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Sydney, 14 April 2016

Mr Nasir Sayed
6 Cotter Place
LEUMEAH NSW 2560

Dear Nasir,

RE: ASSESSMENT OF FILL COMPACTION
6 COTTER PLACE, LEUMEAH, NEW SOUTH WALES

1. Introduction

An existing swimming pool to the southeast of the property at 6 Cotter Place in Leumeah, New South Wales has been backfilled in support of a proposal for a granny flat.

Reference to the aerial imagery from Google Earth indicates that the in-ground swimming pool sizes about 2.5m by 7m. A photograph shown to us on 14 April 2016 infers that the pool may extend to a depth varying from about 1.2m to 1.5m. The types of foundation material at the base of pool excavation are not known.

You have requested that MM Geomechanics assess the density or consistency of the fill. The work was carried out in general accordance with our proposal reference MM2016NS_AA dated 11 April 2016.

This letter presents the assessment results.

2. Investigation Methodology

Experienced Geotechnical Engineers from MM Geomechanics visited the site in Leumeah on 14 April 2016 for appreciation of site conditions and to assess the compaction of the backfill using a 9kg Dynamic Cone Penetrometer (DCP). The penetration resistance recorded during the DCP testing was relied upon to infer the density or consistency of the fill and to assess the adequacy of the fill as foundations.

We consider that direct method involving the use of a nuclear densometer is no longer relevant for the reasons that placement of a relatively thick fill already took place and that the effectiveness of the densometer testing is constricted to the near surface fill. Instead, the adoption of DCP testing tool was introduced.

Prior to commencing the DCP testing, advice from the property owner regarding the extent of the swimming pool was sought. No services searches and scanning were undertaken; however, consultation with the property owner was made regarding the presence of any potential buried services within the footprint of the swimming pool that may be affected by the DCP testing.

Five DCP tests (herein referred to as MM-DCP01 to MM-DCP05) were carried out within the footprint of the swimming pool. MM-DCP01 was positioned approximately near the western corner of the pool while the remaining tests MM-DCP02 to MM-DCP05 were specifically located in the proximity of a proposed footing (close to the northeastern side of the pool).

The DCP tests encountered practical refusal at depths ranging from about 1.2m to 1.4m below the existing ground surface.

The DCP test locations are shown in Figure 1 attached to this report.

3. Site Geology

The Wollongong 1:250,000 Geological Series Sheet SI 56-9 infers that Hawkesbury Sandstone (which was described to comprise quartz sandstone with some shale) underlies the site locality and that the boundary with Quaternary Alluvium (Qal) and Liverpool Sub-Group (Rwl) are nearby to the west and the east, respectively. The Qal geological unit was described as 'alluvium, gravel, swamp deposits and sand dunes' while the Rwl geological unit as 'shale with some sandstone beds'.

4. Site Observations

At the time of undertaking the site visit, we observed the following:

- The site is positioned close to the end of a cul-de-sac and on a relatively flat ground of trapezium shape.
- A northwesterly facing single storey house occupies the site.
- Cotter Place bounds the site to the northwest and neighbouring properties to the southwest, northeast and southeast.
- The swimming pool that has been backfilled is located to the rear of the house.

5. Geotechnical Assessment

We were not present on site at the time of the fill placement thus are not in a position to verify the following:

- Fill placement and compaction methods adopted.
- Nature of the backfill materials used.
- Extent of foundation preparation works.

You, however, have advised us of the following:

- Mainly clays with no significant content of oversized particles were used as backfill.
- The fill layers have been placed in lifts no thicker than 0.2m.
- A 2.5 tonne tracked excavator was used for the fill compaction.
- No significant ground heaves following compaction.

The contractor responsible for the backfilling of the pool confirmed that the backfill comprises mainly clays, which are Virgin Excavated Natural Material sourced from an excavation in Bankstown, New South Wales. Neither a certificate nor a test report was supplied. At the time of undertaking the site visit, the clays were no longer exposed due to placement of topsoil across the pool area.

