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Posted		
Faxed		
Emailed	X	david@mmjarchitects.com.au
Courier		
By Hand		

Contact: Jeff Fulton
Our Ref: P1304015JC09V01
Pages: 5 + attachments
cc.

26 August, 2019

Bill and Mandy Palmer
C/- mm + j architects Pty Ltd
Attn: David McCrae
by email

Dear David,

RE: LIMITED GEOTECHNICAL ASSESSMENT – 26 BYNYA ROAD, PALM BEACH, NSW

INTRODUCTION

This letter provides the findings of a limited geotechnical assessment undertaken as part of a Development Application (DA) to Northern Beaches Council ('Council') – former Pittwater Council – for the proposed alterations and additions to an existing dwelling at 26 Bynya Road, Palm Beach, NSW ('the site').

The site has been mapped on the Council landslip risk map as 'Geotechnical Hazard H1' (refer Figure 1, Attachment A). We understand that Council requires a geotechnical report, prepared by a suitably qualified Geotechnical Engineer, for the proposed development at the site.

PROPOSED DEVELOPMENT

Architectural and structural drawings (mm + j, 2019 and NBCE, 2019) indicate the following:

- Proposed alterations and additions to an existing dwelling will include construction of a suspended walkway and associated stairs at the rear (west) of dwelling.
- No bulk excavation and / or filling will be required for construction works.
- Structural loads will be transmitted into sandstone bedrock in accordance with the details provided in structural drawings (NBCE, 2019).

PREVIOUS SITE ASSESSMENT

Previous geotechnical assessments at the site, carried out by Martens and Associated (MA), include:

- Geotechnical Assessment for the proposed split-level dwelling; report reference P1304015JR01V01, dated November 2013 (MA, 2013).
- Stabilisation of Excavation Face and Boulders; report reference P1304015JC02V01, dated October 2014 (MA, 2014a).
- Site inspection for condition assessment of soil and rock exposure; report reference P1304015JC03V01, dated November 2014 (MA, 2014b).

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MARTENS & ASSOCIATES P/L
ABN 85 070 240 890 ACN 070 240 890

- Site inspection for final condition assessment of soil and rock exposures associated with boulders and excavations at the site; report reference P1304015JC04V01, dated February 2015 (MA, 2015a).
- Site inspection for foundation condition assessment associated with on-site stormwater detention tank and dispersion spreader as well as condition of rock rubble supporting the corner boulders; report reference P1304015JC06V01, dated May 2015 (MA, 2015b).

INVESTIGATION SCOPE OF WORK

Following a desktop review of previous MA's geotechnical assessments at the site, a site walkover was undertaken on 20 August 2019 to assess current geotechnical conditions at the site and potential slope instability risks.

GENERAL SITE DETAILS AND INVESTIGATION FINDINGS

General site details and investigation findings are summarised in Table 1.

Table 1: Summary of general site details and investigation findings.

Item	Comment
Topography	The site is located within highly undulating terrain, near the crest of a steep west facing slope of a north – south aligned ridge.
Typical Slopes, Aspect, Elevation	The site has a westerly aspect. The proposed development area has an overall grade of > 30% and comprises very steep to near vertical rock ledges. Site elevation across the proposed development area ranges between approximately 73.0 mAHD (east) and 67.0 mAHD (west).
Expected Geology	The *Sydney 1:100,000 Geological Series Sheet 9130* identifies the site as being underlain by Hawkesbury Sandstone, typically comprising medium to coarse grained quartz sandstone with minor shale and laminite lenses.
Existing Site Development	A split-level dwelling and a carport in the front (east) of the property. A stormwater detention tank and dispersion spreader in the back (east) of the property.
Vegetation	Grass and bushes across the proposed development area
Drainage	Via overland flow to the west
Expected Subsurface Conditions	Exposures of weathered and inferred medium strength sandstone were observed across the site. The subsurface profile across the proposed development area is expected to comprise typically < 0.5 m thick soil overlying weathered sandstone.

GEOTECHNICAL LANDSLIP RISK ASSESSMENT

No evidence of extensive subsidence or recent large-scale slope instability was observed on site.

A geotechnical hazard risk assessment for the proposed works has been completed in accordance with the qualitative risk matrices provided in Section 7 of the Australian Geomechanics Society's Landslide Risk Management Guidelines (2007). We have considered two key geotechnical hazards that are most likely to impact the proposed development. These, and associated treatment recommendations and resultant risks, are described in Table 2.

Table 2: Geotechnical hazards and treatment measures.

Hazard	Treatment Recommendations	Likelihood After Treatment	Consequences	Risk to Life / Property
Shallow rotational slide	Ensure good hillslope engineering practice is adopted (examples are provided in Attachment B). Maintain vegetation cover on steep slopes. Do not over-steepen existing grades without suitable shoring support. Do not place excessive load onto existing and final sloping surfaces. Ensure foundations extend into the bedrock. Limit ponding of surface water and provide adequate surface and sub-surface drainage.	Unlikely	Minor	Acceptable / Low
Rock slide		Unlikely	Medium	Acceptable / Low

The proposed development is considered to constitute an acceptable risk to life and a low risk to property resulting from assessed geotechnical hazards, provided that good hill slope engineering practices, the slope treatment measures presented in Table 2 and recommendations presented in this report are adhered to, where applicable. Refer Plates 1 to 4 in Attachment A for geotechnical conditions across the proposed development area. A description of good hillslope engineering practices is presented in Attachment B. Geotechnical Risk Management Policy for Pittwater Forms 1 and 1a are provided as Attachment D.

GEOTECHNICAL RECOMMENDATIONS

The following preliminary geotechnical recommendations are provided for the proposed development. Further general geotechnical recommendations are presented in Attachment C.

1. Safe Bearing Capacity: Preliminary estimate of end bearing capacity for sandstone bedrock is 500 kPa, subject to:
    - An at least 0.2 m offset from rock ledge edges.
    - An at least 0.2 m footing embedment into the sandstone bedrock. Alternatively, if footings are to be founded on sandstone bedrock surface (i.e. no embedment into rock), anchor bolts, grouted into the rock, should be included in the footing design to prevent sliding of footings on sloping rock surface.

