CLAYTON UTZ

Email

12 April 2017

Planning Panels Secretariat
Hunter and Central Coast Joint Regional Planning Panel
320 Pitt Street
SYDNEY NSW 2000

enquiry@planningpanels.nsw.gov.au

Dear Secretariat

JRPP reference 2015HCC020
158 Macquarie Road, Cardiff - 99 Bed Aged Care Facility Proposal
Development application DA/1043/2015

We act for HammondCare, the owner of Lot 2 in Deposited Plan 788892 (**HammondCare Land**), in relation to Development Application **DA/1043/2015** (**HammondCare DA**) for an aged care facility on that land (**HammondCare Proposal**).

This letter responds to the letters from Dibbs Barker, lawyers for Misonpet Pty Ltd, to the JRPP dated 6 February 2017 and 16 February 2017 in relation to the HammondCare DA.

As the JRPP is aware, Misonpet is the owner of Lot 1 in Deposited Plan 788892 (**Misonpet Land**), which adjoins the northern boundary of the HammondCare Land.

At its meeting on 9 February 2017 to consider the HammondCare DA, the JRPP decided to defer determining the HammondCare DA until the matters identified in its deferral notice had been addressed. These matters included:

- considering the Dibbs Barker letter dated 9 February, which the JRPP described as a "late submission"; and
- giving Misonpet the opportunity to respond to a flooding assessment report prepared by HammondCare's consultants, TTW, in December 2016, which the JRPP had sought to make publicly available before its 9 February meeting but which had not been accessible for technical reasons - the Dibbs Barker letter dated 16 February is meant to be that response.

HammondCare separately wrote to the Secretariat on 21 February 2017 responding to most of the matters in the JRPP's deferral notice.

This letter responds to the Dibbs Barker letters dated 9 February and 16 February. Given that those letters raise hydrology issues and also attach some comments on drainage issues which were made by Misonpet's consultant, Dr Brett Phillips of Cardno, we attach (as **Attachment A**) a letter from TTW dated 12 April 2017 responding to those comments (**TTW Letter**).

In our submission, and having regard to the TTW Letter, the Dibbs Barker letters and the accompanying technical comments from Cardno do not raise any issues of concern for HammondCare's DA, and provide no basis for altering the JRPP's consideration of the HammondCare DA.

HammondCare believes that there is now no basis for deferring the determination of the HammondCare DA, and that the JRPP should grant development consent for the HammondCare Proposal as soon as practicable.

Level 15, 1 Bligh Street
Sydney NSW 2000

GPO Box 9806
Sydney NSW 2001
DX 370 Sydney

T +61 2 9353 4000
F +61 2 8220 6700
www.claytonutz.com

1. FLOODING AND STORMWATER ASSESSMENT

1.1 The Dibbs Barker letters make several assertions in relation to the flooding and stormwater assessment for the HammondCare DA. Our responses are set out below.

Clause 7.15 of Lake Macquarie LEP

1.2 The Dibbs Barker letters assert that the HammondCare DA does not satisfy clause 7.15 of the *Lake Macquarie Local Environmental Plan* 2014 (**Lake Macquarie LEP**).

1.3 Clause 7.15 relevantly requires Council to be satisfied, before it grants consent to a proposed development on any of the HammondCare Land or the Misonpet Land, that *"the existing on-site stormwater detention and any additional stormwater detention required by the proposed development will be detained within the boundaries of the site, or at an alternative location approved by Council".*

1.4 It appears that Misonpet is interpreting this requirement to mean that no development on **any of** the HammondCare Land or the Misonpet Land can be carried out until either:

(a) a solution for detaining **all** stormwater on **both** the HammondCare Land **and** the Misonpet Land has been provided; or

(b) the proposed development provides a solution for detaining **all** stormwater on **both** the HammondCare Land **and** the Misonpet Land.

1.5 These interpretations are, in our submission, incorrect and unreasonable. They involve a misreading of clause 7.15. Clause 7.15 is clearly focused on ensuring that the development of either the HammondCare Land or the Misonpet Land does not result in a higher stormwater flow off the land to be developed than the existing situation.

1.6 There is no basis for reading the word "site" as anything other than the site of the proposed development - in this case, the HammondCare Land.

1.7 The HammondCare DA proposes a significant on-site stormwater detention (**OSD**) basin and accompanying system, in a location proposed by *Lake Macquarie Development Control Plan* 2014 (**Lake Macquarie DCP**). The OSD system is described specifically on page 7 of the Stormwater Report dated 16 December 2016 and page 9 of the Flood Impact Report dated 16 December 2016, both prepared by TTW.

1.8 The HammondCare Land does not currently have an OSD system, so the proposed OSD system would be an improvement on the existing situation if it does any more than capture the additional stormwater runoff which the HammondCare Proposal would cause.

1.9 The TTW Letter states that the HammondCare Proposal will actually improve the stormwater flow situation for the Misonpet Land - that is, it will deliver a "net benefit" to the Misonpet Land, capturing any additional flow from the HammondCare Proposal **and** some of the existing flow across the HammondCare Land. That outcome must satisfy any reasonable reading of clause 7.15 of Lake Macquarie LEP.

1.10 There is no evidence, even from the Cardno comments, that the HammondCare Proposal would worsen the existing stormwater situation for the Misonpet Land. Consequently, if Misonpet continues to oppose the HammondCare DA, it is effectively saying that the HammondCare DA does not take **enough** of the **existing** flow away from the Misonpet Land. In our submission, that is not a reasonable position to take.

"Natural watercourse"

1.11 The Dibbs Barker letters assert that the existing drainage channel on the HammondCare Land is not a "natural watercourse".

1.12 It is not clear what relevance this has to stormwater issues for the HammondCare DA. The only relevance which specifying the watercourse as "natural" has for the HammondCare DA is that additional controls providing for a riparian zone are proposed. The landscape treatment proposed in the HammondCare DA complies with the riparian zone controls. In our submission, the issue is irrelevant for stormwater issues, which is the focus of Misonpet's objection.

1.13 In any event, there is no basis for asserting that the watercourse is anything other than "natural".

1.14 There is no history of development of the HammondCare Land, other than historic clearing and the current use as a golf driving range. The 16 February Dibbs Barker letter attaches a chronology which attempts to suggest that the watercourse was enhanced by works in decades past (ie. prior to HammondCare's acquisition of the HammondCare Land), but does not provide any support for that suggestion.

1.15 It is difficult to see why a person would have gone to the effort and expense of creating an artificial channel without having any development to benefit from it. Far more likely, in our submission, is that the current watercourse across the HammondCare Land is natural.

1.16 It may be that the watercourse has been altered over time by flows from land upstream of the HammondCare Land (although, again, there is no clear evidence of this), but that would not change its essential nature as a natural watercourse.

Effect on the Misonpet Land

1.17 The Dibbs Barker letters assert that the HammondCare Proposal relies on the Misonpet Land to manage stormwater. That is incorrect.

1.18 As stated in paragraph 1.9 of this letter, the TTW Letter states that the HammondCare Proposal will deliver a "net benefit" to the Misonpet Land in stormwater flow, by detaining all of the additional flow from the HammondCare Proposal and some of the existing flow. That shows that the HammondCare DA does not in any way rely on any detention of flow on the Misonpet Land.

1.19 The Dibbs Barker letters assert that the HammondCare Proposal will "magnify the nuisance" on the Misonpet Land caused by stormwater flows. HammondCare denies that it is causing any nuisance on the Misonpet Land, and Misonpet has not provided any evidence to show there is in fact a "nuisance". Moreover, the conclusions of the TTW Letter remove any suggestion that any existing stormwater flows on the Misonpet Land would be "magnified" by the HammondCare Proposal.

1.20 The Dibbs Baker letters also assert that the HammondCare Proposal would use the Misonpet Land as a "weir or spill way" in the event of flood. This is also not correct.

1.21 The TTW Letter confirms that, in addition to the proposed OSD system providing a "net benefit" to the Misonpet Land, the open stormwater channel system has been designed to convey up to the 1 in 100 Year ARI event storm event from the upstream Council system. In storm events larger than the 1 in 100 Year ARI event, increased flows will be conveyed by a culvert system instead of the channel. Further, the TTW Letter confirms that the on-site

detention basin proposed on the HammondCare Land will not result in overland flows even in the 1 in 100 Year ARI event.

1.22 It is worth noting, as the TTW Letter does, that Lake Macquarie DCP only requires attenuation of the 1 in 20 Year ARI event, so that the HammondCare DA actually provides a more conservative solution than the Lake Macquarie DCP requires.

Council assessment of stormwater effects

1.23 The final stormwater-related assertion in the Dibbs Barker letters is that Council has not assessed stormwater flows, largely because the Council report on the HammondCare DA states that "stormwater design has been deemed satisfactory subject to conditions of consent". It is very clear that Council has assessed stormwater issues in some detail - in the text of the assessment section, in the response to Misonpet's submissions, and in the proposed conditions of consent (which are specific to the HammondCare Proposal).

1.24 In our submission, a proper reading of the Council report shows that the words "deemed satisfactory" are simply a way of the Council expressing its decision (which, in our experience, is not uncommon for council reports).

1.25 There is no basis for Misonpet's objection in this regard.

2. LEGAL CHALLENGE TO THE ADA STREET AREA PLAN

2.1 The Dibbs Barker letters refer to Misonpet's current challenge in the NSW Land and Environment Court to the development control plan (**DCP**) which Council adopted on 9 May 2016 for the Ada Street Urban Release Area (**Ada Street Area Plan**).

2.2 The Ada Street Urban Release Area is established under the Lake Macquarie LEP. It comprises the HammondCare Land, the Misonpet Land and some adjacent Council land. Council often refers to DCPs for urban release areas as "Area Plans".

2.3 Misonpet is challenging the validity of the Ada Street Area Plan on several grounds, including alleged non-compliance with clause 6.3 of Lake Macquarie LEP and alleged inconsistency with clause 7.15 of Lake Macquarie LEP. For the reasons set out below:

(a) it seems unlikely that these challenges will succeed on those bases; and

(b) in any event, the legal challenges should not interfere with the JRPP's determination of the HammondCare DA.

Clause 6.3 of Lake Macquarie LEP

2.4 Clause 6.3(2) of Lake Macquarie LEP requires that there be a DCP for an "urban release area" identified in Lake Macquarie LEP, which provides for the matters specified in clause 6.3(3), before development consent for land in that urban release area can be granted.

2.5 The Dibbs Barker letters assert that the Ada Street Area Plan does not contain a "staging plan" in the terms specified in clause 6.3(3), and therefore it does not satisfy clause 6.3(2) and so consent cannot be granted for the HammondCare DA.

2.6 The Ada Street Area Plan is Part 12.20 - *"Precinct Plan - Ada Street Cardiff"* of Lake Macquarie DCP, and was adopted in order to satisfy clause 6.3(2) of Lake Macquarie LEP for the Ada Street Urban Release Area.

2.7 The HammondCare Land, the Misonpet Land and a strip of adjacent Council bushland comprise an unusually small "urban release area" under Lake Macquarie LEP, known as the Ada Street Urban Release Area. Usually, an urban release area is a large area of land which is proposed for redevelopment for urban uses and has strategic significance for the region in which it is located. The concept of a staging plan should be understood in that context.

2.8 It is likely that a "staging plan" for the Ada Street Urban Release Area would have very limited function, given the very small scale of that urban release area.

2.9 In this context, figure 3 in the Ada Street Area Plan could serve as a staging plan for the Ada Street Urban Release Area. It is described as a structure plan, but there is no separate requirement for a structure plan and there is no reason why the plan could not satisfy the requirement for a staging plan. It is important to note that, although clause 6.3(3) refers to "staging", that does not mean that the DCP must propose that the lots within the relevant urban release area occur in a defined sequence, especially when the urban release area consists of only two developable lots.

2.10 Figure 3 sets out, among other things, the design and layout for the development of the Urban Release Area, including the layout of the road infrastructure and proposed paths for pedestrian and vehicular movement. That will facilitate development of the two lots in the Urban Release Area concurrently or separately. Other clauses in the Ada Street Area Plan make detailed provision for flooding and stormwater management infrastructure.

2.11 Further, clause 6.3(3) of Lake Macquarie LEP states that a staging plan should provide only for infrastructure and sequencing which is *"necessary"*. It is a matter for Council to decide what else might be *"necessary infrastructure and sequencing"*. The fact that Council has raised no issues with this, even after the Dibbs Barker letters, indicates that Council is satisfied. In our view, it would be appropriate for the JRPP to be satisfied as well.

2.12 In our submission, it is clear that the Ada Street Area Plan satisfies clause 6.3(3) of Lake Macquarie LEP.

Clause 7.15 of Lake Macquarie LEP

2.13 Clause 7.15 of Lake Macquarie LEP applies to the HammondCare land and the Misonpet Land. We have set out the relevant wording of the clause in paragraph 1.3 of this letter.

2.14 As demonstrated in part 1 of this letter and in the TTW Letter, Council and the JRPP should be satisfied that the HammondCare DA satisfies clause 7.15.

2.15 The Dibbs Barker letters assert that the Ada Street Area Plan is not consistent with clause 7.15 of Lake Macquarie LEP, because:

(a) it requires only the Misonpet Land and not both the Misonpet Land and the HammondCare Land to manage stormwater and detention; and

(b) it requires that the stormwater detention be within the Misonpet Land and not at an alternative location approved by Council, as allowed by clause 7.15 of Lake Macquarie LEP.

2.16 There is no basis for these assertions, in our submission. Section 1.7 of the Ada Street Area Plan essentially replicates clause 7.15 of Lake Macquarie LEP (see subsection 1.7.1) and provides additional measures (such as consistency with the NSW Floodplain Development Manual) which do not discriminate between the Misonpet Land and the HammondCare Land.

2.17 In our submission, it is clear that the Ada Street Area Plan is consistent with clause 7.15 of Lake Macquarie LEP.

The legal challenges do not affect the HammondCare DA

2.18 As the Dibbs Barker letters point out, Misonpet's legal challenge to the Ada Street Area Plan is effectively on hold, but Misonpet's appeal to the Court against Council's refusal of a development application (**Misonpet DA**) which Misonpet lodged for the Misonpet Land is progressing. The Misonpet DA proposes the removal of land forms on the Misonpet Land which Misonpet says currently retain stormwater on the Misonpet Land.

2.19 It is not entirely clear why the legal challenge should be held up pending the appeal, except that we note that Misonpet would need the Ada Street Area Plan to be in place for the Court to grant consent for its DA. Clause 6.3(2) of Lake Macquarie LEP provides some exceptions to the need for an urban release area DCP, but, in our view, none of those applies to the Misonpet DA.