The penetration resistance recorded by the DCP testing infers that the clayey fill is stiff in general (with the exception of MM-DCP02 and MM-DCP05). The relatively stiff soil consistency in turn infers that the clayey fill has been subjected to reasonable compaction in general.

Both MM-DCP02 and MM-DCP05 detected the existence of a thin layer of soft to firm clay up to 0.3m thick below a depth of 0.9m below the existing ground surface. MM-DCP02 and MM-DCP05 are located close to the eastern corner of the pool. Sharp corners could make compaction of soil difficult. The difficulty in compacting the backfill around the pool corner may have caused the localised soft spot.

The DCP refusal levels may be associated with the base of the pool.

The results from the DCP testing are presented as an attachment to this report.

6. Engineering Comments

An allowable bearing pressure of 80kPa may be adopted for shallow footings that bear on the fill. Footings should be positioned such that they are away from the locations of MM-DCP02 and MM-DCP05. Positioning of a footing at the location of either MM-DCP03 or MM-DCP04 is ideal from a geotechnical perspective due to the absence of localised soft spots.

Inspection by an experienced Geotechnical Engineer is advisable prior to footing formation. If a delayed construction is expected, consideration should be given to applying a 50mm thick blinding concrete across the base of a footing excavation immediately following the inspection to prevent further softening of the founding material.

Bankstown is dominated by Bringelly Shale in the north and Ashfield Shale in the south. Clays derived from shales are typically susceptible to volume changes with variations in moisture content. We thus recommend that the shrink-swell behaviour of the clays be further investigated for reactivity classification in accordance with Australian Standard AS2870 – 2011 Residential Slabs and Footings. There may be a requirement to accommodate the expected movements caused by seasonal volume changes in the clayey fill (swelling when wet and shrinking when dry).

7. Limitations

No topographical survey plans were available at the time of writing this report.

While the frequency of field testing generally complies with that specified by Australian Standard AS3798 – 2007 Guidelines on Earthworks for Commercial and Residential Developments for Type 3 Concentrated Operations less than 500m^2, we wish to point out that we were not on site at the time of the fill placement. As such we can only rely on the advice given to us. The assessment in this report is based on the assumption that the contractor responsible for the backfilling of the swimming pool has maintained consistency across the backfilling processes.

Your attention is drawn to the Important Information about Your Geotechnical Report attached to this report (as Appendix A), which presents additional information on the uses and limitation of this report.

Should you require further clarification, please contact us on 0400 393 008.

