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Meriton Apartments
Level 11
528-534 Kent Street
SYDNEY NSW 2000

ATTENTION: Mr Geoff Hopkins

Dear Sir

ESTIMATE OF GROUNDWATER INFLOW INTO BASEMENT **14-18 BOONDAH ROAD, WARRIEWOOD**

This letter reports our estimate of groundwater inflow into the proposed Stage 1 basement from the rock exposed at bulk excavation level.

The proposed basement will be provided with a bypass system whereby groundwater flowing downslope towards the south-west will be collected behind the upslope basement wall, diverted around the basement and disposed into infiltration beds downslope. A detailed investigation, analysis and description of the proposed bypass system has been presented in our report (ref 23540Zrpt3) dated 2 March 2011.

The purpose of this current report is to estimate the groundwater flow rate into the basement from the bedrock which has been exposed at the base of the bulk excavation and which will not be cut off by the bypass system.



Principals: L J Speechley BE(Hons) MEngSc; P Stubbs BSc(Eng) MICE FGS; D Treweek DipTech; B F Walker BE DIC MSc. **Senior Associates:** D J Bliss BE(Hons) MEngSc; A L Jackaman BE MEngSc; A J Kingswell BSc(Hons) MSc; P D Roberts BSc MSc; F A Vega BSc(Eng) GDE; P C Wright BE(Hons) MEngSc; A Zenon BSc(Eng) GDE. **Associates:** A J Hulskamp BE(Hons) MEngSc; W Theunissen BE MEngSc; A B Walker BE(Hons) MEngSc. **Principal Consultant:** R P Jeffery BE DIC MSc.





ESTIMATION METHODOLOGY

In order to determine the permeability of the rock mass, a borehole was auger drilled into bedrock from bulk excavation level to a depth of 2.23m using our track mounted rig. A slotted PVC standpipe was installed into the borehole, which was backfilled with clean sand and a bentonite surface seal at least 0.3m thick provided. The borehole was pumped 'dry'.

Seven days after installation, the groundwater level in the borehole was measured, and pump-out tests carried out. On this basis, a mass rock permeability was determined.

Based on the results of our previous report and the above permeability, the groundwater seepage flow was estimated.

GEOTECHNICAL EVALUATION AND CONCLUSIONS

A mass rock permeability of 7.3×10^{-8} m/sec was estimated for the sandstone which underlies the basement. Adopting a permeability value of 10^{-7} m/sec in our seepage analysis, a total inflow rate of groundwater into the basement of $0.136 \text{ m}^3/\text{day}$ was estimated.

We note that the permeability of the rock mass is often controlled by defects (such as joints, bedding planes, etc). The number and orientation of any such defects which may have been intersected by the borehole drilled on site is unknown. We further note, however, that defects tend to result in a local increase in groundwater flow rate and have a lesser effect on the overall flow rate from within a larger rock mass.

However, even if the very low inflow rate which was estimated is significantly exceeded, the volume of groundwater flow into the basement from the underlying rock mass will still be relatively low.



For design purposes, we recommend that the estimated groundwater inflow be increased by one order of magnitude, and a total groundwater inflow rate into the Stage 1 basement of 1.5m³/day be catered for.

Once the bypass is in place, the actual inflow rate should be monitored to confirm our estimates. As a further precaution to reduce the inflow, we also recommend that the upslope basement wall strip footing excavation be inspected by a geotechnical engineer prior to pouring. In addition, to satisfying founding/bearing considerations, the footing should extend at least 0.8m below bulk excavation where low or better rock is exposed, 1.4m below bulk excavation where extremely low or better rock is exposed, and below any localised weak/soft spots, etc.

Should you require any further information regarding the above please do not hesitate to contact the undersigned.

Yours faithfully
For and on behalf of
JEFFERY AND KATAUSKAS PTY LTD

A ZENON
Senior Associate.