2. Other Consideration: Design of stair footings in the vicinity of the existing stormwater detention tank should consider potential impacts on / by the existing dispersion spreaders. All footings should be located upslope of the dispersion spreaders.

3. Site Classification: The site is classified as an "A" site in accordance with AS 2870 (2011), subject to all footings founding on rock and footings unlikely being impacted by the presence of environments that could lead to exceptional foundation material movements, such as existing or future trees or surface / subsurface water accumulation.

4. Inspection: Exposed material at foundation level should be inspected by an experienced geotechnical engineer prior to steel reinforcement and concrete placement to verify suitability as foundation.

REFERENCES

Australian Geomechanics Society (2007) *Practice Note Guidelines For Landslide Risk Management 2007,* Journal and News of the Australian Geomechanics Society Volume 42 No 1 March 2007.

Herbert C. (1983) *Sydney 1:100 000 Geological Sheet 9130*, 1st edition, Geological Survey of New South Wales, Sydney.

Martens and Associates Pty Ltd (2013) *Geotechnical Assessment,* document reference P1304015JR01V01, dated November 2013 (MA, 2013).

Martens and Associates Pty Ltd (2014) *Stabilisation of Excavation Face and Boulders,* document reference P1304015JC02V01, dated October 2014 (MA, 2014a).

Martens and Associates Pty Ltd (2014) Site inspection for condition assessment of soil and rock exposure, document reference P1304015JC03V01, dated November 2014 (MA, 2014b).

Martens and Associates Pty Ltd (2014) Site inspection for final condition assessment of soil and rock exposures associated with boulders and excavations at the site, document reference P1304015JC04V01, dated February 2015 (MA, 2015a).

Martens and Associates Pty Ltd (2014) Site inspection for foundation condition assessment associated with on-site stormwater detention tank and dispersion spreader as well as condition of rock rubble supporting the corner boulders, document reference P1304015JC06V01, dated May 2015 (MA, 2015b).

Mm + j architects (2019) Architectural Drawings, Job No. 1860, Drawing Nos. DD01 to DD05, Rev. C, dated 27 June 2019 (mm + j, 2019).

Northern Beaches Consulting Engineers Pty Ltd (2019) Structural Drawings, Job No. 190667, dated 26 June 2019 (NBCE, 2019).

Pittwater Local Environmental Plan (2014), *Geotechnical Hazard Map*, *Sheet GTH_015*.

Standards Australia Limited (2017) AS 1726:2017, *Geotechnical site investigations*, SAI Global Limited.

Should you have any questions, please contact the undersigned.

For and on behalf of

MARTENS & ASSOCIATES PTY LTD

HAMED NAGHIBI

B.Sc. Eng (Civil) M.Eng. (Geo), MIEAust
Senior Geotechnical Engineer

ATTACHMENTS

Attachment A – Figures

Attachment B – Hillside Construction Guidelines (AGS, 2007)

Attachment C – General Geotechnical Recommendations

Attachment D – Geotechnical Risk Management Policy for Pittwater – Forms 1 and 1a

