

JOB NO. DE16/234 AUGUST, 2016
QUEENSLAND DEPARTMENT OF NATURAL
RESOURCES AND MINES
PRELIMINARY ASSESSMENT
OF SINKHOLES
53 17 MILE ROCKS ROAD AND
113 CLIVEDEN AVENUE
OXLEY

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Author: Russell Howchin

11 August 2016

QLD Department of Natural Resources and Mines (NRM)
27 O'Connell Street
Gympie Q 4570

ATTENTION: MR MICHAEL OVERLAND
Email: michael.overland@dnrm.qld.gov.au

Dear Sir,

RE: PRELIMINARY ASSESSMENT OF SINKHOLES, 53 17 MILE ROCKS ROAD AND 113 CLIVEDEN AVENUE, OXLEY

1.0 INTRODUCTION

This report presents the results of a preliminary assessment of the sinkholes at 53 17 Mile Rocks Road and 113 Cliveden Avenue, Oxley (herein referred to as the "Site"). This preliminary assessment was commissioned by the QLD Department of Natural Resources and Mines (herein referred to as the "Client").

This report is Revision 1 and includes comments and information in relation to a recent phone conversation with Mr Michael Overland of the QLD Department of Natural Resources and Mines.

2.0 METHODOLOGY

This preliminary assessment has been based on:-

- A desk study of available Geological Maps;
- Held borelog data for locations within the local area of the Site;
- A walk-over observational assessment of the Site and surrounds by a Senior Geoscientist; and
- Discussions with the QLD Department of Natural Resources and Mines.

2.0 EXISTING CONDITIONS

2.1 Geology and Landsliding

Four sinkholes between approximately 0.5m to 1m in diameter and between 500mm to 800mm in depth are present on a hillslope within a drainage line adjacent to the boundary of No 38 Blackheath Street and 53 17 Mile Rocks Road. These sinkholes have appeared "in the last month or two" according to anecdotal information from nearby residents. Another smaller sinkhole approximately 0.5m in diameter and 300mm to 400mm deep is located downslope of Nos 12 to 14 Blackheath Street. Site photos are attached as Appendix A.



The local area surrounding the Site has previously experienced landslip events. In 1974, following a period of heavy rainfall and the 1974 Brisbane River floods, a landslip approximately 1.6km long affected land and homes just to the north of the Site in Cliveden Avenue, Strathburn Street and Oxley Terrace. Subsequently, many homes were abandoned and Cliveden Avenue was permanently closed within the landslip area. In 1981 a landslip at No 56 Blackheath Street was triggered by heavy rainfall. The house was demolished due to the presence of the unstable land in the immediate area. It is noted that investigations at No 56 Blackheath Street or other properties along either Blackheath Street or 17 Mile Rocks Road have not been carried out as part of this assessment.

In both landslip cases, the active mechanisms were likely to be a combination of:

- High rainfall;
- Vegetation clearing allowing the development of high subsurface pore water pressures and consequential loss of shear strength and lateral slope creep instability;
- Surface water and groundwater entering the interface between the surficial, porous basalt caps and underlying "soft" sedimentary rocks of the Corinda Formation, which is present beneath the ground surface at the Site and local area.

Anecdotal evidence suggests that slip escarpments up to 6m in height have been observed in the past in the local Site area.

Landslips have the potential to adversely affect both the upslope Blackheath Street and 17 Mile Rocks Road properties, and the Child Care Centre and Oxley Secondary College (presently used for police training) present at the base of the hillslope.

The impact on the upslope properties along Blackheath Street and 17 Mile Rocks Road is likely to be more probable and more severe when compared to the downslope properties including the Child Care Centre and Oxley Secondary College.

The extent of any damage would be determined by the location of the eventual slip escarpment, but when accounting for the fact there has been a house in Blackheath Street which has had to be demolished due to landslip in the past, we would evaluate that the potential for a landslip to affect one or more of the upslope properties along Blackheath Street and possibly 17 Mile Rocks Road to be likely. It is extremely difficult to predict when a landslip event may occur, other than to state that the longer the slope is left in its current condition, the more likely the slope will fail, potentially causing damage to at least parts of the upslope properties and possibly the downslope structures. The risk to life would depend on how frequently and how long the upslope and downslope properties are occupied at any one time.