2.20 It seems that Misonpet's pursuit of its own DA, which depends on the Ada Street Area Plan, is inconsistent with its objection to the HammondCare DA on the basis that it is challenging the Ada Street Area Plan in separate Court proceedings.

2.21 HammondCare is not a party to Misonpet's legal challenge to the Ada Street Area Plan. However, having read Misonpet's grounds of challenge, and having been involved with Misonpet and Council in the preparation of the Ada Street Area Plan, HammondCare does not see any reason why the Ada Street Area Plan would be invalid.

2.22 In any event, as a matter of law, the existence of the legal challenge must not interfere with the determination of the HammondCare DA.

2.23 The Dibbs Barker letter dated 9 February asserts that, if the Court declares the Ada Street Area Plan to be invalid, then any consent granted to the HammondCare DA is also invalid. We disagree. That will be a matter for the Court to decide.

2.24 The Ada Street Area Plan is currently valid, and will remain valid unless the Court declares otherwise. Therefore, the HammondCare DA is currently valid and must be determined. It cannot be deferred pending the outcome of Misonpet's legal challenge. Even if it could, our view is that this would be pointless, because we do not think Misonpet's legal challenge should succeed.

3. SENIORS LIVING SEPP

3.1 The Dibbs Barker letters raise the issue of whether *State Environmental Planning Policy (Housing for Seniors or People with a Disability)* 2004 (**Seniors Living SEPP**) applies to the HammondCare DA, because Dibbs Barker assert that the HammondCare Land is "environmentally sensitive land" to which the Seniors Living SEPP does not apply.

3.2 For the reasons outlined below, we disagree and, in any event, the HammondCare Proposal is permissible with consent under Lake Macquarie LEP even if the Seniors Living SEPP does not apply. Consequently, the Dibbs Barker allegations should have no effect on the HammondCare DA.

Seniors Living SEPP and "environmentally sensitive land"

3.3 Schedule 1 and section 4(6) of the Seniors Living SEPP provide that where a planning instrument, such as Lake Macquarie LEP or Lake Macquarie DCP, uses certain words (or like words) to describe land, that land will be classified as "environmentally sensitive land" and the

Seniors Living SEPP will not apply. Those words relevantly include "floodway", "high flooding hazard", "natural hazard", "water catchment" and "natural wetland".

Lake Macquarie DCP

3.4 While the HammondCare Land is identified on the Flood Control Lot map in Lake Macquarie DCP as "Lots Affected by the Catchment Flooding Controls" and a detention basin is indicated in Part 12 of Lake Macquarie DCP (ie. the Ada Street Area Plan), the HammondCare Land has not been identified as a "floodway", "high flooding hazard", "natural hazard" or any like description in Lake Macquarie DCP.

3.5 Further, Part 12 of Lake Macquarie DCP discusses flooding holistically - for example, it discusses how construction should be managed around any identified floodway and that fill is not permitted within the 1:100 year flood level (see section 1.7 of Lake Macquarie DCP). While flooding is discussed generally in Lake Macquarie DCP with respect to the entirety of the Cardiff Area 1, the HammondCare Land is not described in any way that would preclude the operation of the Seniors Living SEPP.

3.6 Consequently, in our view, the Seniors Living SEPP applies to the HammondCare Proposal.

Lake Macquarie LEP

3.7 The HammondCare Land does not appear on the Environmentally Sensitive Land Map under Lake Macquarie LEP. In addition, the HammondCare Land is not described as a "floodway", "high flooding hazard", "natural hazard" or any like description in Lake Macquarie LEP.

3.8 Further, while the Council report states that the HammondCare Land is identified as "flood control lot - high hazard" and that places it within the definition of "environmentally sensitive land" under Schedule 1 of the Seniors Living SEPP, this description is actually taken from an historical Council map that does not form part of a planning instrument, and therefore it does not make the HammondCare Land "environmentally sensitive land" under the Seniors Living SEPP.

HammondCare Proposal permissible with consent even without Seniors Living SEPP

3.9 Nonetheless, the Dibbs Barker contention that the Seniors Living SEPP does not apply to the HammondCare DA is not relevant because:

(a) "seniors housing" is permitted with consent under the Lake Macquarie LEP zoning for the HammondCare Land - R2 Low Density Residential;

(b) the HammondCare Proposal, which is for a 99 bed residential aged care facility, clearly would satisfy the definition of "seniors housing" in Lake Macquarie LEP; and

(c) consequently, HammondCare does not need to rely on the Seniors Living SEPP in order for the HammondCare Proposal to be capable of approval.

3.10 Despite this, HammondCare has ensured that the HammondCare Proposal meets the more stringent design standards of the Seniors Living SEPP in order to provide a standard of design appropriately suited to its future residents.

4. INTEGRATED DEVELOPMENT AND MSB CONCURRENCE

4.1 The Dibbs Barker letters make three allegations about the Mine Subsidence Board (**MSB**) general terms of approval (**GTAs**) in relation to the HammondCare DA:

(a) the GTAs were given on the basis of a design for the HammondCare Proposal which has now changed;

(b) the GTAs seek to defer for later consideration matters which must be considered at the DA stage, so that any approval which is based on the GTAs would not be sufficiently final and certain to be legally valid; and

(c) the HammondCare DA does not comply with the terms of the GTAs, because it does not include an "impact assessment" which the GTAs require.

4.2 As to the first allegation, the changes to the HammondCare Proposal were not relevant to the issues which the MSB needs to consider in evaluating that Proposal. Nevertheless, HammondCare provided revised plans to the MSB showing the changes to its Proposal and the MSB confirmed that no changes to its GTAs were warranted. HammondCare has provided copies of relevant correspondence in this regard to the JRPP separately.

4.3 The second allegation focuses on the terms of the GTAs. The GTAs provide for further assessment in the detailed design phase, when details of the proposed mine subsidence mitigation solution will be prepared. This is not unusual for a MSB approval for a new development. HammondCare has developed a grouting solution, which involves filling areas of the mine void under the HammondCare Land. Detailed assessment of this will be undertaken, and submitted for acceptance by the MSB, as part of the detailed design. There is no basis for saying this gives rise to some legal invalidity.

4.4 As to the third allegation, consent for the HammondCare Proposal has not yet been granted, so it is not possible for the Proposal to comply with the GTAs yet. If consent is granted, the GTAs will become conditions of that consent. Accordingly, if the GTAs require something which is not yet provided in the HammondCare DA, then HammondCare will need to comply with them then.

5. RMS RESPONSE

5.1 The Dibbs Barker letters suggest that the HammondCare DA cannot be determined because there is no deferred commencement condition to account for the absence of an RMS response to the HammondCare DA on the intersection with Macquarie Road.

5.2 We are instructed that RMS has now provided a favourable response. On that basis, there is no need for a deferred commencement condition and no reason to oppose the HammondCare DA on traffic related matters.

Please do not hesitate to contact us regarding anything contained in this letter.

Yours faithfully

Nick Thomas, Partner
+61 2 9353 4751
nthomas@claytonutz.com

Janelle Reid, Lawyer
+61 2 9353 4725
jareid@claytonutz.com

Our ref 751/17537/80180886

Attachment A - TTW letter dated 12 April 2017

Taylor Thomson Whitting

Structural
Civil
Traffic
Facade

12 April 2017 141125.P

Clayton Utz
GPO Box 9806
Sydney NSW 2001
nthomas@claytonutz.com.au

Attention: Mr Nick Thomas

HammondCare Cardiff - 158 Macquarie Road, Cardiff

DA/1043/2015

Dear Nick,

This letter responds to the hydrology issues raised in the Dibbs Barker letters to the JRPP dated 9 February 2017 and 16 February 2017 and the notes prepared by Dr Brett Phillips from Cardno attached to the Dibbs Barker 16 February 2016 letter. This letter adequately addresses all of the matters raised by Cardno.

Source and distribution of water flows

As indicated in TTW's and GHD's previous reports for the HammondCare DA, water flows overland generally from south to north in the vicinity of the HammondCare site (Lot 1 DP 788892) and the adjoining Misonpet site (Lot 2 DP 788892), and water also flows onto these sites from land to the east and west of these sites.
Some of the overland flow from land to the south of the HammondCare site is piped from the developed areas of that land, via Council drains, onto the HammondCare site.

The grassy channel on the HammondCare site collects upstream water and conveys it onto the Misonpet site. On the boundary between the HammondCare and Misonpet sites is a short concrete culvert which the channel discharges through. The channel continues into the Misonpet site and is eventually piped.

The open stormwater channel system has been designed to convey up to the 1 in 100 Year ARI storm event from the upstream Council system. Larger storms will be captured and conveyed via an underground culvert before connecting into the open channel.

The Dibbs Barker letter argues that the channel is not a "natural watercourse". We are not aware of any evidence to indicate that it is an artificial or human-made.

The stormwater system for the HammondCare proposal has been designed to ensure that the flow through the channel onto the Misonpet site will not increase as a result of the HammondCare proposal. In storm events larger than the 1 in 100 Year ARI event, increased flows will be conveyed by a culvert system instead of the channel.

As set out below, the HammondCare proposal will not result in an increase in volume or intensity of flow on the Misonpet site.

Stormwater assessment

The stormwater modelling indicates that the HammondCare proposal will deliver a net benefit to the Misonpet site. As outlined in Table 1 of the TTW Stormwater Report (16 December 2016), the post development flow rates are reduced well below the pre-development flow rates, as a result of the Onsite Stormwater Detention (OSD).

Onsite storage detention

The stormwater runoff from the HammondCare proposal is piped to a proposed OSD basin located near the northern boundary of the HammondCare site. This basin will attenuate post development flows, as shown in table 1 of the TTW Stormwater Report, well below the pre development flow rates. It therefore meets the requirements of clause 7.15(3) of the *Lake Macquarie Local Environmental Plan* 2014, which requires existing stormwater detention and any additional stormwater detention created by the development to be detained on the site.

The location of the OSD basin was selected to make sure it effectively captures the downstream flow while not interfering with the Ausgrid easement or the Sydney Water main. The OSD basin has sufficient capacity to attenuate flows up to and including the 1 in 100 Year ARI event, in normal operating circumstances and will not result in overland flows. The basin has been oversized to attenuate storm events up to and included the 1 in 100 Year ARI event which greater than the requirements of Lake Macquarie Development Control Plan 2014 which only requires attenuation of the 1 in 20 Year ARI event

Data

The detailed hydrology data for the TTW Stormwater Report have not been included in the report, because it was considered more detail than was necessary. However, the conclusions of the report are based on detailed modelling specific to the HammondCare proposal. An additional report, outlining hydrology parameters adopted, can be produced should it be necessary.

Flood impact assessment

Flood modelling

TTW flood modelling, which is based on the information provided by GHD, is shown to have beneficial or neutral impact on the Misonpet site.

The hydrology used for the flood modelling, as opposed to the stormwater modelling, was done by GHD. .We have been provided with a further hydrology report prepared by GHD dated 22 February 2017 (attached at Annexure A). There are differences in the catchments shown in this report with the GHD report issued to Council (GHD report Macquarie Road, Cardiff Flood Impact Assessment, June 2016). GHD's subsequent hydrology report and corresponding catchments are a result of a more detailed analysis. The more detailed analysis does not change the report's conclusions

Distribution between channel and culverts

As explained earlier in this letter, the overland flood flow through the HammondCare site is managed via an open channel, which is designed to take flows from a Council network (including pipes) upstream, which is south of the HammondCare site, as well as other overland flows on the HammondCare site.

Council's pipes have been calculated to take all storm flows up to and including the 1 in 100 Year ARI event. Flows larger than the 1 in 100 Year ARI event will enter the HammondCare site as overland flow. Once this overland flow enters the HammondCare site, it is captured and conveyed separately to the open channel downstream to the northern boundary of the HammondCare site.

A review based on the sensitivity of the flood level in the channel has not been undertaken. As there is limited past flood data, a sensitivity analysis is difficult to compare against and becomes subjective.

Relationship to Misonpet land

The Dibbs Barker letters suggest that the HammondCare proposal somehow relies on the Misonpet land as a water detention facility. We do not think that is the case at all. As explained in this letter:

- the proposed OSD system will control flow from any additional runoff so that there is actually a much lower flow rate onto the Misonpet site than the current situation (see Table 1 of the TTW Stormwater Report); and
- apart from this, the drainage system once the HammondCare proposal is operating will be essentially similar to the existing situation.

Australian Rainfall & Runoff data

Dr Phillips is concerned that the development continues to be assessed against the 2001 Australian Rainfall & Runoff data, when this data was updated in November 2016. He has not said that this has resulted in any underestimate of hydrology impacts, and we are not aware that it does cause any underestimate. At the time of submitting the development application for the project in May 2015, the 2001 data was current.

In our experience, it is appropriate to continue with base data throughout a development application process, even if the data set is updated during that process.

As the stormwater design for the proposed development exceeds the minimum requirements by a significant amount specified by Council, our opinion is that it is unlikely that increased intensities would lead to not meeting the minimum requirements.

Comments by Dr Brett Phillips

The Dibbs Barker letters attach some comments on the hydrology assessments for the HammondCare proposal from Dr Brett Philips at Cardno. TTW has reviewed these comments and consider that those comments do not alter anything set out in this letter.

Draft Council condition 7

In our opinion, the current design as presented will lead to compliance with Council draft consent condition 7.

Yours faithfully
TAYLOR THOMSON WHITTING (NSW) PTY LTD

Kelvin Holey
Civil Associate

P:\2014\1411\141125\Letters\Secure\Clayton Utz\20170412 Letter to Clayton Utz - Misonpet Response.kh.docx

A. **ANNEXURE A: GHD hydrology report and catchment parameters**

22 February 2017

HammondCare
c/o Richard Abbott
10 Murrua Rd,
North Turramurra
NSW 2074

Our ref: 22/17163
16722

Your ref:

Dear Richard

HammondCare Cardiff
Flood Assessment - Hydrology

1 Background

GHD was commissioned by the client to provide a Flood Impact Assessment to support Development Applications (DA) at a proposed Age Care site on Macquarie Road, Cardiff (hereafter called 'site'). The site is located east of Macquarie Road at the location of the current Lymington Park Golf Driving Range. It is located in the upper reaches of a north-draining Winding Creek tributary.

The purpose of this report is to provide a summary of the hydrological compiled for the site, which was applied as inflows to the flood modelling at the site.

2 Hydrology

2.1 General

Hydrology for the site was compiled using a WBNM model which was simulated with the same hydrological parameters as used in the *Winding Creek and Lower Cockle Creek Flood Study*, Lake Macquarie City Council (August 2013). Simulations were undertaken for the 20-year, 100-year and PMF events, and flood levels were validated against flood levels documented in the *Winding Creek and Lower Cockle Creek Flood Study* for the Lymington Park Sports field.

