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SPECIALISTS MANAGING THE EARTH

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To	**Mr Rob Purdon**	From	**Dr Matthew Raine**
Fax No	**02 6248 8347**	Date	**04 January 2007**
Company	**Purdon Associates Pty Ltd**	Reference	**GF8613AA-02**
cc		Pages	**6**
Subject	**Proposed ACTEW Powerline, Williamsdale to South Canberra, ACT - Preliminary Geotechnical Assessment**		

1 INTRODUCTION

In accordance with your request, this report presents a preliminary geotechnical assessment of the proposed route for a new ACTEW powerline between Theodore and Williamsdale, ACT. This preliminary geotechnical assessment is based primarily on previous experience in the area and a desk study of available geological and topographic data. A visual assessment of sections of the proposed route was also undertaken by Coffey Geotechnics Pty Ltd on 3 January, 2007. Access to the route was not possible and therefore the visual assessment was undertaken from Angle Crossing Road and the Monaro Highway, from which parts of the proposed route were not visible, particularly between chainages CH 0 and CH 1800.

It is our understanding that the proposed route is approximately 14.6km in length and will comprise high voltage transmission lines and monopole support towers. It is also understood that the proposed development will require clearing of an easement and the construction of access roads for both construction and maintenance vehicles.

2 PRELIMINARY ASSESSMENT OF SITE CONDITIONS

The following sections present a preliminary assessment of the likely surface and subsurface conditions along the proposed route for the new ACTEW powerline. For clarity and ease of description the proposed route has been subdivided in to three segments with corresponding chainages as defined on the supplied drawings.

2.1 Segment 1 - Chainage CH 0 to CH 4600

The proposed route for the new powerline between chainages CH 0 and CH 4600 comprises two sub-parallel lines about 500m apart that trend approximately south-southeast and converge to a single line at about chainage CH 2143. Between chainages CH 2143 and CH 4600 the proposed power line trends almost north-south.

The topography along this segment of the proposed route comprises moderate to steep sided hills with a general slope down towards the east and northeast. The proposed route traverses a number of southeast-northwest and northeast-southwest trending natural drainage lines. The slope of the

topography was observed to steepen significantly in the immediate vicinity of several of the more significant drainage lines.

The amount of outcrop along this segment of the proposed route decreases southwards, with extensive outcrop visible between chainages CH 0 and CH 2800 and minor outcrop visible between chainages CH 2800 and CH 4600. The ground surface along the proposed route for the powerline appears in general to be covered by low grasses and sparsely to densely distributed small to medium sized trees. The density of the vegetation, in particular the trees, was observed to increase in the vicinity of natural drainage lines.

The 1992, Bureau of Mineral Resources 1:100,000 scale geological map covering the Canberra Region (*Canberra*, Geological Series Sheet 8727, Edition 1) indicates that a northeast southwest trending fault traverses the proposed route at about chainage CH 3800. The geological map indicates that the proposed route between chainages CH 0 and CH 3800 is underlain by Late Silurian rhyodacitic ignimbrites and minor volcaniclastic sediments and argillaceous sediments of the Deakin Volcanics. South of the fault between chainages CH 3800 and CH 4600 the proposed route is shown to be underlain by dacitic ignimbrite and minor volcaniclastic sediments of the Colinton Volcanics.

Access to the proposed route was not possible, however, the geological map suggests that the subsurface profile will comprise lithologies similar to those observed in outcrop proximal to Angle Crossing Road and described below in Section 2.3. The soil profile appears to be shallow in the vicinity of rock outcrop and deeper weathering profiles should be anticipated proximal to natural drainage lines.

Existing tracks were not observed in the vicinity of the proposed route between chainage CH 0 and CH 4600.

2.2 Segment 2 - Chainage CH 4600 to CH 11600

The proposed route for the powerline between chainage CH 4600 and CH 11600 trends south to south-southwest, parallel to sub-parallel with Guises Creek and along the lower slopes of the hills to the west. The general topography along this segment of the proposed route slopes gently down towards the east-southeast. The proposed route traverses numerous minor and predominantly southeast-northwest trending natural drainage lines, which form a series of gently undulating east-southeast trending gullies and low rounded spurs. The slope of the topography was observed to steepen in the immediate vicinity of several of the more significant drainage lines.

The amount of outcrop along this segment of the proposed route is minor, with outcrop typically only visible along the more significant drainage gullies and steeper hill sides to the west. The ground surface along the proposed route for the powerline is generally covered by low grasses and sparsely distributed small to medium sized trees. The density of the vegetation, as with Segment 1, was observed to increase in the vicinity of the natural drainage lines. To the west and upslope of the proposed route dense woodland forms a distinct tree line that parallels Guises Creek.

