SOIL SURVEYS

ACID SULFATE MANAGEMENT PLAN

PROJECT NO. 1-12516

JANUARY, 2016

825 STANLEY PTY LTD

APARTMENT BUILDINGS

825 STANLEY STREET, WOOLLOONGABBA

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1.0 INTRODUCTION

This report presents the Acid Sulfate Soil Management Plan (ASSMP) for the proposed development at 825 Stanley Street, Woolloongabba.

It is understood that the proposed development will comprise:-

- Three, twenty level towers, constructed in three stages.
- Buildings 2 and 3 will incorporate three levels of basement carparking. Earthworks will comprise excavations of up to 9.5m to form the lower basement level of RL -4.5m.
- No basement is proposed for Building 1. However, excavation to RL 3.0m is proposed at Building 1 location to create a lined detention basin beneath ground floor.

Refer Figures 1, 2 and 3.

FIGURE 1 – STANLEY STREET PERSPECTIVE

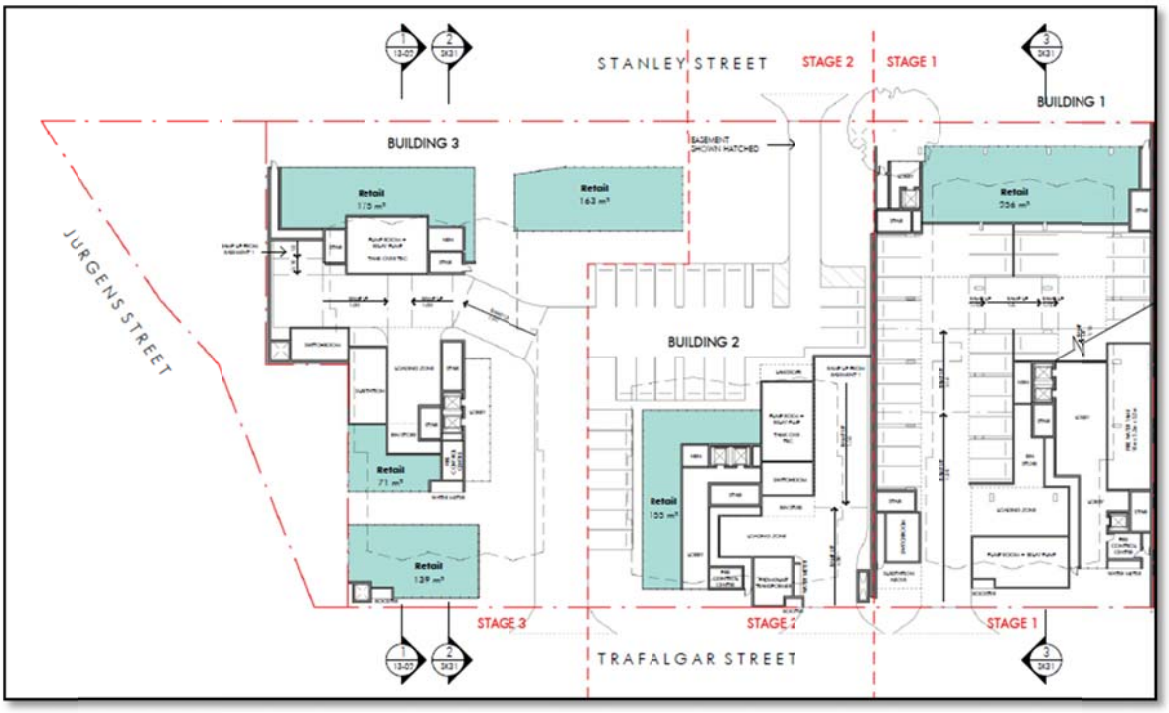

FIGURE 2 – GROUND FLOOR

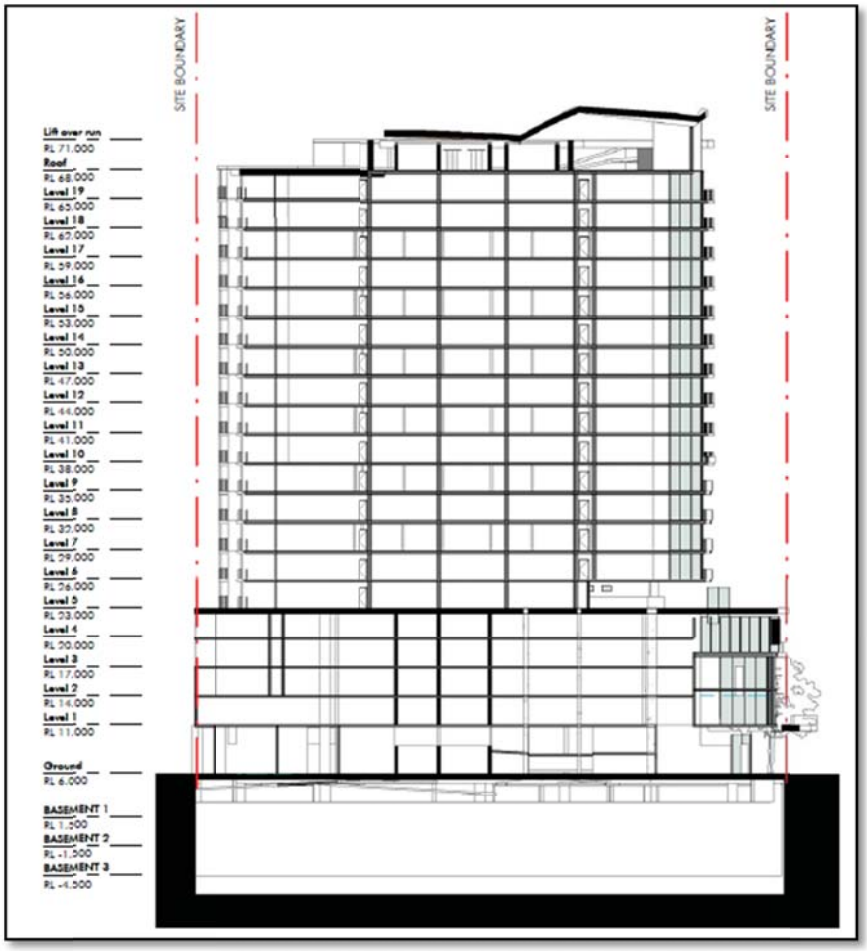

FIGURE 3 – SECTION

From an Acid Sulfate Soil (ASS) perspective, disturbance will occur to levels up to 10.0m below existing ground levels.

2.0 SCOPE OF SERVICES

The scope of services provided by Soil Surveys Engineering Pty Limited was directed towards development of an ASSMP in accordance with the State Planning Policy 2013, State Planning Policy Guideline: State interest - emissions and hazardous activities - Guidance on acid sulfate soils, December, 2013 (SPP 2013 ASS guidelines).

3.0 SITE DESCRIPTION

The site of the proposed development is located at 825 Stanley Street, Woolloongabba – refer Figure 4.

FIGURE 4 – SITE LOCATION

The site is occupied by a series of single and two level structures, along with a large open carpark area.

Ground surface levels fall north to south and west to east, with ground surface levels typically between RL 5.0m and RL 4.5m.

Drainage conditions are considered to be poor.

Numerous underground services exist on site. Of particular note is the presence of the "brick drain" located to the east of the site – refer detailed survey, Appendix D. This brick drain runs north south, is approximately 2.8m wide, has an invert level of RL 1.07m, with top of drain recorded at levels between RL 3.83m and RL 3.38m.

Boundary conditions comprise:-

- Northern Boundary – Stanley Street
- Eastern Boundary – residential tower, currently under construction (refer Photographs 1 and 4).
- Southern Boundary – Trafalgar Street.
- Western Boundary – Jurgen Street, with a single storey brick veneer "BCC Building" (refer Photograph 3) located adjacent the north western corner of the development site.

Photographs 1 to 4 indicate typical site conditions. Please also refer Detailed Survey prepared by Jensen Bowers (Appendix D).

PHOTOGRAPH 1

PHOTOGRAPH 2

PHOTOGRAPH 3

PHOTOGRAPH 4

4.0 ACID SULFATE SOIL INVESTIGATION

4.1 Field Investigation

Subsurface conditions at the site were investigated by drilling and sampling ten boreholes to depths up to 26.77m; all boreholes extended to rock. Boreholes associated with this ASS study and the Geotechninal study were drilled using both a 4WD mounted small drilling rig (EVH1750) along with a truck mounted large drilling rigs (Scout rigs), i.e.:-

- Boreholes 1 to 4 and 8 to 10 – Scout drilling rigs
- Boreholes 5 to 7 – EVH1750 drilling rig.

ASS soil and water samples were retrieved from Boreholes 1 to 4.

A description of the investigation method, borehole records and a site plan showing the location of boreholes are included in the Appendices.

4.2 Standards

This study, including the soil classification descriptions and field sampling, were carried out in general accordance with the following procedures:-

- AS1726 - 1993 Geotechnical Site Investigations
- Queensland Acid Sulfate Soil Investigation Team, Dept. of Natural Resources, 'Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland, 1998' (Oct. 1998, Revision 4.0).
- The State Planning Policy Guideline: State interest - emmissions and hazardous activities - Guidance on acid sulfate soils, December, 2013.
- Brisbane City Council Acid Sulfate Soil Overlay Code.

4.3 Laboratory Assessments

Soils

A staged testing program was carried out on recovered soil samples; Table 1 refers:-

TABLE 1 LABORATORY TESTING

Test Method	Test Objective
pH_F, pH_{FOX} and Reaction to HCl & H_2O_2	Qualitative screening
ANC (Acid Neutralising Capacity)	Quantitative - acid trail
TAA (Total Actual Acidity)	Quantitative - acid trail
SCr (Chromium Reducible Sulfur)	Quantitative - sulfur trail
S-NAS (Retained Acidity)	Quantitative - sulfur trail

Samples were screened by Soils Surveys Engineering as part of this study to assess field pH (pH_F) and pH after oxidation (pH_{FOX}) using 30% hydrogen solution buffered to between pH 4.5 to pH 5.5.

The pH_F/pH_{FOX} screening method consists of two steps. In the first step, the field pH of a 1:5 soil/water suspension is measured (pH_F). In the second step, a 30% Hydrogen Peroxide solution is added to the sample which is then heated to accelerate the oxidation of the sample. The pH after oxidation (pH_{FOX}) is then measured. A significant difference between the pH_F and pH_{FOX} result is indicative of PASS; however, test results may be affected by other inclusions such as shell material and organics.

Samples were also subject to quantitative analysis by the Chromium Reducible Sulfur suite in accordance with appropriate laboratory procedures.

The Chromium Reducible Sulfur suite had been adopted by QASSIT in Queensland for the testing of ASS in Queensland. This method includes analysis of 'inherent buffering capacity' from naturally occurring alkaline materials (i.e. calcite, coral debris, fine shell fragments) and 'retained acidity' which includes sulfur held in stable oxidation minerals such as 'jarosite' and allows for calculation of 'net acidity'. The Chromium Reducible Sulfur test method was selected in preference to the Suspension Peroxide Oxidation Combined Acidity & Sulfur (SPOCAS) method as it is gives more accurate indications of pyrite content where significant amounts of organic matter (and organic derived acidity) are present in the soil samples.

An overall acid-base accounting method was used to calculate a 'net acidity' value which is used to qualify analytical test results and calculate liming rates. This equation is given by:

Net Acidity = Actual Acidity (as TAA) + Retained Acidity (as S_{NAS}) + Potential Acidity (as S_{CR}) - insitu Acid Neutralising Capacity (ANC).

Laboratory test results are included in Appendix C.

Groundwater

Groundwater water samples were submitted for chemical analysis to assess the following:-

- pH
- Electrical Conductivity
- Aluminium
- Total Iron

The laboratory test certificate is contained in Appendix C.

5.0 INVESTIGATION FINDINGS

5.1 Regional Geology

Reference to the Department of Mines 1:100,000 Brisbane Geological Map (Sheet 9543), 1986 (Refer Figure 5), indicates that the site is underlain by undifferentiated alluvial soils (Qa), above a basement geology comprising rocks of the Middle Triassic Period (~240 Mya), which in this area are made up of the Brisbane Tuff (Rii). This unit is understood to outcrop in a broad band from Annerley in the south through Woolloongabba and Kangaroo point to Bowen Hills in the north.

It is expected that the majority of the soil directly underlying the site is most likely to be from the older of the alluvial deposits (sand, silt, clay and gravel) and/or residual soils derived from the weathering of the underlying rock.

The typical lithologies of the Brisbane Tuff can include ignimbrite, stratified and massive rhyolitic tuff, conglomerate, sandstone and scree breccia. Structurally, the rocks commonly show clearly defined orthogonal joint sets (linear rock defects), creating a blocky rock mass.

It is understood that these volcanic rocks were formed as the product of explosive eruptions of rhyolitic magma, onto an erosional surface. The older bedrock consisted of Bunya Phyllite (DCb) which also outcrops nearby. Associated with the Tuff are sedimentary rocks (sandstones, conglomerate, shale, coal, etc.) of the Aspley Formation (Rip) which were laid down in and adjacent to rivers and lakes also during this period.

Because the volcanic and sedimentary rocks were laid down at a similar time, there is generally not a clear boundary between the units; rather they tend to be inter-bedded, particularly towards the outer edges of the Tuff flows.

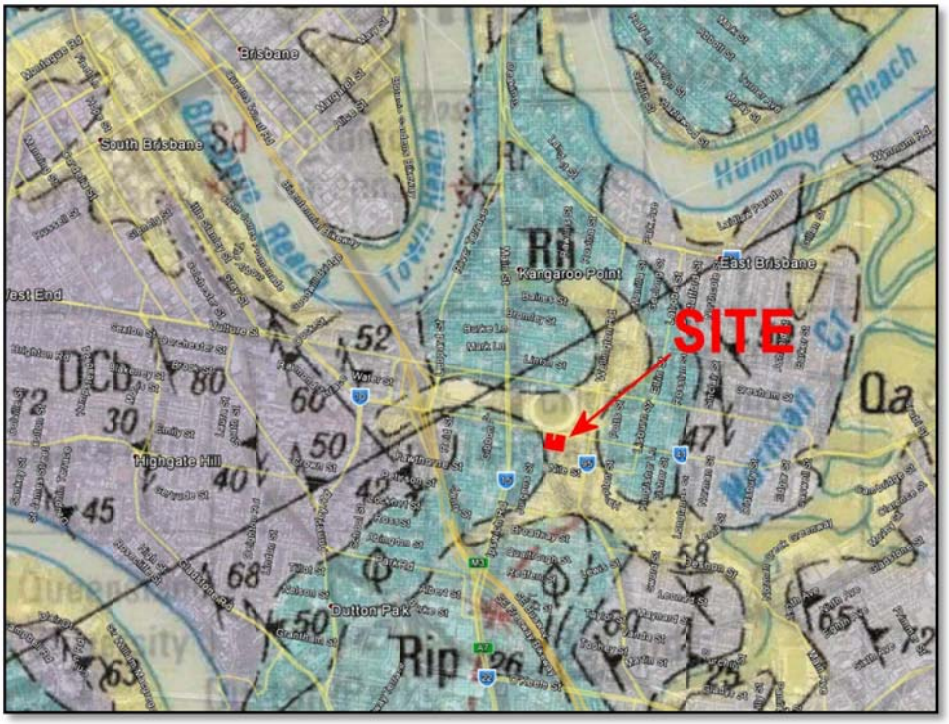

FIGURE 5 – SECTION OF REGIONAL GEOLOGY MAP ON GOOGLE EARTH

5.2 Subsurface Profile

Subsurface conditions encountered are consistent with conditions described on geological maps; subsurface conditions can be broadly grouped into three material types:-

- Fill Material
- Natural Soils
- Tuff Rock

Fill Material

Fill material was encountered at all boreholes to depths between 0.2m (BH5) and 2.6m (BH8); maximum depth of fill is expected to be encountered directly adjacent the brick drain. The fill material is variable in terms of nature and type and comprised:-

- Bitumen and pavement gravels
- Ash
- Clayey Gravel – medium dense
- Clayey/Gravelly Sand – loose/very loose
- Clayey Sand – loose
- Gravelly Sand – medium dense
- Gravelly/Sandy Clay – stiff
- Clay – stiff

The fill stratum is considered to be generally poor quality, weak and uncontrolled.