2.2 WBNM Model Configuration

Compilation of the WBNM model comprised:

- The catchments draining to the site were discretised into sub-catchments to represent inflows from west of Macquarie Road, residential areas upstream (south), residential areas east of the site and a catchment representing the site itself. Catchment delineation was based on the topography and developments in the proximity of the site. A total of 20 sub-catchments were delineated.
- Catchment parameters were determination, namely sub-catchment area, impervious fractions and general model topology.

GHD Pty Ltd ABN 39 008 488 373
Level 3 GHD Tower 24 Honeysuckle Drive Newcastle NSW 2300 PO Box 5403 Hunter Region Mail Centre NSW 2310 Australia
T 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com

- Estimations of pervious and impervious areas were compiled for each sub-catchment. To represent the rural nature of the catchments nearer to the catchment boundary, a 5% impervious fraction was assumed.
- Design rainfall was derived from the Australian Rainfall and Runoff 2001, given the time at which the study was undertaken.

Catchment maps and sub-catchment delineation have been attached.

2.3 Design Rainfall

2.3.1 Intensity Frequency duration (IFD)

Design rainfall events were derived in accordance with the procedures of the Australian Rainfall and Runoff, Region 2 (AR&R 2001). The Intensity Frequency Duration parameters adopted are listed in the table below.

Table 1 IFD Parameters

AR&R Parameters	Value
2yr 1hr (ARI, duration)	33.88
2yr 12hr (ARI, duration)	7.2
2yr 72 hr (ARI, duration)	2.41
50yr 1hr (ARI, duration)	64.76
50yr 12hr (ARI, duration)	14.63
50yr 72 hr (ARI, duration)	5.06
Skew	0.02
F2 Value	4.31
F50 Value	15.96

2.3.2 PMF

Given the size of catchment and recommended BOM thresholds, the Probable Maximum Precipitation was compiled using the Bureau of Meteorology Australia Generalised Short Duration Method (BOM 2003). The PMP rainfall depths, derived for a range of durations using this method, are tabulated below. Rainfall spatial distribution was applied to the WBNM model as per the method specified in the estimation of Probable Maximum Precipitation in Australia: Generalised Short-Duration Method (BOM 2003).

2.3.3 Rainfall Losses

Rainfall losses were adopted in accordance with the Australian Rainfall and Runoff, as tabulated below.

Table 2 Rainfall losses

Event	Initial Loss	Continuing Loss
Up to and including the 1% AEP event	10 mm	2.5 mm/hr
PMF	0 mm	0.1 mm/hr

2.3.4 WBNM Parameters

The WBNM model was not calibrated due to the lack of concurrent pluviographic rainfall and runoff data. The WBNM C value of 1.7 was adopted as recommended in the *Winding Creek and Lower Cockle Creek Flood Study*. This is close to the default C value of 1.6, which simulates the shorter lag times associated with developed catchments.

2.3.5 Validation

Since the *Winding Creek and Lower Cockle Creek Flood Study* did not list the inflow peaks near John Street, and since this part of the study was coarsely represented as a single sub-catchment, a comparison of flood peaks was not possible. However, subsequent flood modelling using TUFLOW and the derived flood peaks showed favourable agreement of the *Winding Creek and Lower Cockle Creek Flood Study* flood levels, at the location of the playing field downstream of the site.

3 Flood Hydrographs

The WBNM model was simulated together with design rainfall and rainfall loss estimates in accordance with the Australian Rainfall and Runoff. The model was simulated for a range of durations ranging up to 6 hours. For each event the critical duration was reported, being the duration at which the peak flood flow occurs in this instance. Detailed model results listings are attached, with a summary of flood peaks provided below.

Table 3 Summary of Flood Peaks for Critical Event

Location	20-year ARI Event (2hr storm)	100-year ARI Event (2hr storm)	PMF Event (0.75hr storm)
Inflow at southern site boundary	1.7 m^3/s	2.3 m^3/s	12.1 m^3/s
At John Street and model outlet	10.0 m^3/s	13.5 m^3/s	90.7 m^3/s

Sincerely
GHD Pty Ltd

Rainer Berg
Principal
(02) 8898 8815

Scale Bar

Map projection: Transverse Mecator
Horizontal datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Legend

- Proposed Development
- 2m Contours

Hammondcare
Age Care, Cardiff

2217163
2017.02.21

Hydrology
Catchment Areas

Figure 1

6/20 Smith St, Parramatta NSW 2150, (02) 8898 8800 www.ghd.com

```
#####START_QA_SUMMARY_FILE################################################

G:\22\17163\Technical\WBNM\22_17163_Cardiff_WBNM_020yr_2hr.wbn
Program run at 13: 4 on   1  4 2015  (ddmmyy)

 Webb McKeown and Associates Pty Ltd
 Water and Environment Consulting Engineers
 level 2, 160 Clarence Street
 Sydeny
 NSW
 Australia
 2000
 +61 2 92992855
 +61 2 92626208
 wma@webbmckeown.com.au
 EJT
  wbnm.ifd

 out_metafile= T
 out_culverts= F
 out_scourable= F
 sum_catchments= T
 sum_volumes= T
 sum_outlet_structures= T
 sum_local_structures= T
 sum_subareas= F
 sum_depths= F
 sum_Qpeaks= T
 sum_Tpeaks= T
 sum_multiStorms= F
 dbg_run= F
 dbg_echo= F
 dbg_edit= F
 dbg_ifd= F
 trig_flowmin= 5

#####START_PREAMBLE_BLOCK##########|###########|###########|###########|
Project Number: Hammond Aged Care
Project Description: Model For Cardiff Aged Care, NSW
Incldues surrounding urban area to Downstream of basin
RUNFILE: G:\22\17163\Technical\WBNM\22_17163_Cardiff_WBNM_020yr_2hr.wbn
DES Storm ARI (Env ARI):     20()
DES Burst Dura (Env Dura):   120()
Constructed using iWBNM_2006
Max 8 lines of text
#####END_PREAMBLE_BLOCK############|###########|###########|###########|


#####START_STATUS_BLOCK############|###########|###########|###########|

last edited on 1/04/2015 1:04:03 PM
by Sam Douglas
2003_V103
#####END_STATUS_BLOCK##############|###########|###########|###########|
```

```
#####START_DISPLAY_BLOCK###########|###########|###########|###########|
         0.0         0.0         0.0         0.0
         none
                  0.0         0.0         0.0         0.0         0.0         0.0
#####END_DISPLAY_BLOCK#############|###########|###########|###########|


#####START_TOPOLOGY_BLOCK##########|###########|###########|###########|
          22
F                    0.0         0.0         0.0         0.0 K
K                    0.0         0.0         0.0         0.0 R
H                    0.0         0.0         0.0         0.0 J
E                    0.0         0.0         0.0         0.0 G
G                    0.0         0.0         0.0         0.0 J
J                    0.0         0.0         0.0         0.0 R
I                    0.0         0.0         0.0         0.0 R
R                    0.0         0.0         0.0         0.0 S
S                    0.0         0.0         0.0         0.0 T
D                    0.0         0.0         0.0         0.0 T
A                    0.0         0.0         0.0         0.0 B
B                    0.0         0.0         0.0         0.0 C
C                    0.0         0.0         0.0         0.0 T
T                    0.0         0.0         0.0         0.0 U
Q                    0.0         0.0         0.0         0.0 U
O                    0.0         0.0         0.0         0.0 P
N                    0.0         0.0         0.0         0.0 P
L                    0.0         0.0         0.0         0.0 M
M                    0.0         0.0         0.0         0.0 P
P                    0.0         0.0         0.0         0.0 U
U                    0.0         0.0         0.0         0.0 V
V                    0.0         0.0         0.0         0.0 SINK
#####END_TOPOLOGY_BLOCK############|###########|###########|###########|


#####START_SURFACES_BLOCK##########|###########|###########|###########|
        0.77
       -1.00
F                   1.35        65.0        1.70        0.10
K                   0.45        80.0        1.70        0.10
H                   0.28        50.0        1.70        0.10
E                   4.52         5.0        1.70        0.10
G                   2.38        80.0        1.70        0.10
J                   1.62        80.0        1.70        0.10
I                   0.11        50.0        1.70        0.10
R                   2.55         5.0        1.70        0.10
S                   3.40         5.0        1.70        0.10
D                   2.49        65.0        1.70        0.10
A                   3.98        50.0        1.70        0.10
B                   6.67        50.0        1.70        0.10
C                   2.75        65.0        1.70        0.10
T                   5.71         5.0        1.70        0.10
Q                   1.37        80.0        1.70        0.10
O                   4.09        80.0        1.70        0.10
N                   1.16        80.0        1.70        0.10
```

```
L                    5.55        80.0        1.70        0.10
M                    0.45        40.0        1.70        0.10
P                    3.75        10.0        1.70        0.10
U                    7.58        65.0        1.70        0.10
V                   14.08        50.0        1.70        0.10
#####END_SURFACES_BLOCK############|############|############|############|


#####START_FLOWPATHS_BLOCK#########|############|############|############|
          22
F
#####ROUTING
        1.00
K
#####ROUTING
        1.00
H
#####ROUTING
        1.00
E
#####ROUTING
        1.00
G
#####ROUTING
        1.00
J
#####ROUTING
        1.00
I
#####ROUTING
        1.00
R
#####ROUTING
        1.00
S
#####ROUTING
        1.00
D
#####ROUTING
        1.00
A
#####ROUTING
        1.00
B
#####ROUTING
        1.00
C
#####ROUTING
        1.00
T
#####ROUTING
        1.00
Q
#####ROUTING
        1.00
```

```
O
#####ROUTING
        1.00
N
#####ROUTING
        1.00
L
#####ROUTING
        1.00
M
#####ROUTING
        1.00
P
#####ROUTING
        1.00
U
#####ROUTING
        1.00
V
#####ROUTING
        1.00
#####END_FLOWPATHS_BLOCK###########|###########|###########|###########|


#####START_LOCAL_STRUCTURES_BLOCK##|###########|###########|###########|
          0
#####END_LOCAL_STRUCTURES_BLOCK####|###########|###########|###########|


#####START_OUTLET_STRUCTURES_BLOCK#|###########|###########|###########|
          0
#####END_OUTLET_STRUCTURES_BLOCK###|###########|###########|###########|


#####START_STORM_BLOCK#############|###########|###########|###########|
          1
#####START_STORM#1
20 Year ARI 120 Mins Duration DESIGN STORM
        1.00
        1.00
#####START_DESIGN_RAIN
          20         120      -99.90
IFD_COEFFS_IN_THIS_FILE
          1
N_Cardiff              1UNKNOWN             0.00        0.00       30.00
33.80        7.22        2.41       64.76       14.63        5.06        4.32
15.96        0.02     1165.00          25        0.73
#####END_DESIGN_RAIN
#####START_CALC_RAINGAUGE_WEIGHTS
#####END_CALC_RAINGAUGE_WEIGHTS
#####START_LOSS_RATES
F                  10.00        2.50        2.50
K                  10.00        2.50        2.50
H                  10.00        2.50        2.50
E                  10.00        2.50        2.50
```

```
G                   10.00        2.50        2.50
J                   10.00        2.50        2.50
I                   10.00        2.50        2.50
R                   10.00        2.50        2.50
S                   10.00        2.50        2.50
D                   10.00        2.50        2.50
A                   10.00        2.50        2.50
B                   10.00        2.50        2.50
C                   10.00        2.50        2.50
T                   10.00        2.50        2.50
Q                   10.00        2.50        2.50
O                   10.00        2.50        2.50
N                   10.00        2.50        2.50
L                   10.00        2.50        2.50
M                   10.00        2.50        2.50
P                   10.00        2.50        2.50
U                   10.00        2.50        2.50
V                   10.00        2.50        2.50
#####END_LOSS_RATES
#####START_RECORDED_HYDROGRAPHS
           0
#####END_RECORDED_HYDROGRAPHS
#####START_IMPORTED_HYDROGRAPHS
           0
#####END_IMPORTED_HYDROGRAPHS
#####END_STORM#1

#####START_RESULTS_STORM_1

#####START_HYDROGRAPHS_V
    Time    Rain  Rainperv    Qtop      Qbot      Qper      Qimp    Qinto_OS
    Qout_OS  Stage
      0.0    0.00    0.00     0.000     0.000     0.000     0.000     0.000
      0.000     0.000
      1.0   19.49    0.00     0.000     0.000     0.000     0.000     0.000
      0.000     0.000
      2.0   19.49    0.00     0.000     0.000     0.000     0.000     0.000
      0.000     0.000
      3.0   19.49    0.00     0.000     0.000     0.000     0.000     0.000
      0.000     0.000
      4.0   19.49    0.00     0.000     0.000     0.000     0.000     0.000
      0.000     0.000
      5.0   19.49    0.00     0.000     0.000     0.000     0.000     0.000
      0.000     0.000
      6.0   46.94    0.00     0.000     0.000     0.000     0.000     0.000
      0.000     0.000
      7.0   46.94    0.00     0.107     0.000     0.000     0.140     0.141
      0.141     0.000
      8.0   46.94    0.00     0.210     0.003     0.000     0.276     0.278
      0.278     0.000
      9.0   46.94    0.00     0.295     0.007     0.000     0.387     0.395
      0.395     0.000
     10.0   46.94    0.00     0.368     0.015     0.000     0.479     0.494
     0.494     0.000
     11.0   27.46    0.00     0.381     0.024     0.000     0.489     0.513
```

