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LAING EXPLORATION PTY LTD

Specialist Consulting in Structural Geology, Smart Mapping
Drillcore Analysis, Ore Systems, and Exploration Design

11 McLauchlan Crescent

Kelso, Queensland 4815

Australia

Telephone: 61 7 4789 1401

Mobile: 0439 891 452

Email: Manager@laingex.com

Website: www.laingex.com

ABN 88 011 000 641

EVALUATION OF GEOTECHNICAL REPORTS FOR THE ROSECORP DEVELOPMENT 2010

Two geotechnical Reports were prepared for Rosecorp (Coastal Hamlets Pty Ltd) by Geotech Solutions December 2010, for the proposed development of Hamlets 1 to 7. My evaluation as a structural geologist experienced in geotechnical assessment, is summarised as follows. The evaluation has been assisted and endorsed by Damien Hawcroft, Mining Engineer.

SPECIFIC ISSUES

The geotechnical brief

The geotechnical Reports are the response to a brief from Coastal Hamlets Pty Ltd, which is confined to the need for "accurate estimates of quantities and pricing for bulk earthworks (and) additional information on existing site conditions and in particular the spatial extent of filling and the suitability of the site for proposed urban development".

There are 2 components to the investigation which is required to fulfil this brief:

- (i) Surface geotechnical assessment and recommendations.
- (ii) Subsurface assessment of mine workings and their implications for ground subsidence at the surface.

The provisional nature of the assessment

The Reports are by their own admission provisional in that they acknowledge that further geotechnical work is required in the following areas:

- (a) Determination of the compliance of the widespread ground fill type "CWR" with regulatory requirements.
- (b) Development of remedial strategies to ameliorate the impact of previous practices.
- (c) The optimum use of available materials.
- (d) The minimisation of costs associated with remediation of uncontrolled fill areas.

In addition to responding to a provisional brief whose elements are deficient in terms of supporting a complete development proposal, the assessments lack critical information in several of the areas of the brief. This is particularly evident in the critical issue of subsurface workings and the possibility of subsidence under the homes in the development.

The lack of spatial analysis and spatial support for the assessment

The Reports are based on a number of assessments of geotechnically relevant spatial parameters, or spatial units. The variation of these units across the proposed development area is critical to the geotechnical basis of the development. These identified parameters are:

- topographic units
- vegetation units
- geological (lithostratigraphic) units
- soil units
- land use units
- geotechnical units
- risk to property units

These parameters are fundamental to the Reports, indeed the purpose of the Reports was to "delineate the spatial extent of filling and identify any geotechnical constraints to the proposed development" and to provide a geotechnical basis for the quantity surveying of the site. The Reports state that "due to its former use as a coal mine and preparation area, the topography of the site is heavily disturbed and requires a significant bulk earthworks operation to rehabilitate for residential use (approximately 0.75 million m³ of cut-to-fill earthworks)". The fill is identified as being up to 11.5 metres deep and varying from loose, poorly compacted to well compacted. Geotechnical unit D, the areas of fill, occur extensively across various parts of the proposed development and are classified as moderate to very high risk to property. The latter category is prescribed in geotechnical regulations as "unacceptable without treatment, requiring extensive detailed investigation and research, planning and implementation of treatment options essential to reduce risk to acceptable levels; may be too expensive and not practical".

The spatial parameters and units are constantly being referenced in the Reports, but their distribution is nowhere displayed in the Reports. Except for the sample locations, it is not possible to determine where any of the information in the Reports is located on the ground. The land use units, inter alia CSA (coal stockpile area) and CHPP (Wallarrah coal preparation plant), are nowhere delineated in a map.

The Reports provide only two geotechnical maps of the site. The first is a map of the 2010 test borehole locations, together with a single map of 2004 test borehole locations (Appendix E; Jeffery and Katauskas, 2004). A second map shows the distribution of the mine workings in the New Wallsend 1874 colliery beneath Hamlet 3 (the headland).

The development site was "walked over" (part of Hamlets 6 and 7) and "mapped" by geotechnical staff. However the results appear nowhere in the Reports.

This absence of spatiality in a geotechnical report of a proposed land development can only be described as astonishing, and technically unsustainable.

The possibility of catastrophic cliff failure

Geotechnical unit C, the cliff face area in Hamlet 3, is assessed as high risk due to its propensity for rock falls and undercutting of the cliff face by wave action and other weathering mechanisms. The development in Hamlet 3 and proposed public cliff walk is planned to be within 20 metres of the cliff top. The Reports note that "the cliff face is predominantly aligned on a NW orientation, which coincides with a major joint set which strikes NW. As such, much of the cliff face has formed along existing NW-striking joint surfaces. A second major set striking NE typically intersects the cliff face at right angles and locally forms large blocks where intersections with the NW-striking joint set are exposed in the cliff face". This structural combination of strong through-going orthogonal vertical joints in a high (30-35 metres) vertical cliff face open to the sea, with one joint set parallel to the cliff face, and with an overhanging base above a soft coal seam, provides ideal conditions for wedge failures and rock falls. At Catherine Hill Bay this is augmented by strong undercutting wave action, with ocean swells up to 5-8 metres having been observed by the writer on numerous occasions over the past 45 years. The Hamlet 3 cliff face has a large collection of boulders and fallen cliff segments up to small house size (some shown in Report Photograph 1). These boulders are strongly polygonal, and at least some of the larger ones have clearly fractured along the two orthogonal joint sets. The Australian Geoguide LR2 (Landslides) (Figure 3) states that in these situations "cliffs may remain apparently unchanged for hundreds of years. Collection of boulders at the foot of a cliff may indicate that rock falls are ongoing. Wedge failures and rock falls do not "creep". Familiarity with a particular situation can instil an false sense of security since failure, when it occurs, is usually sudden and catastrophic".