Natural Soils

Natural soils were encountered at levels between RL 4.86m (BH1) and RL 2.4m (BH8). Please note that depth to natural soils will be greater along the brick drain alignment, with level to top of natural approximately the same as the brick drain invert level (approximately RL 1.0m).

Natural soils encountered comprised:-

- Gravelly Clayey Sand – very loose/loose/medium dense
- Silty Clayey Sand/Clayey Sand – very loose/loose/medium dense
- Silty Clay/Clay – firm/stiff/very stiff
- Sandy Clay – firm/stiff/very stiff/hard
- Gravelly Sandy Clay – stiff/very stiff/hard

Tuff Rock

Tuff rock was encountered at levels between RL 4.4m (BH5) and RL -1.8m (BH7). As borehole records indicate, the level to tuff rock is variable, with significant differences in levels to rock observed at adjacent boreholes.

The tuff rock was described as initially being very weak/weak, however, rock strength increased with depth, with medium strong/strong/very strong tuff encountered (refer Boreholes 8, 9 and 10).

* * *

A summary of the subsurface profile is presented in Table 2.

TABLE 2 SUBSURFACE PROFILE

Location	Surface Level RL (m)	Fill Material (m)	Natural Soils (m)	Tuff Rock (m)	Termination Depth (m)
BH 1	5.5	0.00-0.80	0.80-5.30	5.30-6.00	6.00
BH 2	5.0	0.00-0.25	0.25-4.00	4.00-4.50	4.50
BH 3	5.0	0.00-1.60	1.60-5.20	5.20-6.00	6.00
BH 4	4.0	0.00-1.20	1.20-2.60	2.60-3.00	3.00
BH 5	5.0	0.00-0.20	0.20-0.60	0.60-1.20	1.20(4)
BH 6	4.5	0.00-0.80	0.80-2.70	2.70-3.20	3.20(4)
BH 7	5.0	0.00-0.14	0.14-6.80	6.80-7.00	7.00(4)
BH 8	5.0	0.00-2.60	2.60-4.80	4.80-26.77	26.77
BH 9	4.2	0.00-1.60	1.60-5.50	5.50-20.20	20.20
BH10	5.0	0.70-4.30	0.70-4.30	4.30-20.66	20.66

Notes:-
1. NE – Not Encountered.
2. All depths below existing ground surface level as of date of investigation.
3. Surface levels inferred from Client supplied survey.
4. Borehole terminated at drill rig refusal ('TC' bit refusal).

5.3 Groundwater

A pre-works groundwater investigation was carried out as per SPP 2013 ASS Guideline requirements, i.e. borehole drilling and groundwater monitoring.

Groundwater was encountered at most borehole locations as seepage at the time of the investigation during augering; Table 3 refers.

TABLE 3 GROUNDWATER

Location	Surface Level RL (m)	Groundwater Noted RL (m)
BH1	5.5	4.9
BH2	5.0	4.1
BH3	5.0	2.7
BH4	4.0	NE
BH5	5.0	NE
BH6	4.5	3.7
BH7	5.0	0.5
BH8	5.0	2.4
BH9	4.2	2.2
BH10	5.0	NE

Note:- Groundwater noted indicates depth at which groundwater was observed during open hole augering.

As Table 3 indicates, seepage (where encountered) was encountered at or near (within 0.4m) of the fill/natural interface at Boreholes 1, 2, 6, 8 and 9, with seepage encountered within natural soils at Boreholes 3 and 7.

Groundwater monitoring wells were installed at Boreholes 3, 9 and 10, with steady groundwater levels recorded at RL 0.7m, RL 0.3m and RL -0.8m respectively (refer borehoe records).

Groundwater wells at Boreholes 9 and 10 were also checked on 3rd February, 2016, with groundwater levels recorded at RL 0.4m and RL -1.3m respectively.

Seepage is expected to be encountered, particularly within the fill material/natural soils, and at the fill/natural and soil/rock interfaces at all boreholes locations. It should also be noted that groundwater conditions can vary both seasonally and with prevailing weather conditions. If construction is to be undertaken at a “significant” time following this investigation, or following ‘wet’ weather, then it would be prudent to confirm groundwater levels prior to construction.

6.0 DISCUSSION OF RESULTS

6.1 Net Acidity

Table 4 presents calculated net acidity considering quantitative test results.

TABLE 4 NET ACIDITY

BH No.	Depth (m)	Net Acidity (mole H^+/t)
1	0.25-0.50	3
1	1.00-1.25	10
1	1.75-2.00	388
1	2.25-2.50	384
1	2.50-2.75	62
1	3.00-3.25	40
1	3.50-3.75	25
1	4.25-4.50	2
1	4.50-4.75	6
1	5.00-5.25	3
1	5.75-6.00	2
2	0.25-0.50	2
2	0.75-1.00	18
2	1.25-1.50	399
2	1.75-2.00	64
2	2.25-2.50	565
2	2.75-3.00	373
2	3.25-3.50	286
2	3.75-4.00	10
2	4.25-4.50	4
3	0.25-0.50	4
3	0.75-1.00	36
3	1.25-1.50	3
3	1.75-2.00	39
3	2.25-2.50	484
3	2.75-3.00	18
3	3.25-3.50	5
3	4.00-4.25	3
3	4.25-4.50	5
3	4.75-5.00	4
3	5.25-5.50	4
3	5.75-6.00	1
4	0.25-0.50	8
4	0.75-1.00	5
4	1.25-1.50	8
4	1.50-1.75	4
4	1.75-2.00	8
4	2.25-2.50	18
4	2.75-3.00	2

6.2 Action Criteria

Indicator or action levels considering quantitative test results are used as a guide to assess the need for an ASSMP. Indicator or action levels are presented in Table 5 (reference: QASSIT - Nov, 2002, Revision 3.8).

TABLE 5 ACTION CRITERIA - (QASSIT OCT. 1998 TABLE 4.0)

Texture Range/Classification	Approximate Clay Content (%)	Action Criteria 1-1000 tonnes disturbed		Action Criteria >1000 tonnes disturbed	
		S_{pos} (%)	TPA (mole H^+/t)	S_{pos} (%)	TPA (mole H^+/t)
Coarse / Sands to Loamy Sands	≤5	0.03	18	0.03	18
Medium / Sandy Loams to Light Clays	5-40	0.06	36	0.03	18
Fine / Medium to Heavy Clays and Silty Clays	≥40	0.1	62	0.03	18

Examination of test results indicate that the onsite soils exceed action levels and therefore an ASSMP is required (refer Section 8.0).

7.0 ACID SULFATE SOIL HAZARD MODEL

In determining the ASS hazard model, factors including proposed works (i.e. depth of excavation/disturbance), subsurface profile and laboratory test results are considered.

There is a significant difference in the visual appearance of soils, i.e. fill material, natural soils and weathered rock.

We therefore propose that the hazard model be zones in terms of material type; Table 6 refers.

TABLE 6 HAZARD MODEL

Material Type	Net Acidity - Maximum Value (mole H^+/t)
Fill Material	36
Natural Soils	565
Weathered Rock	4

8.0 ACID SULFATE SOIL MANAGEMENT PLAN

8.1 Introduction

The laboratory test results indicate that the action criteria have been exceeded for the onsite soils. When these soils are disturbed or drained, toxic quantities of acid, aluminium, iron and heavy metals may contaminate land and waterways. For this reason, it is critical that any excavation operations be carried out in such a way as to limit or avoid any adverse environmental or infrastructure impacts.

Management strategies have been proposed for prevention and treatment to address the following concerns:-

- Prevention of oxidation.
- Management of the acid sulfate soils.
- Treatment of the acid sulfate soils as necessary.
- Control of acid leachate.
- Neutralisation of acid leachate.
- Prevention of acid leachate seepage to the surrounding environment.

Groundwater

The hydrological regimes that operate in an area affect the behaviour of ASS and the transport of oxidation products. Considering investigation findings and the proposed development, we advise that groundwater is expected to be encountered during construction.

The above has been considered in formulating the ASSMP.

* * *

The following sections, which have been prepared in accordance with Appendix B of SPP 2013 ASS Guideline, present the recommended ASSMP.

8.2 Avoiding or Minimising Disturbance

The preferred management strategy for ASS is to avoid or minimise the disturbance of these materials.

Given the proposed development, avoidance of ASS is not possible and neutralisation of the disturbed soil material will be required.

8.3 Neutralisation of Disturbed Soils

Current experience suggests that one of the most effective methods that can be implemented to limit or prevent the adverse consequences of excavation of ASS material, is the controlled application of a suitable neutralising agent.

Various neutralising agents are available, with aglime being the most widely used product for ASS treatment.

It is advised that this ASSMP considers that excavated material will be treated at an off site facility.

Treatment of ASS should be carried out in accordance with this management plan. Validation testing would be required to confirm neutralisation.

8.4 Lime Application

Considering Table 4 test results, Table 7 presents the estimated lime dosages per cubic metre of soil to be added to respective material types encountered. Please note that estimated lime dosage rates are subject to verification testing at time of construction (refer Section 8.7.2).

TABLE 7 DESIGN LIMING RATE

Predominant Material Type	Maximum Net Acidity Value (mole H^+/t)	Factored Lime Rate (kg/m^3 of soil)
Fill Material	36	4
Natural Soils	565	64
Weathered Rock	4	0

Notes:
1. Bulk (dry) density 1.8t/m^3 assumed
2. Lime dosing rates include a factor of safety of 1.5
3. 100% purity (neutralising value) is assumed for the aglime (any variation must be factored accordingly).
4. Dosing rate calculations were carried out in general accordance with the method set out in the QASSIT guidelines.

It should be noted that the liming rates arrived at in Table 7 are based on the most severe laboratory results. Should verification testing indicate that disturbed soils have net acidity values greater/lower than Table 7 values, then appropriate modification to factored liming rates must be taken.

Construction Techniques

The construction technique implemented during the lime application is critical and as such, the following measures will be undertaken:-

- Excavated soils are to be immediately removed from site following excavation.
- Only aglime (calcium carbonate) should be used, as quicklime or slaked lime is not considered a long term neutralising agent of sulfuric acid, and eventually may raise groundwater pH to unacceptable levels.
- The recommended lime dosing rates refer to a 100% pure lime product. The actual liming rate would need to be factored according to the product's quoted neutralising value in order to reach the ideal neutralising capacity.
- The aglime must be fine grained to ensure better mixing and decreased chance of acid leachate runoff occurring.

- The maximum time between exposure on excavation and treatment should not exceed 18 hours. This would require all disturbed material to be treated on the day of excavation or the following day. Alternatively, untreated material would need to be suitably stockpiled (refer Section 8.5) at the off site treatment facility.
- Exposed soils on the base of the Stage 1 detention basin excavation should be treated with lime (guard layer) at a rate of 5kg/m^2 (minimum), tyned into the underlying soil (as appropriate) for a depth of 0.3m below surface level. However, the actual guard layer rate should be calculated in accordance with Section 8.3.6 of the Queensland Acid Sulfate Soil Techincal Manual.
- Treatment should be undertaken on a suitably prepared treatment pad (refer section 8.5).
- Thorough mixing of the aglime is critical. Following excavation of the material, it must be dried and ploughed, followed by lime dosing. This is to be followed by further ploughing and harrowing to provide a homogeneous mix of the excavated material and the lime.
- Each layer of material to be treated must not be greater than 200-300mm in thickness to ensure thorough mixing of the lime.

8.5 Material Handling

The treatment and/or stockpiling of ASS at the off site facility should be located in settings that will ensure minimal risk of adverse environmental impacts as a result of acid leachate. The following recommendations are made for the design of treatment pads and/or stockpiling areas.

- The treatment pad and/or stockpile area should be surrounded by bunded drains to allow collection, containment and treatment of surface runoff and leachate from the stockpile; drains should flow to catchponds.
- It is important that agricultural lime be added to the material used in the bund walls.
- At the treatment pad and/or stockpile locations agricultural lime (at a **minimum** rate of 5.0kg/m^2 per vertical metre of stockpiled soil) should be tyned into the underlying soil for a depth of 0.3m below surface level. However, the actual guard layer rate should be calculated in accordance with Section 8.3.6 of the Queensland Acid Sulfate Soil Technical Manual. As construction proceeds, additional lime may be added should any of the leachate neutralise the original lime.
- Regular testing of water/discharge should be undertaken (refer Section 8.7.3).

8.6 Groundwater/Discharge

Groundwater/discharge encountered during site excavations should be pumped to tanks for subsequent off site treatment.

Treatment

Waters must be treated to bring water quality criteria to acceptable levels and in accordance with Authority requirements and ANZECC Water Quality Guidelines for Fresh and Marine Waters (2000). Appropriate neutralising agents, eg. aglime, slaked lime or magnesium/calcium hydroxide may be used to treat water. However, it should be the intention to maintain off-site catchpond waters at pH levels between 6.5 and 8.5 at all times.

Waters should only discharged upon acceptable (in accordance with Authority requirements) water quality criteria being achieved.

8.7 Monitoring Program

8.7.1 General

A monitoring program will be implemented to provide feedback on the effectiveness of the management strategy and provide early warning should environmental degradation begin.

The following aspects have been considered in the monitoring program:-

- Parameters to be monitored
- Location of monitoring systems
- Frequency
- Type of analysis
- Procedures to be undertaken should monitoring indicate problems

It is recommended that Soil Surveys Engineering, who have relevant experience in this field, be appointed to supervise on site monitoring of the project.

8.7.2 Soil Monitoring

Onsite and off site testing and monitoring should be performed throughout the construction period.

Verification testing (testing of soils prior to neutralisation and during construction) of excavated material will be carried out at a rate of at least one sample per 250m^3, with the sampling and testing intensity increasing should results prove to be extremely variable. Verification testing should be carried out using the Chromium Suite.

Further, when incorporation of the lime is complete, Chromium Suite **validation** testing of soils should be carried out at a rate of 1 test per 250m^3 to establish that aglime has been sufficiently added to neutralise the soil. The following performance criteria must be attained for soil that has been treated using neutralisation:-

1) The neutralising capacity of the treated soil must exceed the existing plus potential acidity of the soil (by at least a safety factor of 1.5).
2) Post neutralisation, the soil pH is to be greater than 6.5.

3) Excess neutralising agent should remain within the soil until all acid generation reactions are complete and the soil has no further capacity to generate acidity.

8.7.3 Water Monitoring

The following water monitoring frequency (at the off site treatment facitlity) is recommended:

- Daily - pH, Dissolved Oxygen (DO), Temperature, Turbidity and Electrical Conductivity.
- Weekly - As above plus chloride, sulphate, total iron, dissolved iron, filtered aluminium, bicarbonate and calcium.

Further to the above, monitoring of the pH levels of the off site catchponds should also be carried out immediately after rain. If the results of monitoring prove consistent, the frequency of monitoring could be reduced.

Water must be treated to bring water quality criteria to acceptable levels and in accordance with Authority requirements and ANZECC Water Quality Guidelines for Fresh and Marine Water (2000) and Queensland Water Quality Guidelines (2006) including dissolved metal concentration. Appropriate neutralising agents, eg. aglime, slaked lime or magnesium/calcium hydroxide may be used to treat catchpond water. However, it is the intention to maintain waters at pH levels between 6.5 and 8.5 at all times.

Also refer Appendix C of SPP 2013 ASS Guideline.

8.7.4 ASSMP - Engineering Supervision

It is recommended that experienced personnel from Soil Surveys Engineering be appointed to coordinate the ASSMP.

The Geotechnical Engineer from Soil Surveys Engineering will be responsible for implementation of all facets of the ASSMP, including:-

1) Confirmation that agreed performance criteria and objectives reflect any new knowledge and standards.
2) Confirmation that prevention, minimisation and mitigation strategies are implemented.
3) Confirmation that monitoring as per ASSMP and Authority requirements is carried out completely and in a timely manner.
4) Confirmation that corrective actions are implemented to rectify any deviation from performance standards.
5) Confirmation that reporting requirements and auditing responsibilities for meeting performance objectives are fulfilled**.**

9.0 LIMITATIONS

We have prepared this report for the use of **825 Stanley Pty Ltd**, for design purposes in accordance with generally accepted geotechnical engineering practices. No other warranty, expressed or implied, is made as to the professional advice included in this report. This report has not been prepared for use by parties other than **825 Stanley Pty Ltd**; it may not contain sufficient information for purposes of other parties or for other uses. Please note that any third party relying on the information contained in this report for any purpose whatsoever does so entirely at its own risk, and any duty of care to that third party is excluded.

