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Our Ref: PSM2497-003L

26 June 2014

Urbis Pty Ltd
Level 23, Darling Park Tower 2
201 Sussex Street
SYDNEY NSW 2000

ATTENTION: NORELLE JONES
By email: njones@urbis.com.au

Dear Norelle

**RE: PRELIMINARY GEOTECHNICAL ADVICE FOR PLANNING AND REZONING
PURPOSES, RECLAIMED AREAS OF PEAT ISLAND AND FORESHORE**

1 INTRODUCTION

At the request of Norelle Jones, PSM has undertaken a desktop study and site visit of Peat Island for the purpose of preliminary geotechnical advice for rezoning purposes of the area of Peat Island and the foreshore identified as comprising reclaimed land on Drawing No CMP03, Rev 4, dated 2 June 2014

The areas hatched in light blue on the JBS Figure 3: Site Details, Job No: 42532 attached to this letter have been assessed as comprising reclaimed land. The advice in this letter refers to these areas in particular.

The following document was provided to PSM:

- Drawing No: CMP03, "Conceptual Master Plan", Rev 4, dated 2 June 2014
- JBS report "Phase 1 Environmental Site Assessment, Peat Island, Mooney Mooney, NSW" dated February 2013, Reference: JBS 42532-53028 (Rev 0)

The works have been carried out in accordance with our email proposal dated 26 May 2014.

2 SCOPE OF WORKS

The following tasks were completed:

- Desk top study comprising of
 - Review of geological maps
 - Review of historical aerial photography (Appendix C of JBS report)
 - Review of conceptual master plan
- Site visit to verify surface conditions
- Reporting on findings of the above
- Preliminary geotechnical advice for re-zoning purpose

3 DESK TOP STUDY

A review of the aerial photographs from 1947, 1955, 1964, 1978, 1986, 1994 and 2005 was undertaken to verify the extent of reclaimed land within the precinct boundary shown on the Conceptual Masterplan.

In summary the photos show:

- Between 1947 and 1955: Some filling occurring on south of Peat Island, with the original wharf being converted into a bridge in this time period as well.
- Between 1955 and 1964: Construction of the F3 freeway has begun, with cut and fill works evident. Filling works resulting in reclaimed land evident on the western foreshore and south portion of Peat Island.
- Between 1964 and 1978: F3 freeway construction complete. Some development on the south portion of Peat Island. Filling works evident on the southern foreshore adjacent to the F3 Freeway.
- Between 1978 and 2005: No major cut and fill works identified, some land clearing evident on the southern foreshore adjacent to the F3 freeway.
- The timing of the filling on Peat Island and Peat Island foreshore is commensurate with the construction of the F3.

4 SITE VISIT

A walkover and inspection of the reclaimed land areas on Peat Island and the foreshore was undertaken on 19 June 2014. The following observations were made:

1. Peat island is relatively level, with very few natural rock surfaces observed.
2. Sandstone bedrock was observed on the beach at the north side of the island at water level.

3. Sandstone boulders were observed on the south side of Peat Island.
4. Concrete rubble and reinforcement was present on both the south and north portions of Peat Island.
5. The western foreshore area was covered in mangrove trees, a sandstone rock surface was observed near the bridge connecting the foreshore to Peat Island.

5 GEOTECHNICAL MODEL OF RECLAIMED LAND

5.1 Regional Geology

The 1:100,000 geology map for the Sydney region indicates that Peat Island is underlain by the Newport and Garrie Formation / Terrigal Formation comprising of interbedded laminite, shale and quartz, to lithic quartz sandstone as well as sandy mud and muddy sand from the Cainozoic era.

5.2 Inferred Sub-surface Conditions

The sub-surface conditions in the areas of reclaimed land have been inferred to comprise of:

- **UNCONTROLLED FILL** – The fill is likely to comprise of ripped sandstone from cuttings for the F3 freeway project. It is likely that the fill was placed with no engineering compaction controls and has been in place since at least 1978 and possible as far back as 1964. It is likely that large boulders are present within the fill. It is also possible that building rubble, concrete bricks are present in the fill. It was not possible to assess the thickness of the fill we assume it is at least 2 m thick and possibly up to 6 m thick. The thickness is likely to vary. Overlying
- **ALLUVIUM** – Comprising sandy mud / muddy sand layer, likely to be loose and of limited thickness, may not be present in some areas. Overlying
- **BEDROCK** – Comprising of interbedded sandstone, laminites and shales. The bedrock profile is likely to be stepped with levels dropping rapidly over small distances.