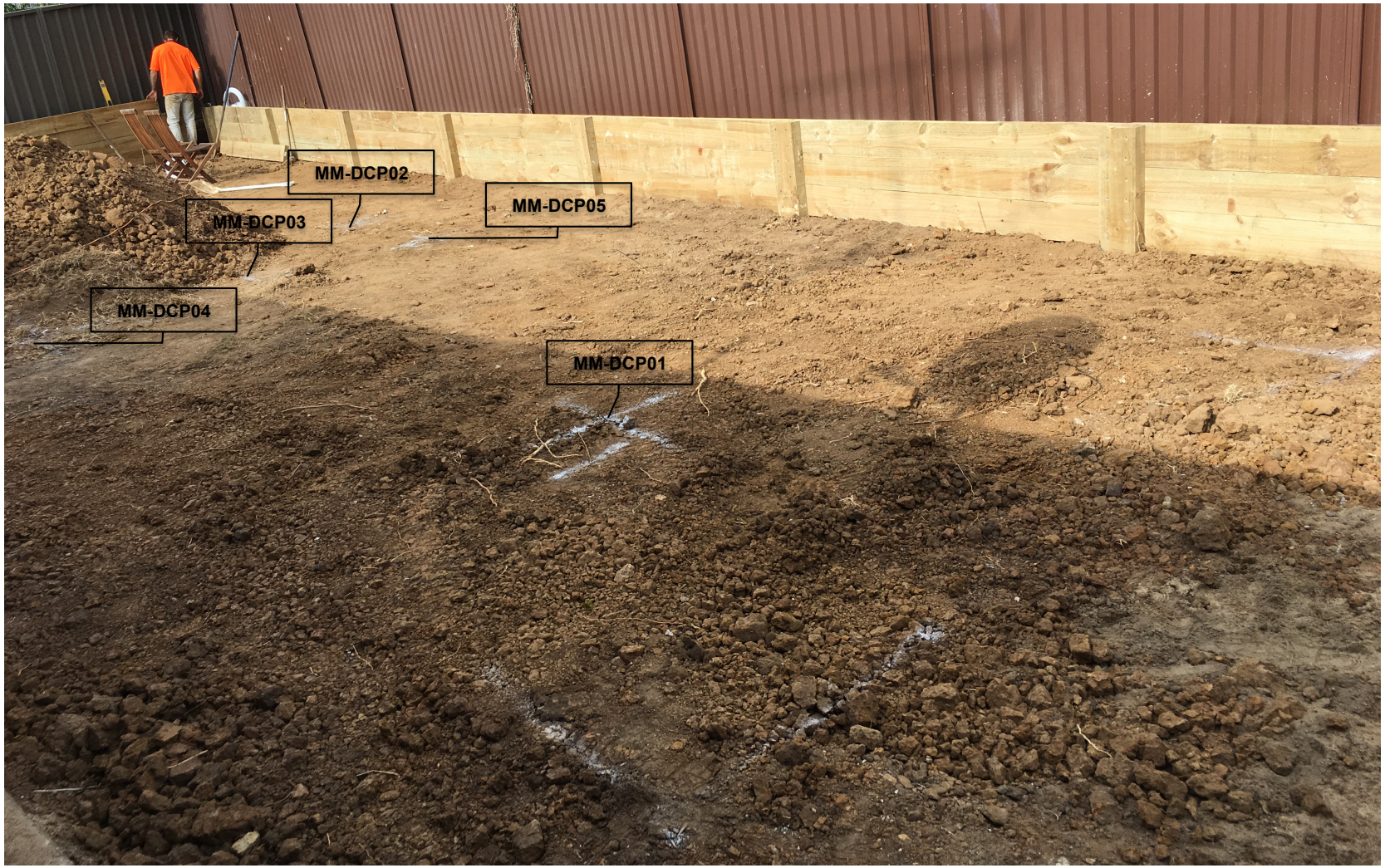
For and on behalf of **MM Geomechanics**,

Muliadi Merry BEng MEng MIEAust CPEng NER (Civil)
Principal
Chartered Professional Engineer Membership Number 1401340

Attachments:
Figure 1 – Dynamic Cone Penetrometer Test Locations
Appendix A – Important Information about Your Geotechnical Report
Appendix B – Dynamic Cone Penetrometer Test Results

14/04/2016 6:45 PM
MM2016NS_AB.docx

Figures



drawn	MM		client:	MR NASIR SAYED
approved	MM		project:	PROPOSED GRANNY FLAT - ASSESSMENT OF FILL COMPACTION 6 COTTER PLACE, LEUMEAH, NEW SOUTH WALES
date	14/04/16		title:	DYNAMIC CONE PENETROMETER TEST LOCATIONS - VIEW TO EAST
scale	As Shown		project no: MM2016NS_AB	figure no: FIGURE 1
original size	A4			

LaCie:MM Geomechanics:Correspondence:NS:[Figure 1.xls]Figure 1

Appendix A

Important Information about Your Geotechnical Report

Your report are based on project specific criteria

Your report has been developed on the basis of your unique project specific requirements as understood by MM Geomechanics and applies only to the site investigated. Project criteria typically include the general nature of the project; its size and configuration; the location of any structures on the site; other site improvements; the presence of underground utilities; and the additional risk imposed by scope-of-service limitations imposed by the client. Your report should not be used if there are any changes to the project without first asking MM Geomechanics to assess how factors that changed subsequent to the date of the report affect the report's recommendations. MM Geomechanics cannot accept responsibility for problems that may occur due to changed factors if they are not consulted.

Your report is prepared for specific purposes and persons

To avoid misuse of the information contained in your report it is recommended that you confer with MM Geomechanics before passing your report on to another party who may not be familiar with the background and the purpose of the report. Your report should not be applied to any project other than that originally specified at the time the report was issued.