0.513	0.000						
12.0	27.46	0.00	0.395	0.034	0.000	0.498	0.532
0.532	0.000						
13.0	27.46	0.00	0.411	0.045	0.000	0.505	0.550
0.550	0.000						
14.0	27.46	0.00	0.429	0.058	0.000	0.510	0.568
0.568	0.000						
15.0	27.46	0.00	0.450	0.070	0.000	0.515	0.585
0.585	0.000						
16.0	43.40	0.00	0.516	0.085	0.000	0.573	0.658
0.658	0.000						
17.0	43.40	0.00	0.578	0.102	0.000	0.621	0.723
0.723	0.000						
18.0	43.40	0.00	0.639	0.121	0.000	0.660	0.782
0.782	0.000						
19.0	43.40	40.55	0.707	0.143	0.013	0.693	0.849
0.849	0.000						
20.0	43.40	40.90	0.780	0.168	0.031	0.720	0.920
0.920	0.000						
21.0	85.03	82.53	0.984	0.199	0.077	0.884	1.160
1.160	0.000						
22.0	85.03	82.53	1.185	0.238	0.129	1.019	1.386
1.386	0.000						
23.0	85.03	82.53	1.385	0.287	0.183	1.131	1.601
1.601	0.000						
24.0	85.03	82.53	1.591	0.345	0.240	1.224	1.809
1.809	0.000						
25.0	85.03	82.53	1.806	0.413	0.297	1.300	2.010
2.010	0.000						
26.0	46.06	43.56	1.908	0.489	0.321	1.231	2.041
2.041	0.000						
27.0	46.06	43.56	2.031	0.569	0.344	1.173	2.087
2.087	0.000						
28.0	46.06	43.56	2.171	0.655	0.367	1.126	2.148
2.148	0.000						
29.0	46.06	43.56	2.326	0.748	0.389	1.087	2.223
2.223	0.000						
30.0	46.06	43.56	2.492	0.847	0.410	1.054	2.311
2.311	0.000						
31.0	159.43	156.93	3.036	0.964	0.536	1.413	2.913
2.913	0.000						
32.0	159.43	156.93	3.571	1.112	0.662	1.709	3.484
3.484	0.000						
33.0	159.43	156.93	4.108	1.290	0.788	1.954	4.032
4.032	0.000						
34.0	159.43	156.93	4.656	1.499	0.911	2.156	4.566
4.566	0.000						
35.0	159.43	156.93	5.224	1.738	1.031	2.323	5.093
5.093	0.000						
36.0	109.83	107.33	5.646	2.005	1.092	2.293	5.389
5.389	0.000						
37.0	109.83	107.33	6.098	2.292	1.149	2.268	5.709
5.709	0.000						
38.0	109.83	107.33	6.574	2.601	1.204	2.247	6.052
6.052	0.000						

39.0	109.83	107.33	7.068	2.932	1.256	2.230	6.418	
6.418	0.000							
40.0	109.83	107.33	7.574	3.286	1.306	2.215	6.807	
6.807	0.000							
41.0	49.60	47.10	7.878	3.653	1.283	1.999	6.934	
6.934	0.000							
42.0	49.60	47.10	8.185	4.022	1.262	1.820	7.104	
7.104	0.000							
43.0	49.60	47.10	8.483	4.394	1.242	1.672	7.308	
7.308	0.000							
44.0	49.60	47.10	8.763	4.765	1.223	1.550	7.538	
7.538	0.000							
45.0	49.60	47.10	9.017	5.133	1.206	1.449	7.788	
7.788	0.000							
46.0	27.46	24.96	9.168	5.492	1.164	1.291	7.947	
7.947	0.000							
47.0	27.46	24.96	9.293	5.836	1.126	1.160	8.122	
8.122	0.000							
48.0	27.46	24.96	9.387	6.163	1.089	1.052	8.303	
8.303	0.000							
49.0	27.46	24.96	9.451	6.467	1.055	0.962	8.484	
8.484	0.000							
50.0	27.46	24.96	9.486	6.750	1.024	0.888	8.662	
8.662	0.000							
51.0	29.23	26.73	9.495	7.011	0.996	0.833	8.840	
8.840	0.000							
52.0	29.23	26.73	9.480	7.248	0.970	0.788	9.006	
9.006	0.000							
53.0	29.23	26.73	9.444	7.462	0.945	0.750	9.157	
9.157	0.000							
54.0	29.23	26.73	9.388	7.652	0.922	0.719	9.293	
9.293	0.000							
55.0	29.23	26.73	9.315	7.818	0.900	0.694	9.411	
9.411	0.000							
56.0	37.20	34.70	9.256	7.962	0.888	0.699	9.549	
9.549	0.000							
57.0	37.20	34.70	9.183	8.085	0.877	0.704	9.667	
9.667	0.000							
58.0	37.20	34.70	9.101	8.190	0.866	0.708	9.764	
9.764	0.000							
59.0	37.20	34.70	9.012	8.272	0.856	0.712	9.840	
9.840	0.000							
60.0	37.20	34.70	8.914	8.338	0.847	0.714	9.900	
9.900	0.000							
61.0	38.09	35.59	8.816	8.388	0.839	0.720	9.947	
9.947	0.000							
62.0	38.09	35.59	8.716	8.425	0.832	0.724	9.981	
9.981	0.000							
63.0	38.09	35.59	8.616	8.448	0.825	0.728	10.000	
10.000	0.000							
64.0	38.09	35.59	8.516	8.459	0.818	0.731	10.008	
10.008	0.000							
65.0	38.09	35.59	8.417	8.460	0.812	0.733	10.005	
10.005	0.000							
66.0	18.60	16.10	8.255	8.448	0.786	0.669	9.903	

9.903	0.000						
67.0	18.60	16.10	8.097	8.422	0.761	0.616	9.799
9.799	0.000						
68.0	18.60	16.10	7.940	8.383	0.738	0.572	9.693
9.693	0.000						
69.0	18.60	16.10	7.785	8.334	0.716	0.536	9.586
9.586	0.000						
70.0	18.60	16.10	7.631	8.274	0.695	0.506	9.475
9.475	0.000						
71.0	19.49	16.99	7.481	8.206	0.677	0.484	9.367
9.367	0.000						
72.0	19.49	16.99	7.332	8.130	0.659	0.466	9.255
9.255	0.000						
73.0	19.49	16.99	7.184	8.047	0.643	0.451	9.141
9.141	0.000						
74.0	19.49	16.99	7.038	7.955	0.627	0.439	9.022
9.022	0.000						
75.0	19.49	16.99	6.893	7.858	0.613	0.429	8.900
8.900	0.000						
76.0	30.12	27.62	6.785	7.758	0.609	0.457	8.824
8.824	0.000						
77.0	30.12	27.62	6.679	7.658	0.606	0.480	8.744
8.744	0.000						
78.0	30.12	27.62	6.575	7.558	0.603	0.499	8.659
8.659	0.000						
79.0	30.12	27.62	6.475	7.458	0.600	0.514	8.572
8.572	0.000						
80.0	30.12	27.62	6.379	7.358	0.597	0.527	8.482
8.482	0.000						
81.0	16.83	14.33	6.243	7.257	0.581	0.493	8.331
8.331	0.000						
82.0	16.83	14.33	6.114	7.153	0.567	0.464	8.184
8.184	0.000						
83.0	16.83	14.33	5.990	7.048	0.553	0.441	8.041
8.041	0.000						
84.0	16.83	14.33	5.870	6.941	0.539	0.422	7.902
7.902	0.000						
85.0	16.83	14.33	5.754	6.833	0.527	0.405	7.766
7.766	0.000						
86.0	10.63	8.13	5.621	6.725	0.509	0.371	7.605
7.605	0.000						
87.0	10.63	8.13	5.492	6.614	0.493	0.343	7.449
7.449	0.000						
88.0	10.63	8.13	5.366	6.502	0.477	0.319	7.299
7.299	0.000						
89.0	10.63	8.13	5.242	6.390	0.462	0.300	7.152
7.152	0.000						
90.0	10.63	8.13	5.122	6.277	0.448	0.284	7.009
7.009	0.000						
91.0	8.86	6.36	4.997	6.164	0.433	0.265	6.861
6.861	0.000						
92.0	8.86	6.36	4.876	6.050	0.419	0.249	6.717
6.717	0.000						
93.0	8.86	6.36	4.756	5.936	0.405	0.236	6.577
6.577	0.000						

94.0	8.86	6.36	4.639	5.822	0.393	0.225	6.440
6.440	0.000						
95.0	8.86	6.36	4.525	5.709	0.381	0.216	6.305
6.305	0.000						
96.0	20.37	17.87	4.449	5.597	0.379	0.248	6.224
6.224	0.000						
97.0	20.37	17.87	4.374	5.490	0.378	0.274	6.141
6.141	0.000						
98.0	20.37	17.87	4.301	5.385	0.377	0.295	6.058
6.058	0.000						
99.0	20.37	17.87	4.230	5.285	0.376	0.313	5.974
5.974	0.000						
100.0	20.37	17.87	4.162	5.187	0.374	0.328	5.890
5.890	0.000						
101.0	7.97	5.47	4.057	5.091	0.363	0.298	5.752
5.752	0.000						
102.0	7.97	5.47	3.958	4.995	0.351	0.273	5.619
5.619	0.000						
103.0	7.97	5.47	3.864	4.899	0.341	0.253	5.492
5.492	0.000						
104.0	7.97	5.47	3.773	4.803	0.331	0.236	5.370
5.370	0.000						
105.0	7.97	5.47	3.685	4.709	0.321	0.222	5.252
5.252	0.000						
106.0	11.51	9.01	3.612	4.616	0.315	0.223	5.154
5.154	0.000						
107.0	11.51	9.01	3.541	4.526	0.309	0.223	5.058
5.058	0.000						
108.0	11.51	9.01	3.472	4.438	0.303	0.223	4.964
4.964	0.000						
109.0	11.51	9.01	3.404	4.351	0.298	0.224	4.873
4.873	0.000						
110.0	11.51	9.01	3.339	4.267	0.293	0.224	4.784
4.784	0.000						
111.0	9.74	7.24	3.271	4.185	0.286	0.218	4.689
4.689	0.000						
112.0	9.74	7.24	3.204	4.104	0.280	0.213	4.598
4.598	0.000						
113.0	9.74	7.24	3.140	4.025	0.274	0.209	4.509
4.509	0.000						
114.0	9.74	7.24	3.078	3.948	0.269	0.206	4.423
4.423	0.000						
115.0	9.74	7.24	3.018	3.872	0.264	0.203	4.339
4.339	0.000						
116.0	12.40	9.90	2.969	3.799	0.261	0.210	4.270
4.270	0.000						
117.0	12.40	9.90	2.921	3.728	0.258	0.216	4.202
4.202	0.000						
118.0	12.40	9.90	2.874	3.659	0.256	0.220	4.135
4.135	0.000						
119.0	12.40	9.90	2.829	3.592	0.253	0.224	4.069
4.069	0.000						
120.0	12.40	9.90	2.786	3.527	0.251	0.227	4.006
4.006	0.000						
121.0	0.00	0.00	2.706	3.463	0.241	0.188	3.892

3.892	0.000						
122.0	0.00	0.00	2.632	3.398	0.231	0.155	3.785
3.785	0.000						
123.0	0.00	0.00	2.560	3.333	0.222	0.128	3.683
3.683	0.000						
124.0	0.00	0.00	2.492	3.268	0.213	0.106	3.587
3.587	0.000						
125.0	0.00	0.00	2.426	3.203	0.205	0.088	3.495
3.495	0.000						
126.0	0.00	0.00	2.361	3.138	0.197	0.072	3.407
3.407	0.000						
127.0	0.00	0.00	2.298	3.073	0.189	0.060	3.322
3.322	0.000						
128.0	0.00	0.00	2.236	3.009	0.182	0.049	3.240
3.240	0.000						
129.0	0.00	0.00	2.175	2.945	0.175	0.041	3.161
3.161	0.000						
130.0	0.00	0.00	2.115	2.882	0.169	0.034	3.085
3.085	0.000						
131.0	0.00	0.00	2.057	2.820	0.162	0.028	3.010
3.010	0.000						
132.0	0.00	0.00	1.999	2.758	0.157	0.023	2.938
2.938	0.000						
133.0	0.00	0.00	1.942	2.697	0.151	0.019	2.867
2.867	0.000						
134.0	0.00	0.00	1.886	2.636	0.145	0.016	2.797
2.797	0.000						
135.0	0.00	0.00	1.831	2.577	0.140	0.013	2.730
2.730	0.000						
136.0	0.00	0.00	1.777	2.518	0.135	0.011	2.663
2.663	0.000						
137.0	0.00	0.00	1.725	2.459	0.130	0.009	2.598
2.598	0.000						
138.0	0.00	0.00	1.673	2.402	0.126	0.007	2.535
2.535	0.000						
139.0	0.00	0.00	1.623	2.345	0.121	0.006	2.472
2.472	0.000						
140.0	0.00	0.00	1.574	2.289	0.117	0.005	2.411
2.411	0.000						
141.0	0.00	0.00	1.526	2.234	0.113	0.004	2.351
2.351	0.000						
142.0	0.00	0.00	1.479	2.180	0.109	0.003	2.293
2.293	0.000						
143.0	0.00	0.00	1.433	2.126	0.106	0.003	2.235
2.235	0.000						
144.0	0.00	0.00	1.389	2.074	0.102	0.002	2.179
2.179	0.000						
145.0	0.00	0.00	1.346	2.023	0.099	0.002	2.123
2.123	0.000						
146.0	0.00	0.00	1.304	1.972	0.096	0.002	2.069
2.069	0.000						
147.0	0.00	0.00	1.263	1.922	0.092	0.001	2.016
2.016	0.000						
148.0	0.00	0.00	1.224	1.874	0.089	0.001	1.964
1.964	0.000						