Attachment E – Notes About This Report

Attachment – Figures

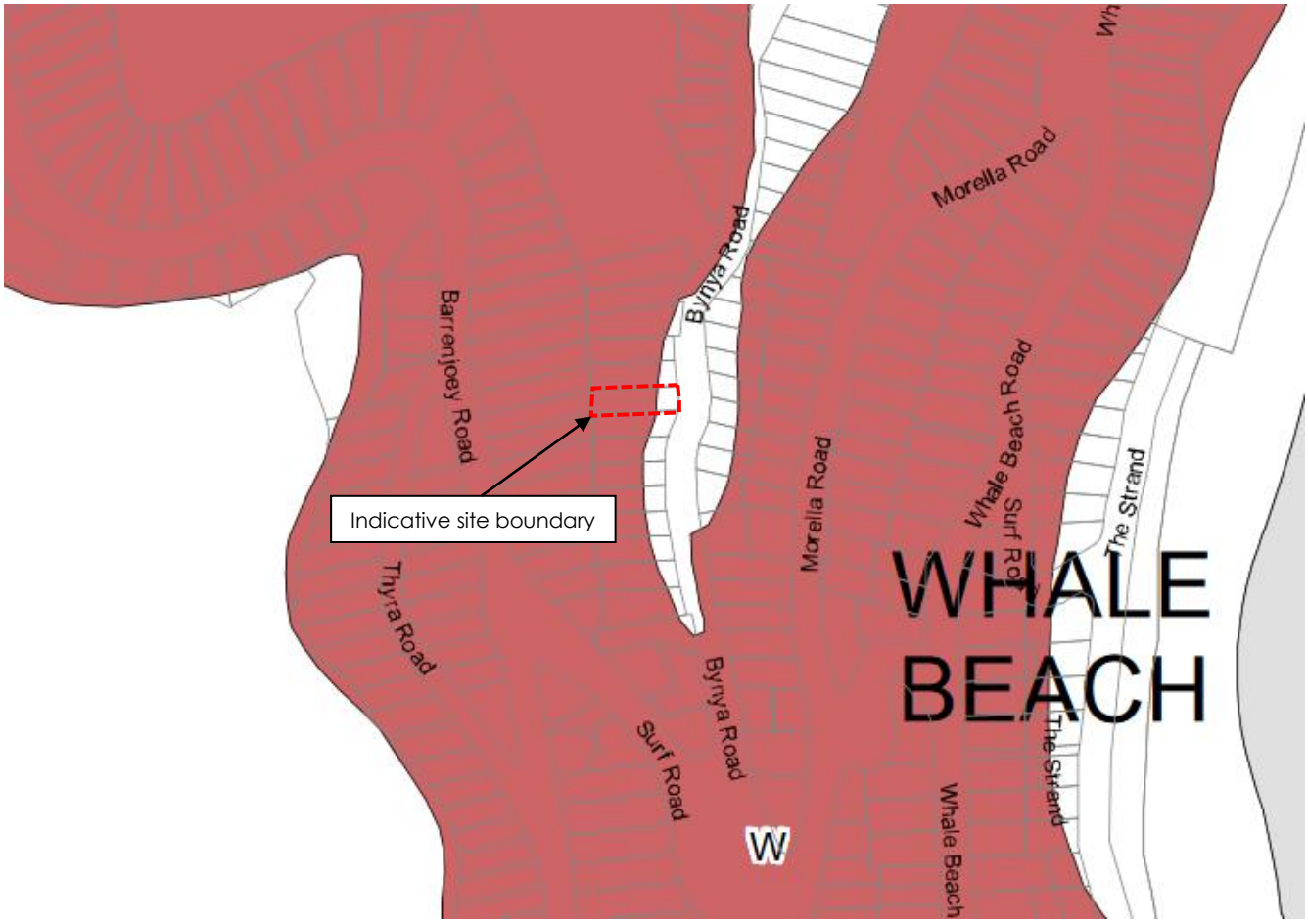
Pittwater Local Environmental Plan 2014

Geotechnical Hazard Map - Sheet GTH_015

Geotechnical Hazard

W Geotechnical Hazard H1

AE Geotechnical Hazard H2



Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	HN	**SITE LOCATION RELATIVE TO LANDSLIP RISK CLASSES** **26 Bynya Road, Palm Beach, NSW** (Source: Pittwater LEP, 2014)	Drawing No: **FIGURE 1**
Approved:	RE		
Date:	26.08.2019		
Scale:	Not to Scale		File No: P1304015JC09V01

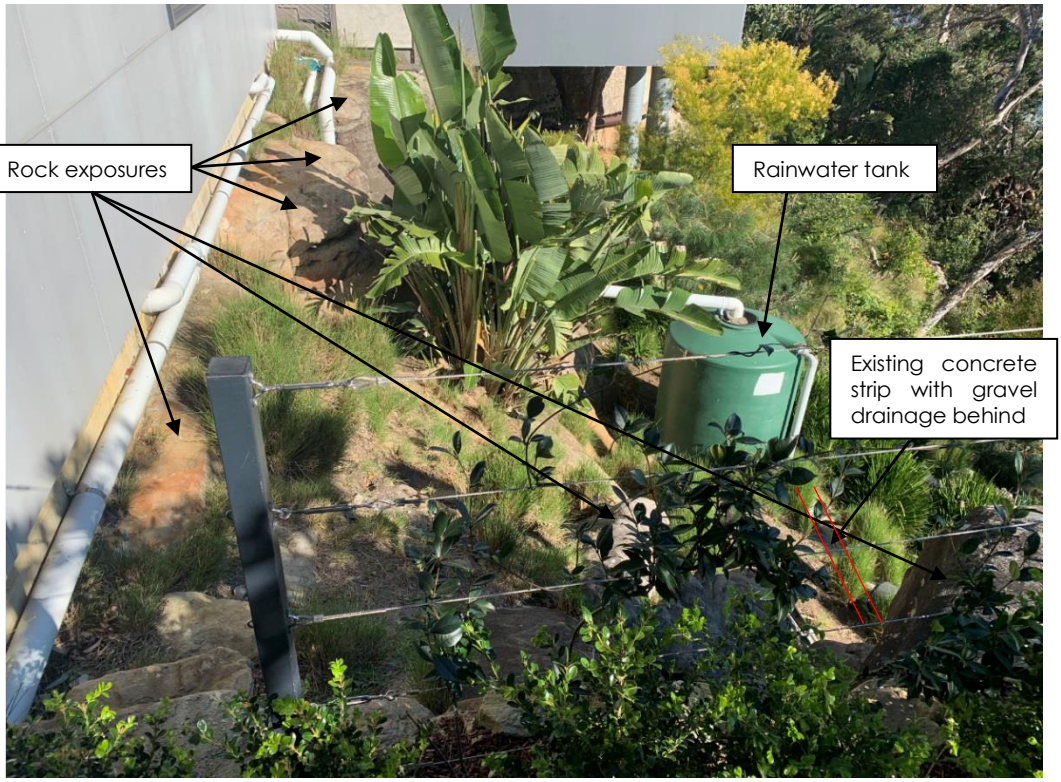


Plate 1 – Geotechnical conditions across the proposed development area – looking towards the south

Plate 2 - Geotechnical conditions across the proposed development area – looking towards the north

Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	HN	**SITE CONDITIONS ACROSS THE DEVELOPMENT AREA** **26 Bynya Road, Palm Beach, NSW** (Source: Site photos)	Drawing No: **PLATES 1 & 2**
Approved:	RE		
Date:	26.08.2019		
Scale:	Not to Scale		File No: P1304015JC09V01

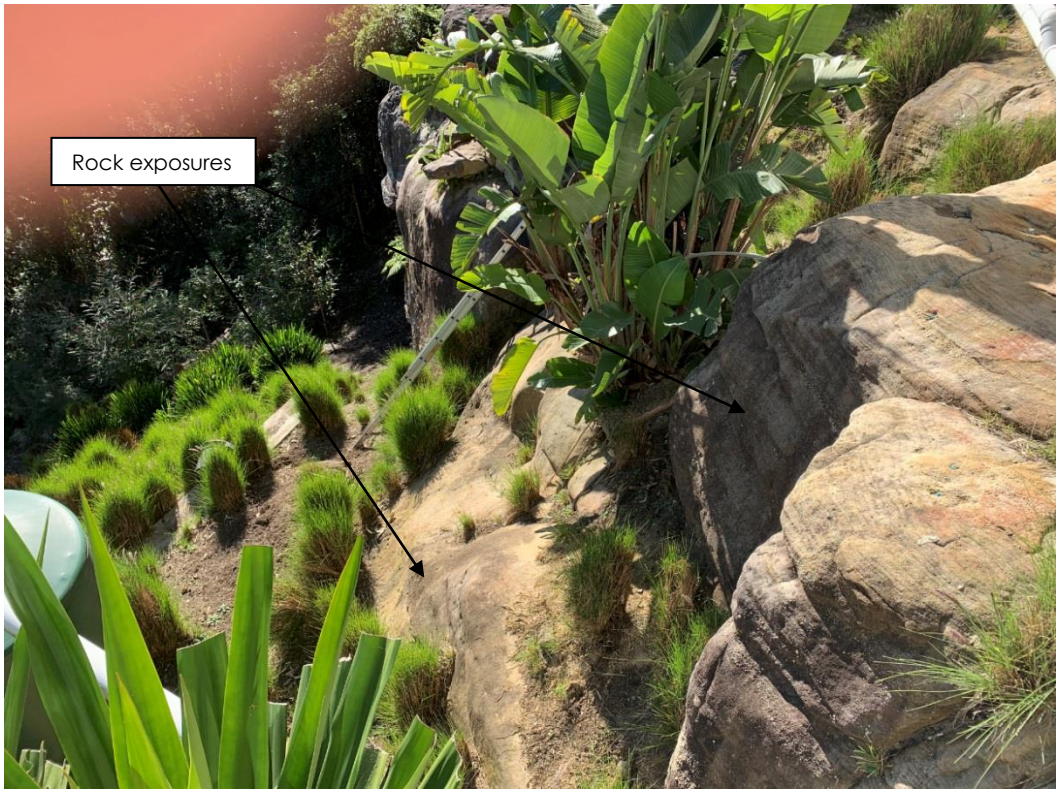


Plate 3 - Geotechnical conditions across the proposed development area – looking towards the south