2.2 Topography

The Site is located along a hillslope positioned between residential homes at the top of the hill on Blackheath Road to the east, and a flat, low lying alluvial floodplain on 53 17 Mile Rocks Road down to the west.

The ground surface slopes down to the west at angles typically ranging between 10° and 13° (approximate). The hillslope is approximately 10m to 12m in height.

Morrison Geotechnic does not know if cut to fill earthworks within the Blackheath Street and 17 Mile Rocks Road properties have been carried out, and where they have been carried out, if they have been carried out by "benching" into the ground surface. The assessment of whether cut to fill earthworks have been carried out on these upslope properties did not form part of this assessment.

Several drainage lines are present at various locations across the hillslope.

2.3 Groundwater

Groundwater seepages were not observed over the hillslope ground surface during the Site walkover assessment.

However, sandy silt debris material was observed at the base of the slope adjacent to the sinkhole area. This indicates the possible presence of groundwater springs originating between the basalt and underlying siltstone, and associated erosion and "washout" of the soft siltstone rock.

High groundwater pressures within the subsurface materials and especially along the basalt/siltstone interface, associated with the infiltration of rainfall and clearing of trees can reactivate old slides within the hillslope, especially near the heads of drainage lines.

Sand and silt materials were observed as debris in scattered areas over the hillslope. The accumulation of the debris materials in these areas is also possibly related to sedimentary rock washouts beneath the ground surface. It is noted that the greatest accumulation of sand and silt materials was observed at the base of the slope directly beneath the sinkhole area.

2.4 Drainage

Surface drainage over the hillslope is assessed to be poor due to the presence of porous surficial basalt and underlying, relatively impermeable siltstone rock. Surface water has the potential to infiltrate the ground surface and run between the basalt and siltstone rock layers. Upslope surface and subsurface drainage is critical to reducing the potential for future sinkhole or landslip development. Water flows must be intercepted and diverted below the hillslope in a controlled way to avoid saturation of the subsurface materials and reactivation of relict landslides.

It is recommended that the Brisbane City Council and other relevant underground service asset owners be contacted to assess the locations of underground service trenches within the Blackheath Street, 17 Mile Rocks Road and NRM properties and whether these trenches or services may be increasing water flows into the hillslope, especially within the area of the sinkholes.

2.5 Vegetation

Grass and scattered trees cover the ground surface along the hillslope at the Site. It is likely that at least part of the Site, and parts of the Blackheath Street properties upslope of the Site have been cleared of trees and shrubs in the past.

Vegetation including the existing large trees must be retained where possible to assist in maintaining a stable slope, and to aid in reducing groundwater pressures. Trees and vegetation essentially "remove" subsurface water from the hillslope through evapotranspiration and uptake through the root system.

3.0 ASSESSMENT OF EXISTING SLOPE

3.1 Identified Geotechnical Hazards

In the present condition, several geotechnical hazards or potential hazards can be identified at the Site as discussed in the following subsections.

3.1.1 Shallow Soil Creep on Escarpment

Shallow soil creep is an active Geotechnical process at and near this Site. This Geotechnical Hazard is triggered by rainfall and continues as a passive process within the shallow profile of the soil cover over the weathered rock profile (basalt/siltstone) with relatively minor adverse consequences with respect to slope stability. Indicators of this shallow creep movement in-situ include the curved trunks of trees particularly towards the top of the hillslope and adjacent to the rear boundaries of the residential properties along Blackheath Street.

3.1.2 Reactivation of Possible Historic Landslides Within the Hillslope

The gently sloping hill may be susceptible to slow creep activity involving complex rotational slides along deep seated shear surfaces, and triggered by high groundwater pressures resulting from upslope infiltration of surface water associated with rainfall events.

This landslide activity may occur as reactivation processes along deep shear surfaces after significant rainfall events and periods when groundwater pressures increase in response to the infiltration of surface water. This rainfall infiltration may take place well above and away from the Site resulting in significant increases in groundwater pressures beneath the entire hillside further downslope. This type of landslide reactivation may have aided the creation of the sinkholes observed at the Site, and may cause significant damage to properties upslope if creep movement is initiated.