Any interpretation or recommendation given by Soil Surveys Engineering shall be understood to be based on judgement and experience and not on greater knowledge of the facts than the reported investigations would imply. The interpretation and recommendations are therefore opinions provided for our Client's sole use in accordance with the specific brief. As such they do not necessarily address all aspects of ground behaviour on the subject site. Information provided by others has been taken in good faith, but no liability can be accepted for information provided by others.

Your attention is drawn to 'Appendix A', 'Notes Relating to this Report'. Interpretation of factual data given in this report is based on judgement, not a greater knowledge of facts other than those reported.

Interpretation of the information shown on the logs, and its application to design and construction, should therefore take into account the spacing of boreholes, the method of drilling, the frequency of sampling and testing and the possibility of other than "straight line" variations between the boreholes. Subsurface conditions between boreholes may vary significantly from conditions encountered at the borehole locations.

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

Soil Surveys Engineering consider that a documentation review service (during the design phase and prior to construction) to verify that the intent of geotechnical recommendations is properly reflected in the design, along with construction inspections, forms a very important component of the geotechnical engineering design service/process.

The geotechnical review ensures geotechnical risks to our Client and their project are minimised at the design and tender stage of the project. Further, with Soil Surveys Engineering being commissioned to carry out geotechnical construction inspections, an opportunity at the time of construction to confirm any assumptions made in the preparation of the report and allow the effect of any normally occurring variation in ground conditions to be assessed with respect to construction becomes available.

The above statements are not intended to reduce the level of responsibility accepted by Soil Surveys Engineering in accordance with our commission, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in doing so and the risks they accept should they decline to have Soil Surveys Engineering carry out a geotechnical documentation review and geotechnical construction inspections.

It is highly recommended that the Client avail themselves of these review and inspection services; our standard rates will apply.

M. Geale

M. V. GEALE (RPEQ 3839)
PRINCIPAL ENGINEER

for and on behalf of
SOIL SURVEYS ENGINEERING PTY LIMITED

APPENDIX A

NOTES RELATING TO THIS REPORT

INTRODUCTION

These notes are provided by Soil Surveys Engineering Pty Limited (the Company) to complement the geotechnical report in regard to classification methods and field procedures. Not all notes are necessarily relevant to all reports.

The ground is a product of continuing natural and man-made processes and therefore exhibits a variety of characteristics and properties which vary from place to place and can change with time. Geotechnical engineering involves gathering and assimilating limited information about these characteristics and properties in order to understand or predict the behaviour of the ground on a particular site under certain conditions. This report may contain such information obtained by inspection, excavation, probing, sampling, testing or other means of investigation. If so, they are directly relevant only to the ground at the place where and at the time when the investigation was carried out.

DESCRIPTION AND CLASSIFICATION METHODS

Soils - The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726-1993 (Geotechnical Site Investigations), where appropriate. In general, descriptions cover the following properties - soil or rock type, colour, structure, strength or density, and inclusions. Identification and classification of soil and rock involves judgement and the Company infers accuracy only to the extent that is common in current geotechnical practice.

Soil types are described according to the dominant particle size and behaviour as set out in AS 1726-1993.

Cohesive soils are classified on the basis of strength (consistency) either by use of hand penetrometer, shear vane, laboratory testing or engineering examination. The strength terms are defined in AS1726-1993 Table A4.

Non-cohesive soils are classified on the basis of relative density usually based on insitu testing or engineering examination (see AS1726-1993 Table A5).

Rocks - Rock types are classified by their geological names (AS1726-1993 Table A6), together with descriptive terms regarding weathering (AS1726-1993 Table A9), strength (refer Table 1 below), defects (AS1726-1993 Table A10), etc. Where strength testing (ie Point Loads) is carried out, AS1726-1993 Table A8 is used. Where relevant, further information regarding rock classification is attached.

Table 1 Estimated strength descriptions given to rock based on engineering examination

Strength Term	Approximate Qu (MPa)
Extremely Weak	< 1.0
Very Weak	1.0 - 5.0
Weak	5.0 - 25
Medium Strong	25 - 50
Strong	50 - 100
Very Strong	100 - 250
Extremely Strong	> 250

Ref ISRM "Suggested Methods for the Quantitative Description of Discontinuities in Rock Masses"

SAMPLING

Sampling is carried out during drilling or from other excavations to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on plasticity, grain size, colour, moisture content, minor constituents and, depending upon sample disturbance, (information on strength and structure).

Undisturbed samples are taken by pushing a thin walled sample tube, usually 50mm diameter (U50), into the soil and withdrawing it with a sample of the soil contained in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength, volume change potential and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Details of the type and method of sampling used are given on the attached logs.

TEST LOCATIONS

Test locations (e.g. boreholes, CPT's, test pits etc.) were based on available access at the time of testing (access may need to be provided "by others"). Test locations may have been shifted if access was not suitable.

Unless noted otherwise, accuracy of test locations are to the accuracy of hand held GPS equipment.

INVESTIGATION METHODS

The following is a brief summary of investigation methods currently adopted by the Company and some comments on their use and application.

Test Pits - These are normally excavated with a backhoe or a tracked excavator, allowing close examination of the insitu soils if it is safe to descend into the pit. The depth of penetration is limited to about 3m for a backhoe and up to 6m for an excavator. Limitations of test pits are the problems associated with disturbance and difficulty of reinstatement and the consequent effects on close-by structures. Care must be taken if construction is to be carried out near test pit locations to either properly recompact the backfill during construction or to design and construct the structure so as not to be adversely affected by poorly compacted backfill at the test pit location.

Hand Auger Drilling - A borehole of 50 to 100mm diameter is advanced by manually operated equipment. Refusal of the augers can occur on a variety of materials such as hard clay, gravel or rock fragments and does not necessarily indicate rock level.

Continuous Spiral Flight Augers - The borehole is advanced using 75 to 300 mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling or insitu testing. This is a relatively economical means of drilling in clays and in sands above the water table. Samples are returned to the surface by the flights or may be collected after withdrawal of the augers. Information from the drilling (as distinct from specific sampling) is of relatively lower reliability due to remoulding, inclusion of cuttings from above or softening of samples by groundwater, or uncertainties as to the original depth of the samples. Augering below the groundwater table has a lower reliability than augering above the water table. Various drill bits are attached to the base of the augers during the drilling. The depth of refusal of the different bit types can provide information as to the strength of the material encountered. Generally two different bit types are used. The 'V' bit is a V shaped steel bit and the 'TC' bit is a tungsten carbide tipped screw type bit.

Wash Boring - The borehole is usually advanced by a rotary bit with water or fluid pumped down the hollow drill rods and returned up in the space between the rods and the soil or casing, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from "feel" and rate of penetration. More accurate information on soil strata is gained by regular testing and sampling using the Standard Penetration Test (SPT) and undisturbed thin walled tube samples (U50).

Mud Stabilized Drilling - Either Wash Boring or Continuous Core Drilling can use drilling mud as a circulating fluid to stabilize the borehole. The term "mud" encompasses a range of products ranging from bentonite to polymers such as Revert or Biogel. The mud tends to mask the cuttings and reliable identification is only possible from regular intact sampling (eg. from SPT and U50 samples) or from rock coring, etc.

Continuous Core Drilling - A continuous core sample is obtained using a diamond or tungsten carbide tipped core barrel. Provided full core recovery is achieved (which is not always possible in very weak rocks and granular soils), this technique provides a very reliable method of investigation. In rocks, NMLC coring (nominal 52 mm diameter) is usually used with water flush. The length of core recovered is compared to the length drilled and any length not recovered is shown as CORE LOSS. The location of losses is determined on site by the supervisor. If the location of the loss is uncertain, it is placed at the top end of the run, when the core is placed in a storage tray and recorded on the log.

Standard Penetration Tests - Standard Penetration Tests (SPT) are used mainly in non-cohesive soils, but can also be used in cohesive soils, as a means of indicating density or strength. The test procedure is described in Australian Standard 1289, "Methods of Testing Soils for Engineering Purposes" - Test 6.3.1.

The test is carried out in a borehole by driving a 50mm diameter split sample tube with a tapered shoe, under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm, the upper 150 mm being neglected due to possible disturbance from the drilling method. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued at a reduced penetration.

In the case where full penetration is obtained with successive blow counts for each 150 mm of, say 4, 6 and 7 blows, the record shows,

4, 6, 7 N = 13

In a case where the test is discontinued short of full penetration, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm, the record shows:

15, 30/40mm

The results of the test can be related empirically to the engineering properties of the soil.

Occasionally, the drop hammer is used to drive 50mm diameter thin walled sample tubes (U50) in clays. In such circumstances, it is noted on the borehole logs.

A modification to the SPT test is where the same driving system is used with a solid 60^0 tipped steel cone of the same diameter as the SPT hollow sampler. The solid cone can be continuously driven for some distance in soft clays or loose sands, or may be used where damage would otherwise occur to the SPT. The results of this Solid SPT are shown as "N_c" on the borehole logs, together with the number of blows per 150 mm penetration.

Cone Penetration Tests - Test Method - Cone Penetration Tests (CPT) are carried out in accordance with AS 1289 Test 6.5.1-1977, using an electrical friction-cone penetrometer.

The test essentially comprises the measurement of resistance to penetration of a cone of 35.7 mm diameter pushed into the soil at a rate of 10-20 mm per second by hydraulic force. The resistance to penetration is recorded in terms of pressure on the end area of the cone (cone resistance, q_c, in MPa) and friction on the side of the 135 mm long sleeve immediately above the top of the cone (friction resistance, f_s, in kPa). These forces are measured by electrical transducers (strain gauges) within the cone device. The ratio between friction resistance and cone resistance is also calculated as a percentage, ie.-

$$Friction\ Ratio\ (FR) = \frac{Friction\ Resistance, f_s\ (kPa) \times 100}{cone\ resistance,\ q_c\ (kPa)}$$

The friction ratio, FR, is generally low in sands (less than 1% or 2%) and generally higher in clays (say 3% or more). The interpretation of sandy clays, clayey sands and material with a high silt content is more difficult, but intermediate values (between 1% and 3%) would be expected. Highly organic clays and peats generally have a friction ratio in excess of 5%.

Static cone data is recorded in the field on disc for later presentation using computer aided drafting.

The equipment can be operated from any conventional drill rig. A total applied load in the range of 4 to 10 tonnes is required for practical purposes, although lighter loads may be used. The cone penetrometers are available with various capacities of cone resistance ranging up to 100 MPa for general purpose investigations, while a range of 0 to 10 MPa can be used where more sensitive investigations of soft clay are required.

The cone resistance value provides a continuous measure of soil strength or density, and together with the friction ratio, provide very useful indications of the presence of narrow bands of geotechnically significant layers such as thin, soft clay layers or lenses of sand which might otherwise be missed using conventional drilling methods.

The lithology of the encountered soils is interpreted from static cone data and is generally presented on the static cone log sheets.

It is important to note that the lithology is interpreted information and is based on research by Schmertmann (1970), Sanglerat (1972), Robinson and Campinalli (1986), modified to suit local conditions as indicated by borehole information and laboratory testing.

As soils generally change gradually it is sometimes difficult to accurately describe depths of strata changes, although greater accuracy is obtained with the static cone compared with conventional drilling. In addition, friction ratios decrease in accuracy with low cone resistance values, and in desiccated soils. As a result, some overlap and minor discrepancies may

exist between static cone and nearby borehole information.

Portable Dynamic Cone Penetrometers - Portable Dynamic Cone Penetrometer (DCP) tests are carried out by driving a rod into the ground with a falling weight hammer and measuring the blows for successive 100mm increments of penetration.

The DCP comprises a Cone of 20 mm diameter with 30 degree taper attached to steel rods of smaller section.

The cone end is driven with a 9 kg hammer falling 510 mm (AS. 1289 Test 6.3.2). The test was developed initially for pavement subgrade investigations, and empirical correlations of the test results with California Bearing Ratio have been published by various Road Authorities. The Company has developed their own correlations with Standard Penetration tests and Density Index tests in sands.

LOGS

The borehole or test pit logs presented herein are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on the frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will enable the most reliable assessment but is not always practicable or possible to justify on economic grounds. In any case, the boreholes or test pits represent only a very small sample of the total subsurface conditions.

The attached explanatory notes define the terms and symbols used in preparation of the logs.

Interpretation of the information shown on the logs, and its application to design and construction, should therefore take into account the spacing of boreholes or test pits, the method of drilling or excavation, the frequency of sampling and testing and the possibility of other than "straight line" variations between the boreholes or test pits. Subsurface conditions between boreholes or test pits may vary significantly from conditions encountered at the borehole or test pit locations.

GROUNDWATER

Where groundwater levels are measured in boreholes, there are several potential problems.

- Although groundwater may be present in lower permeability soils, it may enter the hole slowly or perhaps not at all during the time the hole is open.
- A localized perched water table may lead to an erroneous indication of the true water table.
- Water table levels will vary from time to time with seasons or recent weather changes and may not be the same at the time of construction.
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be bailed out of the bore and mud must be washed out of the hole or "reverted" if water observations are to be made.

More reliable measurements can be made by use of standpipes which are read after stabilizing at periods ranging from several days to perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from perched water tables or surface water.

FILL

The presence of fill materials can often be determined only by the inclusion of foreign objects (eg. bricks, steel, etc.) or by distinctly unusual colour, texture or fabric. Identification of the extent of fill materials will also depend on investigation methods and frequency. Where natural soils similar to those at the site are used for fill, it may be difficult with limited testing and sampling to reliably determine the extent of the fill.

The presence of fill materials is usually regarded with caution as the possible variation in density, strength and material type is much greater than with natural soil deposits. Consequently, there is an increased risk of adverse engineering characteristics or behaviour. If the volume and quality of fill is important to a project, then frequent test pit excavations are preferable to boreholes.

LABORATORY TESTING

Laboratory testing is normally carried out in accordance with Australian Standard 1289 "Methods of Testing Soil for Engineering Purposes". Details of the test procedure used are given on the individual report forms and the attached explanatory notes summarize important aspects of the Laboratory Test Procedures adopted.

ENGINEERING REPORTS

Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. The information provided in Soil Surveys Engineering reports is opinion and interpretation and not factual. The client/contractor increases their risk by not retaining the person who authored the geotechnical report, to carry out site inspection and review (overseeing role) during construction, to confirm opinion and interpretation expressed in the report is accurate. Where the report has been prepared for a specific design proposal the information and interpretation may not be relevant if the design proposal is changed. If this happens, the Company will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical aspects and recommendations or suggestions for design and construction. Since the test sites in any exploration represent a very small proportion of the total site and since the exploration only identifies actual ground conditions at the test sites, even under the best circumstances actual conditions may vary from those inferred to exist. No responsibility is taken for:-

- Unexpected variations in ground and/or groundwater conditions.
- Changes in policy or interpretation of policy by statutory authorities.
- The actions of other persons.
- Any work where the company is not given the opportunity to supervise the construction using the Companies designs/recommendations.

If differences occur, the Company will be pleased to assist with investigation or advice to resolve any problems occurring.

SITE ANOMALIES

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

Extreme events including but not limited to the results of climate change, eg. flood levels above previously identified levels, beach scour or erosion beyond normal expectations (as identified by local authorities) extreme rainfall events, war, espionage, sabotage may result in different conditions between time of investigation and time of construction.

REPRODUCTION OF INFORMATION FOR CONTRACTUAL PURPOSES

Attention is drawn to the document “Guidelines for the Provision of Geotechnical Information in Construction Contracts (1987)”, published by the Institution of Engineers, Australia. Where information obtained from this investigation is provided for tendering purposes, it is recommended 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. The Company would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

REVIEW OF DESIGN

Where major civil or structural developments are proposed or where only a limited investigation has been completed or where the geotechnical conditions/ constraints are quite complex, it is prudent to have a joint design review which involves a senior geotechnical engineer. We would be happy to assist in this regard as an extension of our investigation commission. Construction drawings should be reviewed by Soil Surveys Engineering, with sufficient time to allow changes if required, prior to inspections.

