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26 June 2013

Mr James Hammill
Lend Lease
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Our Ref: 130626PDADOPI&COS

**SICEEP – The Haymarket Stage 1 Stage Significant Development Application (SSD 5878 – 2013)
– Hyder Consulting response to stakeholder comments, recommendations and key issues.**

Dear James,

Hyder Consulting has reviewed the comments, recommendations and key issues provided by:-

- City of Sydney Council in its submission to Department of Planning and Infrastructure on the above mentioned State Significant Development Application (SSDA) dated 20 May 2013;
- Sydney Water in its responses to the above mentioned SSDA dated 9 and 21 May 2013; and
- Department of Planning & Infrastructure (DOPI) in its Issues letter dated 29 May 2013 regarding the subject SSDA.

Through the preparation of the initial Stage 1 DA scheme (SSDA2) and on-going development of these designs to support the subsequent submission of the Stage 2 DAs (SSDA3, 4 & 5), Hyder had considered many of the issues raised by the stakeholders noted above to ensure robust and considered applications which Hyder is happy to support. A schedule of the relevant issues raised by the various stakeholders listed above follows with clarification and/or responses provided. Many of these flooding and stormwater issues were discussed at a meeting, dated 6th June 2013, with an independent reviewer appointed by the Department of Planning and Infrastructure.

We trust that these responses adequately address the issues that have been raised. Should there be any further questions please do not hesitate to contact Michael Kurtz.

Yours sincerely

Michael Kurtz

02 8907 9065

City of Sydney Council Issue	Hyder Response
<p>Recommendation 7</p> <p>Flooding impacts on the provision of active ground floors should be engineered out where possible. Where impossible, flood management techniques based on a risk assessment approach should be adopted for ground level tenancies below the flood planning levels.</p>	<p>The flood mapping in the Flooding & Stormwater Report is considered adequate for Lend Lease to complete a flood risk assessment and set concept design planning levels.</p> <p>Throughout the design development of The Haymarket buildings, the interface with the boulevard has considered the planning and architectural needs against the engineering results. This has led to some shop fronts below the flood level. Hyder is aware that Lend Lease (in conjunction with flood protection specialists) have prepared a flood defence strategy for these situations.</p>
DOPI Key Issue (Stormwater)	Hyder Response
<p>24.. The rainfall and tide events data provided In Appendix F of the Stormwater and Flooding report suggests that there is a risk that peak runoff for a significant rainfall event will coincide with tide levels equal to or above 0. 7m AHD once every 20 to 30 years. Therefore adopting the design still water levels of 0.9 AHD for the 100 year ARI rainfall event may not define the worst case 1% Annual Exceedance Probability event that takes into account the joint probability of rainfall and high tide. In order to support the argument for adopting the lower design still water levels further comment is required on the approximate probability of occurrence of a tide level of 0.9m AHD and the risk of tide levels of this magnitude coinciding with peak runoff. Further comment based on existing is sufficient to support the argument for the adopted downstream boundary conditions.</p>	<p>The coincident catchment runoff and tide level is a function of probability. As stated by Hyder in its Stormwater and Flooding Report Appendix at section 'Coincidence of Cockle Bay and Catchment Runoff' (p18), this probability has been investigated by Australian Rainfall & Runoff (ARR) Revision Project 18 'Interaction of Coastal Processes And Severe Weather Events' (June 2012, ARR) using Sydney Harbour and Sydney metropolitan catchments, with the conclusion that storm surge and rainfall runoff is independent.</p> <p>Our further investigation of the SICEEP catchment (having a rapid response time of only 25 minutes) and examination of 99 years of continuously recorded Sydney Harbour water levels, and 155 years of rainfall data affirms the ARR (June, 2012) findings.</p> <p>While it is noted that there is a possibility of any and all catchment runoff events coinciding with Cockle Bay water levels greater than 0.9m AHD, there is also the need when determining flood frequency, to understand that such possibility sits alongside all the other the possibilities of any and all catchment runoff coinciding with Cockle Bay water levels of less than 0.9m AHD and in fact as low as -0.8m AHD (or lower).</p>
<p>25. With reference to Section 3.3.1 Model Setup - Inlet pit Blockage confirmation is required as to whether the modelling assumes all upstream catchment flows entering the Project site are contained within underground pipe systems with no overland flow component.</p>	<p>Not all existing trunk drainage systems have 20 year ARI capacity for runoff (when considering the entire catchment flow).</p> <p>The modelling of underground systems extends beyond the site boundary. In the TUFLOW model, all upstream catchment flows have been applied to the culvert. Once the culvert has reached capacity, the excess is applied to the surface. Therefore modelling includes overland flow from adjacent areas.</p> <p>Hyder do not consider it useful to complete modelling for the unrealistic condition of runoff</p>