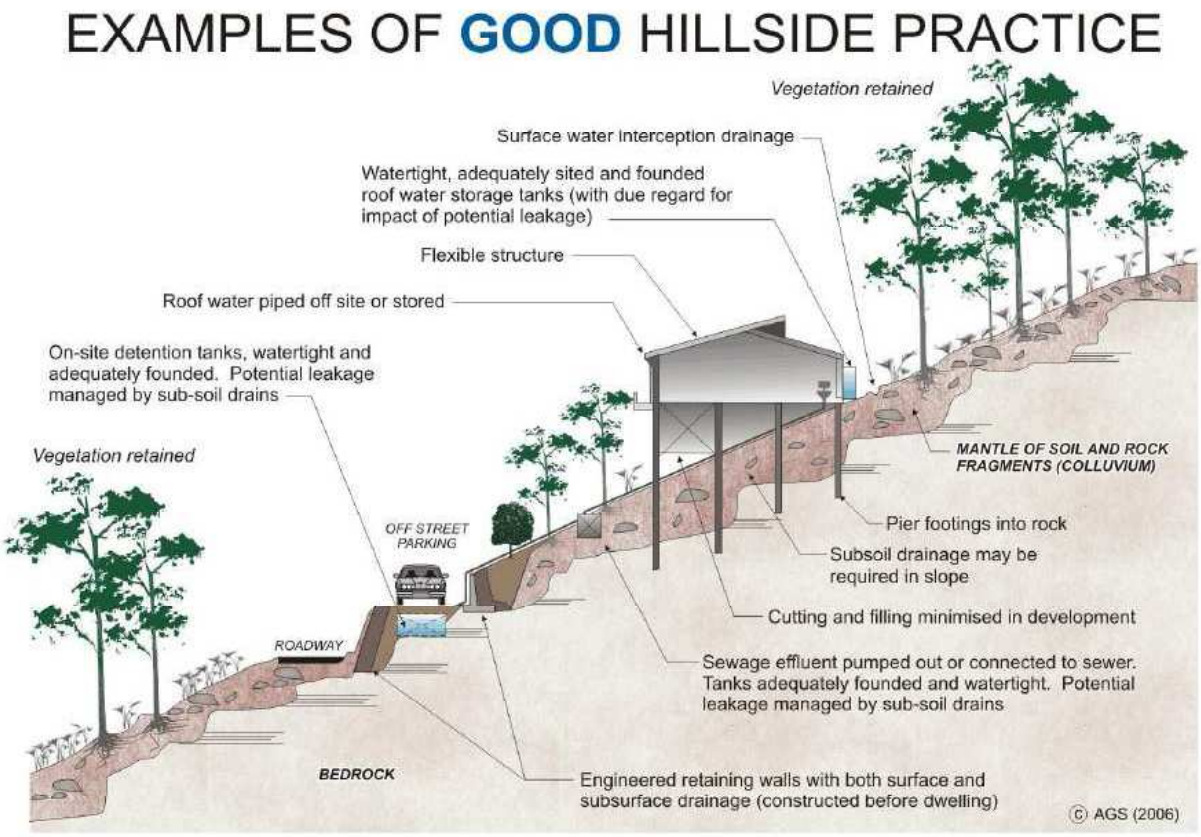
Plate 4 - Geotechnical conditions across the proposed development area – looking towards the west

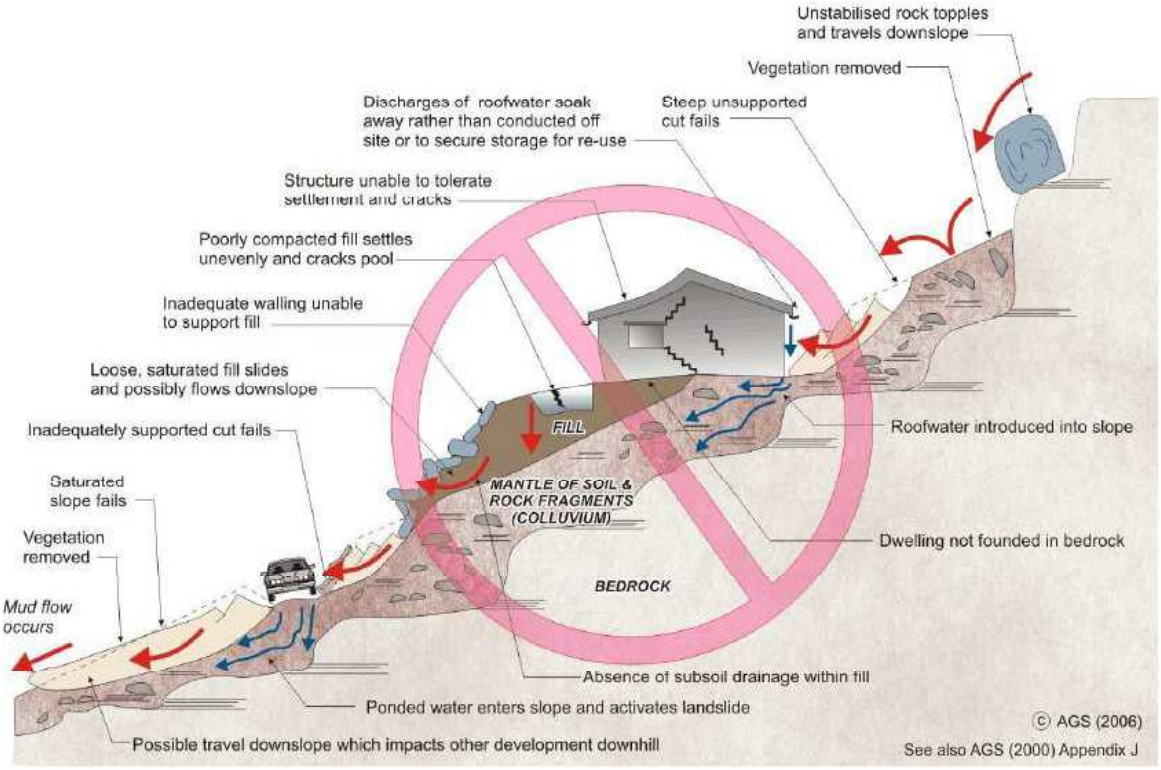
Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	HN	**SITE CONDITIONS ACROSS THE DEVELOPMENT AREA** **26 Bynya Road, Palm Beach, NSW** (Source: Site photos)	Drawing No: **PLATES 3 & 4**
Approved:	RE		
Date:	26.08.2019		
Scale:	Not to Scale		File No: P1304015JC09V01