Otherwise Soil Surveys Engineering reserves the right to refuse to carry out inspections.

SITE INSPECTION

The Company will always be pleased to provide engineering inspection services for geotechnical aspects of work to which this report is related.

i) Site visits during construction to confirm reported ground conditions

ii) Site visits to assist the contractor or other site personnel in identifying various soil/rock types such as appropriate footing or pier founding depths, the stability of a filled or excavated slope; or

iii) Full-time engineering presence on site.

In the vast majority of cases it is advantageous to the principal for the geotechnical engineer who wrote the investigation report to be involved in the construction stage of the project.

The geotechnical engineer cannot take responsibility for variations in encountered conditions, where he is not given the opportunity to review plans for the proposed development with sufficient time to allow review and make changes to the proposed development if required, and where he is not given the opportunity to inspect the site and oversee construction methods with regard to site conditions with sufficient time to observe all relevant site conditions and operations.

RESPONSIBLE USE OF GEOTECHNICAL INFORMATION

Recommendations in our report are for design purposes only and provided on the basis that inspections are carried out to allow finalisation of opinions and recommendations contained in our report.

The geotechnical investigation consisting of field and laboratory testing has been carried out to indicate typical conditions by indicating conditions and parameters at the specific locations of boreholes/test pits. Subsurface conditions are indicated at these locations only and the inference of conditions between or away from these locations (interpolation and extrapolation) involves a certain degree of risk. Persons inferring such conditions or carrying out such inferences should do so with a degree of caution and conservatism which is commensurate with the consequences of the risk of error.

Estimates of volumes based on our findings require interpolation and extrapolation between test locations and as such may be significantly different from actual volumes.

APPENDIX B

BOREHOLE RECORD SHEET

Soil Surveys Engineering Pty. Limited
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BOREHOLE RECORD SHEET

Location Number: BH 1A

Project Number: 110-12516
Project Name: Apartment Buildings
Location: 825 Stanley Street, Woolloongabba
Client: 825 Stanley Pty Ltd
Date: 24/07/2010 Page: 1 OF 1

Easting: 503740 Northing: 6959618 RL: 5.5 m
Logger: DA Operator: DA Machine: Scout 2

Drilling Method (TC / WB / RR / NMLC / Casing)	Depth	Graphic	Description	Samples and Remarks
	0.20		FILL Sandy GRAVEL (GP) Medium dense, fine to medium size, grey and yellow brown, fine to coarse grained sand, dry.	ASS
	0.60		FILL Clayey Gravelly SAND (SC) Loose, fine to coarse grained, dark grey and brown, fine to medium size gravel, high plasticity fines, dry.	ASS
	0.80		FILL Clayey Gravelly SAND (SC) Very loose, fine to coarse grained, dark grey, fine size gravel, high plasticity fines, wet.	ASS
	1.0		NATURAL Clayey SAND (SC) Very loose, fine to medium grained, grey brown, high plasticity fines, wet.	ASS
	1.60		CLAY (CH) Very stiff, high plasticity, red brown and grey mottled, moist.	ASS
	2.0			ASS
				ASS
				ASS
				ASS
				ASS
	2.80			ASS
	3.0		Sandy CLAY (CH) Very stiff to hard, high plasticity, grey and red brown mottled, fine grained sand, moist.	ASS
	3.40		CLAY (CH) Very stiff, high plasticity, grey red and yellow brown mottled, moist.	ASS
	4.0			ASS
				ASS
				ASS
	4.20		CLAY (CH) Very stiff, high plasticity, grey, trace of fine grained sand, moist.	ASS
	4.50		CLAY (CH) Very stiff, high plasticity, yellow brown mottled, trace of fine grained sand, moist.	ASS
	4.80		Gravelly Sandy CLAY (CH) Hard, high plasticity, grey mottled, fine to coarse grained sand, fine size gravel, moist.	ASS
	5.0			ASS
	5.30		TUFF (DW) Very weak, light grey and light yellow brown.	ASS
	5.60		TUFF (DW) Weak, light yellow brown.	ASS
	6.0	6.00		ASS
			BOREHOLE BH 1A TERMINATED AT 6.00 m	
	7.0			
	8.0			
	9.0			
	10.0			

Comments:
1) Groundwater noted at 0.6m.

Water First Noted Water Steady Level

Weathering Grades
RS - Residual Soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh

Rock Strength
VW - Very weak
W - Weak
MS - Medium strong
S - Strong
VS - Very strong
ES - Extremely strong

Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved: JD
Date: 4/02/2016

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BOREHOLE RECORD SHEET

Location Number: BH 2A

Project Number: 110-12516
Project Name: Apartment Buildings
Location: 825 Stanley Street, Woolloongabba
Client: 825 Stanley Pty Ltd
Date: 24/07/2010

Easting: 503748 Northing: 6959568 RL: 5.0 m
Logger: DA Operator: DA Machine: Scout 2

Drilling Method (TC / WB / RR / NMLC / Casing)	Depth	Graphic	Description	Samples and Remarks
	0.25		FILL Sandy GRAVEL (GP) Medium dense, fine to medium size, yellow brown, fine to coarse grained sand, dry.	ASS
	0.50		NATURAL Clayey SAND (SC) Loose, fine to medium grained, dark grey and brown, high plasticity fines, moist.	ASS
	0.90		Clayey SAND (SC) Very loose, fine to coarse grained, brown, high plasticity fines, moist.	ASS
	1.0 ▽ 1.10		Clayey SAND (SC) Very loose, fine to coarse grained, brown, high plasticity fines, wet.	ASS
	1.60		Gravelly Sandy CLAY (CH) Very stiff, high plasticity, grey and red brown, fine to coarse grained sand, fine to medium size gravel, moist.	ASS
	2.0 2.20		Sandy CLAY (CH) Very stiff, high plasticity, grey and red brown, fine to medium grained sand, moist.	ASS
	3.0 3.70		Sandy CLAY (CH) Very stiff, high plasticity, grey and red brown, with fine grained sand, moist.	ASS
	4.0 4.00		Gravelly Sandy CLAY (CH) Hard, high plasticity, grey red and yellow brown, fine to coarse grained sand, fine to medium size gravel, moist.	ASS
	4.50		TUFF (DW) Weak, yellow brown, dry.	ASS
	5.0		BOREHOLE BH 2A TERMINATED AT 4.50 m	
	6.0			
	7.0			
	8.0			
	9.0			
	10.0			

Comments:
1) Groundwater noted at 0.9m.

▽ Water First Noted ▼ Water Steady Level

Weathering Grades
RS - Residual Soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh

Rock Strength
VW - Very weak
W - Weak
MS - Medium strong
S - Strong
VS - Very strong
ES - Extremely strong

Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved: JD
Date: 4/02/2016

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BOREHOLE RECORD SHEET

Location Number: BH 3A

Project Number: 110-12516
Project Name: Apartment Buildings
Location: 825 Stanley Street, Woolloongabba
Client: 825 Stanley Pty Ltd
Date: 24/07/2010

Easting: 503797 Northing: 6959609 RL: 5.0 m
Logger: DA Operator: DA Machine: Scout 2

Drilling Method (TC / WB / RR / NMLC / Casing)	Depth	Graphic	Description	Samples and Remarks
	0.00		Bitumen	ASS
			FILL Gravelly Clayey SAND (SC) Loose, fine to coarse grained, dark grey and brown, high plasticity fines, fine size gravel, dry.	ASS
	0.90			ASS
	1.0			ASS
	1.20		FILL Clayey SAND (SC) Loose, fine to coarse grained, dark grey, high plasticity fines, with charcoal, dry.	ASS
	1.60		FILL Gravelly Sandy CLAY (CH) Stiff, high plasticity, yellow red brown and dark grey, fine to coarse grained sand, fine to medium size gravel, moist.	ASS
	2.0		NATURAL Sandy CLAY (CH) Stiff, high plasticity, grey brown, fine to medium grained sand, moist.	ASS
	2.10		Gravelly Clayey SAND (SC) Loose, fine to coarse grained, orange and yellow brown, high plasticity fines, some fine size gravel.	ASS
	2.60		Clayey SAND (SC) Loose, fine to medium grained, grey and light yellow brown mottled, high plasticity fines, wet.	ASS
	3.0			ASS
	3.20		Sandy CLAY (CH) Hard, high plasticity, yellow brown and light grey, fine to medium grained sand, moist.	ASS
	3.80		Clayey SAND (SC) Medium dense, fine to coarse grained, yellow brown and light grey, high plasticity fines, moist.	ASS
	4.0			ASS
	24/07/10			ASS
	4.70		Sandy CLAY (CH) Hard, high plasticity, yellow brown and light grey, fine to medium grained sand, moist.	ASS
	5.0			ASS
	5.20		TUFF (DW) Weak, yellow brown and light grey.	ASS
	6.0			ASS
	6.00		BOREHOLE BH 3A TERMINATED AT 6.00 m	
	7.0			
	8.0			
	9.0			
	10.0			

Comments:
1) Groundwater noted at 2.3m.
2) Groundwater level noted at 4.3m.
3) Groundwater monitoring well installed to 6.0m.

Water First Noted Water Steady Level

Weathering Grades
RS - Residual Soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh

Rock Strength
VW - Very weak
W - Weak
MS - Medium strong
S - Strong
VS - Very strong
ES - Extremely strong

Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved: JD
Date: 4/02/2016

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BOREHOLE RECORD SHEET

Location Number: BH 4A

Project Number: 110-12516
Project Name: Apartment Buildings
Location: 825 Stanley Street, Woolloongabba
Client: 825 Stanley Pty Ltd
Date: 24/07/2010

Easting: 503807 Northing: 6959567 RL: 4.0 m
Logger: DA Operator: DA Machine: Scout 2

Drilling Method (TC / WB / RR / NMLC / Casing)	Depth	Graphic	Description	Samples and Remarks
	0.25		Bitumen	ASS
	0.40		FILL Sandy GRAVEL (GP) Medium dense, fine to medium size, yellow brown, fine to coarse grained sand, dry.	ASS
	0.60		FILL Gravelly Clayey SAND (SC) Very loose, fine to coarse grained, dark grey, high plasticity fines, fine size gravel, moist.	ASS
	1.0			ASS
	1.20		FILL Gravelly Sandy CLAY (CH) Stiff, high plasticity, grey brown, fine to coarse grained sand, fine size gravel, moist.	ASS
	1.50		FILL Gravelly Clayey SAND (SC) Loose, fine to coarse grained, brown, high plasticity fines, fine size gravel, moist.	ASS
			NATURAL Gravelly Sandy CLAY (CH) Stiff, high plasticity, yellow red brown, fine to coarse grained sand, fine size gravel, moist.	ASS
	2.0			ASS
	2.00		Gravelly Clayey SAND (SC) Loose, fine to coarse grained, red yellow brown and grey mottled, high plasticity fines, some fine size gravel.	ASS
	2.60		Gravelly Clayey SAND (SC) Medium dense, fine to coarse grained, red yellow brown and grey mottled, high plasticity fines, some fine size gravel.	ASS
			TUFF (DW) Weak, yellow brown and light grey.	ASS
	3.0			
	3.00		BOREHOLE BH 4A TERMINATED AT 3.00 m	SPT 30/120mm N=R
	4.0			
	5.0			
	6.0			
	7.0			
	8.0			
	9.0			
	10.0			

Comments:
1) Groundwater not observed.

Water First Noted Water Steady Level

Weathering Grades
RS - Residual Soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh

Rock Strength
VW - Very weak
W - Weak
MS - Medium strong
S - Strong
VS - Very strong
ES - Extremely strong

Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved: JD
Date: 4/02/2016

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BOREHOLE RECORD SHEET

Location Number: BH 05

Project Number: 110-12516
Project Name: Apartment Buildings
Location: 825 Stanley Street, Woolloongabba
Client: 825 Stanley Pty Ltd
Date: 14/01/2016

Easting: 503824 Northing: 6959588 RL: 5.0 m
Logger: RH Operator: RH Machine: EVH1750

Drilling Method (TC / WB / RR / NMLC / Casing)	Depth	Graphic	Description	DCP Test (blows/100mm) 0 6 12 18 24 30	Samples and Remarks
	0.10		BITUMEN		
	0.20		FILL Gravelly CLAY (CH) Stiff, high plasticity, dark grey, fine to medium sized gravel, moist,		
	0.50				
	0.60		NATURAL Silty CLAY (CH) Stiff, high plasticity, dark brown, trace of fine sized gravel, moist.		
	1.0		Silty CLAY (CH) Stiff, high plasticity, dark brown mottled orange-brown, trace of fine to medium sized gravel, moist.		
	1.10		TUFF (DW) Very weak, light brown, moist.		
	1.20		TUFF (DW) Weak, light brown, moist.		
			BOREHOLE BH 05 TERMINATED AT 1.20 m		
	2.0				
	3.0				
	4.0				
	5.0				
	6.0				
	7.0				
	8.0				
	9.0				
	10.0				

Comments:
1. Groundwater not encountered.
2. DCP refusal at 0.62m.
3. 'TC' bit refusal at 1.20m.

▽ Water First Noted ▼ Water Steady Level

Weathering Grades
RS - Residual Soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh

Rock Strength
VW - Very weak
W - Weak
MS - Medium strong
S - Strong
VS - Very strong
ES - Extremely strong

Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved: JD
Date: 4/02/2016

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BOREHOLE RECORD SHEET

Location Number: BH 06

Project Number: 110-12516
Project Name: Apartment Buildings
Location: 825 Stanley Street, Woolloongabba
Client: 825 Stanley Pty Ltd
Date: 14/01/2016

Easting: 503781 Northing: 6959587 RL: 4.5 m
Logger: RH Operator: RH Machine: EVH1750

Drilling Method (TC / WB / RR / NMLC / Casing)	Depth	Graphic	Description	DCP Test (blows/100mm) 0 6 12 18 24 30	Samples and Remarks
	0.09		BITUMEN		
	0.20		FILL Sandy GRAVEL (GP) Very dense, fine to medium sized, dark brown, fine to coarse grained sand, moist.		
	0.50		FILL Gravelly CLAY (CI-CH) Stiff, medium to high platicity, dark brown, fine to medium sized gravel, with fine to coarse grained sand, smell of hydrocarbons, moist.		D
	0.80 ▽				
	1.0				
	1.10		FILL Clayey GRAVEL (GC) Medium dense, fine to medium sized, dark brown mottled dark grey, medium to high plasticity fines, with fine to coarse grained sand, smell of hydrocarbons, moist.		U50 PP = 110
	2.0		NATURAL Clayey SAND (SC) Loose, fine to coarse grained, dark grey, medium to high plasticity fines, trace of fine sized gravel, wet.		
	2.40		Silty CLAY (CH) Stiff, high plasticity, dark grey mottled red-brown, trace of fine sized gravel, moist.		
	2.70		Silty CLAY (CH) Very stiff, high plasticity, orange-brown mottled light brown, trace of fine sized gravel, moist.		
	3.0		TUFF (DW) Very weak, light brown mottled light grey, moist.		
	3.20		BOREHOLE BH 06 TERMINATED AT 3.20 m		
	4.0				
	5.0				
	6.0				
	7.0				
	8.0				
	9.0				
	10.0				

Comments:
1. Groundwater encountered at 0.80m.
2. DCP refusal at 2.73m.
3. 'TC' bit refusal at 3.20m.