DOPI Key Issue (Stormwater)	Hyder Response
	<p>from site only.</p> <p>For design purposes, at detail design stage, systems will provide 20 year ARI capacity except when limited by downstream system capacities.</p> <p>Catchment flows are not contained within the underground system. The underground systems have limited capacity and the modelling includes overland flows in excess of the underground capacity. The flood mapping provided in the Stormwater and Flooding Report addresses this comment.</p>
<p>26. Further explanation is required as to the key differences in hydrological and hydraulic representations between the existing and proposed case DRAINS and TUFLOW models (Section 3.4 potential flood impact).</p>	<p>The key differences between the existing and proposed DRAINS and TUFLOW models is that the proposed models include:</p> <ul style="list-style-type: none"> • A concept minor drainage system (pits, pipes and proposed building connections); • The proposed surface re-grading (including the proposed building ground floor footprints); • Revised sub-catchment boundary delineation to reflect the proposed building / public domain layout (noting that overall (total) existing and proposed catchment areas are the same); and • An amplification option. <p>All other parameters are consistent in existing and proposed models.</p>
<p>27. Confirmation is required of how the runoff from flyover road structures are drained and whether they have any interaction with the existing or proposed site drainage systems including Sydney water trunk drainage systems (Section 5.7 MUSIC Models and assumptions).</p>	<p>Runoff from the flyover drains into the existing stormwater system below or in the case of the proposed development into the new drainage system within the SICEEP site. Hyder has not provided treatment to stormwater runoff from external catchments, including flyover road structures. Therefore, flyover road structures have been included in the MUSIC model as a 'bypass' catchment in both the existing and proposed modelling.</p> <p>Hyder has assumed that drainage from the flyover structures will be independent of the proposed stormwater quality treatment strategy for SICEEP. The runoff from the flyover is not considered in the determination of the percentage pollutant reductions achieved by the treatment strategy proposed for the SICEEP PPP site hence its nomination as a 'bypass' catchment.</p>
<p>28. Section 5.9.1 Pollutant Load Estimates notes an increase in SS load and slight decrease in the TP and TN pollutant loads. Clarification of the reason for the increase in SS load is required.</p>	<p>The MUSIC modelling completed in the SSDA 1 and SSDA 2 was applicable only to the PPP site.</p> <p>Further modelling has been completed to support SSDA 3, 4 and 5 which addresses the DGR requirement to provide "an Integrated Water Management Plan including alternative water supply, proposed end uses of potable and non-potable water, water sensitive urban design and water conservation measures". The Development Control Plan (DCP) of the City of Sydney Council, the adjoining LGA, was adopted as reference targets in the</p>

