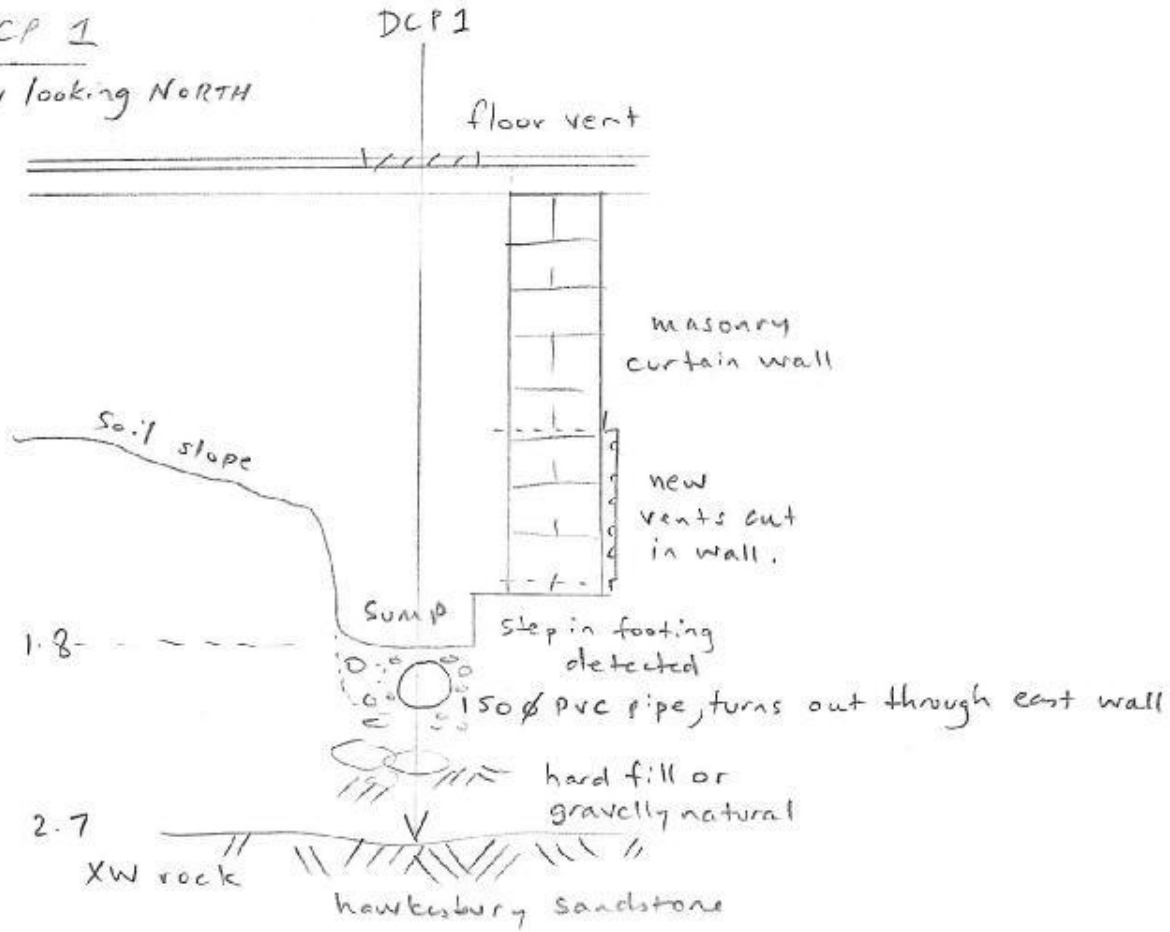
Reviewed

Peter Tobin
Senior Geotechnical Engineer
Project Delivery Division

GT19.271 HELENSBURGH COMMUNITY CENTRE

DCP 1

view looking NORTH



NOTE PVC pipe has no inlet for sump pit

Sump pit outlet not found.

5/8/19

Dynamic Cone Penetrometer Log Sheet

GT19.271, Helensburgh Community Centre

Date: 29/07/2019

DEPTH (mm)	DCP1 in vent @ 1850	DCP2 DCP2 in vent 2 @1100	DCP3 in vent 3 @ 1000	DCP4 in vent 4 @ 950	DCP5 in vent 5 @ 950
100					
200					
300					
400					
500					
600					
700					
800					
900				5	4
1000			32	5	Aug-40
1100		8	*B-Ref @ 1.1m 0.91m to G.L sandy R.O.T*	13	*B-Ref @1.09m Sandy R.O.T 0.88m to G.L*
1200		7		26	
1300		5		*B-Ref @ 1.35m 0.87m to G.L Sandy R.O.T*	
1400		5			
1500		9			
1600		14-90			
1700		*B-Ref @ 1.69m*			
1800	0-50				
1900	3				
2000	5				
2100	8				
2200	20				
2300	23				
2400	23				
2500	14				
2600	5				
2700	*Term @ 2.7m Wet, sandy R.O.T*				
Start R.L (m)	252.15m	252.9m	253m	253.05m	253.05m
Term R.L (m)	**249.45m**	**251.21m**	**251.9m**	**251.7m**	**251.96m**

LEGEND	
Term	Test Terminated
V-Ref	Virtual Refusal
B-Ref	Bouncing Refusal
SW	Self Weight
RTIG	Rod Turning In Ground
R.E.W	Rod Extracted Wet
R.O.T	Rock On Tip

GT19.271 – D1
Helensburgh Community Centre
Test Location Drawing