▽ Water First Noted ▼ Water Steady Level

Weathering Grades
RS - Residual Soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh

Rock Strength
VW - Very weak
W - Weak
MS - Medium strong
S - Strong
VS - Very strong
ES - Extremely strong

Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved: JD
Date: 4/02/2016

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BOREHOLE RECORD SHEET

Location Number: BH 07

Project Number: 110-12516
Project Name: Apartment Buildings
Location: 825 Stanley Street, Woolloongabba
Client: 825 Stanley Pty Ltd
Date: 14/01/2016 Page: 1 OF 1

Easting: 503754 Northing: 6959591 RL: 5.0 m
Logger: RH Operator: RH Machine: EVH1750

Drilling Method (TC / WB / RR / NMLC / Casing)	Depth	Graphic	Description	DCP Test (blows/100mm) 0 6 12 18 24 30	Samples and Remarks
	0.02		BITUMEN		
	0.14		FILL Sandy GRAVEL (GP) Dense, fine to medium sized, light brown, fine to coarse grained sand, trace of low plasticity fines, moist.		
	0.60		NATURAL Silty CLAY (CH) Firm, high plasticity, dark grey, with fine to coarse grained sand, trace of fine sized gravel, moist.		U50 PP = 140
	1.0		Silty CLAY (CH) Stiff, high plasticity, dark grey mottled red-brown, trace of fine sized gravel, moist.		U50 PP = 100
	2.0				
	2.30		Silty CLAY (CH) Very stiff, high plasticity, dark grey mottled red-brown, trace of fine sized gravel, moist.		
	3.0				U50 PP = 230
	3.40		Silty CLAY (CH) Very stiff, high plasticity, light grey mottled red-brown, trace of fine sized gravel, moist.		
	4.0				
	4.20		Silty CLAY (CH) Very stiff, high plasticity, dark grey mottled light brown, trace of fine sized gravel, moist.		
	5.0				
	6.0				U50 PP = 230
	6.20		Silty CLAY (CH) Very stiff, high plasticity, dark grey mottled light brown, trace of fine sized gravel, with some GRAVEL bands, moist.		
	6.80				
	7.0		TUFF (DW) Weak, light brown, moist.		
	7.00		BOREHOLE BH 07 TERMINATED AT 7.00 m		
	8.0				
	9.0				
	10.0				

Comments:
1. Groundwater encountered at 5.50m.
2. DCP refusal at 4.09m.
3. 'TC' bit refusal at 7.00m.

▽ Water First Noted ▼ Water Steady Level

Weathering Grades
RS - Residual Soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh

Rock Strength
VW - Very weak
W - Weak
MS - Medium strong
S - Strong
VS - Very strong
ES - Extremely strong

Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved: JD
Date: 4/02/2016

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BOREHOLE RECORD SHEET

Location Number: BH 08

Project Number: 110-12516
Project Name: Apartment Buildings
Location: 825 Stanley Street, Woolloongabba
Client: 825 Stanley Pty Ltd
Date: 15/01/2016

Easting: 503817 Northing: 6959609 RL: 5.0 m
Logger: DA/CB Operator: DA Machine: Scout

Depth	Graphic	Description	Weathering	Strength (Estimated)	Defect Spacing	Rec (%)	RQD	Samples and Remarks
0.02		BITUMEN						
0.60		FILL Sandy GRAVEL (GP) Medium dense, fine to medium sized, grey, fine to coarse grained sand, dry.						
0.80		FILL ASH Very loose, dark grey/black.						
1.10		FILL Gravelly Clayey SAND (SC) Loose, fine to coarse grained, brown mottled, high plasticity fines, fine sized gravel, moist.						SPT 2, 2, 4 N=6
1.70		FILL Gravelly Sandy CLAY (CH) Stiff, high plasticity, brown, fine to coarse grained sand, fine sized gravel, moist.						U50
2.60		FILL Gravelly Clayey SAND (SC) Loose, fine to coarse grained, yellow-brown, high plasticity fines, fine sized gravel, moist.						
3.25		NATURAL Clayey SAND (SC) Very loose, fine to coarse grained, grey and brown, high plasticity fines, wet.						SPT 1, 2, 2 N=4
3.90		Sandy CLAY (CH) Firm, high plasticity, dark grey, fine to medium grained sand, moist.						
4.30		Clayey SAND (SC) Loose, fine to medium grained, brown, high plasticity fines, wet.						
4.80		Sandy CLAY (CH) Very stiff, high plasticity, light grey and yellow brown, fine to medium grained sand, moist.						U50 PP > 600
5.60		TUFF (DW) Weak, yellow brown and light grey.						
6.05		TUFF (DW) Weak, orange/yellow-brown.						
6.10		TUFF (DW) Weak, yellow-brown.	DW					SPT 50/80mm N=R
		TUFF fine to medium grained, light grey/light red, mottled orange, massive, with very closely spaced fractures, with some limonite staining and viens.						6.14 m; J, **15°**, P, R, O, L 6.26 m; J, **20°**, S, R, O, W 6.32 m; J, **15°**, P, R, O, L 6.45 m; J, **10°**, S, R, O, W 6.52 m; J, **15°**, S, R, O, L 6.76 m; J, **20°**, S, R, O, W 7.16m, Is50 = 0.16 MPa 7.08 m; J, **10°**, S, R, O, L 7.10 m; J, **5°**, P, R, O, L 7.25 m; J, **10°**, P, R, O, L 7.34 m; J, **10°**, P, R, O, L 7.41 m; J, **15°**, P, R, O, L 7.84 m; J, **10°**, P, R, O, L 8.20 m; J, **10°**, S, V, O, L 8.33 m; J, **10°**, S, R, O, L 8.40 m; J, **10°**, S, R, O, L
			DW - SW			100	18	
						100	76	8.70 m; J, **20°**, P, R, O, L 8.9m, Is50 = 0.68 MPa 8.83 m; J, **15°**, P, R, O, L 9.04 m; J, **10°**, S, R, O, W 9.19 m; J, **10°**, P, R, O, Z 9.24 m; J, **20°**, P, R, O, L 9.35 m; V, **80°**, R, C, L
9.67		TUFF fine to coarse grained, light grey/light brown with closely spaced fractures.	DW					
10.00								

Drilling Method: TC, WB, RR, NMLC, Casing

15/01/16

Comments:
1. Groundwater encountered at 2.60m.
2. Borehole bailed on completion of drilling.
3. Steady water level measured post bailing at 4.75m on 15/1/16.

Chainage : m Offset : m
Water First Noted Water Steady Level

Defects - 1.54m : F,60°,P,R,O,C

Depth (m) | Type: B - Bedding, C - Clay seam, F - Foliation, H - Schistosity, J - Joint, L - Cleavage, R - Fracture, S - Shear zone, T - Contact, V - Vein, Z - Decomposed Zone, DI - Drilling Induced break | Dip (deg) | Planarity: C - Curvilinear, D - Discontinuous, P - Planar, S - Subplanar, T - Stepped, U - Undulating | Roughness: L - Slickensides, P - Polished, R - Rough, S - Smooth, V - Very rough | Aperature: C - Closed, F - Filled, N - Clean, O - Open, S - Stain | Infil: C - Clay, F - Iron Oxide, K - Calcite, L - Limonite, Q - Quartz, S - Secondary mineral, U - Unidentified mineral, W - Weathered rock, X - Carbonaceous, Z - Clean

Weathering Grades
RS - Residual Soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh

Rock Strength
VW - Very weak
W - Weak
MS - Medium strong
S - Strong
VS - Very strong
ES - Extremely strong

Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved: JD
Date: 4/02/2016

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BOREHOLE RECORD SHEET

Location Number: BH 08

Project Number: 110-12516
Project Name: Apartment Buildings
Location: 825 Stanley Street, Woolloongabba
Client: 825 Stanley Pty Ltd
Date: 15/01/2016

Easting: 503817 Northing: 6959609 RL: 5.0 m
Logger: DA/CB Operator: DA Machine: Scout

Depth	Graphic	Description	Weathering	Strength (Estimated)	Defect Spacing	Rec (%)	RQD	Samples and Remarks
		TUFF, fine to coarse grained, light grey/light green, mottled orange, massive with moderatly widely spaced fractures and trace limonite staining.	DW - SW					10.07 m; J, **15°,** P, R, O, L
			SW					10.48 m; J, **10°,** S, R, O, L
11.0						100	76	10.92m, Is50 = 0.22 MPa
11.00								10.88 m; J, **10°,** P, V, O, L
		TUFF, fine to coarse grained, speckled light grey, massive with widely spaced fractures with a limonite stained clay infilled joint at 12.65m, near vertical joint between 14.9m and 15.5m.	FR					11.54m, Is50 = 1.43 MPa
12.0								11.47 m; J, **12°,** P, V, O, Z
			SW - FR					12.65 m; J, **60°,** P, R, O, L/C
13.0						100	84	13.20 m; J, **30°,** P, R, O, Z
								13.45 m; J, **20°,** U, R, O, W
14.0								14.08 m; J, **50°,** P, R, O, Z
								14.18 m; J, **15°,** S, V, O, Z
								14.64 m; J, **10°,** S, R, O, W
15.0								14.88m, Is50 = 0.75 MPa
								15.05 m; J, **70°,** U, R, O, W
								15.20 m; J, **20°,** S, R, O, Z
			FR					15.9m, Is50 = 1.45 MPa
16.0						100	79	
16.00		TUFF, fine to coarse grained, speckled grey to dark grey, massive, with widely to very widely spaced fractures, with some calcite lenses.						16.64 m; J, **10°,** P, R, O, Z
17.0								17.28 m; J, **10°,** S, V, O, Z
								17.38 m; J, **10°,** S, V, O, Z
18.0								17.89m, Is50 = 1.15 MPa
19.0						100	100	
								19.46 m; J, **40°,** P, R, O, Z
20.0								

Drilling Method: TC, WB, RR, NMLC, Casing

Comments:
1. Groundwater encountered at 2.60m.
2. Borehole bailed on completion of drilling.
3. Steady water level measured post bailing at 4.75m on 15/1/16.

Chainage : m Offset : m
Water First Noted Water Steady Level

Defects - 1.54m : F,60°,P,R,O,C

Depth (m) | Type: B - Bedding, C - Clay seam, F - Foliation, H - Schistosity, J - Joint, L - Cleavage, R - Fracture, S - Shear zone, T - Contact, V - Vein, Z - Decomposed Zone, DI - Drilling Induced break | Dip (deg) | Planarity: C - Curvilinear, D - Discontinuous, P - Planar, S - Subplanar, T - Stepped, U - Undulating | Roughness: L - Slickensides, P - Polished, R - Rough, S - Smooth, V - Very rough | Aperture: C - Closed, F - Filled, N - Clean, O - Open, S - Stain | Infill: C - Clay, F - Iron Oxide, K - Calcite, L - Limonite, Q - Quartz, S - Secondary mineral, U - Unidentified mineral, W - Weathered rock, X - Carbonaceous, Z - Clean

Weathering Grades
RS - Residual Soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh

Rock Strength
VW - Very weak
W - Weak
MS - Medium strong
S - Strong
VS - Very strong
ES - Extremely strong

Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved: JD
Date: 4/02/2016

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BOREHOLE RECORD SHEET

Location Number: BH 08

Project Number: 110-12516
Project Name: Apartment Buildings
Location: 825 Stanley Street, Woolloongabba
Client: 825 Stanley Pty Ltd
Date: 15/01/2016

Easting: 503817 Northing: 6959609 RL: 5.0 m
Logger: DA/CB Operator: DA Machine: Scout

Depth	Graphic	Description	Weathering	Strength Estimated (RS VW W MS S VS)	Defect Spacing (20 60 200 600)	Rec (%)	RQD	Samples and Remarks
21.0		TUFF, fine to coarse grained, speckled grey to dark grey, massive, with widely to very widely spaced fractures, with some calcite lenses. *(continued)*	FR			100	100	20.85m, Is50 = 1.36 MPa 21.12m, Is50 = 1.28 MPa 21.19 m; J, **10°,** S, R, O, Z
22.0						100	100	
23.0								
24.0								24.20 m; J, **15°,** P, R, O, Z
25.0						100	100	24.9m, Is50 = 1.06 MPa 24.80 m; J, **10°,** S, R, O, Z
26.0								
26.77								26.55m, Is50 = 0.99 MPa
27.0		BOREHOLE BH 08 TERMINATED AT 26.77 m						
28.0								
29.0								
30.0								

Drilling Method: TC, WB, RR, NMLC, Casing

Comments:
1. Groundwater encountered at 2.60m.
2. Borehole bailed on completion of drilling.
3. Steady water level measured post bailing at 4.75m on 15/1/16.

Chainage : m Offset : m
Water First Noted Water Steady Level

Defects - 1.54m : F,60°,P,R,O,C
Depth (m) | Type: B - Bedding, C - Clay seam, F - Foliation, H - Schistosity, J - Joint, L - Cleavage, R - Fracture, S - Shear zone, T - Contact, V - Vein, Z - Decomposed Zone, DI - Drilling Induced break | Dip (deg) | Planarity: C - Curvilinear, D - Discontinuous, P - Planar, S - Subplanar, T - Stepped, U - Undulating | Roughness: L - Slickensides, P - Polished, R - Rough, S - Smooth, V - Very rough | Aperture: C - Closed, F - Filled, N - Clean, O - Open, S - Stain | Infill: C - Clay, F - Iron Oxide, K - Calcite, L - Limonite, Q - Quartz, S - Secondary mineral, U - Unidentified mineral, W - Weathered rock, X - Carbonaceous, Z - Clean

Weathering Grades
RS - Residual Soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh

Rock Strength
VW - Very weak
W - Weak
MS - Medium strong
S - Strong
VS - Very strong
ES - Extremely strong

Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved: JD
Date: 4/02/2016

Client: 825 Stanley Street Pty Ltd
Project: Apartment Buildings
Location: 825 Stanley Street, Woolloongabba

Project no: 110-12516

SSE Borehole: 8
Depth: 6.10m - 12.00m
Box: 1 of 4

Client: 825 Stanley Street Pty Ltd
Project: Apartment Buildings
Location: 825 Stanley Street, Woolloongabba

Project no: 110-12516

SSE Borehole: 8
Depth: 12.00m - 18.00m
Box: 2 of 4

PointID : BH 08 Depth Range: 12.00 - 18.00 m

SOIL SURVEYS

TITLE: 825 Stanley Pty Ltd 825 Stanley Street, Woolloongabba Apartment Buildings Core Photo - BH 08	DRAWN: CB	DATE: 18/01/2016	
	CHECKED: GB	DATE: 18/01/2016	
	SCALE: Not To Scale		A4
	PROJECT No: 110-12516	FIGURE No: 1/2	

Client: 825 Stanley Street Pty Ltd
Project: Apartment Buildings
Location: 825 Stanley Street, Woolloongabba

Project no: 110-12516

SSE Borehole: 8
Depth: 18.00m - 24.00m
Box: 3 of 4

Client: 825 Stanley Street Pty Ltd
Project: Apartment Buildings
Location: 825 Stanley Street, Woolloongabba

Project no: 110-12516

SSE Borehole: 8
Depth: 24.00m - 26.77m
Box: 4 of 4

PointID : BH 08 Depth Range: 24.00 - 26.77 m

SOIL SURVEYS

TITLE: 825 Stanley Pty Ltd 825 Stanley Street, Woolloongabba Apartment Buildings Core Photo - BH 08	DRAWN: CB	DATE: 18/01/2016	
	CHECKED: GB	DATE: 18/01/2016	
	SCALE: Not To Scale		A4
	PROJECT No: 110-12516	FIGURE No: 2/2	

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BOREHOLE RECORD SHEET

Location Number: BH 09

Project Number: 110-12516
Project Name: Apartment Buildings
Location: 825 Stanley Street, Woolloongabba
Client: 825 Stanley Pty Ltd
Date: 13/01/2016

Easting: 503780 Northing: 6959568 RL: 4.2 m
Logger: DA/CB Operator: DA Machine: Scout

Depth	Graphic	Description	Weathering	Strength (Estimated)	Defect Spacing	Rec (%)	RQD	Samples and Remarks
0.20		BITUMEN						
0.70		FILL Clayey SAND (SC) Loose, fine to coarse grained, dark grey, high plasticity fines, dry.						
0.90		FILL Clayey SAND (SC) Loose, fine to coarse grained, dark grey, high plasticity fines, with ASH, dry.						SPT 3, 3, 1 N=4
1.60		FILL CLAY (CH) Stiff, high plasticity, brown mottled, moist.						
2.00		NATURAL Silty Clayey SAND (SC) Very loose, fine to medium grained, dark brown, high plasticity fines.						U50
2.60		Clayey SAND (SC) Very loose, fine to coarse grained, grey, high plasticity fines, wet.						SPT 2, 1, 2 N=3
4.30		Sandy CLAY (CH) Firm to stiff, high plasticity, grey, fine to medium grained sand, moist.						U50 PP = 100
5.50		Gravelly Clayey SAND (SC) Very loose, fine to coarse grained, dark grey, high plasticity fines, fine sized gravel.						SPT 1, 0, 0 N=0
5.70		TUFF (DW) Weak, yellow-brown and grey.						
5.80		TUFF (SW) Medium strong, yellow-brown and grey.	SW					5.82 m; J, **35°**, P, V, O, L 5.95m, Is50 = 1.51 MPa
6.93		TUFF fine to medium grained, light grey mottled light brown, massive, with closely spaced fractures. Some orange stained weathered bands from 6.27m to 6.49m and 6.69m to 6.93m.	DW SW DW			100	70	6.08 m; J, **10°**, P, V, O, W 6.21 m; J, **15°**, P, V, O, W 6.27 m; J, **10°**, P, R, O, W 6.33 m; J, **10°**, S, R, O, W 6.36 m; J, **10°**, P, R, O, W 6.41 m; J, **15°**, P, R, O, L 6.48 m; J, **10°**, P, R, O, L 6.71 m; J, **10°**, P, R, O, L 6.79 m; J, **10°**, P, R, O, L 6.86 m; J, **10°**, S, R, O, L
10.00		TUFF fine to medium grained, light grey, massive, with widely spaced fractures, possible shear zone at 9.60m.	FR			100	100	7.37 m; J, **10°**, P, V, O, Z 7.85m, Is50 = 2.71 MPa 8.94 m; J, **70°**, P, R, O, C 9.05m, Is50 = 2.77 MPa 9.22 m; J, **10°**, P, V, O, Z 9.42 m; J, **15°**, P, R, O, Z 9.61 m; J, **60°**, P, R, O, W

Drilling Method: TC, WB, RR, NMLC, Casing

Comments:
1. Groundwater encountered at 2.00m.
2. Borehole bailed on completion of drilling and groundwater monitoring well installed to 9.20m (RL -5.0m).
3. Steady water level measured at 3.90m on 15/1/16 and 3.8m 03/02/16.