DOPI Key Issue (Stormwater)	Hyder Response
	design of WSUD treatment trains which achieve industry accepted / best practice water quality targets.
<p>29. With reference to the TUFLOW Model at Appendix C, clarification is required of the following:</p> <p>a) how potential climate change applied to the PMF event and whether this involved applying sea level rise only;</p> <p>b) it is unclear from the colour coding for localised flood Impacts what the maximum impact is at the northern end of the Boulevard (i.e. is it in the order of 0.5m or considerably higher). Identify the cause of the & flux and provide details as to whether is it possible to eliminate/mitigate at a later stage of the design; and</p> <p>c) what technique has been used to map the provisional hydraulic hazard (i.e. how were the hazard categories defined in Figure L2 of the Floodplain Development Manual translated to mapped outputs).</p>	<p>a) Hyder has applied sea level rise only to the PMF modelling.</p> <p>b) The afflux in this area has been investigated in the modelling and is suggested to be due to a change in the local drainage systems and catchment break-up. It is expected that with further detail this afflux can be mitigated/eliminated.</p> <p>c) The provisional hydraulic hazard mapping has been an output from TUFLOW (similar to flood depths and velocities) with the _Z1.dat function. The results (based on the maximum D x V) produce a number, of 1, 2 or 3, representing Low Hazard, Intermediate Hazard or High Hazard, respectively. These numbers have then been mapped based on the grid output.</p>

Sydney Water Corporation (Stormwater)	Hyder Response
<p>The SICEEP is proposed over and adjacent to a number of Sydney Water stormwater underground culverts, located downstream of the Darling Harbour catchment. Sydney Water is concerned the proposed structures will interfere with the integrity of these culverts and accessibility for Sydney Water to operate, maintain and reconstruct these assets.</p> <p>The Haymarket</p> <p>The offices, public parking and residential apartments (PDA South 11 and PDA South 12) are proposed over and adjacent to Sydney Water major stormwater culverts. These proposed structures do not meet Sydney Water's policy and guidelines for "Building over or adjacent to Sydney Water stormwater assets". The structure containing offices and public parking (PDA South 11) will be over a proposed stormwater culvert. This is not satisfactory. Sydney Water will work with you to consider alternative designs or proposals to deviate these stormwater culverts around these structures. These options are based on Sydney Water approving a Services Protection Report, Stormwater Deviation Report and Flood Impact Assessment Report.</p> <p>Stormwater and Flooding report indicates that the proposed provisional hydraulic hazards are high. However it concludes that the impact of the proposed development with the culvert amplification would result in negligible flood impact. To support this statement the flood mitigation measures and associated risks identified need to be addressed including confirming design levels to undertake further modelling and developing a Floodplain Risk Management Plan</p>	<p>Hyder are assisting Lend Lease to prepare a Site Wide Servicing Strategy (SWSS) and have attended meetings with Sydney Water and Lend Lease to discuss the proposed development. The SWSS will respond to the issues raised by Sydney Water.</p>
<p>The Water Quality Analysis and Water Sensitive Urban Design are acceptable for the concept design of the SICEEP - PPP site, which includes Bayside, North Exhibition, South Exhibition, The Theatre and Tumbalong Park. However, separate Water Quality Analysis and Water Sensitive Urban Designs will need to be submitted for approval for The Haymarket and ICC Hotel sites.</p>	<p>Noted. Water Quality Analysis and Water Sensitive Urban Design has been submitted as part of the Stage 2 Stage Significant Development Applications (SSDAs) for the Haymarket.</p> <p>Hyder has recently prepared Flooding, Stormwater and Water Sensitive Urban Design Reports to support the three Stage 2 State SSDAs that are currently on exhibition.</p>
<p>Sydney Water seeks a response to the above matters and will be happy to discuss in detail. We need to ensure that the existing and proposed stormwater systems:</p> <ul style="list-style-type: none"> • are protected, accessible to operate and maintain • protect people and properties from flooding • protect the natural environment • improve waterway health • incorporate WSUD 	<p>Throughout the design development of the Haymarket, consideration has been given to compliance with Sydney Water's requirements for building over their assets. This will be included in the SWSS.</p> <p>The Flooding & Stormwater Report has quantified the flows, water levels and hydraulic hazard categories for the SICEEP site. This information can be used to develop strategies to protect people and properties from flooding.</p> <p>Water quality is integral to the proposed development and will result in improved quality of stormwater discharge from the Haymarket. This is achieved through the use of tree pits, rainwater tanks and proprietary water treatment devices.</p>