3.1.3 Water Infiltration Along Basalt/Siltstone Interface

The sinkholes have most likely been initiated by the accumulation of groundwater along the basalt/siltstone interface, the subsequent erosion of the soft siltstone creating voids beneath the basalt cap, and the collapse of the basalt and surface soils into the voids. Further rainfall can exacerbate and increase the size of the sinkhole areas.

3.2 Risk to Property

Where the hillslope at the Site is left in its present condition, it is likely that the sinkholes will become larger and deepen, and the potential for landslip will only increase with time. Landslip potential exists along the entire length of the hillslope and also in the local area underlain by the rocks of the Corinda formation. It is noted that the Site is located in a risk area for landslide in accordance with Brisbane City Council hazard mapping. Refer to Appendix B which shows the Site in relation to the "Landslide susceptibility areas" according to the Brisbane City Council.

4.0 PRELIMINARY METHODS TO REDUCE GEOTECHNICAL RISK

The following preliminary methods to reduce geotechnical risk at the Site must be confirmed by further investigation and in-situ testing, where able to be carried out safely and without adversely affecting either the upslope or downslope properties. Rough estimates for further testing would range between \$5,000 to \$10,000 exclusive of GST, but the cost estimate would need to be further refined closer to the testing time.

4.1 Upslope Residential Property Drainage

Uncontrolled surface water discharge from the properties upslope of the sinkhole area along Blackheath Street may be a contributing factor to the development of the sinkholes and landslip activity. During the walkover survey, it was noted that the ground surface in the rear portion of No 38 Blackheath Street battered down to the hillslope in the sinkhole area, allowing surface water flows to enter the sinkhole area in an uncontrolled manner. It is strongly recommended that surface and subsurface drainage be installed immediately behind the rear boundaries of the Blackheath Street residential properties between 17 Mile Rocks Road to the South, and Cliveden Avenue to the north. This drainage treatment would most likely only help improve the stability of the NRM property (the "Site") rather than the upslope Blackheath Street and 17 Mile Rocks Road properties. These properties would require similar drainage upgrades, connecting in a controlled manner into the drainage network to be installed on the NRM property. Ideally, this drainage treatment would be extended immediately downslope of, and along the rear boundaries between Nos 29 and 67 17 Mile Rocks Road.

4.2 Reinstatement of Slope

Removal of the soil and rock in the sinkhole area, and reinstatement using the in-situ materials is recommended. The basalt must be broken down so that the rock structure is destroyed and the material has soil like properties upon replacement. The subsurface materials must be removed so as to expose the siltstone rock layer (where not too deep beneath the ground surface), thoroughly blended and reinstated in small, "hit and miss" sections along the hillslope, to reduce the potential for further instability and activation of landslips which may affect the upslope and downslope properties. It is noted that the height of any future landslide escarpments would not necessarily be limited to the thickness of the basalt cap over the siltstone, and would typically include in addition at least the thickness of siltstone below which is washed away by groundwater flows. It is noted that the lower portions of the hillslope and the area surrounding the Child Care Centre may also be adversely affected by floodwaters, as these areas were covered by floodwater during the Brisbane 2011 flood event.

"Benching" into the hillslope will help allow for compaction and improve the likelihood of slope retention. A diagram showing an example of "benching" is attached as Appendix C.

Where the siltstone rock is deep beneath the ground surface, excavations must be stopped immediately and alternative treatment methods must be assessed. In-situ testing could be carried out to refine the maximum allowable cut depths over the hillslope.

4.3 Drainage Issues

Uncontrolled surface runoff and discharges can cause ingress of surface water into the natural soils and rock if adequate surface and subsurface drainage is not implemented. Reducing the ingress of surface and subsurface water into the subsurface materials is of critical importance.

Providing adequately designed, constructed and maintained surface and subsurface drainage is important to the long term performance of the Site in terms of slope stability and erosion, in particular reducing the likelihood of shallow soil creep and also deep seated failures in the weathered rock profile. It is acknowledged that the development of high groundwater pressures along potential deep seated shear surfaces resulting from rainfall infiltration well above and distant from this Site is beyond the control of the Client. Deep seated movements along old or new shear surfaces triggered by high groundwater pressures and potentially causing significant property damage has been identified as a Geotechnical Hazard for this Site.