Attachment B – Hillside Construction Guidelines (AGS, 2007)

APPENDIX G - SOME GUIDELINES FOR HILLSIDE CONSTRUCTION

	GOOD ENGINEERING PRACTICE	*POOR ENGINEERING PRACTICE*
ADVICE		
GEOTECHNICAL ASSESSMENT	Obtain advice from a qualified, experienced geotechnical practitioner at early stage of planning and before site works.	Prepare detailed plan and start site works before geotechnical advice.
PLANNING		
SITE PLANNING	Having obtained geotechnical advice, plan the development with the risk arising from the identified hazards and consequences in mind.	Plan development without regard for the Risk.
DESIGN AND CONSTRUCTION		
HOUSE DESIGN	Use flexible structures which incorporate properly designed brickwork, timber or steel frames, timber or panel cladding. Consider use of split levels. Use decks for recreational areas where appropriate.	Floor plans which require extensive cutting and filling. Movement intolerant structures.
SITE CLEARING	Retain natural vegetation wherever practicable.	Indiscriminately clear the site.
ACCESS & DRIVEWAYS	Satisfy requirements below for cuts, fills, retaining walls and drainage. Council specifications for grades may need to be modified. Driveways and parking areas may need to be fully supported on piers.	Excavate and fill for site access before geotechnical advice.
EARTHWORKS	Retain natural contours wherever possible.	Indiscriminatory bulk earthworks.
CUTS	Minimise depth. Support with engineered retaining walls or batter to appropriate slope. Provide drainage measures and erosion control.	Large scale cuts and benching. Unsupported cuts. Ignore drainage requirements
FILLS	Minimise height. Strip vegetation and topsoil and key into natural slopes prior to filling. Use clean fill materials and compact to engineering standards. Batter to appropriate slope or support with engineered retaining wall. Provide surface drainage and appropriate subsurface drainage.	Loose or poorly compacted fill, which if it fails, may flow a considerable distance including onto property below. Block natural drainage lines. Fill over existing vegetation and topsoil. Include stumps, trees, vegetation, topsoil, boulders, building rubble etc in fill.
ROCK OUTCROPS & BOULDERS	Remove or stabilise boulders which may have unacceptable risk. Support rock faces where necessary.	Disturb or undercut detached blocks or boulders.
RETAINING WALLS	Engineer design to resist applied soil and water forces. Found on rock where practicable. Provide subsurface drainage within wall backfill and surface drainage on slope above. Construct wall as soon as possible after cut/fill operation.	Construct a structurally inadequate wall such as sandstone flagging, brick or unreinforced blockwork. Lack of subsurface drains and weepholes.
FOOTINGS	Found within rock where practicable. Use rows of piers or strip footings oriented up and down slope. Design for lateral creep pressures if necessary. Backfill footing excavations to exclude ingress of surface water.	Found on topsoil, loose fill, detached boulders or undercut cliffs.
SWIMMING POOLS	Engineer designed. Support on piers to rock where practicable. Provide with under-drainage and gravity drain outlet where practicable. Design for high soil pressures which may develop on uphill side whilst there may be little or no lateral support on downhill side.	
DRAINAGE		
SURFACE	Provide at tops of cut and fill slopes. Discharge to street drainage or natural water courses. Provide general falls to prevent blockage by siltation and incorporate silt traps. Line to minimise infiltration and make flexible where possible. Special structures to dissipate energy at changes of slope and/or direction.	Discharge at top of fills and cuts. Allow water to pond on bench areas.
SUBSURFACE	Provide filter around subsurface drain. Provide drain behind retaining walls. Use flexible pipelines with access for maintenance. Prevent inflow of surface water.	Discharge roof runoff into absorption trenches.
SEPTIC & SULLAGE	Usually requires pump-out or mains sewer systems; absorption trenches may be possible in some areas if risk is acceptable. Storage tanks should be water-tight and adequately founded.	Discharge sullage directly onto and into slopes. Use absorption trenches without consideration of landslide risk.
EROSION CONTROL & LANDSCAPING	Control erosion as this may lead to instability. Revegetate cleared area.	Failure to observe earthworks and drainage recommendations when landscaping.
DRAWINGS AND SITE VISITS DURING CONSTRUCTION		
DRAWINGS	Building Application drawings should be viewed by geotechnical consultant	
SITE VISITS	Site Visits by consultant may be appropriate during construction/	
INSPECTION AND MAINTENANCE BY OWNER		
OWNER'S RESPONSIBILITY	Clean drainage systems; repair broken joints in drains and leaks in supply pipes. Where structural distress is evident see advice. If seepage observed, determine causes or seek advice on consequences.	