Subsurface conditions can change with time

Natural processes and man induced activity influence subsurface conditions. For example, water levels can vary with time, fill may be placed on a site and pollutants may migrate with time. Because a report is based on conditions, which existed at the time of subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. Consult MM Geomechanics for advice on how time may have impacted on the project.

Interpretation of factual data

Site assessment identifies actual subsurface conditions only at specific points where samples are taken and when they are taken. Data derived from literature and external data source review, sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact on the proposed development and recommended actions.

Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions, which exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, owners should retain the services of MM Geomechanics through the development stage, to identify variances, conduct additional tests if required, and recommend solutions to problems encountered on site.

Your report's recommendations are preliminary

Your report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until project implementation has commenced and therefore your report recommendations can only be regarded as preliminary.

Only MM Geomechanics, who prepared the report, is fully familiar with the background information needed to assess whether or not the report's recommendations are valid and whether or not changes should be considered as the project develops. If another party undertakes the implementation of the recommendations of this report, there is a risk that the report will be misinterpreted and MM Geomechanics cannot be held responsible for such misinterpretation.

Interpretation by other design professionals

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, retain MM Geomechanics to work with other project design professionals who are affected by the report. Have MM Geomechanics explain the report implications to design professionals affected by them and then review plans and specifications produced to see how they incorporate the report findings.

Data should not be separated from the report

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way.

Logs, figures, drawings, etc. are customarily included in our reports and are developed by scientists, engineers or geologists based on their interpretation of field logs (assembled by field personnel) and laboratory evaluation of field samples. These logs etc. should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

Contamination concerns

Your report is not likely to relate any findings, conclusions, or recommendations about the potential for hazardous materials existing at the site unless specifically required to do so by the client. Specialist equipment, techniques, and personnel are used to perform a contamination assessment.

Contamination can create major health, safety and environmental risks. If you have no information about the potential for your site to be contaminated, you are advised to contact MM Geomechanics.

Rely on MM Geomechanics for additional assistance

MM Geomechanics is experienced with a variety of techniques and approaches that can be used to help reduce risks for all parties to a project, from design to construction. It is common that not all approaches will be necessarily dealt with in your site assessment report due to concepts proposed at that time. As the project progresses through design towards construction, consideration should be given to retain the services of MM Geomechanics to develop alternative approaches to problems that may be of genuine benefit both in time and cost.

Appendix B

Dynamic Cone Penetrometer Test Results

JOB NUMBER: MM2016NS
CLIENT: MR NASIR SAYED
PROJECT ID: 6 COTTER PLACE, LEUMEAH NSW 2560

DYNAMIC CONE PENETROMETER (DCP) TEST REPORT

PREPARED BY: M Merry
DATE: 14 APRIL 2016

Test Method: ☑ AS1289.6.3.2 Cone Penetrometer ☐ AS1289.6.3.3 Perth Sand Penetrometer

Depth (m)	Penetration Resistance (blows per 100mm)				
	MM-DCP01	MM-DCP02	MM-DCP03	MM-DCP04	MM-DCP05
0.00 – 0.10	5	8	6	3	5
0.10 – 0.20	5	3	4	4	4
0.20 – 0.30	4	3	5	3	5
0.30 – 0.40	3	3	3	3	2
0.40 – 0.50	2	2	3	4	2
0.50 – 0.60	2	2	3	3	3
0.60 – 0.70	3	2	3	3	4
0.70 – 0.80	2	3	5	4	3
0.80 – 0.90	3	2	5	5	2
0.90 – 1.00	2	2	3	5	1
1.00 – 1.10	3	2	3	8	1
1.10 – 1.20	4	2	5	R	2
1.20 – 1.30	4	R	3		4
1.30 – 1.40	R		R		R
1.40 – 1.50					
1.50 – 1.60					
1.60 – 1.70					
1.70 – 1.80					
1.80 – 1.90					
1.90 – 2.00					
2.00 – 2.10					

Note: R Practical Refusal