The 1977 Geological Survey of NSW, Department of Mines, 1:100,000 scale geological map covering the Williamsdale Region (*Michelago*, Geological Series Sheet 8726, Edition 1) indicates that this section of the proposed route is underlain by Late Silurian rhyolitic and rhyodacitic tuff, and minor siltstone, sandstone and limestone of the Colinton Volcanics. To the west of the proposed powerline route the geological map shows an inferred boundary between the rhyolitic and rhyodacitic tuff and a tuff comprised of quartz and pink feldspar, which is also part of the Colinton Volcanics. The inferred boundary between these lithological units appears to correspond with a marked steepening of the east facing slopes and the observed tree line that runs parallel to Guises Creek. The geological map also shows occurrences of undifferentiated high-level gravels, sand, silt and tallus in the vicinity of Guises Creek from about chainage CH 8400 to about CH 11600. The exact extent and depth of these unconsolidated deposits is unknown.

It was not possible to gain access to this segment of the proposed route, however, the geological map suggests that the subsurface profile will comprise rock types similar to those observed in outcrop proximal to Angle Crossing Road and described below in Section 2.3. The lack of outcrop along the proposed route between chainages CH 4600 and CH 11600 suggests a deeper soil profile, which may possibly be attributable to the close proximity of the proposed route to Guises Creek and the numerous minor drainage gullies in the vicinity or to colluvial soils developed as slope wash off the hillsides.

A number of farm tracks are visible to the west of Guises Creek and in the vicinity of the proposed route will aid access to the site.

2.3 Segment 3 - Chainage CH 11600 to CH 14660

The general topographic profile between chainage CH 11600 and CH 14660 undulates gently forming a series of open hills traversed by a number of minor northeast-southwest and southeast-northwest trending natural drainage lines. The slope of the topography was observed to steepen significantly in the vicinity of several of the drainage lines.

The amount of outcrop and the prominence of outcrop along this segment of the proposed route is varied. The 1977 Geological Survey of NSW, Department of Mines, 1:100,000 scale geological map covering the Williamsdale Region (*Michelago*, Geological Series Sheet 8726, Edition 1) indicates that this segment of the proposed route is underlain by Late Silurian rhyolitic and rhyodacitic tuff, and minor siltstone, sandstone and limestone of the Colinton Volcanics. The lithologies exposed in outcrop proximal to Angle Crossing Road appear to exhibit rhyodacitic to rhyolitic compositions, with quartz float evident in a number of places. Rock outcrops of rhyolitic composition appear foliated and cut by a number of closely spaced (<200mm) joint sets. Rock outcrops of rhyodacitic composition are also cut by a number of joint sets; however, these outcrops appear more massive due to wider defect spacings and the absence of any foliation.

Rock outcrops of rhyodacitic composition are assessed to be highly to moderately weathered and of low to possibly high strength, whereas rock outcrops of rhyolitic composition are assessed to be highly weathered and of low to medium strength. The variability between rock outcrops, both in terms of extent and prominence, is assessed to be related to the observed variability in lithology, with the most prominent outcrops being characterised by the harder lithologies, fewer defects and a lower susceptibility to weathering. Slickenlines can be observed on a number of defect planes indicating that an amount of fault movement has occurred on those planes.

Extremely weathered rhyodacitic and rhyolitic rocks are apparent as fine to coarse grained gravelly sand, whereas colluvial soils predominantly comprised sandy gravelly clay of low plasticity, with fine to coarse grained sand, fine to coarse grained gravel and some low liquid limit silt. Both the colluvial soils and extremely weathered rock appeared to be shallow in the vicinity of rock outcrop and deeper weathering profiles should be anticipated proximal to natural drainage lines.

The ground surface along the proposed route for the powerline is generally covered by low grasses and sparsely distributed small to medium sized trees. The density of the vegetation, in particular the trees, was observed to increase in the vicinity of the natural drainage lines.

A number of farm tracks are visible in the area surrounding the proposed route which will aid access to the site.

3 POTENTIAL GEOTECHNICAL FACTORS

The following sections provide preliminary assessments of geotechnical factors that may be of potential significance to the proposed powerline.

3.1 Excavation Conditions

It is our understanding that monopole support towers are generally embedded to a depth of about 4m below the surface and that this process involves the boring of large diameter holes.

