Our ref: 190415 ML/LF
17th September 2019

Port Stephens Council
116 Adelaide Street
RAYMOND TERRACE NSW 2324

c/o: Alina Tipper

Attention: Mr. Ryan Falkenmire

Dear Ryan,

**RE: DA 16-2018-774-1**
**STOCKTON BIGHT TRACK, FULLERTON COVE**
**WCMP RFI ADDENDUM**

## 1.0 GENERAL

ADW Johnson was commissioned by Worimi Local Aboriginal Land Council (LALC) to prepare a Water Cycle Management Plan (WCMP) for a proposed carpark and visitor centre within Lot 227 DP1097995 Lavis Lane, Williamtown. The preparation of this management plan has been undertaken to accompany a Development Application required for the proposed development.

A geotechnical investigation was undertaken by Cardno on the existing site to determine the subsurface conditions including infiltration capacity and water table. The report found the existing soils to be sand with fine to medium grain size.

Infiltration testing was performed on site that found in-situ infiltration was likely to be high (>1080mm/hr) although applying factors of safety the initial infiltration rate adopted on site was 216mm/hr.

Further council comments were received from council on Friday 9th August that resulted in a revised infiltration rate at the low point within the site of 120mm/hr being adopted and agreed to by council in a reply email on the 2nd September. Further to this it was agreed that the groundwater level would be revised to RL 2.5AHD and commentary would be provided on how the swale would achieve an acceptable velocity to reduce the potential for scour.

In summary the revised modelling was undertake on the basis of:

1. *Adopt 120 mm/hr for infiltration rates without further geotechnical investigations.*
2. *Apply the following parameters, update and re-run the models:*
    a. *Infiltration rate of 120 mm/hr; and*
    b. *Groundwater level of 2.5 m AHD.*
3. *Following re-modelling, will need to address swale's conveying flow with a velocity greater than 0.15 m/s.*

The revised modeling was undertaken using XP-RAFTS as per the initial WCMP and the results have been detailed within the plans provided as part of this response being 190415-WCMP-003 and 190145-WCMP-004.

The results show some increased ponding at the existing low point in comparison to utilising the original rate of 216mm/hr. The ponding reaches peak depth of around 1.45m at around 90minutes and subsides completely after approximately 12.5 hours.

The 100 year ARI results in comparison to the previous modelling have been summaries in Table 1 below:

**Table 1 – Revised Modelling Results**

| Infiltration Rate | Time to peak depth | Max depth (m) | Time to fully dissipate |
|---|---|---|---|
| 210mm/hr | 90min | 1.32 | 6.0hrs |
| 120mm/hr | 90min | 1.41 | 12.5 hrs |

The overall difference in depth is approximately 9mm, resulting in an increased area of inundation if a 120mm/hr infiltration rate is adopted greatly increasing the overall surface area and hence infiltration capacity of the ponding area.

As previously stated the ponding does not impact any of the buildings/residents ability to evacuate in the case of an emergency during a 100 year ARI storm and although the depth can be seen as relatively high the minimal velocities (almost zero) that are present at the low point will greatly reduce the risk to humans in the rare event that someone would enter the floodwaters during a large storm event.

With regard to the swale design it has been determined that the swales, where grades are greater than 4% will have rock check dams at appropriate intervals to reduce velocities as well as be fully turf/native grass lined as soon as practical after construction. It is proposed that details of the swale design including long sections, rock check dam locations and details be provided as part of the construction certificate for the project.

Additional MUSIC modelling was also undertaken to confirm that the targets have still been achieved. Based on the fact that all water still infiltrates on site it was determined that the required pollutant removal efficiencies are still well exceeded and a revised MUSIClink report has been provided as part of this addendum.

Should you require any further information please contact the undersigned on 4305 4300.

Yours faithfully,

**MARK LITTLEFIELD**
**SENIOR CIVIL ENGINEER**
ADW JOHNSON
CENTRAL COAST OFFICE

**ATTACHMENTS:**

- 190415-WCMP-003 - 100 year results – 210mm/hr infiltration
- 190145-WCMP-004 - 100 year results – 120mm/hr infiltration
- Revised MUSIClink report – 120mm/hr infiltration


LEGEND

- PRE-DEVELOPED CATCHMENT
- POST-DEVELOPED CATCHMENT
- INFILTRATION SWALE
- MAJOR CONTOURS
- MINOR CONTOURS

CONTOUR INTERVAL = 1.0m

| LEGEND Lower_value | | Upper_value | Colour |
|---|---|---|---|
| 0 | to | 0.250 m | |
| 0.250 | to | 0.5 m | |
| 0.500 | to | 0.75 m | |
| 0.75 | to | 1 m | |
| 1 | to | 1.25 m | |
| 1.25 | to | 1.5 m | |
| 1.5 | to | 1.75 m | |
| 1.75 | to | 2 m | |
| 2 | to | 2.5 m | |
| 2.5 | to | 3 m | |
| 3 | to | 3.5 m | |
| 3.5 | to | 4 m | |
| 4 | to | 10 m | |

- MAX DEPTH ACHIEVED AT 90 MINUTES FOR 100 YEAR ARI.
- WATER COMPLETELY DISSIPATED AFTER 6 HOURS.