The evidence described above shows that Hamlet 3 and the proposed public cliff walks' cliff face is likely to be subject to catastrophic falls of large segments of cliff. However, despite classifying the risk to property in the Hamlet 3 cliff face area as high, the Reports do not further discuss the possibility nor the implications for the proposed development, of catastrophic failure of the cliff face at Hamlet 3 and consequent destruction of houses, commercial buildings and the public cliff walk.

The foundation requirements

The Reports recommend that on the disturbed areas of the proposed development, "individual building sites be investigated to define the extent of filling. All footings should be founded below the extent of filling or filling removed and replaced with controlled fill in accordance with AS3798-2007 [7]." This requirement, for an investigation of every building on filled areas, and subsequent appropriately robust footings, is a major remedial imposition which would add significant expense to the development. The extent of disturbance is not determined or mapped in the Reports, but if it be say 50%, then circa 300 houses and commercial buildings may require individual geotechnical investigation.

An earlier Report (Jeffery and Katauskas, 2004) state that mine subsidence and uncontrolled fill result in a site classification of Class "P" (AS2870). This requires "footings designed for mine subsidence effects heavy impact rolling buildings and floor slabs suspended on piles taken down to competent natural strata below the uncontrolled fill".

Should the Rosecorp development be to the land preparation stage only, with land lots sold to owners prior to house design and construction, the geotechnical investigation would become the responsibility of the individual home owner and builder. This would create a major regulatory and financial burden on the State and on the home owners.

The errors in subsurface working locations and the implications for assessment of subsidence

The assessment of mine workings beneath the Rosecorp development is seriously flawed as both Reports incorrectly state "there are no workings beneath the Moonee Colliery site although the mine entry and drift were located on and under the land". The material in the Reports shows that this statement relates to Hamlets 1-2 and 4-7. However information from the NSW Mines Department shows that this is incorrect. Major mine workings are present under all Hamlets except Hamlet 1. The workings beneath Hamlets 2 and 4-7 are within the Wallarah and/or Moonee Moonee Colliery, in the Wallarah Coal Seam, which is considerably higher in the stratigraphic sequence than the Great Northern Coal Seam and its contained workings under Hamlet 3. The Wallarah Coal Seam lies much closer to the surface than the Great Northern Coal seam, within 0-50 metres of the surface, throughout the Rosecorp development, under all Hamlets except Hamlets 1 and 3.

The Reports' failure to acknowledge the Wallarah Coal Seam and its extensive workings under the Rosecorp development is a major error of omission.

Restricting factors in site development

The Reports list 8 separate types of "site conditions which are considered problematic to development on portions of the site and should be considered in staging of earthworks". These include potential acid leachate generation from coal rejects, which is not further considered in the Reports under the caveat "the investigation and report do not include environmental assessment in relation to the potential for contamination due to past usage".

There are no maps of the distribution of these 8 problematic site conditions.

The Reports list 7 separate engineering solutions to overcome "current constraints". They are all substantial and together comprise a major cost burden to the development. The Reports provide no information, particularly maps of the areas of the proposed development in which each solution would be required, on which a costing could be implemented.

SUMMARY

The geotechnical Reports commissioned by Coastal Hamlets Pty Ltd in 2010 to support the development proposal for in excess of 550 buildings (546 homes plus a number of commercial buildings) in the Catherine Hill Bay area, with respect to this proposal are significantly deficient in their brief, and significantly deficient in their discharge of this limited brief.

The brief to sample ground conditions at individual sites, and the sampling itself, in the development area appear to be thorough, and at each sample site provides valuable information for any future engineering. It is in other more global and critical areas of geotechnical assessment that major deficiencies are embedded.

Some of the deficiencies are recognised in the Reports, and require further geotechnical assessment before the development proposal can be regarded as geotechnically satisfactory. These comprise in particular the recognised need for complex and potentially (prohibitively) expensive foundation work, and work to manage 8 problematic site conditions. Each of these may be accommodated commercially as individual issues, but their occurrence as a complex suite of problematic conditions renders their successful management somewhat in doubt.

Other deficiencies are not recognised, and these are major. They comprise:

1. The absence of information on the distribution of all spatial geotechnical parameters.
2. The lack of acknowledgement of major workings at shallow depth beneath a substantial proportion of the development (Hamlets 2 and 4-7), and the consequent absence of analysis of the potential ground subsidence due to these workings.
3. The absence of analysis of prospective catastrophic cliff failure in Hamlet 3.
4. The Reports recommend, on the extensive disturbed areas of the proposed development, geotechnical investigation of every building site. Should the Rosecorp development be to the land preparation stage only, the geotechnical investigation would become the responsibility of each land purchaser, which would number hundreds of individuals. This would create a major regulatory and financial burden on the State and on the home owners, creating, in common parlance, a "minefield".

Implications for the Rosecorp proposal

These major issues are each potentially fatal to the Rosecorp development.

Furthermore, in their lack of recognition of these core geotechnical elements, the geotechnical Reports lack technical credibility with regard to the proposed development. This leads one to assume that other elements of geotechnical assessment, not necessarily yet identified, may be also missing from the geotechnical assessment.

Dr William P. Laing
BSc(Hons1) PhD FSEG FAusIMM(CP) FAIG MGSA MASEG

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Principal Consultant and Managing Director

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