149.0	0.00	0.00	1.186	1.826	0.087	0.001	1.914
1.914	0.000						
150.0	0.00	0.00	1.149	1.779	0.084	0.000	1.863
1.863	0.000						
151.0	0.00	0.00	1.113	1.734	0.081	0.000	1.815
1.815	0.000						
152.0	0.00	0.00	1.078	1.689	0.079	0.000	1.768
1.768	0.000						
153.0	0.00	0.00	1.045	1.645	0.076	0.000	1.722
1.722	0.000						
154.0	0.00	0.00	1.012	1.603	0.074	0.000	1.676
1.676	0.000						
155.0	0.00	0.00	0.981	1.561	0.072	0.000	1.632
1.632	0.000						
156.0	0.00	0.00	0.950	1.520	0.069	0.000	1.590
1.590	0.000						
157.0	0.00	0.00	0.921	1.480	0.067	0.000	1.548
1.548	0.000						
158.0	0.00	0.00	0.892	1.442	0.065	0.000	1.507
1.507	0.000						
159.0	0.00	0.00	0.865	1.404	0.063	0.000	1.467
1.467	0.000						
160.0	0.00	0.00	0.838	1.367	0.061	0.000	1.428
1.428	0.000						
161.0	0.00	0.00	0.813	1.331	0.060	0.000	1.391
1.391	0.000						
162.0	0.00	0.00	0.788	1.296	0.058	0.000	1.354
1.354	0.000						
163.0	0.00	0.00	0.764	1.262	0.056	0.000	1.318
1.318	0.000						
164.0	0.00	0.00	0.741	1.228	0.055	0.000	1.283
1.283	0.000						
165.0	0.00	0.00	0.718	1.196	0.053	0.000	1.249
1.249	0.000						
166.0	0.00	0.00	0.696	1.165	0.051	0.000	1.216
1.216	0.000						
167.0	0.00	0.00	0.676	1.134	0.050	0.000	1.184
1.184	0.000						
168.0	0.00	0.00	0.655	1.104	0.049	0.000	1.153
1.153	0.000						
169.0	0.00	0.00	0.636	1.075	0.047	0.000	1.122
1.122	0.000						
170.0	0.00	0.00	0.617	1.047	0.046	0.000	1.093
1.093	0.000						
171.0	0.00	0.00	0.599	1.019	0.045	0.000	1.064
1.064	0.000						
172.0	0.00	0.00	0.581	0.993	0.043	0.000	1.036
1.036	0.000						
173.0	0.00	0.00	0.564	0.967	0.042	0.000	1.009
1.009	0.000						
174.0	0.00	0.00	0.548	0.941	0.041	0.000	0.983
0.983	0.000						
175.0	0.00	0.00	0.532	0.917	0.040	0.000	0.957
0.957	0.000						
176.0	0.00	0.00	0.517	0.893	0.039	0.000	0.932

```
    0.932     0.000
    177.0    0.00    0.00     0.502     0.870     0.038     0.000     0.908
    0.908     0.000
    178.0    0.00    0.00     0.487     0.847     0.037     0.000     0.884
    0.884     0.000
    179.0    0.00    0.00     0.474     0.825     0.036     0.000     0.861
    0.861     0.000
    180.0    0.00    0.00     0.460     0.804     0.035     0.000     0.839
    0.839     0.000
    181.0    0.00    0.00     0.447     0.783     0.034     0.000     0.817
    0.817     0.000
    182.0    0.00    0.00     0.435     0.763     0.033     0.000     0.797
    0.797     0.000
    183.0    0.00    0.00     0.422     0.744     0.032     0.000     0.776
    0.776     0.000
    184.0    0.00    0.00     0.411     0.725     0.032     0.000     0.756
    0.756     0.000
    185.0    0.00    0.00     0.399     0.706     0.031     0.000     0.737
    0.737     0.000
    186.0    0.00    0.00     0.388     0.688     0.030     0.000     0.718
    0.718     0.000
    187.0    0.00    0.00     0.378     0.671     0.029     0.000     0.700
    0.700     0.000
    188.0    0.00    0.00     0.367     0.654     0.028     0.000     0.683
    0.683     0.000
    189.0    0.00    0.00     0.357     0.638     0.028     0.000     0.665
    0.665     0.000
    190.0    0.00    0.00     0.348     0.622     0.027     0.000     0.649
    0.649     0.000
    191.0    0.00    0.00     0.338     0.606     0.026     0.000     0.633
    0.633     0.000
    192.0    0.00    0.00     0.329     0.591     0.026     0.000     0.617
    0.617     0.000
    193.0    0.00    0.00     0.320     0.576     0.025     0.000     0.602
    0.602     0.000
    194.0    0.00    0.00     0.312     0.562     0.025     0.000     0.587
    0.587     0.000
    195.0    0.00    0.00     0.304     0.548     0.024     0.000     0.572
    0.572     0.000
    196.0    0.00    0.00     0.296     0.535     0.023     0.000     0.558
    0.558     0.000
    197.0    0.00    0.00     0.288     0.522     0.023     0.000     0.545
    0.545     0.000
    198.0    0.00    0.00     0.280     0.509     0.022     0.000     0.531
    0.531     0.000
    199.0    0.00    0.00     0.273     0.497     0.022     0.000     0.518
    0.518     0.000
    200.0    0.00    0.00     0.266     0.485     0.021     0.000     0.506
    0.506     0.000
    201.0    0.00    0.00     0.259     0.473     0.021     0.000     0.494
    0.494     0.000
#####END_HYDROGRAPHS_V

#####START_CATCHMENT_SUMMARY################################################
```

```
Catchment area   (hectares) =        76.29
Impervious percent      (%) =        47.75
Rainfall depth         (mm) =        73.81
Excess rainfall        (mm) =        65.17
Calc. runoff depth     (mm) =        65.34  - from bottom subarea
Recd. runoff depth     (mm) =         0.00  - from bottom subarea
Calc. peak discharge (m3/s) =        10.008 - from bottom subarea
Recd. peak discharge (m3/s) =         0.000 - from bottom subarea
#####END_CATCHMENT_SUMMARY##################################################


#####START_VOLUME_SUMMARY#####################################################
#############
SUBAREA DIRECTED IMPORTED      LOCAL       LOCAL    DIRECTED    IMPORTED
OUTFLOW     BALANCE
          TO TOP   TO TOP   PERVIOUS  IMPERVIOUS   TO BOTTOM   TO BOTTOM
                  (Volumes in thousands m3)
          F
       0.000       0.000       0.280       0.626       0.000       0.000
       0.906       0.000
K
       0.906       0.000       0.053       0.257       0.000       0.000
       1.215       0.001
H
       0.000       0.000       0.083       0.100       0.000       0.000
       0.183       0.000
E
       0.000       0.000       2.562       0.161       0.000       0.000
       2.723       0.000
G
       2.723       0.000       0.282       1.358       0.000       0.000
       4.364      -0.001
J
       4.546       0.000       0.192       0.924       0.000       0.000
       5.664      -0.002
I
       0.000       0.000       0.032       0.039       0.000       0.000
       0.072       0.000
R
       6.951       0.000       1.443       0.091       0.000       0.000
       8.488      -0.004
S
       8.488       0.000       1.926       0.121       0.000       0.000
       10.541      -0.006
D
       0.000       0.000       0.518       1.154       0.000       0.000
       1.672       0.000
A
       0.000       0.000       1.185       1.419       0.000       0.000
       2.604       0.000
B
       2.604       0.000       1.988       2.378       0.000       0.000
       6.971      -0.001
C
       6.971       0.000       0.572       1.275       0.000       0.000
```

```
       8.823      -0.005
T
      21.035       0.000       3.238       0.204       0.000       0.000
      24.494      -0.018
Q
       0.000       0.000       0.162       0.781       0.000       0.000
       0.944       0.000
O
       0.000       0.000       0.486       2.333       0.000       0.000
       2.819       0.000
N
       0.000       0.000       0.137       0.662       0.000       0.000
       0.799       0.000
L
       0.000       0.000       0.660       3.166       0.000       0.000
       3.826       0.000
M
       3.826       0.000       0.160       0.128       0.000       0.000
       4.114       0.000
P
       7.732       0.000       2.012       0.267       0.000       0.000
      10.016      -0.004
U
      35.453       0.000       1.580       3.513       0.000       0.000
      40.581      -0.034
V
      40.581       0.000       4.205       5.020       0.000       0.000
      49.848      -0.041
#####END_VOLUME_SUMMARY#########################################################
#############


#####START_PEAK_SUMMARY##########################################################
###
SUBAREA OUT_STR     STREAM    STREAM     LOCAL     LOCAL    DIRECTED
OUTLET_STRUCTURE
        1=exist        TOP    BOTTOM  PERVIOUS IMPERVIOUS  TO BOTTOM  INFLOW
        OUTFLOW
                 including                                 including
                                 imported to                                  imported
                 to
                      TOP                                    BOTTOM

                      (Discharges in m3/s)
F            0       0.000     0.000     0.139     0.337     0.000     0.474
0.474
K            0       0.474     0.422     0.033     0.145     0.000     0.568
0.568
H            0       0.000     0.000     0.049     0.059     0.000     0.108
0.108
E            0       0.000     0.000     0.899     0.093     0.000     0.970
0.970
G            0       0.970     0.791     0.140     0.694     0.000     1.415
1.415
J            0       1.503     1.319     0.100     0.485     0.000     1.738
```

1.738
I 0 0.000 0.000 0.021 0.024 0.000 0.045
0.045
R 0 2.337 2.021 0.572 0.054 0.000 2.530
2.530
S 0 2.530 2.256 0.720 0.071 0.000 2.789
2.789
D 0 0.000 0.000 0.241 0.597 0.000 0.821
0.821
A 0 0.000 0.000 0.487 0.723 0.000 1.144
1.144
B 0 1.144 0.771 0.738 1.168 0.000 2.497
2.497
C 0 2.497 2.128 0.263 0.655 0.000 2.799
2.799
T 0 5.887 5.252 1.074 0.116 0.000 6.098
6.098
Q 0 0.000 0.000 0.087 0.415 0.000 0.502
0.502
O 0 0.000 0.000 0.228 1.147 0.000 1.360
1.360
N 0 0.000 0.000 0.076 0.355 0.000 0.430
0.430
L 0 0.000 0.000 0.298 1.521 0.000 1.791
1.791
M 0 1.791 1.709 0.086 0.075 0.000 1.848
1.848
P 0 3.515 2.980 0.745 0.151 0.000 3.773
3.773
U 0 9.719 8.580 0.616 1.674 0.000 9.495
9.495
V 0 9.495 8.460 1.306 2.323 0.000 10.008
10.008
#####END_PEAK_SUMMARY###
###

#####START_TIME_SUMMARY###
SUBAREA OUT_STR STREAM STREAM LOCAL LOCAL DIRECTED OUTLET_STRUCTURE
1=exist TOP BOTTOM PERVIOUS IMPERVIOUS TO BOTTOM INFLOW OUTFLOW
(Times in minutes)
F 0 0.0 0.0 40.0 35.0 0.0 35.0 35.0
K 0 35.0 40.0 35.0 35.0 0.0 38.0 38.0
H 0 0.0 0.0 35.0 35.0 0.0 35.0 35.0
E 0 0.0 0.0 40.0 35.0 0.0 40.0 40.0
G 0 40.0 46.0 40.0 35.0 0.0 40.0 40.0
J 0 40.0 44.0 35.0 35.0 0.0 40.0 40.0
I 0 0.0 0.0 35.0 35.0 0.0 35.0 35.0
R 0 40.0 45.0 40.0 35.0 0.0 44.0 44.0
S 0 44.0 50.0 40.0 35.0 0.0 48.0 48.0
D 0 0.0 0.0 40.0 35.0 0.0 35.0 35.0
A 0 0.0 0.0 40.0 35.0 0.0 35.0 35.0
B 0 35.0 45.0 40.0 35.0 0.0 40.0 40.0
C 0 40.0 44.0 40.0 35.0 0.0 40.0 40.0
T 0 43.0 50.0 40.0 35.0 0.0 49.0 49.0

Q	0	0.0	0.0	35.0	35.0	0.0	35.0	35.0
O	0	0.0	0.0	40.0	35.0	0.0	35.0	35.0
N	0	0.0	0.0	35.0	35.0	0.0	35.0	35.0
L	0	0.0	0.0	40.0	35.0	0.0	35.0	35.0
M	0	35.0	40.0	35.0	35.0	0.0	40.0	40.0
P	0	38.0	42.0	40.0	35.0	0.0	41.0	41.0
U	0	45.0	53.0	40.0	35.0	0.0	51.0	51.0
V	0	51.0	65.0	40.0	35.0	0.0	64.0	64.0

#####END_TIME_SUMMARY##

#####START_OUTLET_STRUCTURE_SUMMARY###
SUBAREA INITIAL STORAGE (Volumes in thousands m3) INFLOW OUTFLOW FINAL STORAGE BALANCE

SUBAREA	INFLOW PEAK (m3/s)	OUTFLOW PEAK (m3/s)	INFLOW VOLUME (m3 E3)	MAX.VOL STORED (m3 E3)	MAX.WATER ELEVATION (metres)

#####END_OUTLET_STRUCTURE_SUMMARY###

#####START_LOCAL_STRUCTURE_SUMMARY###
SUBAREA INITIAL STORAGE (Volumes in thousands m3) INFLOW OUTFLOW FINAL STORAGE BALANCE

SUBAREA	INFLOW PEAK (m3/s)	OUTFLOW PEAK (m3/s)	INFLOW VOLUME (m3 E3)	MAX.VOL STORED (m3 E3)	MAX.WATER ELEVATION (metres)