The long term stability of the Site will be improved if the recommendations described in this Section and Section 4 are followed and the following drainage provisions are implemented:-

- Suitable surface and subsurface drainage immediately between the rear boundaries of the Blackheath Street and 17 Mile Rocks Road properties and the underlying hillslope must be installed and maintained to prevent water discharging into the downslope terrain.
- Uncontrolled water discharges to the hillslope must be prevented. It is noted that upslope water discharge and drainage was not evaluated as part of this assessment. In particular all surface and subsurface water flows above the sinkhole area must be intercepted and diverted down to the base of the hillslope. Subsurface drains must be installed at the siltstone rock surface, as the basalt/siltstone interface is likely to collect and transport large groundwater flows.
- Surface and subsurface runoff must be directed by lined channels or subsurface pipes wrapped in drainage gravel and suitable geotextile. Drainage structures must have energy dissipators, and discharge either to a Council approved stormwater system or well downslope of the hill.

- Drainage outlets must be located so as not to adversely affect any adjacent property or structure.
- All stormwater and drainage systems must be approved by Council.
- Existing vegetation should not be cleared. New trees and shrubs should be planted over the reinstated ground surface.

4.4 Earthworks

Surface disturbances must be kept to a minimum during hillslope reinstatement to reduce the potential for scour and erosion. Cutting and filling must be minimised to reduce the likelihood of future instability events.

5.0 SUMMARY

In summary, the risk level for future sinkhole development and instability is high, with respect to the exacerbation of existing sinkholes, or activation of new sinkholes by high rainfall events and siltstone washout beneath the basalt. General instability in the basalt and associated residual soil layer may also occur after rain, creating slumped areas. Both instability mechanisms are triggered by elevated groundwater pressures which may occur as trees are increasingly removed facilitating the infiltration of rainfall into and through the basalt cap and along the basalt and siltstone/soft sedimentary rock interface.

Further investigative work to confirm the soil and types and origin, and the weathered rock type and groundwater conditions beneath the hillslope may allow a review of the risk level and the information presented in this preliminary report.

Further work should involve assessment of the soils and weathered rock, to check for colluvial deposits and groundwater seepages, and "global stability modeling", which would assess the hillslope stability based on the slope geometry and subsurface profile. Global stability modeling could be carried out after in-situ testing is completed.

Active monitoring of the sinkholes should be carried out immediately. Monitoring should include, but not be limited to:

- Checking the depths of the sinkholes on a regular, frequent basis;
- Checking the depths to groundwater beneath the hillslope, especially in any sinkholes;
- Continually observe for "hummocky" or irregular land surfaces, where the ground topography appears to have changed from that observed previously.

6.0 LIMITS OF PRELIMINARY ASSESSMENT

This Report has been prepared by Morrison Geotechnic Pty Ltd (**Morrison Geotechnic**), and may include contributions from Morrison Geotechnic's officers and employees, sub-contractors, sub-consultants or agents (**Contributors**).

This Report is for the sole benefit and use of the QLD Department of Natural Resources and Mines (**Client**) and approved parties for the sole purpose of providing a preliminary assessment of the sinkholes at 53 17 Mile Rocks Road and 113 Cliveden Avenue, Oxley (**Project**). The Report is only intended to address those issues expressly described in the scope of work in the Proposal and this Report.

This Report should not be used or relied upon for any other purpose without Morrison Geotechnic's prior written consent. Morrison Geotechnic and the Contributors do not accept any responsibility or liability in any way whatsoever for the use or reliance of this Report by anyone other than the Client or by anyone for any purpose other than that for which it has been prepared.

Except with Morrison Geotechnic's prior written consent, this Report may not be:

- (a) released to any other party, whether in whole or in part (other than to the Client's officers, employees and advisers);
- (b) used or relied upon by any other party; or
- (c) filed with any Governmental agency or other person or quoted or referred to in any public document.

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The information (including technical information and information obtained through discussions) on which this report is based has been provided by the Client and third parties.