6 SUITABILITY FOR RESIDENTIAL/COMMERCIAL DEVELOPMENT

6.1 Geotechnical suitability

At Urbis' request, we have assessed the suitability of the reclaimed areas of land for residential/commercial development as part of its rezoning submission. Further, we understand that development of these areas would require parts of the western foreshore area and Peat Island to be re-graded to achieve the required flood levels by filling of up to 2 m depth; that is to RL 2.6 m from the Conceptual Master Plan.

We consider that the areas of reclaimed land are geotechnically suitable for residential/commercial development subject to detailed design. Similarly, the areas of Peat Island where only minor evidence of filling was observed is considered geotechnically suitable for residential/commercial development.

In addition, we provide the following preliminary geotechnical considerations for planning purposes. These are aimed at the areas of reclaimed land, but are somewhat applicable to the other areas of Peat Island as well.

6.2 Preliminary geotechnical considerations for planning purposes

6.2.1 Further site Investigation

Any development of the reclaimed areas will require additional investigation to characterise:

- The UNCONTROLLED FILL depth and nature
- The presence, thickness and nature of the ALLUVIUM
- The surface geometry and strength of the BEDROCK

The investigation should comprise boreholes to bedrock and shallow test pits. We note that boreholes / test pit through the UNCONTROLLED FILL may prove to be difficult with boulders in the way and water causing holes to collapse.

6.2.2 Raising of reclaimed areas by 2 m

Raising of the reclaimed areas by 2 m by placement of fill will require consideration of:

- The total and differential settlement of the underlying UNCONTROLLED FILL and ALLUVIUM units. The expected settlements should be able to be dealt with at design stage by either preloading or overfilling.
- Stability of the new fill batter. Raising the areas will require either construction of retaining structures along the edges or battering of the fill.
 - Subject to the site investigation, it may not be possible to found the retaining walls on the uncontrolled fill, and the retaining walls would need to be founded on piles founded on the underlying bedrock.
 - Alternatively the fill could be battered back at batter angle of say 2.5H:1V. This would result in loss of developable land.
- New fill should be placed in accordance with an earthworks specification developed in accordance with the guidelines in AS3798.

6.2.3 Excavation in reclaimed areas

Excavating through the UNCONTROLLED FILL unit for basements or services may present difficulties associated with the presence of large boulders, and side wall collapse particularly below the water table.

Basement excavations below the water table are likely to be difficult, requiring dewatering during construction and design and installation of retention systems such as sheet piling / contiguous pile walls where necessary.

6.2.4 Low Rise Developments

Lightly loaded structures may be able to be design and constructed to be able to found on shallow footings supported on the new fill placed on top of the UNCONTROLLED FILL.

This would require careful consideration of the total and differential settlement and provision for articulation of the foundation and superstructures to accommodate for possible differential settlements.

6.2.5 High Rise Developments

High rise development and heavily loaded structures would need to be founded on the BEDROCK below the UNCONTROLLED FILL and ALLUVIUM. This will require pile foundations.

6.2.6 Pile foundations

Where piles are required for foundations, they can either be driven piles, bored or CFA piles.

Selection of piling method and design of the piles should consider:

- Obstructions – Sandstone boulders may be present which will cause slow excavation of bored/CFA piles and refusal of driven piles.
- Collapsing of holes – Due to the nature of uncontrolled fill and groundwater level, bored pile excavation and placement of reinforcement and concrete may be difficult. Borehole cleanliness may be difficult to inspect for bored piles and necking may be an issue for CFA piles.
- Variable rock depth – The uncertain nature of the geometry of the underlying BEDROCK may result in variable pile length across the site. Piles may also intersect a subvertical bedrock surface, and if so may need to be relocated. It will be difficult for piling contractors to provide fixed priced works unless a detailed investigation is undertaken.

Should development of these areas proceed, further geotechnical advice should be sought, as the advice in this letter is for re-zoning and planning purposes only.

Should you have any queries please don't hesitate to contact either of the undersigned.

For and on behalf of
PELLS SULLIVAN MEYNINK



DAVID PICCOLO
Principal



RONALD TAN
Senior Geotechnical Engineer

Encl. Figure 3 of JBS Environmental Report



Source: Base Image - © SIX Maps www.maps.six.nsw.gov.au, imagery date 13-02-2011, accessed 22-01-2013

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0 75 150 300 m			
Scale: 1:7,000			
Datum: GDA 1994 MGA Zone 56 - AHD			
A4			
A	Original Issue - R01	SE	29-01-2013
Rev	Description	Dm.	Date:

Legend:

- Approximate Site Boundary
- Approximate Portion Boundary
- Reclaimed Land



Figure 3: Site Details

Client: State Property Authority

Project: Peat Island, NSW - Phase 1 ESA

Job No: 42532

File Name: 42532_03