EXAMPLES OF GOOD HILLSIDE PRACTICE
Vegetation retained
Surface water interception drainage
Watertight, adequately sited and founded roof water storage tanks (with due regard for impact of potential leakage)
Flexible structure
Roof water piped off site or stored
On-site detention tanks, watertight and adequately founded. Potential leakage managed by sub-soil drains
Vegetation retained
MANTLE OF SOIL AND ROCK FRAGMENTS (COLLUVIUM)
OFF STREET PARKING
Pier footings into rock
Subsoil drainage may be required in slope
Cutting and filling minimised in development
ROADWAY
Sewage effluent pumped out or connected to sewer. Tanks adequately founded and watertight. Potential leakage managed by sub-soil drains
BEDROCK
Engineered retaining walls with both surface and subsurface drainage (constructed before dwelling)
© AGS (2006)


EXAMPLES OF POOR HILLSIDE PRACTICE
Unstabilised rock topples and travels downslope
Vegetation removed
Discharges of roofwater soak away rather than conducted off site or to secure storage for re-use
Steep unsupported cut fails
Structure unable to tolerate settlement and cracks
Poorly compacted fill settles unevenly and cracks pool
Inadequate walling unable to support fill
Loose, saturated fill slides and possibly flows downslope
Inadequately supported cut fails
FILL
Roofwater introduced into slope
Saturated slope fails
MANTLE OF SOIL & ROCK FRAGMENTS (COLLUVIUM)
Vegetation removed
Dwelling not founded in bedrock
BEDROCK
Mud flow occurs
Absence of subsoil drainage within fill
Ponded water enters slope and activates landslide
© AGS (2006)
Possible travel downslope which impacts other development downhill
See also AGS (2000) Appendix J

Attachment C – General Geotechnical Recommendations

Geotechnical Recommendations

Important Recommendations About Your Site (1 of 2)

These general geotechnical recommendations have been prepared by Martens to help you deliver a safe work site, to comply with your obligations, and to deliver your project. Not all are necessarily relevant to this report but are included as general reference. Any specific recommendations made in the report will override these recommendations.

Batter Slopes

Excavations in soil and extremely low to very low strength rock exceeding 0.75 m depth should be battered back at grades of no greater than 1 Vertical (V) : 2 Horizontal (H) for temporary slopes (unsupported for less than 1 month) and 1 V : 3 H for longer term unsupported slopes.

Vertical excavation may be carried out in medium or higher strength rock, where encountered, subject to inspection and confirmation by a geotechnical engineer. Long term and short term unsupported batters should be protected against erosion and rock weathering due to, for example, stormwater run-off.

Batter angles may need to be revised depending on the presence of bedding partings or adversely oriented joints in the exposed rock, and are subject to on-site inspection and confirmation by a geotechnical engineer. Unsupported excavations deeper than 1.0 m should be assessed by a geotechnical engineer for slope instability risk.

Any excavated rock faces should be inspected during construction by a geotechnical engineer to determine whether any additional support, such as rock bolts or shotcrete, is required.

Earthworks

Earthworks should be carried out following removal of any unsuitable materials and in accordance with AS3798 (2007). A qualified geotechnical engineer should inspect the condition of prepared surfaces to assess suitability as foundation for future fill placement or load application.

Earthworks inspections and compliance testing should be carried out in accordance with Sections 5 and 8 of AS3798 (2007), with testing to be carried out by a National Association of Testing Authorities (NATA) accredited testing laboratory.

Excavations

All excavation work should be completed with reference to the *Work Health and Safety (Excavation Work) Code of Practice (2015)*, by Safe Work Australia. Excavations into rock may be undertaken as follows:

1. Extremely low to low strength rock - conventional hydraulic earthmoving equipment.

2. Medium strength or stronger rock - hydraulic earthmoving equipment with rock hammer or ripping tyne attachment.

Exposed rock faces and loose boulders should be monitored to assess risk of block / boulder movement, particularly as a result of excavation vibrations.

Fill

Subject to any specific recommendations provided in this report, any fill imported to site is to comprise approved material with maximum particle size of two thirds the final layer thickness. Fill should be placed in horizontal layers of not more than 300 mm loose thickness, however, the layer thickness should be appropriate for the adopted compaction plant.

Foundations

All exposed foundations should be inspected by a geotechnical engineer prior to footing construction to confirm encountered conditions satisfy design assumptions and that the base of all excavations is free from loose or softened material and water. Water that has ponded in the base of excavations and any resultant softened material is to be removed prior to footing construction.

Footings should be constructed with minimal delay following excavation. If a delay in construction is anticipated, we recommend placing a concrete blinding layer of at least 50 mm thickness in shallow footings or mass concrete in piers / piles to protect exposed foundations.

A geotechnical engineer should confirm any design bearing capacity values, by further assessment during construction, as necessary.

Shoring - Anchors

Where there is a requirement for either soil or rock anchors, or soil nailing, and these structures penetrate past a property boundary, appropriate permission from the adjoining land owner must be obtained prior to the installation of these structures.

Shoring - Permanent

Permanent shoring techniques may be used as an alternative to temporary shoring. The design of such structures should be in accordance with the findings of this report and any further testing recommended by this report. Permanent shoring may include [but not be limited to] reinforced block work walls, contiguous and semi contiguous pile walls, secant pile walls and soldier pile walls with or without reinforced shotcrete infill panels. The choice of shoring system will depend on the type of structure, project budget and site specific geotechnical conditions.

Permanent shoring systems are to be engineer designed and backfilled with suitable granular

material and free-draining drainage material. Backfill should be placed in maximum 100 mm thick layers compacted using a hand operated compactor. Care should be taken to ensure excessive compaction stresses are not transferred to retaining walls.

Shoring design should consider any surcharge loading from sloping / raised ground behind shoring structures, live loads, new structures, construction equipment, backfill compaction and static water pressures. All shoring systems shall be provided with adequate foundation designs.

Suitable drainage measures, such as geotextile enclosed 100 mm agricultural pipes embedded in free-draining gravel, should be included to redirect water that may collect behind the shoring structure to a suitable discharge point.

Shoring - Temporary

In the absence of providing acceptable excavation batters, excavations should be supported by suitably designed and installed temporary shoring / retaining structures to limit lateral deflection of excavation faces and associated ground surface settlements.

Soil Erosion Control

Removal of any soil overburden should be performed in a manner that reduces the risk of sedimentation occurring in any formal stormwater drainage system, on neighbouring land and in receiving waters. Where possible, this may be achieved by one or more of the following means:

1. Maintain vegetation where possible
2. Disturb minimal areas during excavation
3. Revegetate disturbed areas if possible

All spoil on site should be properly controlled by erosion control measures to prevent transportation of sediments off-site. Appropriate soil erosion control methods in accordance with Landcom (2004) shall be required.