Chainage : m Offset : m
Water First Noted Water Steady Level

Defects - 1.54m : F,60°,P,R,O,C
Depth (m) | Type: B - Bedding, C - Clay seam, F - Foliation, H - Schistosity, J - Joint, L - Cleavage, R - Fracture, S - Shear zone, T - Contact, V - Vein, Z - Decomposed Zone, DI - Drilling Induced break | Dip (deg) | Planarity: C - Curvilinear, D - Discontinuous, P - Planar, S - Subplanar, T - Stepped, U - Undulating | Roughness: L - Slickensides, P - Polished, R - Rough, S - Smooth, V - Very rough | Aperture: C - Closed, F - Filled, N - Clean, O - Open, S - Stain | Infil: C - Clay, F - Iron Oxide, K - Calcite, L - Limonite, Q - Quartz, S - Secondary mineral, U - Unidentified mineral, W - Weathered rock, X - Carbonaceous, Z - Clean

Weathering Grades
RS - Residual Soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh

Rock Strength
VW - Very weak
W - Weak
MS - Medium strong
S - Strong
VS - Very strong
ES - Extremely strong

Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved: MG
Date: 4/02/2016

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Specialist in Applied Geotechnics
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Gold Coast: ph +61 7 5500 0465 goldcoast@soilsurveys.com.au

BOREHOLE RECORD SHEET

Location Number: BH 09

Project Number: 110-12516
Project Name: Apartment Buildings
Location: 825 Stanley Street, Woolloongabba
Client: 825 Stanley Pty Ltd
Date: 13/01/2016

Easting: 503780 Northing: 6959568 RL: 4.2 m
Logger: DA/CB Operator: DA Machine: Scout

Depth	Graphic	Description	Weathering	Strength Estimated (RS VW W MS S VS)	Defect Spacing (20 60 200 600)	Rec (%)	RQD	Samples and Remarks
		TUFF fine to medium grained, light grey mottled light red, massive, with widely spaced fractures, with a near vertical joint between 13.70m and 13.95m.	FR			100	100	10.61 m; J, **10°,** P, R, O, Z 10.73 m; J, **10°,** P, R, O, Z
11.0								11.32 m; J, **15°,** S, R, O, Z
12.0						100	94	12.75m, Is50 = 2.51 MPa 12.66 m; J, **15°,** P, V, O, Z 12.91 m; J, **20°,** P, V, O, Z
13.0								
14.0								13.80 m; J, **70°,** U, R, O, U
14.10		TUFF fine to medium grained, light grey mottled light green, massive, with moderately widely spaced fractures.	SW - FR					14.33 m; J, **10°,** P, R, O, Z 14.50 m; J, **10°,** P, R, O, Z 14.57 m; J, **15°,** P, V, O, Z 14.73 m; J, **10°,** T, R, O, Z
15.0						98	89	
16.0								15.86 m; J, **10°,** P, V, O, Z 16.15 m; J, **70°,** P, R, O, U
17.0								16.63 m; J, **70°,** T, R, O, U 16.95m, Is50 = 3.38 MPa
17.00		TUFF fine to medium grained, light grey mottled light red, massive, with very widely spaced fractures.	FR			100	100	
18.0								
19.0								19.8m, Is50 = 5.59 MPa
20.0								

Drilling Method: TC, WB, RR, NMLC, Casing

Comments:
1. Groundwater encountered at 2.00m.
2. Borehole bailed on completion of drilling and groundwater monitoring well installed to 9.20m (RL -5.0m).
3. Steady water level measured at 3.90m on 15/1/16 and 3.8m 03/02/16.

Chainage : m Offset : m
Water First Noted Water Steady Level

Defects - 1.54m : F,60°,P,R,O,C

Depth (m) | Type: B - Bedding, C - Clay seam, F - Foliation, H - Schistosity, J - Joint, L - Cleavage, R - Fracture, S - Shear zone, T - Contact, V - Vein, Z - Decomposed Zone, Di - Drilling Induced break | Dip (deg) | Planarity: C - Curvilinear, D - Discontinuous, P - Planar, S - Subplanar, T - Stepped, U - Undulating | Roughness: L - Slickensides, P - Polished, R - Rough, S - Smooth, V - Very rough | Aperture: C - Closed, F - Filled, N - Clean, O - Open, S - Stain | Infil: C - Clay, F - Iron Oxide, K - Calcite, L - Limonite, Q - Quartz, S - Secondary mineral, U - Unidentified mineral, W - Weathered rock, X - Carbonaceous, Z - Clean

Weathering Grades
RS - Residual Soil
XW - Extremely weathered
DW - Distinctly weathered
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Rock Strength
VW - Very weak
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MS - Medium strong
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Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved: MG
Date: 4/02/2016

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BOREHOLE RECORD SHEET

Location Number: BH 09

Project Number: 110-12516
Project Name: Apartment Buildings
Location: 825 Stanley Street, Woolloongabba
Client: 825 Stanley Pty Ltd
Date: 13/01/2016

Easting: 503780 Northing: 6959568 RL: 4.2 m
Logger: DA/CB Operator: DA Machine: Scout

Drilling Method (TC / WB / RR / NMLC / Casing)	Depth	Graphic	Description	Weathering	Strength Estimated (RS VW W MS S VS)	Defect Spacing (20 60 200 600)	Rec (%)	RQD	Samples and Remarks
NMLC	20.20			FR			100	100	20.15m, Is50 = 6.77 MPa
			BOREHOLE BH 09 TERMINATED AT 20.20 m						

21.0 22.0 23.0 24.0 25.0 26.0 27.0 28.0 29.0 30.0

Comments:
1. Groundwater encountered at 2.00m.
2. Borehole bailed on completion of drilling and groundwater monitoring well installed to 9.20m (RL -5.0m).
3. Steady water level measured at 3.90m on 15/1/16 and 3.8m 03/02/16.

Chainage : m Offset : m
Water First Noted Water Steady Level

Defects - 1.54m : F,60°,P,R,O,C
Depth (m) | Type: B - Bedding, C - Clay seam, F - Foliation, H - Schistosity, J - Joint, L - Cleavage, R - Fracture, S - Shear zone, T - Contact, V - Vein, Z - Decomposed Zone, DI - Drilling Induced break | Dip (deg) | Planarity: C - Curvilinear, D - Discontinuous, P - Planar, S - Subplanar, T - Stepped, U - Undulating | Roughness: L - Slickensides, P - Polished, R - Rough, S - Smooth, V - Very rough | Aperature: C - Closed, F - Filled, N - Clean, O - Open, S - Stain | Infill: C - Clay, F - Iron Oxide, K - Calcite, L - Limonite, Q - Quartz, S - Secondary mineral, U - Unidentified mineral, W - Weathered rock, X - Carbonaceous, Z - Clean

Weathering Grades
RS - Residual Soil
XW - Extremely weathered
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Rock Strength
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W - Weak
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Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved: MG
Date: 4/02/2016

Client: 825 Stanley Street Pty Ltd
Project: Apartment Buildings
Location: 825 Stanley Street, Woolloongabba

Project no: 110-12516

SSE Borehole: 9
Depth: 5.80m - 11.00m
Box: 1 of 3

Client: 825 Stanley Street Pty Ltd
Project: Apartment Buildings
Location: 825 Stanley Street, Woolloongabba

Project no: 110-12516

SSE Borehole: 9
Depth: 11.00m - 17.00m
Box: 2 of 3

PointID : BH 09 Depth Range: 11.00 - 17.00 m

SOIL SURVEYS

TITLE

825 Stanley Pty Ltd
825 Stanley Street, Woolloongabba
Apartment Buildings
Core Photo - BH 09

DRAWN	CB	DATE	18/01/2016
CHECKED	GB	DATE	18/01/2016
SCALE	Not To Scale		A4
PROJECT No	110-12516	FIGURE No	1/2

Client: 825 Stanley Street Pty Ltd
Project: Apartment Buildings
Location: 825 Stanley Street, Woolloongabba

Project no: 110-12516

SSE Borehole: 9
Depth: 17.00m - 20.20m
Box: 3 of 3

SOIL SURVEYS

TITLE

825 Stanley Pty Ltd
825 Stanley Street, Woolloongabba
Apartment Buildings
Core Photo - BH 09

DRAWN CB	DATE 18/01/2016
CHECKED GB	DATE 18/01/2016
SCALE Not To Scale	A4
PROJECT No 110-12516	FIGURE No 2/2

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BOREHOLE RECORD SHEET

Location Number: BH 10

Project Number: 110-12516
Project Name: Apartment Buildings
Location: 825 Stanley Street, Woolloongabba
Client: 825 Stanley Pty Ltd
Date: 14/01/2016

Easting: 503768 Northing: 6959624 RL: 5.0 m
Logger: DA/CB Operator: DA Machine: Scout

Depth	Graphic	Description	Weathering	Strength (Estimated)	Defect Spacing	Rec (%)	RQD	Samples and Remarks
0.02		BITUMEN						
0.08		FILL Gravelly SAND (SP) Medium dense, fine to coarse grained, brown, fine to medium sized gravel, dry.						
0.70		FILL ASH Loose, fine to coarse grained, black, dry.						
1.10		FILL Clayey Gravelly SAND and ASH (SC) Very loose, fine to coarse grained, brown and dark grey/black, fine to medium sized gravel, moist.						SPT 3, 1, 2 N=3
1.60		NATURAL Sandy CLAY (CH) Firm, high plasticity, grey brown, fine grained sand, wet.						
		Sandy CLAY (CH) Stiff to very stiff, high plasticity, red-brown and grey mottled, fine to medium grained sand, moist.						U50 PP = 200
2.40		Sandy CLAY (CH) Very stiff, high plasticity, grey and brown mottled, fine grained sand, moist.						U50 PP = 200-450
3.40		Sandy CLAY (CH) Very stiff, high plasticity, light grey mottled, fine to coarse grained sand.						
4.30		TUFF(DW) Very weak, light grey.						SPT 30/60mm N=R
4.50		TUFF (SW) Strong, light yellow-brown and light grey.	DW - SW					4.92m, Is50 = 4.44 MPa
4.60		TUFF fine to medium grained, light grey mottled orange with some limonite staining, massive, with widely spaced fractures with a dark brown mineral infill in some defects, some evidence of near vertical jointing.				100	83	5.34 m; J, **70°,** U, V, O, X
			SW					
			DW					6.36 m; J, **15°,** S, R, O, W
			SW					6.46 m; J, **20°,** S, V, O, Z 6.50 m; J, **15°,** P, R, O, W 6.54 m; J, **15°,** P, R, O, W 6.58 m; J, **15°,** S, V, O, W 6.9m, Is50 = 3.5 MPa 7.05m, Is50 = 1.93 MPa
						100	55	
			DW - SW					7.43 m; J, **70°,** P, R, O, L 7.70 m; J, **80°,** U, V, O, X 8.10 m; J, **80°,** U, C, X 8.23 m; J, **10°,** T, V, O, X 8.39 m; J, **15°,** S, R, O, W 8.51 m; J, **10°,** S, R, O, W
9.00		TUFF fine to medium grained, light grey, massive with very widely spaced fractures.	FR			100	89	8.80 m; J, **75°,** S, V, O, X 9.95m, Is50 = MPa

03/02/16 15/01/16

Comments:
1. Groundwater not encountered during augering.
2. Borehole bailed on completion of drilling and groundwater monitoring well installed to 10.0m (RL-5.0m).
3. Steady water level measured at 5.80m on 15/1/16 and 6.3m 03/02/16.

Chainage : m Offset : m
Water First Noted Water Steady Level

Defects - 1.54m : F,60°,P,R,O,C
Depth (m) | Type: B - Bedding, C - Clay seam, F - Foliation, H - Schistosity, J - Joint, L - Cleavage, R - Fracture, S - Shear zone, T - Contact, V - Vein, Z - Decomposed Zone, DI - Drilling Induced break | Dip (deg) | Planarity: C - Curvilinear, D - Discontinuous, P - Planar, S - Subplanar, T - Stepped, U - Undulating | Roughness: L - Slickensides, P - Polished, R - Rough, S - Smooth, V - Very rough | Aperture: C - Closed, F - Filled, N - Clean, O - Open, S - Stain | Infill: C - Clay, F - Iron Oxide, K - Calcite, L - Limonite, Q - Quartz, S - Secondary mineral, U - Unidentified mineral, W - Weathered rock, X - Carbonaceous, Z - Clean

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DW - Distinctly weathered
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FR - Fresh

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VW - Very weak
W - Weak
MS - Medium strong
S - Strong
VS - Very strong
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Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved: MG
Date: 4/02/2016

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BOREHOLE RECORD SHEET

Location Number: BH 10

Project Number: 110-12516
Project Name: Apartment Buildings
Location: 825 Stanley Street, Woolloongabba
Client: 825 Stanley Pty Ltd
Date: 14/01/2016

Easting: 503768 Northing: 6959624 RL: 5.0 m
Logger: DA/CB Operator: DA Machine: Scout

Depth	Graphic	Description	Weathering	Strength Estimated (RS VW W MS S VS)	Defect Spacing (20 60 200 600)	Rec (%)	RQD	Samples and Remarks
		TUFF fine to medium grained, light grey, massive with very widely spaced fractures. *(continued)*	FR			100	89	11.53m, Is50 = 3.6 MPa
11.72		TUFF fine to medium grained, light grey, massive with moderlatly widely spaced fractures. With several Calcite infilled near vertical, irregular joints.	SW - FR			100	83	12.48 m; V, **70°,** C, K 12.70 m; J, **80°,** P, R, O, K 13.1m, Is50 = 4.07 MPa 13.70 m; V, **80°,** C, K 14.7m, Is50 = 2.12 MPa 15.20 m; V, **80°,** C, K 15.80 m; J, **85°,** S, R, O, K
17.68		TUFF fine to medium grained, light grey, massive with widely spaced fractures and trace calcite lenses/bands.	FR			100	48	16.51 m; V, **5°,** C, K 16.80 m; V, **85°,** C, K 17.9m, Is50 = 3.32 MPa 19.11 m; J, **45°,** P, R, O, K

Drilling Method: TC, WB, RR, NMLC, Casing

Comments:
1. Groundwater not encountered during augering.
2. Borehole bailed on completion of drilling and groundwater monitoring well installed to 10.0m (RL-5.0m).
3. Steady water level measured at 5.80m on 15/1/16 and 6.3m 03/02/16.