| ver. | date | comment | drawn | pm | level information | scale (A1 original size) | notes |
|---|---|---|---|---|---|---|---|
| C | 19.06.19 | CATCHMENTS UPDATED | J.B. | M.K. | DATUM: A.H.D.<br>CONTOUR INTERVAL: 1m | 0 25 50m<br>SCALE: 1:1000 (FULL) | |

drawing title:

FLOOD EXTENTS
IR = 216mm/hr

location: WORIMI VISITOR DEVELOPMENT LAVIS LANE, WILLIAMTOWN

council: PORT STEPHENS COUNCIL

dwg ref: 190415-WCMP-003

client:

adw johnson
central coast office ph: (02) 4305 4300
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LEGEND

- PRE-DEVELOPED CATCHMENT
- POST-DEVELOPED CATCHMENT
- INFILTRATION SWALE
- MAJOR CONTOURS
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| 0.500 | to | 0.75 m | |
| 0.75 | to | 1 m | |
| 1 | to | 1.25 m | |
| 1.25 | to | 1.5 m | |
| 1.5 | to | 1.75 m | |
| 1.75 | to | 2 m | |
| 2 | to | 2.5 m | |
| 2.5 | to | 3 m | |
| 3 | to | 3.5 m | |
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|---|---|---|---|---|---|---|---|
| C | 19.06.19 | CATCHMENTS UPDATED | J.B. | M.K. | DATUM: A.H.D.<br>CONTOUR INTERVAL: 1m | 0 25 50m<br>SCALE: 1:1000 (FULL) | |

drawing title:

FLOOD EXTENTS
IR = 120mm/hr

location: WORIMI VISITOR DEVELOPMENT
LAVIS LANE, WILLIAMTOWN

council: PORT STEPHENS COUNCIL

dwg ref: 190415-WCMP-004

client:

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# MUSIC-*link* Report

| Project Details | | Company Details | |
|---|---|---|---|
| **Project:** | Worrimi | **Company:** | ADW Johnson |
| **Report Export Date:** | 17/09/2019 | **Contact:** | Mark Littlefield |
| **Catchment Name:** | WORIMI VISITOR CENTRE rev C LDR | **Address:** | 5 Pioneer Ave Tuggerah |
| **Catchment Area:** | 2.281ha | **Phone:** | 43054300 |
| **Impervious Area*:** | 100% | **Email:** | markl@adwjohnson.com.au |
| **Rainfall Station:** | WILLIAMTOWN RAAF - Station 061078 - Zone A | | |
| **Modelling Time-step:** | 6 Minutes | | |
| **Modelling Period:** | 1/01/1998 - 31/12/2007 11:54:00 PM | | |
| **Mean Annual Rainfall:** | 1013mm | | |
| **Evapotranspiration:** | 1394mm | | |
| **MUSIC Version:** | 6.2.1 | | |
| **MUSIC-link data Version:** | 6.22 | | |
| **Study Area:** | Anna Bay and Nelson Bay | | |
| **Scenario:** | Default Catchment - Sandy soils | | |

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

## Treatment Train Effectiveness

| Node: Receiving Node | Reduction |
|---|---|
| **Flow** | 98.4% |
| **TSS** | 99.7% |
| **TP** | 99.3% |
| **TN** | 98.5% |
| **GP** | 99.7% |

## Treatment Nodes

| Node Type | Number |
|---|---|
| Swale Node | 1 |
| Pond Node | 1 |
| Buffer Node | 1 |
| GPT Node | 1 |

## Source Nodes

| Node Type | Number |
|---|---|
| Urban Source Node | 2 |

## Comments

Infiltartion adopted as 120mm/hr

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## Passing Parameters

| Node Type | Node Name | Parameter | Min | Max | Actual |
|---|---|---|---|---|---|
| Buffer | Buffer | Proportion of upstream impervious area treated | None | None | 1 |
| GPT | GPT | Hi-flow bypass rate (cum/sec) | None | 99 | 0.192 |
| Pond | Pond | % Reuse Demand Met | None | None | 0 |
| Receiving | Receiving Node | % Load Reduction | None | None | 98.4 |
| Receiving | Receiving Node | GP % Load Reduction | 90 | None | 99.7 |
| Receiving | Receiving Node | TN % Load Reduction | 45 | None | 98.5 |
| Receiving | Receiving Node | TP % Load Reduction | 60 | None | 99.3 |
| Receiving | Receiving Node | TSS % Load Reduction | 90 | None | 99.7 |
| Swale | SWALE (POSTDEV) | Bed slope | 0.01 | 0.05 | 0.035 |
| Urban | CARPARK | Area Impervious (ha) | None | None | 1.091 |
| Urban | CARPARK | Area Pervious (ha) | None | None | 0 |
| Urban | CARPARK | Total Area (ha) | None | None | 1.091 |
| Urban | ROOF & TRACK | Area Impervious (ha) | None | None | 1.19 |
| Urban | ROOF & TRACK | Area Pervious (ha) | None | None | 0 |
| Urban | ROOF & TRACK | Total Area (ha) | None | None | 1.19 |

Only certain parameters are reported when they pass validation

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## Failing Parameters

| Node Type | Node Name | Parameter | Min | Max | Actual |
|---|---|---|---|---|---|
| Pond | Pond | Extended detention depth (m) | 0.25 | 1 | 0.01 |
| Swale | SWALE (POSTDEV) | Exfiltration Rate (mm/hr) | 0 | 0 | 120 |

Only certain parameters are reported when they pass validation