Morrison Geotechnic and the Contributors:

- (a) have relied upon and presumed the accuracy of this information;
- (b) have not verified the accuracy or reliability of this information (other than as expressly stated in this Report);
- (c) have not made any independent investigations or enquiries in respect of those matters of which it has no actual knowledge at the time of giving this Report to the Client; and
- (d) make no warranty or guarantee, expressed or implied, as to the accuracy or reliability of this information.

Morrison Geotechnic and the Contributors do not accept responsibility or liability for any incorrect assumptions related to this Report. For the avoidance of doubt, this Report:

- (a) cannot predict the ground conditions encountered at any untested location because the ground conditions surrounding a test sampling location (or between any two test sampling locations) may be different from the test samples we have obtained
- (b) is not an environmental, contamination or hazardous materials assessment;
- (c) may be invalid, incomplete or inaccurate (including errors in the scope of work, investigation methodology, observations, opinions and advice) where the information provided to Morrison Geotechnic was invalid, incomplete or inaccurate;
- (d) is limited to observations of those parts of the site that were accessible at the time of the field investigation and is not based on observations about areas of the site which were inaccessible to the investigation equipment (including steep slopes, heavily vegetated areas or service corridors); and

- (e) is not a comprehensive representation of the actual site conditions and may only show a reasonable interpretation of conditions encountered at discrete test locations along with general site observations.

Further assessments are required to confirm the preliminary information presented in this report.

No warranty or guarantee, whether express or implied, is made in respect of the geotechnical data, information, advice, opinions and recommendations present in this Report. In recognition of the limited use to be made by the Client of this Report, the Client agrees that, to the maximum extent permitted by law, Morrison Geotechnic and the Contributors shall not be liable for any losses, claims, costs, expenses, damages (whether in statute, in contract or tort for negligence or otherwise) suffered or incurred by the Client or any third party as a result of or in connection with the information, findings, opinions, estimates, recommendations and conclusions provided in the course of this Report.

If further information becomes available, or additional assumptions need to be made, Morrison Geotechnic reserves its right to amend this Report.

Please do not hesitate to contact this office if you require any further information.

Yours faithfully,

4p4(6) Personal information, signed

R HOWCHIN

For and on behalf of

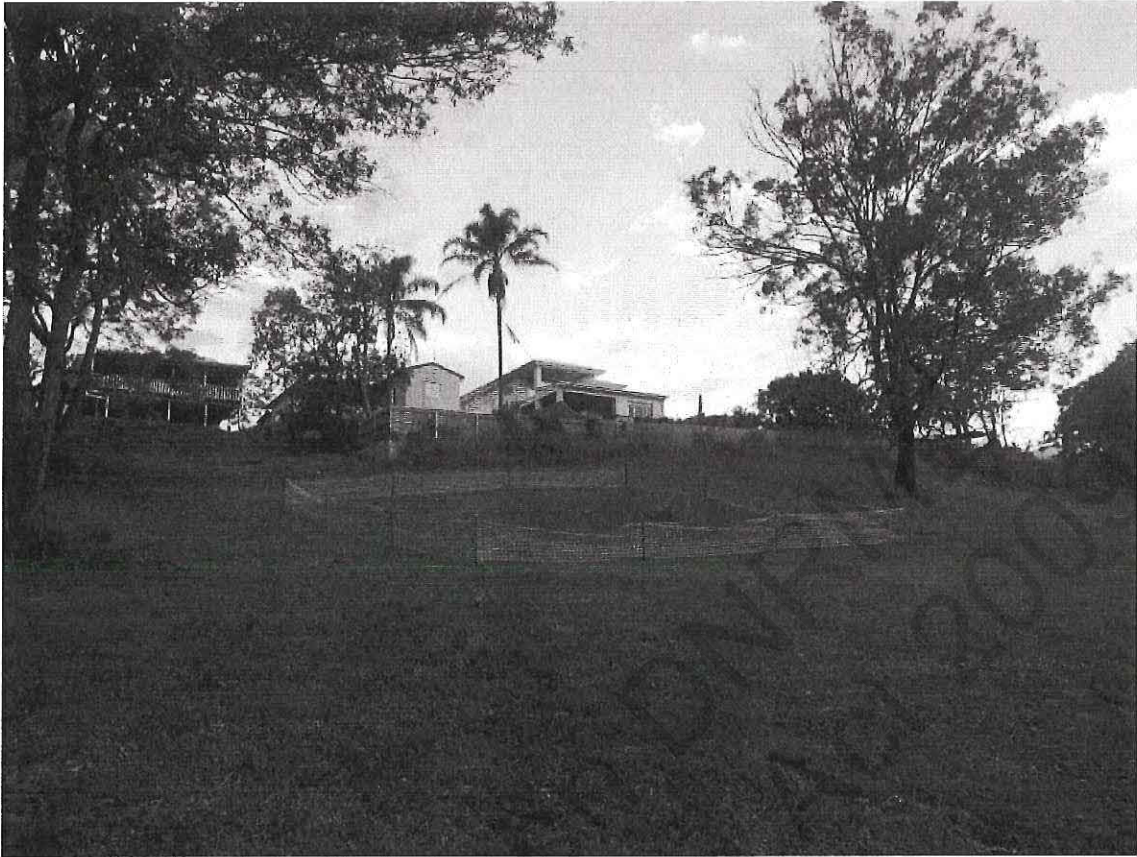
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Encl: Appendix A – Site Photos
Appendix B – Brisbane City Council "Landslide susceptibility areas" map
Appendix C – "Benching" diagram
Important Information about your Geotechnical Engineering Report

