

January 30, 2015

BMT WBM Pty Ltd
Attn: Tony Weber
By Email

Dear Tony,

RE: VEGETATION UPTAKE RATES - WEST CULBURRA (MP 09_0088)

Following our meeting on December 18, 2014 with yourself and the Department of Planning and Environment (DoPE) we have undertaken a literature review on vegetation uptake rates of nutrients. This is in response to your comments that the CSIRO values currently used in MUSIC modelling:

- a) Are related to effluent reuse onto plantation which does not resemble the subject site.
- b) Are from findings that have not been documented as being similar in concentration, soil type and residence time to the site.

We strongly disagree with the WBM's suggestion that the most appropriate way forward is to bypass infiltration, untreated, to the outlet node as it does not reflect and completely ignores the natural processes that will occur within the (minimum) 100m wide vegetated buffer zone at the site.

Table 1 below summarises the outcomes of our literature review in relation to nitrogen and phosphorus uptake rates. Studies considered all assessed the nutrient uptake of vegetated buffers from stormwater sourced groundwater flows as they pass through. Where possible, analyses based on field experiments rather than those simulated in a laboratory were selected.

World Class Sustainable Engineering Solutions

Environmental

EIS & REF
Streams & rivers
Coastal
Groundwater
Catchments
Bushfire
Monitoring

Geotechnics

Foundations
Geotechnical survey
Contamination
Hydrogeology
Mining
Terrain analysis
Waste management

Water

Supply & storage
Flooding
Stormwater & drainage
Wetlands
Water quality
Irrigation
Water sensitive design

Wastewater

Treatment
Re-use
Biosolids
Design
Management
Monitoring
Construction

Civil

Earthworks
Excavations
Pipelines
Roads
Pavements
Parking
Structures

Head Office

Suite 201, 20 George Street,
Hornsby NSW 2077, Australia
Ph 02 9476 9999 Fax 02 9476 8767

> mail@martens.com.au

www.martens.com.au

MARTENS & ASSOCIATES P/L
ABN 85 070 240 890 ACN 070 240 890

Table 1: Literature review results: vegetation uptake rates of nutrients from stormwater sources.

Author	Date	Uptake Rate TN	Uptake Rate TP	Riparian Vegetation Type	Landuse	Study Location	Article
Lowerance <i>et al</i>	1984	51.8 kg/ha/yr	-	Forested wetland	Agricultural, roads, urban and others	Little River, Chesapeake Bay, USA	Riparian Forests as Nutrient Filters in Agricultural Watersheds.
Kelly <i>et al</i>	2007	-	15 kg/ha/yr	Grass and Alfalfa	Agricultural	Iowa, USA	Phosphorus uptake during 4 years by different vegetative covers in a riparian buffer.
Lowerance <i>et al</i>	1997	89%	80%	Coastal plain riparian forest	62% forest, 23% cropland, 12% pasture	Rhode River, Chesapeake Bay, USA	Water Quality Functions of Riparian Forest Buffer in Chesapeake Bay Watersheds.
		66%	24%	Coastal plain riparian forest	Cropland and wetland		
Peterjohn & Correll	1984	77 kg/ha/yr	10 kg/ha/yr	Broad leaved deciduous vegetation	Agricultural	Rhode River Maryland, USA, USA	Nutrient dynamics in an agricultural watershed, observations on the role of a riparian forest.

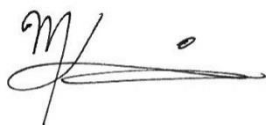
The study by Kelly *et al.* is disregarded as the riparian vegetation type consists of crops with superior nutrient uptake capacity compared with natural forested areas.

Considering the compiled data in Table 1, we pose to update the infiltration treatment node based on the uptake rates of 51.8 kg/ha/yr (TN) and 10 kg/ha/yr (TP) as per Lowerance *et al.* and Peterjohn & Correll respectively. Such an approach shall ensure that the varying depth of the buffer is accounted for.

Can you please provide comment and confirm you are satisfied that such an approach shall be appropriate for site MUSIC modelling.

For and on behalf of

MARTENS & ASSOCIATES PTY LTD



MEGAN KOVELIS

BEnvS(Hons1),
Environmental Scientist



ANDREW NORRIS

BSc (Hons), MEngSc, MAWA
Director/Project Manager