Trafficability and Access

Consideration should be given to the impact of the proposed works and site subsurface conditions on trafficability within the site e.g. wet clay soils will lead to poor trafficability by tyred plant or vehicles.

Where site access is likely to be affected by any site works, construction staging should be organised such that any impacts on adequate access are minimised as best as possible.

Vibration Management

Where excavation is to be extended into medium or higher strength rock, care will be required when using a rock hammer to limit potential structural distress from excavation-induced vibrations where nearby structures may be affected by the works.

To limit vibrations, we recommend limiting rock hammer size and set frequency, and setting the hammer parallel to bedding planes and along defect planes, where possible, or as advised by a geotechnical engineer. We recommend limiting vibration peak particle velocities (PPV) caused by construction equipment or resulting from excavation at the site to 5 mm/s (AS 2187.2, 2006, Appendix J).

Waste – Spoil and Water

Soil to be disposed off-site should be classified in accordance with the relevant State Authority guidelines and requirements.

Any collected waste stormwater or groundwater should also be tested prior to discharge to ensure contaminant levels (where applicable) are appropriate for the nominated discharge location.

MA can complete the necessary classification and testing if required. Time allowance should be made for such testing in the construction program.

Water Management - Groundwater

If the proposed works are likely to intersect ephemeral or permanent groundwater levels, the management of any potential acid soil drainage should be considered. If groundwater tables are likely to be lowered, this should be further discussed with the relevant State Government Agency.

Water Management – Surface Water

All surface runoff should be diverted away from excavation areas during construction works and prevented from accumulating in areas surrounding any retaining structures, footings or the base of excavations.

Any collected surface water should be discharged into a suitable Council approved drainage system and not adversely impact downslope surface and subsurface conditions.

All site discharges should be passed through a filter material prior to release. Sump and pump methods will generally be suitable for collection and removal of accumulated surface water within any excavations.

Contingency Plan

In the event that proposed development works cause an adverse impact on geotechnical hazards, overall site stability or adjacent properties, the following actions are to be undertaken:

1. Works shall cease immediately.
2. The nature of the impact shall be documented and the reason(s) for the adverse impact investigated.
3. A qualified geotechnical engineer should be consulted to provide further advice in relation to the issue.

Attachment D – Geotechnical Risk Management Policy for Pittwater – Forms 1 and 1a

GEOTECHNICAL RISK MANAGEMENT POLICY FOR PITTWATER

FORM NO. 1 – To be submitted with Development Application

Development Application for Bill & Mandy Palmer
Name of Applicant

Address of site 26 Bynya Road, Palm Beach, NSW

Declaration made by geotechnical engineer or engineering geologist or coastal engineer (where applicable) as part of a geotechnical report

I, Ralph Erni (Insert Name) *on behalf of* Martens & Associates (Trading or Company Name)

on this the 26/8/19 certify that I am a geotechnical engineer or engineering geologist or coastal engineer as defined by the Geotechnical Risk Management Policy for Pittwater - 2009 and I am authorised by the above organisation/company to issue this document and to certify that the organisation/company has a current professional indemnity policy of at least $2million.
I:

Please mark appropriate box

☐ have prepared the detailed Geotechnical Report referenced below in accordance with the Australia Geomechanics Society's Landslide Risk Management Guidelines (AGS 2007) and the Geotechnical Risk Management Policy for Pittwater - 2009

☒ am willing to technically verify that the detailed Geotechnical Report referenced below has been prepared in accordance with the Australian Geomechanics Society's Landslide Risk Management Guidelines (AGS 2007) and the Geotechnical Risk Management Policy for Pittwater - 2009

☐ have examined the site and the proposed development in detail and have carried out a risk assessment in accordance with Section 6.0 of the Geotechnical Risk Management Policy for Pittwater - 2009. I confirm that the results of the risk assessment for the proposed development are in compliance with the Geotechnical Risk Management Policy for Pittwater - 2009 and further detailed geotechnical reporting is not required for the subject site.

☐ have examined the site and the proposed development/alteration in detail and I am of the opinion that the Development Application only involves Minor Development/Alteration that does not require a Geotechnical Report or Risk Assessment and hence my Report is in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009 requirements.

☐ have examined the site and the proposed development/alteration is separate from and is not affected by a Geotechnical Hazard and does not require a Geotechnical Report or Risk Assessment and hence my Report is in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009 requirements.

☐ have provided the coastal process and coastal forces analysis for inclusion in the Geotechnical Report

Geotechnical Report Details:

Report Title: Limited Geotechnical Assessment
Report Date: 26/08/2019
Author: Hamed Naghibi
Author's Company/Organisation: Martens & Associates

Documentation which relate to or are relied upon in report preparation:

- Architectural drawings by mm+j Architects, Job No. 1860, dated 27/6/19
- Structural drawings by Northern Beaches Consulting Engineers, Job No. 190667, dated 26/6/19

I am aware that the above Geotechnical Report, prepared for the abovementioned site is to be submitted in support of a Development Application for this site and will be relied on by Pittwater Council as the basis for ensuring that the Geotechnical Risk Management aspects of the proposed development have been adequately addressed to achieve an "Acceptable Risk Management" level for the life of the structure, taken as at least 100 years unless otherwise stated and justified in the Report and that reasonable and practical measures have been identified to remove foreseeable risk.

Signature .....

Name .....Ralph Erni.....

Chartered Professional Status.....CPEng.....

Membership No. .....206149.....

Company.....Martens & Associates

GEOTECHNICAL RISK MANAGEMENT POLICY FOR PITTWATER

FORM NO. 1(a) - Checklist of Requirements For Geotechnical Risk Management Report for Development Application

Development Application for Bill & Mandy Palmer
Name of Applicant

Address of site 26 Bynya Road, Palm Beach, NSW

The following checklist covers the minimum requirements to be addressed in a Geotechnical Risk Management Geotechnical Report. This checklist is to accompany the Geotechnical Report and its certification (Form No. 1).