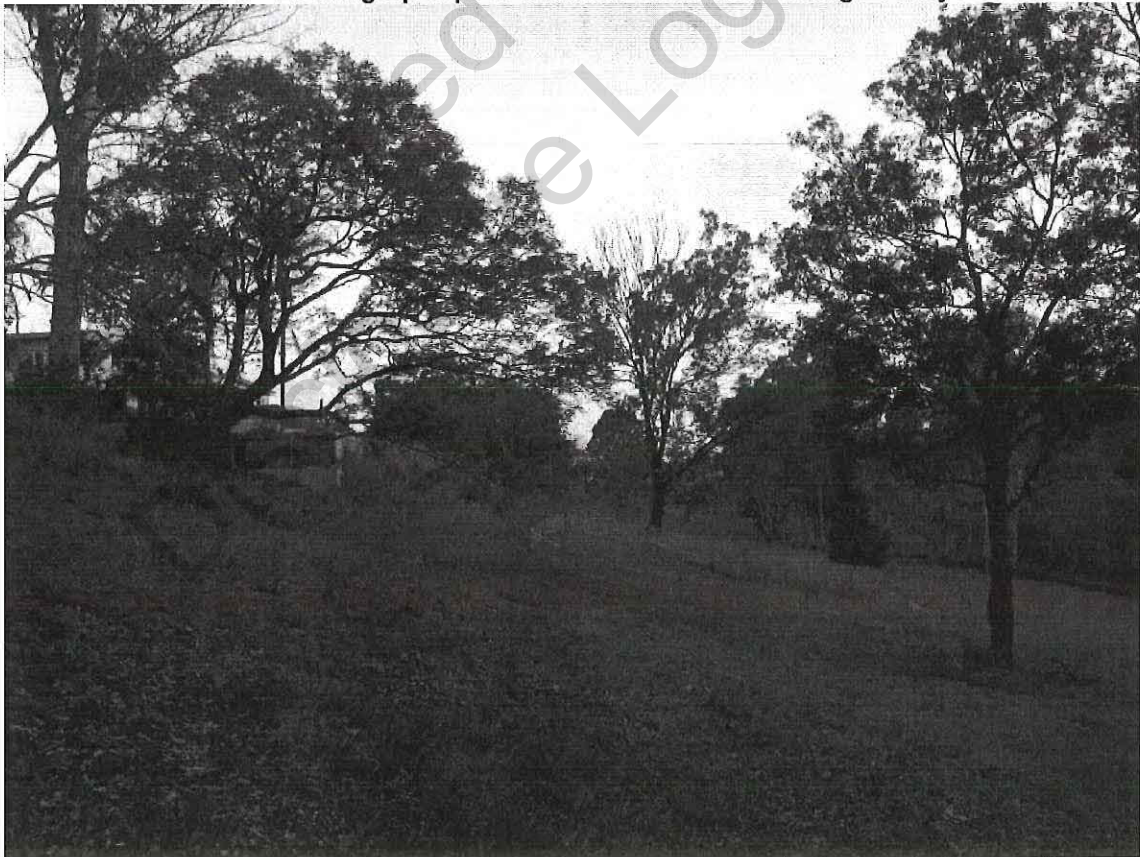
APPENDIX 'A'