Chainage : m Offset : m
Water First Noted Water Steady Level

Defects - 1.54m : F,60°,P,R,O,C
Depth (m) | Type: B - Bedding, C - Clay seam, F - Foliation, H - Schistosity, J - Joint, L - Cleavage, R - Fracture, S - Shear zone, T - Contact, V - Vein, Z - Decomposed Zone, DI - Drilling Induced break | Dip (deg) | Planarity: C - Curvilinear, D - Discontinuous, P - Planar, S - Subplanar, T - Stepped, U - Undulating | Roughness: L - Slickensides, P - Polished, R - Rough, S - Smooth, V - Very rough | Aperture: C - Closed, F - Filled, N - Clean, O - Open, S - Stain | Infill: C - Clay, F - Iron Oxide, K - Calcite, L - Limonite, Q - Quartz, S - Secondary mineral, U - Unidentified mineral, W - Weathered rock, X - Carbonaceous, Z - Clean

Weathering Grades
RS - Residual Soil
XW - Extremely weathered
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Rock Strength
VW - Very weak
W - Weak
MS - Medium strong
S - Strong
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Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved: MG
Date: 4/02/2016

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BOREHOLE RECORD SHEET

Location Number: BH 10

Project Number: 110-12516
Project Name: Apartment Buildings
Location: 825 Stanley Street, Woolloongabba
Client: 825 Stanley Pty Ltd
Date: 14/01/2016

Easting: 503768 Northing: 6959624 RL: 5.0 m
Logger: DA/CB Operator: DA Machine: Scout

Drilling Method (TC / WB / RR / NMLC / Casing)	Depth	Graphic	Description	Weathering	Strength Estimated (RS VW W MS S VS)	Defect Spacing (20 60 200 600)	Rec (%)	RQD	Samples and Remarks
NMLC	20.66		TUFF fine to medium grained, light grey, massive with widely spaced fractures and trace calcite lenses/bands. *(continued)*	FR			100	100	20.38 m; V, **15°**, C, K 20.6m, Is50 = 3.35 MPa
			BOREHOLE BH 10 TERMINATED AT 20.66 m						

21.0
22.0
23.0
24.0
25.0
26.0
27.0
28.0
29.0
30.0

Comments:
1. Groundwater not encountered during augering.
2. Borehole bailed on completion of drilling and groundwater monitoring well installed to 10.0m (RL-5.0m).
3. Steady water level measured at 5.80m on 15/1/16 and 6.3m 03/02/16.

Chainage : m Offset : m
Water First Noted Water Steady Level

Defects - 1.54m : F,60°,P,R,O,C

Depth (m) | Type: B - Bedding, C - Clay seam, F - Foliation, H - Schistosity, J - Joint, L - Cleavage, R - Fracture, S - Shear zone, T - Contact, V - Vein, Z - Decomposed Zone, DI - Drilling Induced break | Dip (deg) | Planarity: C - Curvilinear, D - Discontinuous, P - Planar, S - Subplanar, T - Stepped, U - Undulating | Roughness: L - Slickensides, P - Polished, R - Rough, S - Smooth, V - Very rough | Aperature: C - Closed, F - Filled, N - Clean, O - Open, S - Stain | Infill: C - Clay, F - Iron Oxide, K - Calcite, L - Limonite, Q - Quartz, S-Secondary mineral, U - Unidentified mineral, W - Weathered rock, X - Carbonaceous, Z - Clean

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Samples
U50
SPT
Disturbed Sample
Bulk Sample

Approved: MG
Date: 4/02/2016

Client: 825 Stanley Street Pty Ltd
Project: Apartment Buildings
Location: 825 Stanley Street, Woolloongabba

Project no: 110-12516

SSE Borehole: 10
Depth: 4.60m - 10.00m
Box: 1 of 3

Client: 825 Stanley Street Pty Ltd
Project: Apartment Buildings
Location: 825 Stanley Street, Woolloongabba

Project no: 110-12516

SSE Borehole: 10
Depth: 10.00m - 16.00m
Box: 2 of 3

PointID : BH 10 Depth Range: 10.00 - 16.00 m

SOIL SURVEYS

TITLE

825 Stanley Pty Ltd
825 Stanley Street, Woolloongabba
Apartment Buildings
Core Photo - BH 10

DRAWN	CB	DATE	18/01/2016
CHECKED	GB	DATE	18/01/2016
SCALE	Not To Scale		A4
PROJECT No	110-12516	FIGURE No	1/2

Client: 825 Stanley Street Pty Ltd
Project: Apartment Buildings
Location: 825 Stanley Street, Woolloongabba

Project no: 110-12516

SSE Borehole: 10
Depth: 16.00m - 20.66m
Box: 3 of 3

SOIL SURVEYS

TITLE: 825 Stanley Pty Ltd 825 Stanley Street, Woolloongabba Apartment Buildings Core Photo - BH 10	DRAWN: CB	DATE: 18/01/2016	
	CHECKED: GB	DATE: 18/01/2016	
	SCALE: Not To Scale		A4
	PROJECT No: 110-12516	FIGURE No: 2/2	

APPENDIX C

LABORATORY TEST CERTIFICATES

Soil & Water Laboratories P/L

16/39 Corporation Circuit, Tweed Heads South, NSW. 2486
Phone: (02) 5523 4422; Fax: (07) 3503 9063

NATA
WORLD RECOGNISED ACCREDITATION

This Document is issued in accordance with NATA's accreditation requirements

Accredited for compliance with ISO/IEC 17025

NATA Lab Acc. No. 15277

Chromium Reducible Sulphur Suite Test Results

For Soil Surveys Engineering Pty Ltd, Level 2, 19 Finchley Street Milton, Brisbane Qld. 4064.

Wooloongabba
110-12516

Ref. Number: 12 - 12516

Certificate Number : 201628

Date : 06-Aug-10

Sample Number	Identification/...				Excluded Material		Moisture as Received (85oC)	Init. pH	ANC - bt	a - ANC - bt	s - TAA	TAA	S - HCl	S - KCl	S - NAS	s - S - NAS	SCr	
	Borehole/ Testpit	from (m)	to (m)	Date Sampled	Shell (%d.w.)	Gravel (%d.w.)	2B2	23A (1M KCl)	19A2 (%CaCO3 Eq.)	A19A2 (eq. mol. H+/t)	s - 23F (%S Eq.)	23F (mol. H+/t)	20B	23C (% S)	20J	s - 20J (eq. mol. H+/t)	22B (% S)	a - 22B (eq. mol. H+/t)
2	1	0.25	0.50	26-Jul-10	0.0	45.5	13.0	9.71	n/a	n/a	0.00	0	n/a	n/a	n/a	n/a	<0.01	3
5	1	1.00	1.25	26-Jul-10	0.0	0.0	26.5	8.08	n/a	n/a	0.00	0	n/a	n/a	n/a	n/a	0.02	10
8	1	1.75	2.00	26-Jul-10	0.0	0.0	28.8	3.76	n/a	n/a	0.12	74	0.67	<0.01	0.67	313	<0.01	1
10	1	2.25	2.50	26-Jul-10	0.0	0.0	32.4	3.79	n/a	n/a	0.11	67	0.67	<0.01	0.67	315	<0.01	2
11	1	2.50	2.75	26-Jul-10	0.0	0.0	13.9	3.94	n/a	n/a	0.09	58	<0.01	<0.01	<0.01	0	<0.01	4
13	1	3.00	3.25	26-Jul-10	0.0	0.0	32.2	4.28	n/a	n/a	0.06	39	<0.01	<0.01	<0.01	0	<0.01	1
15	1	3.50	3.75	26-Jul-10	0.0	0.0	35.2	4.55	n/a	n/a	0.04	22	n/a	n/a	n/a	n/a	<0.01	3
18	1	4.25	4.50	26-Jul-10	0.0	0.0	34.1	6.11	n/a	n/a	0.00	1	n/a	n/a	n/a	n/a	<0.01	1
19	1	4.50	4.75	26-Jul-10	0.0	0.0	33.6	5.89	n/a	n/a	0.00	3	n/a	n/a	n/a	n/a	<0.01	3
21	1	5.00	5.25	26-Jul-10	0.0	0.0	16.4	6.47	n/a	n/a	0.00	1	n/a	n/a	n/a	n/a	<0.01	2
24	1	5.75	6.00	26-Jul-10	0.0	0.0	8.1	6.28	n/a	n/a	0.00	1	n/a	n/a	n/a	n/a	<0.01	1
26	2	0.25	0.50	26-Jul-10	0.0	0.0	13.4	7.54	n/a	n/a	0.00	0	n/a	n/a	n/a	n/a	<0.01	2
28	2	0.75	1.00	26-Jul-10	0.0	0.0	13.2	4.92	n/a	n/a	0.02	14	n/a	n/a	n/a	n/a	<0.01	4
30	2	1.25	1.50	26-Jul-10	0.0	0.0	52.5	3.69	n/a	n/a	0.14	87	0.66	<0.01	0.66	310	<0.01	2
32	2	1.75	2.00	26-Jul-10	0.0	0.0	27.9	4.00	n/a	n/a	0.10	61	<0.01	<0.01	<0.01	0	<0.01	3
34	2	2.25	2.50	26-Jul-10	0.0	0.0	31.7	4.08	n/a	n/a	0.08	50	1.62	0.52	1.10	514	<0.01	1
36	2	2.75	3.00	26-Jul-10	0.0	0.0	34.2	4.19	n/a	n/a	0.08	47	0.69	<0.01	0.69	324	<0.01	2
38	2	3.25	3.50	26-Jul-10	0.0	0.0	28.1	4.08	n/a	n/a	0.08	47	1.35	0.84	0.51	238	<0.01	1
40	2	3.75	4.00	26-Jul-10	0.0	13.8	15.1	5.18	n/a	n/a	0.01	9	n/a	n/a	n/a	n/a	<0.01	1
42	2	4.25	4.50	26-Jul-10	0.0	0.0	9.1	6.37	n/a	n/a	0.00	2	n/a	n/a	n/a	n/a	<0.01	2

Samples Received: 26-Jul-10

Tests Completed: 06-Aug-10

Signed: _____ for and on behalf of Soil and Water Laboratories P/L

Trevor Nelson - Chemical Laboratory Manger

1 Determinations have been derived by the adoption of published test methods recommended by National Committee for Acid Sulphate Soils (NatCASS); Queensland Acid Sulphate Soils Management Advisory Committee (QASSMAC); Queensland Acid Sulphate Soils Investigation Team (QASSIT) & Queensland Department of Natural Resources, Mines and Energy; as described in the 'Acid Sulphate Soils Laboratory Methods Guidelines 2004'.

2 Samples supplied by others

3 Samples tested in 'as received' condition

4 The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards - AS17025-2005

5 NATA is a signatory to the APLAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports.

6 Denotation: n/a - not applicable; n/r - not requested

7 Shell & gravel removed is not covered by the scope of accreditation

Soil & Water Laboratories P/L

16/39 Corporation Circuit, Tweed Heads South, NSW. 2486
Phone: (02) 5523 4422; Fax: (07) 3503 9063

NATA
WORLD RECOGNISED ACCREDITATION

This Document is issued in accordance with NATA's accreditation requirements

Accredited for compliance with ISO/IEC 17025

NATA Lab Acc. No. 15277

Chromium Reducible Sulphur Suite Test Results

For Soil Surveys Engineering Pty Ltd, Level 2, 19 Finchley Street Milton, Brisbane Qld. 4064.

Wooloongabba
110-12516

Ref. Number: 12 - 12516

Certificate Number : 201628

Date : 06-Aug-10

Sample Number	Identification/...				Excluded Material		Moisture as Received (85oC)	Init. pH	ANC - bt	a - ANC - bt	s - TAA	TAA	S - HCl	S - KCl	S - NAS	s - S - NAS	SCr	
	Borehole/ Testpit	from (m)	to (m)	Date Sampled	Shell (%d.w.)	Gravel (%d.w.)	2B2 (%d.w.)	23A (1M KCl)	19A2 (%CaCO3 Eq.)	A19A2 (eq. mol. H+/t)	s - 23F (%S Eq.)	23F (mol. H+/t)	20B	23C (% S)	20J	s - 20J (eq. mol. H+/t)	22B (% S)	a - 22B (eq. mol. H+/t)
44	3	0.25	0.50	26-Jul-10	0.0	41.5	9.0	6.49	n/a	n/a	0.00	0	n/a	n/a	n/a	n/a	<0.01	4
46	3	0.75	1.00	26-Jul-10	0.0	27.4	7.6	5.43	n/a	n/a	0.00	3	n/a	n/a	n/a	n/a	0.05	33
48	3	1.25	1.50	26-Jul-10	0.0	22.2	14.0	6.08	n/a	n/a	0.00	1	n/a	n/a	n/a	n/a	<0.01	2
50	3	1.75	2.00	26-Jul-10	0.0	0.0	26.2	4.44	n/a	n/a	0.04	27	<0.01	<0.01	<0.01	0	0.02	12
52	3	2.25	2.50	26-Jul-10	0.0	0.0	18.5	4.41	n/a	n/a	0.04	25	1.31	0.34	0.97	457	<0.01	2
54	3	2.75	3.00	26-Jul-10	0.0	0.0	20.6	4.61	n/a	n/a	0.03	16	n/a	n/a	n/a	n/a	<0.01	2
56	3	3.25	3.50	26-Jul-10	0.0	0.0	20.9	6.20	n/a	n/a	0.00	3	n/a	n/a	n/a	n/a	<0.01	2
59	3	4.00	4.25	26-Jul-10	0.0	0.0	17.0	6.21	n/a	n/a	0.00	2	n/a	n/a	n/a	n/a	<0.01	1
60	3	4.25	4.50	26-Jul-10	0.0	0.0	22.1	6.15	n/a	n/a	0.00	3	n/a	n/a	n/a	n/a	<0.01	2
62	3	4.75	5.00	26-Jul-10	0.0	0.0	16.9	6.18	n/a	n/a	0.00	3	n/a	n/a	n/a	n/a	<0.01	1
64	3	5.25	5.50	26-Jul-10	0.0	0.0	12.7	6.81	n/a	n/a	0.00	0	n/a	n/a	n/a	n/a	<0.01	4
66	3	5.75	6.00	26-Jul-10	0.0	0.0	10.0	6.56	n/a	n/a	0.00	0	n/a	n/a	n/a	n/a	<0.01	1
68	4	0.25	0.50	26-Jul-10	0.0	0.0	7.1	6.41	n/a	n/a	0.00	3	n/a	n/a	n/a	n/a	<0.01	5
70	4	0.75	1.00	26-Jul-10	0.0	0.0	22.5	5.81	n/a	n/a	0.00	2	n/a	n/a	n/a	n/a	<0.01	3
72	4	1.25	1.50	26-Jul-10	0.0	0.0	19.2	5.19	n/a	n/a	0.01	8	n/a	n/a	n/a	n/a	<0.01	0
73	4	1.50	1.75	26-Jul-10	0.0	0.0	15.2	5.89	n/a	n/a	0.00	3	n/a	n/a	n/a	n/a	<0.01	1
74	4	1.75	2.00	26-Jul-10	0.0	0.0	18.2	5.60	n/a	n/a	0.01	6	n/a	n/a	n/a	n/a	<0.01	2
76	4	2.25	2.50	26-Jul-10	0.0	0.0	14.1	4.62	n/a	n/a	0.03	17	n/a	n/a	n/a	n/a	<0.01	1
78	4	2.75	3.00	26-Jul-10	0.0	0.0	7.8	5.47	n/a	n/a	0.00	1	n/a	n/a	n/a	n/a	<0.01	1

Samples Received: 26-Jul-10

Tests Completed: 06-Aug-10

Signed: _____ for and on behalf of Soil and Water Laboratories P/L

Trevor Nelson - Chemical Laboratory Manger

1 Determinations have been derived by the adoption of published test methods recommended by National Committee for Acid Sulphate Soils (NatCASS); Queensland Acid Sulphate Soils Management Advisory Committee (QASSMAC); Queensland Acid Sulphate Soils Investigation Team (QASSIT) & Queensland Department of Natural Resources, Mines and Energy; as described in the 'Acid Sulphate Soils Laboratory Methods Guidelines 2004'.

2 Samples supplied by others

3 Samples tested in 'as received' condition

4 The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards - AS17025-2005

5 NATA is a signatory to the APLAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports.

6 Denotation: n/a - not applicable; n/r - not requested

7 Shell & gravel removed is not covered by the scope of accreditation

Soil & Water Laboratories P/L

16/39 Corporation Circuit, Tweed Heads South, NSW. 2486
Phone: (07) 5523 4422; Fax: (07) 3503 9063

Water Analysis

For Soil Surveys Engineering Pty Ltd, Level 2, 19 Finchley Street Milton, Brisbane Qld. 4064.