#####END_LOCAL_STRUCTURE_SUMMARY###

#####END_RESULTS_STORM_1

#####END_QA_SUMMARY_FILE###

```
#####START_QA_SUMMARY_FILE################################################

G:\22\17163\Technical\WBNM\22_17163_Cardiff_WBNM_100yr_2hr.wbn
Program run at  9:57 on   1  4 2015  (ddmmyy)

 Webb McKeown and Associates Pty Ltd
 Water and Environment Consulting Engineers
 level 2, 160 Clarence Street
 Sydeny
 NSW
 Australia
 2000
 +61 2 92992855
 +61 2 92626208
 wma@webbmckeown.com.au
 EJT
  wbnm.ifd

 out_metafile= T
 out_culverts= F
 out_scourable= F
 sum_catchments= T
 sum_volumes= T
 sum_outlet_structures= T
 sum_local_structures= T
 sum_subareas= F
 sum_depths= F
 sum_Qpeaks= T
 sum_Tpeaks= T
 sum_multiStorms= F
 dbg_run= F
 dbg_echo= F
 dbg_edit= F
 dbg_ifd= F
 trig_flowmin= 5

#####START_PREAMBLE_BLOCK##########|###########|###########|###########|
Project Number: Hammond Aged Care
Project Description: Model For Cardiff Aged Care, NSW
Incldues surrounding urban area to Downstream of basin
RUNFILE: G:\22\17163\Technical\WBNM\22_17163_Cardiff_WBNM_100yr_2hr.wbn
DES Storm ARI (Env ARI):     100()
DES Burst Dura (Env Dura):   120()
Constructed using iWBNM_2006
Max 8 lines of text
#####END_PREAMBLE_BLOCK############|###########|###########|###########|


#####START_STATUS_BLOCK############|###########|###########|###########|

last edited on 1/04/2015 9:57:11 AM
by Sam Douglas
2003_V103
#####END_STATUS_BLOCK##############|###########|###########|###########|
```

```
#####START_DISPLAY_BLOCK###########|###########|###########|###########|
         0.0         0.0         0.0         0.0
         none
                  0.0         0.0         0.0         0.0         0.0         0.0
#####END_DISPLAY_BLOCK#############|###########|###########|###########|


#####START_TOPOLOGY_BLOCK##########|###########|###########|###########|
          22
F                    0.0         0.0         0.0         0.0 K
K                    0.0         0.0         0.0         0.0 R
H                    0.0         0.0         0.0         0.0 J
E                    0.0         0.0         0.0         0.0 G
G                    0.0         0.0         0.0         0.0 J
J                    0.0         0.0         0.0         0.0 R
I                    0.0         0.0         0.0         0.0 R
R                    0.0         0.0         0.0         0.0 S
S                    0.0         0.0         0.0         0.0 T
D                    0.0         0.0         0.0         0.0 T
A                    0.0         0.0         0.0         0.0 B
B                    0.0         0.0         0.0         0.0 C
C                    0.0         0.0         0.0         0.0 T
T                    0.0         0.0         0.0         0.0 U
Q                    0.0         0.0         0.0         0.0 U
O                    0.0         0.0         0.0         0.0 P
N                    0.0         0.0         0.0         0.0 P
L                    0.0         0.0         0.0         0.0 M
M                    0.0         0.0         0.0         0.0 P
P                    0.0         0.0         0.0         0.0 U
U                    0.0         0.0         0.0         0.0 V
V                    0.0         0.0         0.0         0.0 SINK
#####END_TOPOLOGY_BLOCK############|###########|###########|###########|


#####START_SURFACES_BLOCK##########|###########|###########|###########|
        0.77
       -1.00
F                   1.35        65.0        1.70        0.10
K                   0.45        80.0        1.70        0.10
H                   0.28        50.0        1.70        0.10
E                   4.52         5.0        1.70        0.10
G                   2.38        80.0        1.70        0.10
J                   1.62        80.0        1.70        0.10
I                   0.11        50.0        1.70        0.10
R                   2.55         5.0        1.70        0.10
S                   3.40         5.0        1.70        0.10
D                   2.49        65.0        1.70        0.10
A                   3.98        50.0        1.70        0.10
B                   6.67        50.0        1.70        0.10
C                   2.75        65.0        1.70        0.10
T                   5.71         5.0        1.70        0.10
Q                   1.37        80.0        1.70        0.10
O                   4.09        80.0        1.70        0.10
N                   1.16        80.0        1.70        0.10
```

```
L                    5.55        80.0        1.70        0.10
M                    0.45        40.0        1.70        0.10
P                    3.75        10.0        1.70        0.10
U                    7.58        65.0        1.70        0.10
V                   14.08        50.0        1.70        0.10
#####END_SURFACES_BLOCK############|###########|###########|###########|


#####START_FLOWPATHS_BLOCK#########|###########|###########|###########|
          22
F
#####ROUTING
        1.00
K
#####ROUTING
        1.00
H
#####ROUTING
        1.00
E
#####ROUTING
        1.00
G
#####ROUTING
        1.00
J
#####ROUTING
        1.00
I
#####ROUTING
        1.00
R
#####ROUTING
        1.00
S
#####ROUTING
        1.00
D
#####ROUTING
        1.00
A
#####ROUTING
        1.00
B
#####ROUTING
        1.00
C
#####ROUTING
        1.00
T
#####ROUTING
        1.00
Q
#####ROUTING
        1.00
```

```
O
#####ROUTING
        1.00
N
#####ROUTING
        1.00
L
#####ROUTING
        1.00
M
#####ROUTING
        1.00
P
#####ROUTING
        1.00
U
#####ROUTING
        1.00
V
#####ROUTING
        1.00
#####END_FLOWPATHS_BLOCK###########|###########|###########|###########|


#####START_LOCAL_STRUCTURES_BLOCK##|###########|###########|###########|
          0
#####END_LOCAL_STRUCTURES_BLOCK####|###########|###########|###########|


#####START_OUTLET_STRUCTURES_BLOCK#|###########|###########|###########|
          0
#####END_OUTLET_STRUCTURES_BLOCK###|###########|###########|###########|


#####START_STORM_BLOCK#############|###########|###########|###########|
          1
#####START_STORM#1
100 Year ARI 120 Mins Duration DESIGN STORM
        1.00
        1.00
#####START_DESIGN_RAIN
         100         120      -99.90
IFD_COEFFS_IN_THIS_FILE
          1
N_Cardiff              1UNKNOWN             0.00        0.00       30.00
33.80        7.22        2.41       64.76       14.63        5.06        4.32
15.96        0.02     1165.00          25        0.73
#####END_DESIGN_RAIN
#####START_CALC_RAINGAUGE_WEIGHTS
#####END_CALC_RAINGAUGE_WEIGHTS
#####START_LOSS_RATES
F                  10.00        2.50        2.50
K                  10.00        2.50        2.50
H                  10.00        2.50        2.50
E                  10.00        2.50        2.50
```

```
G                   10.00        2.50        2.50
J                   10.00        2.50        2.50
I                   10.00        2.50        2.50
R                   10.00        2.50        2.50
S                   10.00        2.50        2.50
D                   10.00        2.50        2.50
A                   10.00        2.50        2.50
B                   10.00        2.50        2.50
C                   10.00        2.50        2.50
T                   10.00        2.50        2.50
Q                   10.00        2.50        2.50
O                   10.00        2.50        2.50
N                   10.00        2.50        2.50
L                   10.00        2.50        2.50
M                   10.00        2.50        2.50
P                   10.00        2.50        2.50
U                   10.00        2.50        2.50
V                   10.00        2.50        2.50
#####END_LOSS_RATES
#####START_RECORDED_HYDROGRAPHS
           0
#####END_RECORDED_HYDROGRAPHS
#####START_IMPORTED_HYDROGRAPHS
           0
#####END_IMPORTED_HYDROGRAPHS
#####END_STORM#1

#####START_RESULTS_STORM_1

#####START_HYDROGRAPHS_V
    Time    Rain  Rainperv    Qtop      Qbot      Qper      Qimp    Qinto_OS
    Qout_OS  Stage
      0.0    0.00    0.00     0.000     0.000     0.000     0.000     0.000
      0.000     0.000
      1.0   27.70    0.00     0.000     0.000     0.000     0.000     0.000
      0.000     0.000
      2.0   27.70    0.00     0.000     0.000     0.000     0.000     0.000
      0.000     0.000
      3.0   27.70    0.00     0.000     0.000     0.000     0.000     0.000
      0.000     0.000
      4.0   27.70    0.00     0.000     0.000     0.000     0.000     0.000
      0.000     0.000
      5.0   27.70    0.00     0.000     0.000     0.000     0.000     0.000
      0.000     0.000
      6.0   60.02    0.00     0.126     0.001     0.000     0.165     0.166
      0.166     0.000
      7.0   60.02    0.00     0.259     0.003     0.000     0.340     0.344
      0.344     0.000
      8.0   60.02    0.00     0.371     0.010     0.000     0.485     0.495
      0.495     0.000
      9.0   60.02    0.00     0.466     0.019     0.000     0.605     0.624
      0.624     0.000
     10.0   60.02    0.00     0.548     0.033     0.000     0.704     0.737
     0.737     0.000
     11.0   38.09    0.00     0.566     0.049     0.000     0.711     0.760
```

0.760 0.000
12.0 38.09 0.00 0.588 0.066 0.000 0.717 0.783
0.783 0.000
13.0 38.09 0.00 0.614 0.085 0.000 0.722 0.807
0.807 0.000
14.0 38.09 0.00 0.646 0.105 0.000 0.726 0.831
0.831 0.000
15.0 38.09 26.60 0.687 0.127 0.007 0.729 0.863
0.863 0.000
16.0 56.56 54.06 0.793 0.152 0.031 0.795 0.977
0.977 0.000
17.0 56.56 54.06 0.902 0.181 0.060 0.849 1.089
1.089 0.000
18.0 56.56 54.06 1.016 0.215 0.091 0.893 1.199
1.199 0.000
19.0 56.56 54.06 1.137 0.254 0.124 0.930 1.308
1.308 0.000
20.0 56.56 54.06 1.264 0.298 0.157 0.961 1.416
1.416 0.000
21.0 105.04 102.54 1.553 0.352 0.229 1.151 1.732
1.732 0.000
22.0 105.04 102.54 1.840 0.420 0.303 1.308 2.031
2.031 0.000
23.0 105.04 102.54 2.132 0.503 0.378 1.438 2.318
2.318 0.000
24.0 105.04 102.54 2.434 0.601 0.453 1.545 2.598
2.598 0.000
25.0 105.04 102.54 2.751 0.714 0.527 1.633 2.874
2.874 0.000
26.0 60.02 57.52 2.936 0.840 0.556 1.553 2.950
2.950 0.000
27.0 60.02 57.52 3.146 0.975 0.584 1.487 3.046
3.046 0.000
28.0 60.02 57.52 3.377 1.120 0.610 1.433 3.163
3.163 0.000
29.0 60.02 57.52 3.622 1.275 0.636 1.388 3.299
3.299 0.000
30.0 60.02 57.52 3.877 1.441 0.661 1.351 3.452
3.452 0.000
31.0 192.77 190.27 4.582 1.633 0.821 1.771 4.225
4.225 0.000
32.0 192.77 190.27 5.280 1.867 0.980 2.118 4.965
4.965 0.000
33.0 192.77 190.27 5.984 2.143 1.135 2.405 5.683
5.683 0.000
34.0 192.77 190.27 6.704 2.459 1.286 2.643 6.388
6.388 0.000
35.0 192.77 190.27 7.450 2.818 1.432 2.838 7.089
7.089 0.000
36.0 137.36 134.86 8.032 3.212 1.505 2.812 7.529
7.529 0.000
37.0 137.36 134.86 8.646 3.634 1.574 2.790 7.999
7.999 0.000
38.0 137.36 134.86 9.285 4.085 1.640 2.772 8.497
8.497 0.000

39.0	137.36	134.86	9.940	4.564	1.702	2.757	9.023	
9.023	0.000							
40.0	137.36	134.86	10.603	5.070	1.761	2.745	9.576	
9.576	0.000							
41.0	61.18	58.68	10.998	5.590	1.722	2.476	9.788	
9.788	0.000							
42.0	61.18	58.68	11.386	6.109	1.686	2.253	10.049	
10.049	0.000							
43.0	61.18	58.68	11.752	6.624	1.653	2.070	10.347	
10.347	0.000							
44.0	61.18	58.68	12.082	7.132	1.621	1.918	10.672	
10.672	0.000							
45.0	61.18	58.68	12.374	7.629	1.592	1.793	11.014	
11.014	0.000							
46.0	38.09	35.59	12.546	8.107	1.537	1.610	11.254	
11.254	0.000							
47.0	38.09	35.59	12.675	8.557	1.486	1.460	11.503	
11.503	0.000							
48.0	38.09	35.59	12.761	8.975	1.438	1.336	11.749	
11.749	0.000							
49.0	38.09	35.59	12.805	9.361	1.394	1.233	11.987	
11.987	0.000							
50.0	38.09	35.59	12.805	9.713	1.352	1.148	12.213	
12.213	0.000							
51.0	39.25	36.75	12.775	10.030	1.314	1.082	12.426	
12.426	0.000							
52.0	39.25	36.75	12.714	10.311	1.279	1.027	12.618	
12.618	0.000							
53.0	39.25	36.75	12.626	10.557	1.247	0.982	12.786	
12.786	0.000							
54.0	39.25	36.75	12.514	10.768	1.216	0.945	12.929	
12.929	0.000							
55.0	39.25	36.75	12.383	10.945	1.187	0.914	13.046	
13.046	0.000							
56.0	49.64	47.14	12.270	11.090	1.172	0.924	13.186	
13.186	0.000							
57.0	49.64	47.14	12.140	11.204	1.157	0.932	13.293	
13.293	0.000							
58.0	49.64	47.14	12.000	11.292	1.144	0.939	13.375	
13.375	0.000							
59.0	49.64	47.14	11.855	11.357	1.132	0.944	13.433	
13.433	0.000							
60.0	49.64	47.14	11.706	11.400	1.120	0.949	13.469	
13.469	0.000							
61.0	49.64	47.14	11.556	11.424	1.109	0.953	13.486	
13.486	0.000							
62.0	49.64	47.14	11.407	11.430	1.099	0.956	13.485	
13.485	0.000							
63.0	49.64	47.14	11.259	11.420	1.090	0.958	13.468	
13.468	0.000							
64.0	49.64	47.14	11.115	11.396	1.080	0.960	13.437	
13.437	0.000							
65.0	49.64	47.14	10.974	11.360	1.072	0.962	13.394	
13.394	0.000							
66.0	27.70	25.20	10.762	11.310	1.039	0.889	13.238	

13.238 0.000
67.0 27.70 25.20 10.556 11.243 1.009 0.829 13.081
13.081 0.000
68.0 27.70 25.20 10.353 11.163 0.980 0.779 12.922
12.922 0.000
69.0 27.70 25.20 10.152 11.070 0.953 0.738 12.762
12.762 0.000
70.0 27.70 25.20 9.954 10.967 0.928 0.704 12.599
12.599 0.000
71.0 27.70 25.20 9.757 10.855 0.904 0.676 12.435
12.435 0.000
72.0 27.70 25.20 9.563 10.729 0.882 0.652 12.264
12.264 0.000
73.0 27.70 25.20 9.371 10.597 0.861 0.633 12.091
12.091 0.000
74.0 27.70 25.20 9.181 10.459 0.841 0.617 11.918
11.918 0.000
75.0 27.70 25.20 8.995 10.316 0.823 0.604 11.743
11.743 0.000
76.0 39.25 36.75 8.851 10.171 0.818 0.632 11.621
11.621 0.000
77.0 39.25 36.75 8.709 10.027 0.812 0.656 11.496
11.496 0.000
78.0 39.25 36.75 8.573 9.884 0.808 0.675 11.367
11.367 0.000
79.0 39.25 36.75 8.442 9.743 0.803 0.691 11.237
11.237 0.000
80.0 39.25 36.75 8.316 9.603 0.799 0.705 11.106
11.106 0.000
81.0 27.70 25.20 8.159 9.463 0.783 0.676 10.922
10.922 0.000
82.0 27.70 25.20 8.009 9.323 0.768 0.653 10.743
10.743 0.000
83.0 27.70 25.20 7.865 9.182 0.753 0.634 10.569
10.569 0.000
84.0 27.70 25.20 7.726 9.042 0.740 0.618 10.399
10.399 0.000
85.0 27.70 25.20 7.593 8.902 0.727 0.604 10.234
10.234 0.000
86.0 13.85 11.35 7.419 8.762 0.701 0.546 10.009
10.009 0.000
87.0 13.85 11.35 7.250 8.619 0.676 0.499 9.794
9.794 0.000
88.0 13.85 11.35 7.085 8.474 0.653 0.459 9.586
9.586 0.000
89.0 13.85 11.35 6.924 8.328 0.632 0.426 9.386
9.386 0.000
90.0 13.85 11.35 6.765 8.181 0.611 0.399 9.191
9.191 0.000
91.0 13.85 11.35 6.609 8.034 0.592 0.377 9.002
9.002 0.000
92.0 13.85 11.35 6.455 7.886 0.574 0.359 8.818
8.818 0.000
93.0 13.85 11.35 6.303 7.738 0.557 0.343 8.638
8.638 0.000