SITE PHOTOS

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Site Photo 1 – Looking Upslope to Sinkhole Area inside Orange Safety Barrier



Site Photo 2 – Looking Across Slope to Sinkhole Area inside Orange Safety Barrier



Site Photo 3 – Close Up of One of the Sinkholes



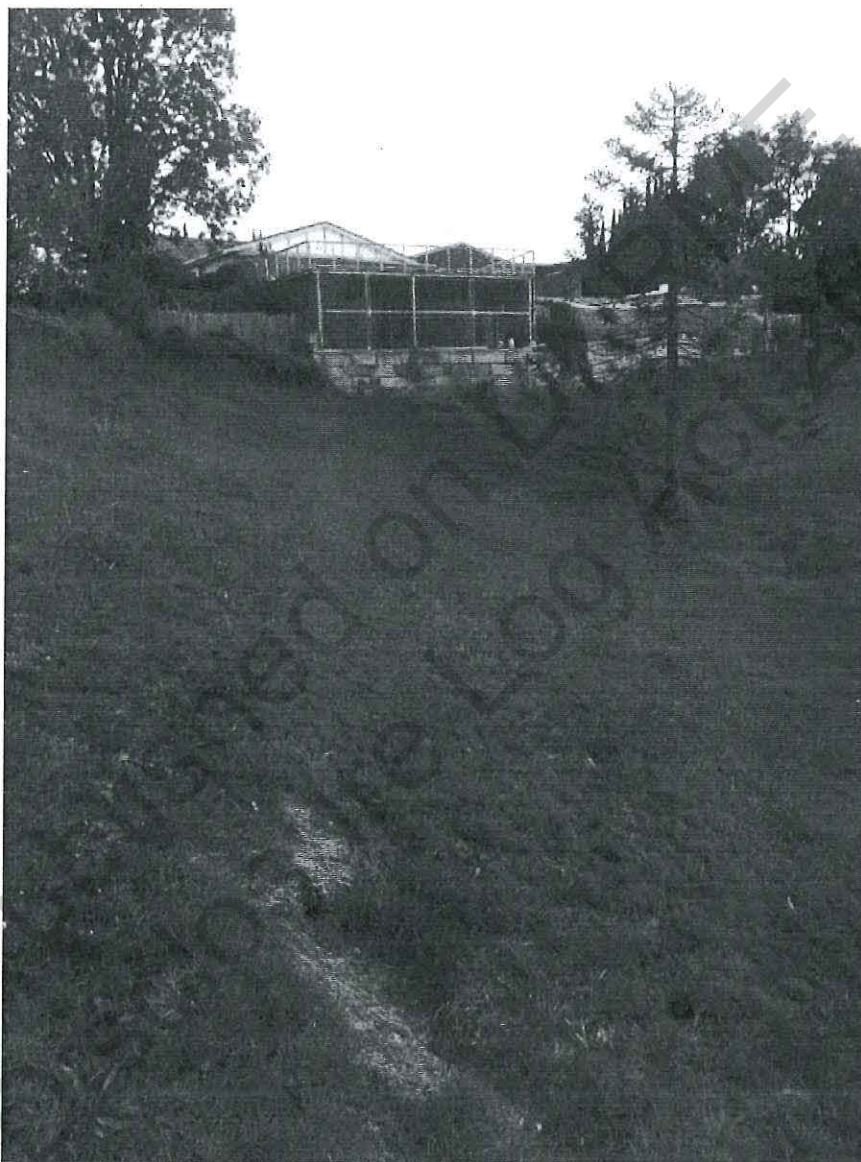
Site Photo 4 – Inside One of the Sinkholes (“Sandy Silt” Sediment at Base of Void)



Site Photo 5 – Looking North Over Hillslope (Sinkholes Inside Orange Barrier in Background)



Site Photo 6 – Looking Upslope towards Sinkhole Area – Note Sandy Silt At Base of Hillslope



Site Photo 7 – Looking South Over Hillslope (Sinkhole Adjacent Nos 12-14 Blackheath Street)

APPENDIX 'B'

BRISBANE CITY COUNCIL
"LANDSLIDE SUSCEPTIBILITY AREAS" MAP

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Landslide overlay map

 Brisbane City Council
 Local Government Area

DCDB 3-06-2014

Waterbody

Sub-category:

 Landslide susceptibility area
 sub-category

"SITE"

NOTES: This map is notational only and should not be used for interpreting City Plan provisions relating to specific sites. To properly interpret the maps, the planning scheme must be referred to.

