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9th April 2019

TSA Management
17 Brett Street
TWEED HEADS NSW 2485

Attention: Sue Folliott

Dear Sue

RE: TWEED VALLEY HOSPITAL DEVELOPMENT – STORMWATER MANGEMENT PROPOSALS FOR PROPOSED TWEED VALLEY HOSPITAL, CUDGEN ROAD, KINGSCLIFF.

Robert Bird Group (RBG) have reviewed the concept stormwater design for the proposed Tweed Valley Hospital at Cudgen Road, Kingscliff on behalf of Lendlease Building (LLB) in relation to the Secretary's Environmental Assessment Requirements (SEARs).

The relevant SEARs requirements relate to the management of the quantity and quality of stormwater discharge from the proposed development, with reference to the *Guidelines for development adjoining land managed by the Office of Environment and Heritage* – Office of Environment and Heritage (OEH), 2013. The above guidelines recommend the following approach in relation to the discharge of stormwater:

- Development proposals for areas adjacent to OEH land should incorporate stormwater detention and water quality systems (with appropriately managed buffer areas) within the development site.
- Stormwater should be diverted to council stormwater systems or to infiltration and subsurface discharge systems within the development site. (OEH acknowledges that in some limited and exceptional cases it may not be possible to avoid the discharge of stormwater from development sites onto OEH land).
- The discharge of stormwater to OEH land, where the quantity and quality of stormwater differs from natural levels, must be avoided.
- The proposal should include details of proposed changes to stormwater related to the development where the following stormwater management standards should be met (for subdivisions, multi-unit dwellings, commercial and industrial development):
 - no increase in pre-development peak flows from rainfall events with a 1 in 5 year and 1 in 100 year recurrence interval
 - no increase in the natural annual average load of nutrients and sediments
 - no increase in the natural average annual runoff volume"

RBG has also referred to the Tweed Shire Council (TSC) Development Design Specification. Section D5 – Stormwater Drainage Design states in respect of stormwater discharge rates and onsite detention that developments "shall limit the maximum discharge rate to 200 L/s/Ha for all storm events up to and including the ARI 100 storm event". However, in their response to the SSD submission, TSC have stated:

"This control is generally reserved for sites where the downstream stormwater infrastructure is under capacity or there is a risk of local stormwater flooding. In my opinion the 200L/s/ha is not necessary on this site as there is no infrastructure or risk of flooding in the downstream area. Simply limiting post-development discharge to pre-development levels would be appropriate."

RBG has modelled the discharge rates from the site using DRAINS software for the ARI 5 and ARI 100 storm events for the extent of disturbed area within the site (approximately 16.3 Ha) as shown in Table 1.

Table 1: Pre and post-development stormwater discharge rates

	Discharge Rate (m ³ / sec)	
	ARI 5	ARI 100
Pre-Development (<5% impervious)	5.8	11.1
Post Development (<48% Impervious) - without OSD	6.4	12.4
Post Development (<48% Impervious) - with OSD	5.8 (max)	11.1 (max)

Since the stormwater discharge from the site cannot be diverted into an adjacent Council stormwater system, a reduction in post-development discharge to match the pre-development runoff rate will be achieved by detaining stormwater in detention basins along the northern side of the site. Sediment basins constructed as early works to act as sediment control during the construction stage, will be adapted to form the permanent on-site detention storage. The DRAINS model shows that the existing basins which have a total capacity of 12,140 m³ are sufficient to restrict the flow well below the pre-development runoff rate (2.7 m³/s in ARI 5 and 4.6m³/s in ARI 100) which means that the basins can be reduced in size if desired. The discharge rate will be controlled by flow controls (orifice plates) in the outlet pipes for each basin. The basins will not be lined and will therefore allow some infiltration of stormwater into the subgrade.

RBG has also modelled the stormwater quality discharging from the 16.3 Ha disturbed site area using MUSIC software for the different stages of development. Section D7 of the TSC Development Design Specification - Water Quality, provides objectives for the stormwater discharge in relation to the target removal rates for suspended solids (TSS), gross pollutants (GP), nitrogen (TN) and phosphorus (TP).

Table 2 Stormwater quality pollutant loads

	Average annual pollutant load (kg/yr)			
	GP	TSS	TN	TP
Pre-Development (<5% impervious)	486	35800	214	37.1
Post Development (<48% imp. - without treatment)	2446	38460	330.4	60.17
Post Development (<48% imp. - with treatment)	3.81	7860	159	14.7
Target reduction (TSC standard)	90%	80%	45%	60%
Actual reduction	99.8%	80.2%	52.1%	75.5

Stormwater treatment will be provided by using a range of water sensitive urban design (WSUD) measures in a treatment train approach. Such measures will include proprietary pit baskets (eg. Enviropods), grass buffer strips, grass swales and bio-retention basins. Preliminary modelling of the concept design using MUSIC software demonstrates that the proposed treatment system can be used to meet the Tweed Shire Council development specification water quality objectives and would also reduce the post-development nutrient and pollutant levels below the existing (agricultural use) levels as shown in Table 2. The preliminary MUSIC model demonstrates that the TSC target reductions in pollutant loads can be achieved using filter baskets and approximately 1,500 m² of bioretention, which will be provided within the proposed detention basins utilising some of the spare capacity detailed above.

Please do not hesitate to contact the undersigned if you require any further information about the above.

Yours sincerely

ROBERT BIRD GROUP PTY LTD



COLIN ROPE
Senior Associate