94.0	13.85	11.35	6.154	7.591	0.540	0.331	8.462
8.462	0.000						
95.0	13.85	11.35	6.008	7.445	0.525	0.320	8.290
8.290	0.000						
96.0	28.86	26.36	5.913	7.301	0.525	0.363	8.189
8.189	0.000						
97.0	28.86	26.36	5.820	7.163	0.524	0.398	8.085
8.085	0.000						
98.0	28.86	26.36	5.729	7.030	0.524	0.427	7.981
7.981	0.000						
99.0	28.86	26.36	5.642	6.902	0.523	0.451	7.876
7.876	0.000						
100.0	28.86	26.36	5.559	6.778	0.523	0.470	7.771
7.771	0.000						
101.0	13.85	11.35	5.432	6.657	0.509	0.436	7.601
7.601	0.000						
102.0	13.85	11.35	5.311	6.535	0.495	0.407	7.437
7.437	0.000						
103.0	13.85	11.35	5.197	6.415	0.482	0.383	7.280
7.280	0.000						
104.0	13.85	11.35	5.087	6.296	0.470	0.364	7.130
7.130	0.000						
105.0	13.85	11.35	4.982	6.178	0.458	0.348	6.984
6.984	0.000						
106.0	15.01	12.51	4.884	6.063	0.448	0.338	6.849
6.849	0.000						
107.0	15.01	12.51	4.789	5.950	0.439	0.330	6.719
6.719	0.000						
108.0	15.01	12.51	4.697	5.839	0.430	0.324	6.593
6.593	0.000						
109.0	15.01	12.51	4.608	5.730	0.421	0.319	6.470
6.470	0.000						
110.0	15.01	12.51	4.521	5.624	0.413	0.314	6.351
6.351	0.000						
111.0	15.01	12.51	4.437	5.520	0.406	0.311	6.236
6.236	0.000						
112.0	15.01	12.51	4.355	5.418	0.398	0.308	6.124
6.124	0.000						
113.0	15.01	12.51	4.276	5.319	0.391	0.305	6.015
6.015	0.000						
114.0	15.01	12.51	4.200	5.222	0.385	0.303	5.910
5.910	0.000						
115.0	15.01	12.51	4.126	5.127	0.379	0.301	5.807
5.807	0.000						
116.0	16.16	13.66	4.058	5.035	0.374	0.304	5.712
5.712	0.000						
117.0	16.16	13.66	3.992	4.945	0.369	0.306	5.620
5.620	0.000						
118.0	16.16	13.66	3.928	4.858	0.364	0.308	5.530
5.530	0.000						
119.0	16.16	13.66	3.867	4.774	0.360	0.309	5.443
5.443	0.000						
120.0	16.16	13.66	3.808	4.691	0.356	0.310	5.358
5.358	0.000						
121.0	0.00	0.00	3.701	4.610	0.340	0.256	5.207

5.207	0.000						
122.0	0.00	0.00	3.600	4.526	0.326	0.212	5.064
5.064	0.000						
123.0	0.00	0.00	3.502	4.442	0.312	0.175	4.928
4.928	0.000						
124.0	0.00	0.00	3.407	4.357	0.298	0.145	4.800
4.800	0.000						
125.0	0.00	0.00	3.315	4.271	0.286	0.120	4.676
4.676	0.000						
126.0	0.00	0.00	3.225	4.185	0.274	0.099	4.558
4.558	0.000						
127.0	0.00	0.00	3.136	4.100	0.263	0.082	4.444
4.444	0.000						
128.0	0.00	0.00	3.048	4.014	0.252	0.067	4.334
4.334	0.000						
129.0	0.00	0.00	2.961	3.929	0.242	0.056	4.227
4.227	0.000						
130.0	0.00	0.00	2.876	3.844	0.232	0.046	4.122
4.122	0.000						
131.0	0.00	0.00	2.792	3.760	0.223	0.038	4.021
4.021	0.000						
132.0	0.00	0.00	2.709	3.676	0.214	0.031	3.921
3.921	0.000						
133.0	0.00	0.00	2.627	3.593	0.206	0.026	3.824
3.824	0.000						
134.0	0.00	0.00	2.547	3.510	0.198	0.021	3.729
3.729	0.000						
135.0	0.00	0.00	2.468	3.428	0.190	0.018	3.635
3.635	0.000						
136.0	0.00	0.00	2.391	3.346	0.183	0.015	3.544
3.544	0.000						
137.0	0.00	0.00	2.315	3.266	0.176	0.012	3.454
3.454	0.000						
138.0	0.00	0.00	2.242	3.186	0.169	0.010	3.366
3.366	0.000						
139.0	0.00	0.00	2.170	3.108	0.163	0.008	3.279
3.279	0.000						
140.0	0.00	0.00	2.100	3.030	0.157	0.007	3.194
3.194	0.000						
141.0	0.00	0.00	2.031	2.954	0.151	0.006	3.111
3.111	0.000						
142.0	0.00	0.00	1.965	2.879	0.146	0.005	3.029
3.029	0.000						
143.0	0.00	0.00	1.900	2.804	0.141	0.004	2.949
2.949	0.000						
144.0	0.00	0.00	1.838	2.732	0.136	0.003	2.870
2.870	0.000						
145.0	0.00	0.00	1.777	2.660	0.131	0.003	2.793
2.793	0.000						
146.0	0.00	0.00	1.718	2.590	0.126	0.002	2.718
2.718	0.000						
147.0	0.00	0.00	1.660	2.521	0.122	0.002	2.644
2.644	0.000						
148.0	0.00	0.00	1.605	2.453	0.118	0.001	2.572
2.572	0.000						

149.0	0.00	0.00	1.552	2.387	0.114	0.001	2.502
2.502	0.000						
150.0	0.00	0.00	1.500	2.322	0.110	0.001	2.433
2.433	0.000						
151.0	0.00	0.00	1.450	2.259	0.106	0.001	2.366
2.366	0.000						
152.0	0.00	0.00	1.402	2.197	0.103	0.000	2.300
2.300	0.000						
153.0	0.00	0.00	1.356	2.137	0.099	0.000	2.236
2.236	0.000						
154.0	0.00	0.00	1.311	2.078	0.096	0.000	2.174
2.174	0.000						
155.0	0.00	0.00	1.267	2.020	0.093	0.000	2.113
2.113	0.000						
156.0	0.00	0.00	1.225	1.964	0.090	0.000	2.054
2.054	0.000						
157.0	0.00	0.00	1.185	1.910	0.087	0.000	1.997
1.997	0.000						
158.0	0.00	0.00	1.146	1.857	0.084	0.000	1.941
1.941	0.000						
159.0	0.00	0.00	1.109	1.805	0.081	0.000	1.886
1.886	0.000						
160.0	0.00	0.00	1.072	1.754	0.079	0.000	1.833
1.833	0.000						
161.0	0.00	0.00	1.038	1.705	0.076	0.000	1.782
1.782	0.000						
162.0	0.00	0.00	1.004	1.657	0.074	0.000	1.731
1.731	0.000						
163.0	0.00	0.00	0.972	1.611	0.072	0.000	1.683
1.683	0.000						
164.0	0.00	0.00	0.940	1.566	0.070	0.000	1.635
1.635	0.000						
165.0	0.00	0.00	0.910	1.522	0.067	0.000	1.590
1.590	0.000						
166.0	0.00	0.00	0.881	1.479	0.065	0.000	1.545
1.545	0.000						
167.0	0.00	0.00	0.853	1.438	0.063	0.000	1.502
1.502	0.000						
168.0	0.00	0.00	0.826	1.398	0.062	0.000	1.459
1.459	0.000						
169.0	0.00	0.00	0.800	1.359	0.060	0.000	1.419
1.419	0.000						
170.0	0.00	0.00	0.775	1.321	0.058	0.000	1.379
1.379	0.000						
171.0	0.00	0.00	0.751	1.284	0.056	0.000	1.341
1.341	0.000						
172.0	0.00	0.00	0.728	1.249	0.055	0.000	1.303
1.303	0.000						
173.0	0.00	0.00	0.705	1.214	0.053	0.000	1.267
1.267	0.000						
174.0	0.00	0.00	0.684	1.180	0.052	0.000	1.232
1.232	0.000						
175.0	0.00	0.00	0.663	1.148	0.050	0.000	1.198
1.198	0.000						
176.0	0.00	0.00	0.643	1.116	0.049	0.000	1.165

```
    1.165     0.000
    177.0    0.00    0.00     0.623     1.085     0.047     0.000     1.133
    1.133     0.000
    178.0    0.00    0.00     0.604     1.056     0.046     0.000     1.102
    1.102     0.000
    179.0    0.00    0.00     0.586     1.027     0.045     0.000     1.072
    1.072     0.000
    180.0    0.00    0.00     0.569     0.999     0.044     0.000     1.042
    1.042     0.000
    181.0    0.00    0.00     0.552     0.972     0.042     0.000     1.014
    1.014     0.000
    182.0    0.00    0.00     0.536     0.945     0.041     0.000     0.987
    0.987     0.000
    183.0    0.00    0.00     0.520     0.920     0.040     0.000     0.960
    0.960     0.000
    184.0    0.00    0.00     0.505     0.895     0.039     0.000     0.934
    0.934     0.000
    185.0    0.00    0.00     0.490     0.871     0.038     0.000     0.909
    0.909     0.000
    186.0    0.00    0.00     0.476     0.848     0.037     0.000     0.885
    0.885     0.000
    187.0    0.00    0.00     0.462     0.825     0.036     0.000     0.861
    0.861     0.000
    188.0    0.00    0.00     0.449     0.803     0.035     0.000     0.838
    0.838     0.000
    189.0    0.00    0.00     0.436     0.782     0.034     0.000     0.816
    0.816     0.000
    190.0    0.00    0.00     0.424     0.761     0.033     0.000     0.795
    0.795     0.000
    191.0    0.00    0.00     0.412     0.741     0.032     0.000     0.774
    0.774     0.000
    192.0    0.00    0.00     0.401     0.722     0.032     0.000     0.753
    0.753     0.000
    193.0    0.00    0.00     0.389     0.703     0.031     0.000     0.734
    0.734     0.000
    194.0    0.00    0.00     0.379     0.685     0.030     0.000     0.715
    0.715     0.000
    195.0    0.00    0.00     0.368     0.667     0.029     0.000     0.696
    0.696     0.000
    196.0    0.00    0.00     0.358     0.650     0.029     0.000     0.678
    0.678     0.000
    197.0    0.00    0.00     0.348     0.633     0.028     0.000     0.661
    0.661     0.000
#####END_HYDROGRAPHS_V


#####START_CATCHMENT_SUMMARY################################################
Catchment area   (hectares) =        76.29
Impervious percent      (%) =        47.75
Rainfall depth         (mm) =        96.19
Excess rainfall        (mm) =        87.47
Calc. runoff depth     (mm) =        87.69  - from bottom subarea
Recd. runoff depth     (mm) =         0.00  - from bottom subarea
Calc. peak discharge (m3/s) =        13.486 - from bottom subarea
Recd. peak discharge (m3/s) =         0.000 - from bottom subarea
```

#####END_CATCHMENT_SUMMARY##

#####START_VOLUME_SUMMARY###
#############

SUBAREA	DIRECTED TO TOP	IMPORTED TO TOP	LOCAL PERVIOUS	LOCAL IMPERVIOUS	DIRECTED TO BOTTOM	IMPORTED TO BOTTOM	OUTFLOW	BALANCE
			(Volumes in thousands m3)					
F								
	0.000	0.000	0.385	0.822	0.000	0.000	1.207	0.000
K								
	1.207	0.000	0.073	0.337	0.000	0.000	1.617	0.001
H								
	0.000	0.000	0.114	0.131	0.000	0.000	0.245	0.000
E								
	0.000	0.000	3.517	0.212	0.000	0.000	3.728	0.000
G								
	3.728	0.000	0.388	1.784	0.000	0.000	5.902	-0.002
J								
	6.147	0.000	0.264	1.214	0.000	0.000	7.628	-0.003
I								
	0.000	0.000	0.045	0.051	0.000	0.000	0.096	0.000
R								
	9.341	0.000	1.982	0.119	0.000	0.000	11.448	-0.006
S								
	11.448	0.000	2.644	0.159	0.000	0.000	14.259	-0.007
D								
	0.000	0.000	0.711	1.516	0.000	0.000	2.227	0.000
A								
	0.000	0.000	1.627	1.864	0.000	0.000	3.492	0.000
B								
	3.492	0.000	2.730	3.124	0.000	0.000	9.349	-0.003
C								
	9.349	0.000	0.786	1.675	0.000	0.000	11.816	-0.006
T								
	28.302	0.000	4.444	0.267	0.000	0.000	33.035	-0.022
Q								
	0.000	0.000	0.223	1.027	0.000	0.000	1.250	0.000
O								

```
       0.000       0.000       0.667       3.065       0.000       0.000
       3.733       0.000
N
       0.000       0.000       0.189       0.869       0.000       0.000
       1.058       0.000
L
       0.000       0.000       0.906       4.160       0.000       0.000
       5.066       0.000
M
       5.066       0.000       0.220       0.169       0.000       0.000
       5.455       0.000
P
      10.246       0.000       2.763       0.351       0.000       0.000
      13.366      -0.007
U
      47.652       0.000       2.170       4.616       0.000       0.000
      54.480      -0.042
V
      54.480       0.000       5.771       6.596       0.000       0.000
      66.901      -0.055
#####END_VOLUME_SUMMARY#########################################################
#############


#####START_PEAK_SUMMARY##########################################################
###
SUBAREA OUT_STR     STREAM    STREAM     LOCAL     LOCAL    DIRECTED
OUTLET_STRUCTURE
        1=exist        TOP    BOTTOM  PERVIOUS IMPERVIOUS  TO BOTTOM  INFLOW
        OUTFLOW
                 including                                 including
                                imported to                                  imported
                 to
                      TOP                                    BOTTOM

                      (Discharges in m3/s)
F            0       0.000     0.000     0.177     0.409     0.000     0.585
0.585
K            0       0.585     0.529     0.041     0.176     0.000     0.710
0.710
H            0       0.000     0.000     0.061     0.071     0.000     0.132
0.132
E            0       0.000     0.000     1.198     0.113     0.000     1.287
1.287
G            0       1.287     1.072     0.178     0.845     0.000     1.886
1.886
J            0       1.995     1.774     0.127     0.590     0.000     2.313
2.313
I            0       0.000     0.000     0.026     0.029     0.000     0.055
0.055
R            0       3.062     2.682     0.752     0.065     0.000     3.356
3.356
S            0       3.356     3.028     0.953     0.086     0.000     3.749
3.749
D            0       0.000     0.000     0.310     0.726     0.000     1.018
```