Extensive rock outcrop is present along most of Segments 1 and 3 of the proposed route for the powerline. A preliminary assessment of the weathered rock exposed in outcrop, particularly that exposed along Segment 3, indicates that at least some of the outcropping rock is of medium, possibly high strength and that the observed defect spacings, in some instances, may not be close enough to be advantageous for boring into the in-situ rock. The strength of the in-situ rock can be expected to increase with depth and therefore boring to a depth of about 4m below surface, particularly in areas characterised by wide defect spacings, may be difficult. Difficult ground conditions are not envisaged along Segment 2, although the presence of unconsolidated sediments of unknown thicknesses between about chainage CH 8400 and chainage CH 11600 may need consideration in terms of required hole depths and casing. Drainage lines will also need consideration when locating of the monopole support towers to ensure that the poles are situated away from the drainage lines.

3.2 Drainage Lines

A number of significant drainage lines traverse the proposed route for the new powerline. The natural drainage gullies will inevitably impact on the positioning and spacing of the monopole support towers and the potential routes for access tracks. Monopole support towers should not be placed proximal to steep sided drainage gullies due to the increased potential for instabilities.

3.3 Reuse of Site Materials

It is our understanding that excavated material will be used as fill and compacted around the base of the monopoles. Observed defect spacings and rock compositions may, in some instances, preclude some excavated rock from being reused as such fill because the rock may not break down to suitably size fragments during extraction, handling and compaction.

3.4 Additional Investigatory Work

The preliminary geotechnical assessment presented in this letter report is based entirely on a desk study and observations made by Coffey Geotechnics from Angle Crossing Road and the Monaro Highway. Although an initial assessment of the subsurface profile has been postulated, a more extensive geotechnical investigation may be required in order to more accurately assess the sub-surface profile along the route of the proposed powerline, particularly for those areas not clearly visible from the highway (e.g. the western most transmission lines between chainage CH 0 and CH 1800).

Please do not hesitate to contact Dr Matthew Raine or the undersigned should you have any questions regarding this report.

For and on behalf of Coffey Geotechnics Pty Ltd

WEEKS WHITE

Senior Principal Engineer

Encl:

Important Information About Your Coffey Report

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Important information about your **Coffey** Report

As a client of Coffey you should know that site subsurface conditions cause more construction problems than any other factor. These notes have been prepared by Coffey to help you interpret and understand the limitations of your report.

Your report is based on project specific criteria

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

Subsurface conditions can change

Subsurface conditions are created by natural processes and the activity of man. For example, water levels can vary with time, fill may be placed on a site and pollutants may migrate with time. Because a report is based on conditions which existed at the time of subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. Consult Coffey to be advised how time may have impacted on the project.

Interpretation of factual data

Site assessment identifies actual subsurface conditions only at those points where samples are taken and when they are taken. Data derived from literature and external data source review, sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, owners should retain the services of Coffey through the development stage, to identify variances, conduct additional tests if required, and recommend solutions to problems encountered on site.

Your report will only give preliminary recommendations

Your report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until project implementation has commenced and therefore your report recommendations can only be regarded as preliminary. Only Coffey, who prepared the report, is fully familiar with the background information needed to assess whether or not the report's recommendations are valid and whether or not changes should be considered as the project develops. If another party undertakes the implementation of the recommendations of this report there is a risk that the report will be misinterpreted and Coffey cannot be held responsible for such misinterpretation.

Your report is prepared for specific purposes and persons

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

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Important information about your **Coffey** Report

Interpretation by other design professionals

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

Data should not be separated from the report*

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

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

Geoenvironmental concerns are not at issue

Your report is not likely to relate any findings, conclusions, or recommendations about the potential for hazardous materials existing at the site unless specifically required to do so by the client. Specialist equipment, techniques, and personnel are used to perform a geoenvironmental assessment.
Contamination can create major health, safety and environmental risks. If you have no information about the potential for your site to be contaminated or create an environmental hazard, you are advised to contact Coffey for information relating to geoenvironmental issues.

Rely on Coffey for additional assistance

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

Responsibility

Reporting relies on interpretation of factual information based on judgement and opinion and has a level of uncertainty attached to it, which is far less exact than the design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. To help prevent this problem, a number of clauses have been developed for use in contracts, reports and other documents. Responsibility clauses do not transfer appropriate liabilities from Coffey to other parties but are included to identify where Coffey's responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Read all documents from Coffey closely and do not hesitate to ask any questions you may have.

* For further information on this aspect reference should be made to "Guidelines for the Provision of Geotechnical Information in Construction Contracts" published by the Institution of Engineers Australia, National Headquarters, Canberra, 1987.

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