Geotechnical Report Details:

Report Title: Limited Geotechnical Assessment
Report Date: 26/08/19
Author: Hamed Naghibi
Author's Company/Organisation: Maftens & Associates

Please mark appropriate box

☒ ~~Comprehensive~~ site mapping conducted 20/08/19 (Limited development and site conditions did not warrant comprehensive site mapping)
(date)

☐ Mapping details presented on contoured site plan with geomorphic mapping to a minimum scale of 1:200 (as appropriate)

☒ Subsurface investigation required
- ☒ No Justification Rock outcropping across the site and limited development.
- ☐ Yes Date conducted .....

☒ Geotechnical model developed and reported as an inferred subsurface type-section

☒ Geotechnical hazards identified
- ☒ Above the site
- ☒ On the site
- ☒ Below the site
- ☒ Beside the site

☒ Geotechnical hazards described and reported

☒ Risk assessment conducted in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009
- ☒ Consequence analysis
- ☒ Frequency analysis

☒ Risk calculation

☒ Risk assessment for property conducted in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009

☒ Risk assessment for loss of life conducted in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009

☒ Assessed risks have been compared to "Acceptable Risk Management" criteria as defined in the Geotechnical Risk Management Policy for Pittwater - 2009

☒ Opinion has been provided that the design can achieve the "Acceptable Risk Management" criteria provided that the specified conditions are achieved.

☒ Design Life Adopted:
- ☒ 100 years
- ☐ Other .....
specify

☒ Geotechnical Conditions to be applied to all four phases as described in the Geotechnical Risk Management Policy for Pittwater - 2009 have been specified

☒ Additional action to remove risk where reasonable and practical have been identified and included in the report.

☐ Risk assessment within Bushfire Asset Protection Zone.

I am aware that Pittwater Council will rely on the Geotechnical Report, to which this checklist applies, as the basis for ensuring that the geotechnical risk management aspects of the proposal have been adequately addressed to achieve an "Acceptable Risk Management" level for the life of the structure, taken as at least 100 years unless otherwise stated, and justified in the Report and that reasonable and practical measures have been identified to remove foreseeable risk.

Signature .....
Name ..... Ralph Ern.....
Chartered Professional Status..... CPEng.....
Membership No. ... 206.11.49.....
Company..... Maftens & Associates

Attachment E – Notes About This Report

Information

Important Information About Your Report (1 of 2)

These notes have been prepared by Martens to help you interpret and understand the limitations of your report. Not all are necessarily relevant to all reports but are included as general reference.

Engineering Reports - Limitations

Engineering reports are based on information that may be gained from limited subsurface site testing and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretative rather than factual documents, limited to some extent by the scope of information on which they rely.

Engineering Reports – Project Specific Criteria

Engineering reports are prepared by qualified personnel. They are based on information obtained, on current engineering standards of interpretation and analysis, and on the basis of your unique project specific requirements as understood by Martens. 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.

Where the report has been prepared for a specific design proposal (e.g. a three storey building), the information and interpretation may not be relevant if the design proposal is changed (e.g. to a twenty storey building). Your report should not be relied upon, if there are changes to the project, without first asking Martens to assess how factors, which changed subsequent to the date of the report, affect the report's recommendations. Martens will not accept responsibility for problems that may occur due to design changes, if not consulted.

Engineering Reports – Recommendations

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

Only Martens, who prepared the report, are 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 Martens cannot be held responsible for such misinterpretation.

Engineering Reports – Use for Tendering Purposes

Where information obtained from investigations is provided for tendering purposes, Martens recommend that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document.

Martens would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Engineering Reports – Data

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

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

Engineering Reports – Other Projects

To avoid misuse of the information contained in your report it is recommended that you confer with Martens before passing your report on to another party who may not be familiar with the background and 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 - General

Every care is taken with the report in relation to interpretation of subsurface conditions, discussion of geotechnical aspects, relevant standards and recommendations or suggestions for design and construction. However, the Company cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions - the potential will depend partly on test point (eg. excavation or borehole) spacing and sampling frequency, which are often limited by project imposed budgetary constraints.

- Changes in guidelines, standards and policy or interpretation of guidelines, standards and policy by statutory authorities.

- The actions of contractors responding to commercial pressures.

- Actual conditions differing somewhat from those inferred to exist, because no professional, no matter how qualified, can reveal precisely what is hidden by earth, rock and time.

  The actual interface between logged 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.

If these conditions occur, Martens will be pleased to assist with investigation or providing advice to resolve the matter.

Subsurface Conditions - Changes

Natural processes and the activity of man create subsurface conditions. For example, water levels can vary with time, fill may be placed on a site and pollutants may migrate with time. Reports are based on conditions which existed at the time of the subsurface exploration / assessment.

Decisions should not be based on a report whose adequacy may have been affected by time. If an extended period of time has elapsed since the report was prepared, consult Martens to be advised how time may have impacted on the project.

Subsurface Conditions - Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those that were expected from the information contained in the report, Martens requests that it immediately be notified. Most problems are much more readily resolved at the time when conditions are exposed, rather than at some later stage well after the event.

Report Use by Other Design Professionals

To avoid potentially costly misinterpretations when other design professionals develop their plans based on a Martens report, retain Martens to work with other project professionals affected by the report. This may involve Martens explaining the report design implications and then reviewing plans and specifications produced to see how they have incorporated the report findings.

Subsurface Conditions – Geo-environmental Issues

Your report generally does not relate to any findings, conclusions, or recommendations about the potential for hazardous or contaminated materials existing at the site unless specifically required to do so as part of Martens' proposal for works.

Specific sampling guidelines and specialist equipment, techniques and personnel are typically used to perform geo-environmental or site contamination assessments. Contamination can create major health, safety and environmental risks. If you have no information about the potential for your site to be contaminated or create an environmental hazard, you are advised to contact Martens for information relating to such matters.

Responsibility

Geo-environmental reporting relies on interpretation of factual information based on professional judgment and opinion and has an inherent level of uncertainty attached to it and is typically far less exact than the design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded.

To help prevent this problem, a number of clauses have been developed for use in contracts, reports and other documents. Responsibility clauses do not transfer appropriate liabilities from Martens to other parties but are included to identify where Martens' responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Read all documents from Martens closely and do not hesitate to ask any questions you may have.

Site Inspections

Martens will always be pleased to provide engineering inspection services for aspects of work to which this report relates. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site. Martens is familiar 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.