As adopted by Council, effective 30 June 2014.

Based on Cadastre Data provided with the permission of the Department of Natural Resources and Mines.

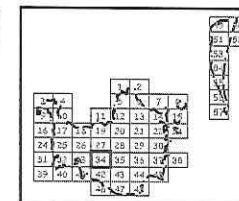
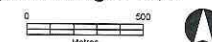
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Projection: Map Grid of Australia, Zone 55
 Horizontal Datum: Geocentric Datum of Australia 1984
 Approximate Scale @ A3 1:22,000


OM-012.1



Landslide overlay map

Brisbane City Council
Local Government Area

DCDB 3-05-2014

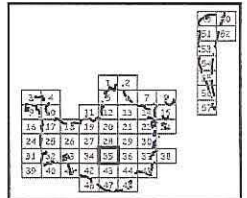
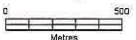
Waterbody

Sub-category:

Landslide susceptibility area
sub-category

NOTES: This map is notional only and should not be used for interpreting City Plan provisions relating to specific sites. To properly interpret the map, the planning scheme must be referred to.
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Projection: Map Grid of Australia, Zone 56
Horizontal Datum: Geocentric Datum of Australia 1994
Approximate Scale @ A3 1:22,000



OM-012.1

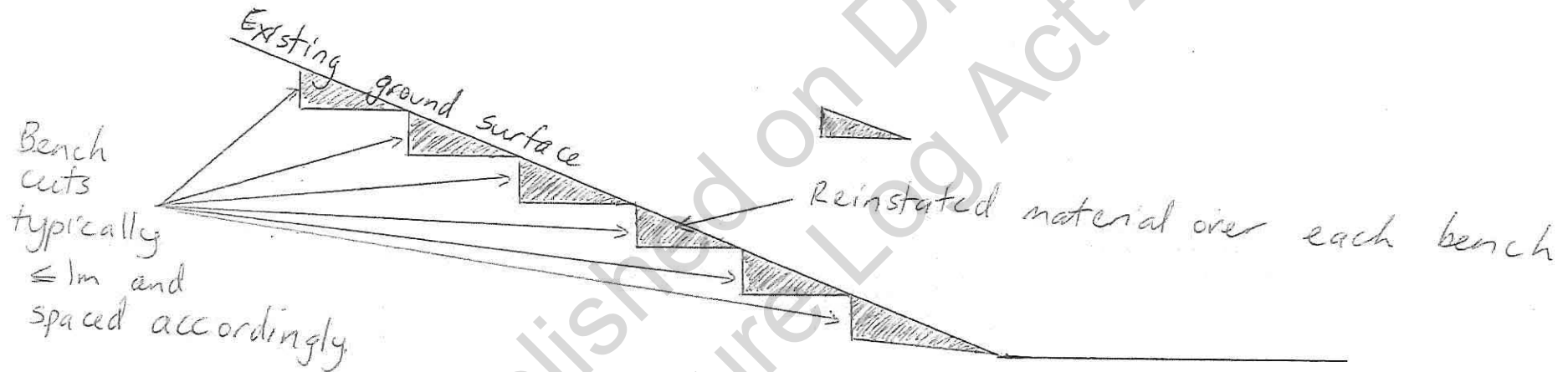
APPENDIX 'C'

"BENCHING" DIAGRAM

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Benching

* drainage not shown



Important Information about Your Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you — should apply the report for any purpose or project except the one originally contemplated.*

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,

- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time to perform additional study.* Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that

have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely on Your ASFE-Member Geotechnical Engineer for Additional Assistance

Membership in ASFE/THE BEST PEOPLE ON EARTH exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.



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