Certificate Number: 201636

Location: Gabba

Reference Number: 12 - 12516

Date: 12-Aug-10

Project Number: 110-12516

Sample Number	1	2
Identification	BH-03 26/7/10	BH-03 3/8/10
Date Received	05-Aug-10	05-Aug-10
Date Tested	06-Aug-10	06-Aug-10
pH	6.53	7.40
E.C.	3.68mS/cm	1845us/cm
Aluminium (mg/L)	0.01	<0.01
Total Iron (mg/L)	<0.01	0.02

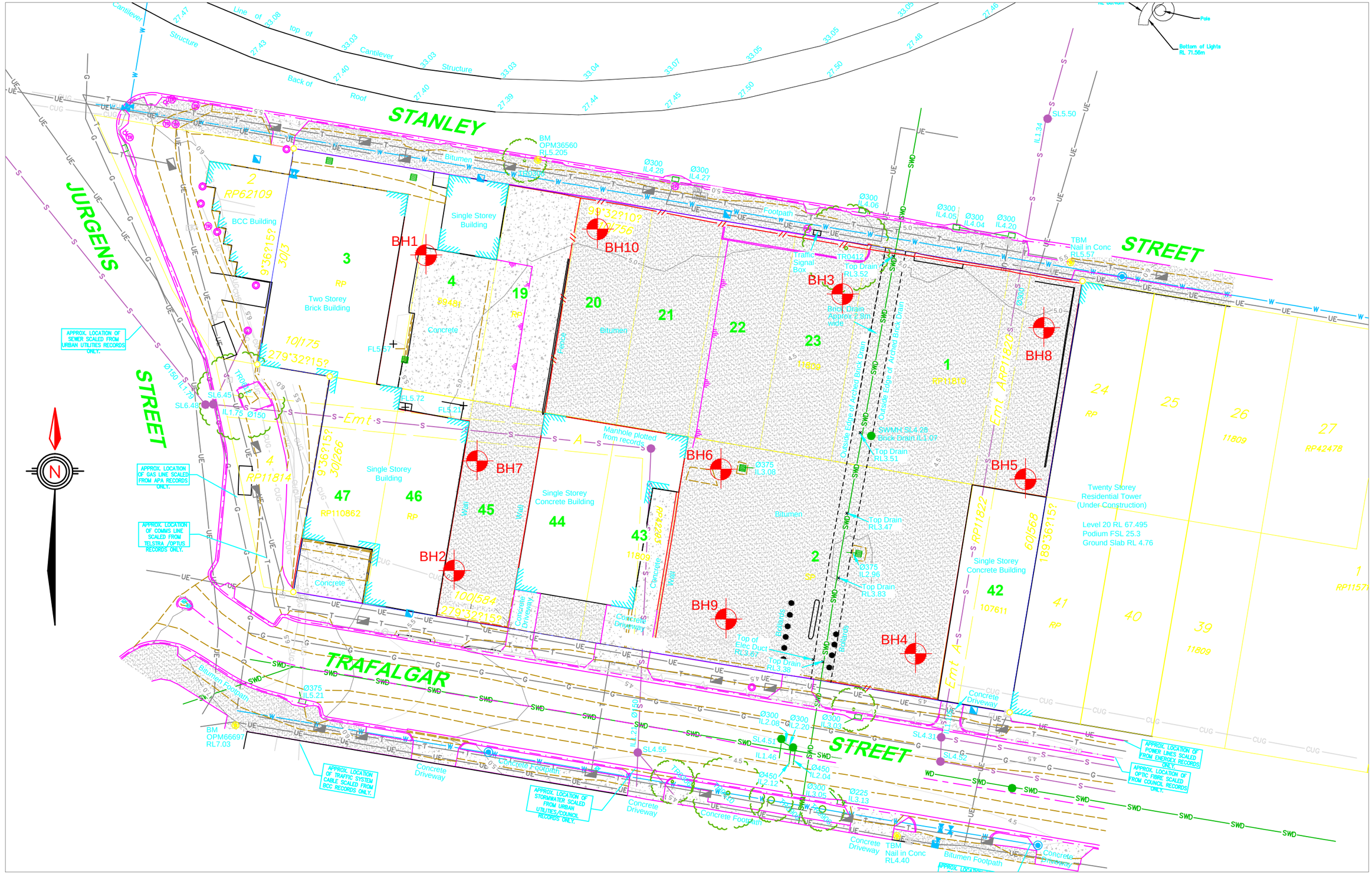
Signed: _____ for and on behalf of Soil and Water Laboratories P/L

Trevor Nelson - Laboratory Manger - Acid Sulphate Soils and Waters

1. Samples supplied by others
2. Samples tested in 'as received' condition
3. Dissovled & suspended determined by AS 35500.4-1990
4. Samples tested in 'as received' condition
5. The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards
6. Determination of bacto analysis performed by NATA accredited laboratory 12754 & 13538, Cert. No. _____

APPENDIX D

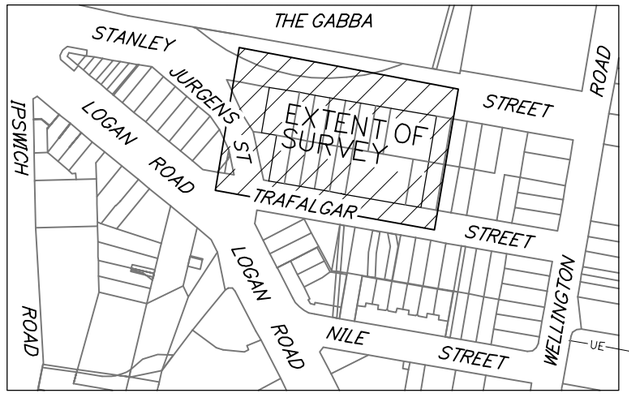
DRAWINGS

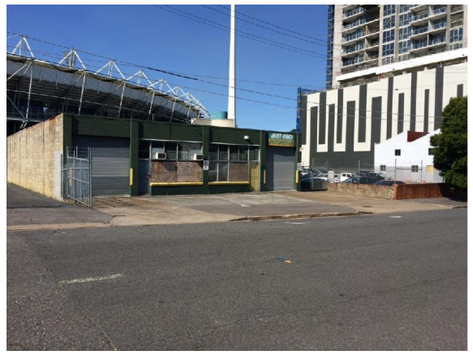


Borehole Location Plan reproduced from plan ref. S-8483-001-A

SCALE 5 0 15 25m	DRAWING TITLE	CLIENT	
REFERENCE V:\Milton\Milton 12001-13000\Milton 12401-12600\1-9819 Woolloongabba\Graphics\	APARTMENT BUILDINGS	825 STANLEY PTY LTD	Soil Surveys
A3 / DRW. NO 110-12516-02 / DATE 13/01/2016 / CHECKED MG	BOREHOLE LOCATION PLAN	LOCATION 825 STANLEY ST, WOOLLOONGABBA	SOIL SURVEYS ENGINEERING PTY.LIMITED Specialists in Applied Geotechnics

KEY MAP





Stanley Street
Looking North toward The Gabba

Legend

CAG	Comms Above Ground	BH	Bore Hole
COMK	Comms Marker	BOL	Bollard
COMP	Comms Pit		Edge Garden
CUG	Comms Under Ground		Fence
SWD	Drainage Swug	IO	Inspection Opening
	Drainage Centre Line	MH	Unidentified Manhole
SWMH	Stormwater MH	PO	Post
SWGT	Stormwater Gully Trap	SI	Sign
SWFI	Field Inlet Pit	TBM	Temporary Bench Mark
SWKA	Stormwater Kerb Adaptor	T	Telecom Line
UE	Power Line Under Ground	TEL	Telecom Pit
	Power Line Above Ground	TELBOX	Telecom Telbox
ELMK	Electrical Marker	TEM	Telecom Marker
ELP	Electrical Pillar	TP	Telecom Pole
ELPI	Electrical Pit		Bottom of Bank
GW	Guy Wire Anchor		Top of Bank
LAMP	Lamp Post		Change of Grade
LP	Light Pole		Water Line
PP #	Power Pole		Edge of Vegetation
PPL	Power Pole with Light	TR 0306	Tree - 0.3m Dia Trunk & 6m Canopy Spread
PPLT	PP with Light & Transformer	W	Water Main
PPT	Power Pole with Transformer	HR	Fire Hose Reel
G	Gas Main	HY	Water Hydrant
GM	Gas Meter	SPR	Water Sprinkler
GV	Gas Valve	SV	Water Valve
	Road Crown	TAP	Water Tap
	Edge of Bitumen	WBE	Hydrant Booster
	Edge Track	WM	Water Meter
GP	Guide Post	WMK	Water Marker
	Guard Rail		Bitumen
	Road Kerb Invert		Concrete
S	Sewer Main		Dirt
SMH	Sewer Manhole		Garden
SMK	Sewer Marker		Gravel / Rock
SVE	Sewer Vent		Pavers
	Awning / Top of Gutter		Tiles

JENSEN BOWERS
SURVEYORS
PLANNERS
DEVELOPMENT ADVISORS
jensenbowers.com.au

72 Costin Street, Fortitude Valley, Qld. 4006
PO Box 799, Spring Hill, Qld. 4004
T (07) 3852 1771 **F** (07) 3252 9818

T.H. Jensen & Bowers Pty. Ltd. (Consulting Surveyors)
ABN. 52 010 872 607

Associated Consultants

Local Authority:	Brisbane C.C.
Authority Ref. No:	
RP Description:	Lots 19-23 & 43-46 on RP11809, Lot 1 on RP11810, Lots 3 & 4 on RP59481, Lot 47 on RP110862 & Lots 2 & 42 on SP107611
Original Portion:	165
Parish/County:	South Brisbane/Stanley
Date of Survey:	01/12/15
Level Datum:	AHD
Origin:	OPM36559 RL 9.354
Level Bk / Fld Bk:	
Horizontal Datum:	IS249973
Contour Interval:	0.5m

Scale

0 5 10 15m
1 : 500@A3 (Before Reduction)

Notes

The services shown hereon have been located where possible by field survey. Whilst due care and attention have been exercised, T.H. Jensen and Bowers Pty. Ltd. does not warrant that the services have been located in their entirety.

The boundaries shown hereon are for plotting purposes only and are subject to final survey.

The location of underground service lines are approximate only and have been plotted from field survey observations and/or service searches. Should their accurate location be critical to detail design we recommend further investigation.

Disclaimer

Any licence, expressed or implied, to use this document for any purpose whatsoever is restricted to the terms of the agreement or implied agreement between Jensen Bowers and the instructing party.

Drawn:	ML	Date:	03/12/15
Surveyed:	BR	Date:	01/12/15
Checked:	DH	Date:	08/12/15
Approved:			

Issue	Description	Date	Appd
A	Original Issue	08/12/15	DH
B	Adjoining Substation Added	18/12/15	DNH

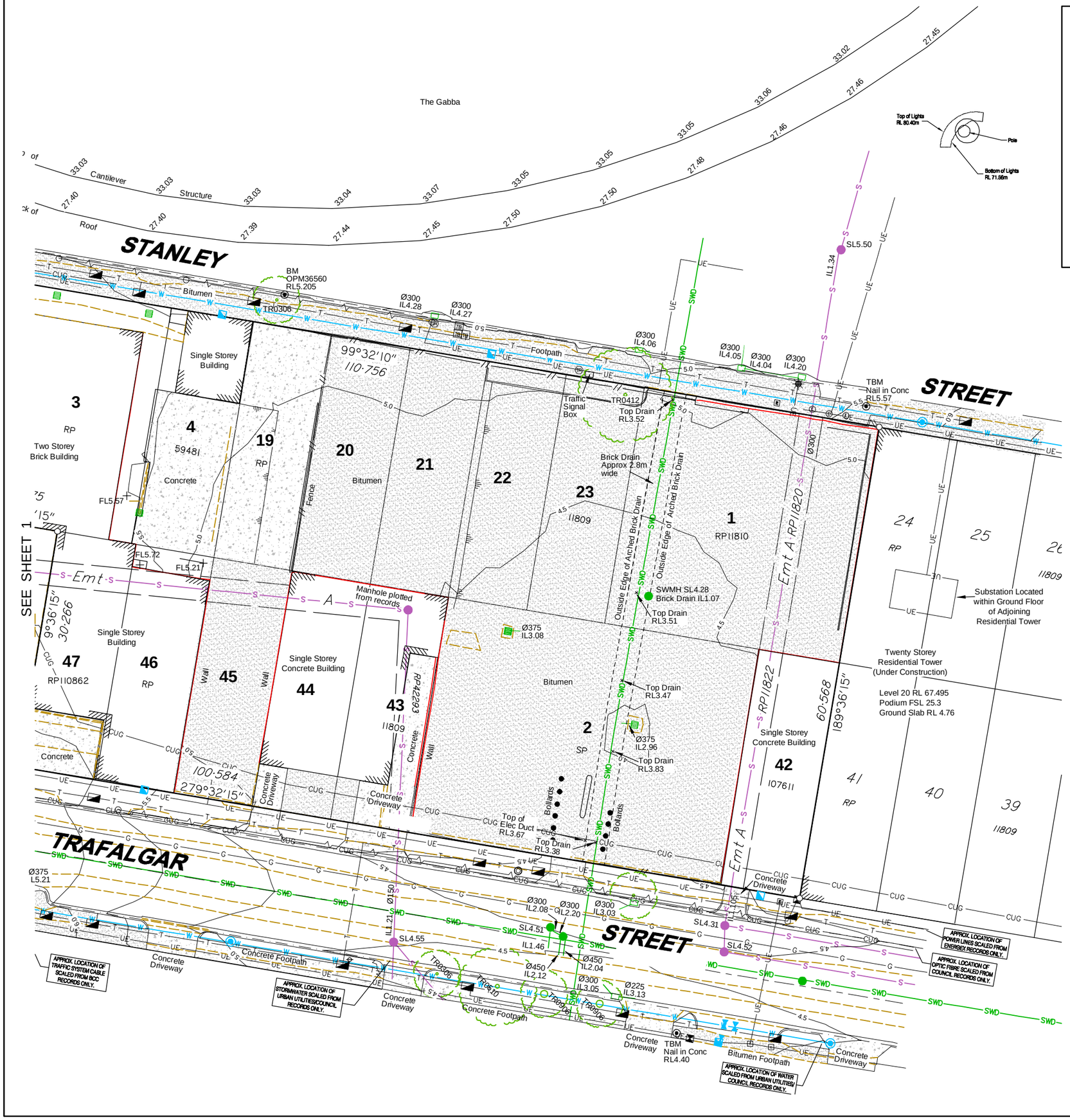
Client

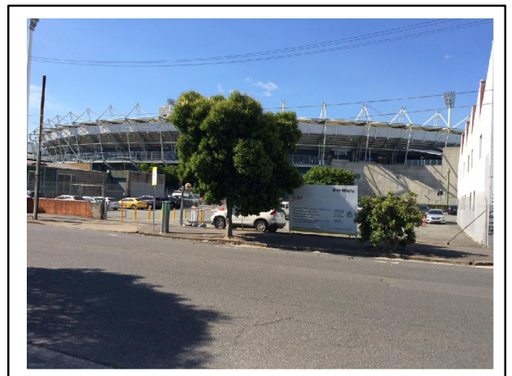
825 Stanley Pty Ltd

825 Stanley Street Woolloongabba

Detail Survey Sheet 1 of 2

Drawing No.	Issue	Original Siz
S-8483-001	B	A3





Stanley Street
Looking North toward The Gabba

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Level Bk / Fld Bk:	
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Contour Interval:	0.5m

Scale

0 5 10 15m
1 : 500@A3 (Before Reduction)

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Surveyed:	BR	Date:	01/12/15
Checked:	DH	Date:	08/12/15
Approved:			

Issue	Description	Date	Appc
A	Original Issue	08/12/15	DH
B	Adjoining Substation Added	18/12/15	DNH

Client

825 Stanley Pty Ltd

825 Stanley Street Woolloongabba

Detail Survey Sheet 2 of 2

Drawing No.	Issue	Original Siz
S-8483-001	B	A3