1.018
A 0 0.000 0.000 0.638 0.880 0.000 1.444
1.444
B 0 1.444 1.019 0.978 1.423 0.000 3.236
3.236
C 0 3.236 2.801 0.339 0.797 0.000 3.677
3.677
T 0 7.874 7.071 1.440 0.141 0.000 8.220
8.220
Q 0 0.000 0.000 0.110 0.504 0.000 0.614
0.614
O 0 0.000 0.000 0.292 1.398 0.000 1.676
1.676
N 0 0.000 0.000 0.095 0.431 0.000 0.526
0.526
L 0 0.000 0.000 0.384 1.855 0.000 2.211
2.211
M 0 2.211 2.132 0.109 0.091 0.000 2.306
2.306
P 0 4.377 3.786 0.988 0.183 0.000 4.840
4.840
U 0 12.878 11.546 0.811 2.042 0.000 12.805
12.805
V 0 12.805 11.430 1.761 2.838 0.000 13.486
13.486
#####END_PEAK_SUMMARY###
###

#####START_TIME_SUMMARY###
SUBAREA OUT_STR STREAM STREAM LOCAL LOCAL DIRECTED OUTLET_STRUCTURE
1=exist TOP BOTTOM PERVIOUS IMPERVIOUS TO BOTTOM INFLOW OUTFLOW
(Times in minutes)
F 0 0.0 0.0 40.0 35.0 0.0 35.0 35.0
K 0 35.0 40.0 35.0 35.0 0.0 38.0 38.0
H 0 0.0 0.0 35.0 35.0 0.0 35.0 35.0
E 0 0.0 0.0 40.0 35.0 0.0 40.0 40.0
G 0 40.0 45.0 40.0 35.0 0.0 40.0 40.0
J 0 40.0 43.0 35.0 35.0 0.0 40.0 40.0
I 0 0.0 0.0 35.0 35.0 0.0 35.0 35.0
R 0 40.0 44.0 40.0 35.0 0.0 43.0 43.0
S 0 43.0 49.0 40.0 35.0 0.0 47.0 47.0
D 0 0.0 0.0 40.0 35.0 0.0 35.0 35.0
A 0 0.0 0.0 40.0 35.0 0.0 35.0 35.0
B 0 35.0 44.0 40.0 35.0 0.0 40.0 40.0
C 0 40.0 43.0 40.0 35.0 0.0 40.0 40.0
T 0 40.0 49.0 40.0 35.0 0.0 48.0 48.0
Q 0 0.0 0.0 35.0 35.0 0.0 35.0 35.0
O 0 0.0 0.0 40.0 35.0 0.0 35.0 35.0
N 0 0.0 0.0 35.0 35.0 0.0 35.0 35.0
L 0 0.0 0.0 40.0 35.0 0.0 35.0 35.0
M 0 35.0 40.0 35.0 35.0 0.0 40.0 40.0
P 0 38.0 42.0 40.0 35.0 0.0 41.0 41.0
U 0 44.0 51.0 40.0 35.0 0.0 50.0 50.0
V 0 50.0 62.0 40.0 35.0 0.0 61.0 61.0

```
#####END_TIME_SUMMARY#################################################################


#####START_OUTLET_STRUCTURE_SUMMARY#########################################
SUBAREA               INITIAL     INFLOW    OUTFLOW      FINAL    BALANCE
                      STORAGE                            STORAGE
                      (Volumes in thousands m3)


SUBAREA                INFLOW    OUTFLOW     INFLOW    MAX.VOL  MAX.WATER
                         PEAK       PEAK     VOLUME     STORED  ELEVATION
                       (m3/s)     (m3/s)    (m3 E3)    (m3 E3)   (metres)

#####END_OUTLET_STRUCTURE_SUMMARY###########################################


#####START_LOCAL_STRUCTURE_SUMMARY##########################################
SUBAREA               INITIAL     INFLOW    OUTFLOW      FINAL    BALANCE
                      STORAGE                            STORAGE
                      (Volumes in thousands m3)


SUBAREA                INFLOW    OUTFLOW     INFLOW    MAX.VOL  MAX.WATER
                         PEAK       PEAK     VOLUME     STORED  ELEVATION
                       (m3/s)     (m3/s)    (m3 E3)    (m3 E3)   (metres)

#####END_LOCAL_STRUCTURE_SUMMARY###########################################

#####END_RESULTS_STORM_1

#####END_QA_SUMMARY_FILE#################################################
```

```
#####START_QA_SUMMARY_FILE################################################

G:\22\17163\Technical\WBNM\22_17163_Cardiff_WBNM_PMF_0_75hr.wbn
Program run at 10: 2 on   1  4 2015  (ddmmyy)

 Webb McKeown and Associates Pty Ltd
 Water and Environment Consulting Engineers
 level 2, 160 Clarence Street
 Sydeny
 NSW
 Australia
 2000
 +61 2 92992855
 +61 2 92626208
 wma@webbmckeown.com.au
 EJT
  wbnm.ifd

 out_metafile= T
 out_culverts= F
 out_scourable= F
 sum_catchments= T
 sum_volumes= T
 sum_outlet_structures= T
 sum_local_structures= T
 sum_subareas= F
 sum_depths= F
 sum_Qpeaks= T
 sum_Tpeaks= T
 sum_multiStorms= F
 dbg_run= F
 dbg_echo= F
 dbg_edit= F
 dbg_ifd= F
 trig_flowmin= 5

#####START_PREAMBLE_BLOCK##########|###########|###########|###########|
Project Number: Hammond Aged Care
Project Description: Model For Cardiff Aged Care, NSW
Incldues surrounding urban area to Downstream of basin
RUNFILE: G:\22\17163\Technical\WBNM\22_17163_Cardiff_WBNM_PMF_0_75hr.wbn
DES Storm ARI (Env ARI):     PMF()
DES Burst Dura (Env Dura):   45()
Constructed using iWBNM_2006
Max 8 lines of text
#####END_PREAMBLE_BLOCK############|###########|###########|###########|


#####START_STATUS_BLOCK############|###########|###########|###########|

last edited on 1/04/2015 10:02:56 AM
by Sam Douglas
2003_V103
#####END_STATUS_BLOCK##############|###########|###########|###########|
```

```
#####START_DISPLAY_BLOCK###########|###########|###########|###########|
         0.0         0.0         0.0         0.0
         none
                  0.0         0.0         0.0         0.0         0.0         0.0
#####END_DISPLAY_BLOCK#############|###########|###########|###########|


#####START_TOPOLOGY_BLOCK##########|###########|###########|###########|
          22
F                    0.0         0.0         0.0         0.0 K
K                    0.0         0.0         0.0         0.0 R
H                    0.0         0.0         0.0         0.0 J
E                    0.0         0.0         0.0         0.0 G
G                    0.0         0.0         0.0         0.0 J
J                    0.0         0.0         0.0         0.0 R
I                    0.0         0.0         0.0         0.0 R
R                    0.0         0.0         0.0         0.0 S
S                    0.0         0.0         0.0         0.0 T
D                    0.0         0.0         0.0         0.0 T
A                    0.0         0.0         0.0         0.0 B
B                    0.0         0.0         0.0         0.0 C
C                    0.0         0.0         0.0         0.0 T
T                    0.0         0.0         0.0         0.0 U
Q                    0.0         0.0         0.0         0.0 U
O                    0.0         0.0         0.0         0.0 P
N                    0.0         0.0         0.0         0.0 P
L                    0.0         0.0         0.0         0.0 M
M                    0.0         0.0         0.0         0.0 P
P                    0.0         0.0         0.0         0.0 U
U                    0.0         0.0         0.0         0.0 V
V                    0.0         0.0         0.0         0.0 SINK
#####END_TOPOLOGY_BLOCK############|###########|###########|###########|


#####START_SURFACES_BLOCK##########|###########|###########|###########|
        0.77
       -1.00
F                   1.35        65.0        1.60        0.10
K                   0.45        80.0        1.60        0.10
H                   0.28        50.0        1.60        0.10
E                   4.52         5.0        1.60        0.10
G                   2.38        80.0        1.60        0.10
J                   1.62        80.0        1.60        0.10
I                   0.11        50.0        1.60        0.10
R                   2.55         5.0        1.60        0.10
S                   3.40         5.0        1.60        0.10
D                   2.49        65.0        1.60        0.10
A                   3.98        50.0        1.60        0.10
B                   6.67        50.0        1.60        0.10
C                   2.75        65.0        1.60        0.10
T                   5.71         5.0        1.60        0.10
Q                   1.37        80.0        1.60        0.10
O                   4.09        80.0        1.60        0.10
N                   1.16        80.0        1.60        0.10
```

```
L                   5.55        80.0        1.60        0.10
M                   0.45        40.0        1.60        0.10
P                   3.75        10.0        1.60        0.10
U                   7.58        65.0        1.70        0.10
V                  14.08        50.0        1.70        0.10
#####END_SURFACES_BLOCK############|###########|###########|###########|


#####START_FLOWPATHS_BLOCK#########|###########|###########|###########|
          22
F
#####ROUTING
        1.00
K
#####ROUTING
        1.00
H
#####ROUTING
        1.00
E
#####ROUTING
        1.00
G
#####ROUTING
        1.00
J
#####ROUTING
        1.00
I
#####ROUTING
        1.00
R
#####ROUTING
        1.00
S
#####ROUTING
        1.00
D
#####ROUTING
        1.00
A
#####ROUTING
        1.00
B
#####ROUTING
        1.00
C
#####ROUTING
        1.00
T
#####ROUTING
        1.00
Q
#####ROUTING
        1.00
```

```
O
#####ROUTING
        1.00
N
#####ROUTING
        1.00
L
#####ROUTING
        1.00
M
#####ROUTING
        1.00
P
#####ROUTING
        1.00
U
#####ROUTING
        1.00
V
#####ROUTING
        1.00
#####END_FLOWPATHS_BLOCK###########|###########|###########|###########|


#####START_LOCAL_STRUCTURES_BLOCK##|###########|###########|###########|
           0
#####END_LOCAL_STRUCTURES_BLOCK####|###########|###########|###########|


#####START_OUTLET_STRUCTURES_BLOCK#|###########|###########|###########|
           0
#####END_OUTLET_STRUCTURES_BLOCK###|###########|###########|###########|


#####START_STORM_BLOCK#############|###########|###########|###########|
           1
#####START_STORM#1
9999 Year ARI 45 Mins Duration DESIGN STORM
        1.00
        1.00
#####START_DESIGN_RAIN
        9999          45      -99.90
IFD_COEFFS_IN_THIS_FILE
           1
N_Cardiff              1UNKNOWN             0.00        0.00       30.00
33.80        7.22        2.41       64.76       14.63        5.06        4.32
15.96        0.02     1165.00          25        0.73
#####END_DESIGN_RAIN
#####START_CALC_RAINGAUGE_WEIGHTS
#####END_CALC_RAINGAUGE_WEIGHTS
#####START_LOSS_RATES
F                   0.00        0.10        0.10
K                   0.00        0.10        0.10
H                   0.00        0.10        0.10
E                   0.00        0.10        0.10
```

```
G                   0.00        0.10        0.10
J                   0.00        0.10        0.10
I                   0.00        0.10        0.10
R                   0.00        0.10        0.10
S                   0.00        0.10        0.10
D                   0.00        0.10        0.10
A                   0.00        0.10        0.10
B                   0.00        0.10        0.10
C                   0.00        0.10        0.10
T                   0.00        0.10        0.10
Q                   0.00        0.10        0.10
O                   0.00        0.10        0.10
N                   0.00        0.10        0.10
L                   0.00        0.10        0.10
M                   0.00        0.10        0.10
P                   0.00        0.10        0.10
U                   0.00        0.10        0.10
V                   0.00        0.10        0.10
#####END_LOSS_RATES
#####START_RECORDED_HYDROGRAPHS
          0
#####END_RECORDED_HYDROGRAPHS
#####START_IMPORTED_HYDROGRAPHS
          0
#####END_IMPORTED_HYDROGRAPHS
#####END_STORM#1

#####START_RESULTS_STORM_1

#####START_HYDROGRAPHS_V
    Time    Rain  Rainperv    Qtop      Qbot      Qper      Qimp    Qinto_OS
    Qout_OS  Stage
      0.0    0.00    0.00     0.000     0.000     0.000     0.000     0.000
      0.000     0.000
      1.0  459.64  459.54     1.359     0.012     0.298     1.542     1.852
      1.852     0.000
      2.0  459.64  459.54     2.653     0.072     0.713     2.836     3.620
      3.620     0.000
      3.0  459.64  459.54     3.918     0.199     1.169     3.905     5.274
      5.274     0.000
      4.0  459.64  459.54     5.231     0.409     1.642     4.789     6.840
      6.840     0.000
      5.0  459.64  459.54     6.668     0.714     2.116     5.519     8.348
      8.348     0.000
      6.0  637.43  637.33     8.934     1.151     2.826     6.726    10.702
      10.702     0.000
      7.0  637.43  637.33    11.457     1.767     3.524     7.723    13.014
      13.014     0.000
      8.0  637.43  637.33    14.308     2.596     4.200     8.547    15.343
      15.343     0.000
      9.0  637.43  637.33    17.528     3.672     4.847     9.228    17.747
      17.747     0.000
     10.0  637.43  637.33    21.125     5.032     5.461     9.791    20.284
     20.284     0.000
     11.0  607.07  606.97    24.956     6.703     5.990    10.152    22.845
```

```
 22.845     0.000
 12.0  607.07  606.97    29.077     8.704     6.484    10.451    25.640
 25.640     0.000
 13.0  607.07  606.97    33.422    11.044     6.945    10.698    28.687
 28.687     0.000
 14.0  607.07  606.97    37.920    13.730     7.372    10.902    32.004
 32.004     0.000
 15.0  607.07  606.97    42.492    16.751     7.767    11.071    35.588
 35.588     0.000
 16.0  568.05  567.95    46.912    20.073     8.060    11.077    39.211
 39.211     0.000
 17.0  568.05  567.95    51.252    23.653     8.330    11.083    43.065
 43.065     0.000
 18.0  568.05  567.95    55.451    27.442     8.577    11.087    47.107
 47.107     0.000
 19.0  568.05  567.95    59.462    31.391     8.804    11.091    51.286
 51.286     0.000
 20.0  568.05  567.95    63.249    35.442     9.012    11.094    55.548
 55.548     0.000
 21.0  481.32  481.22    66.435    39.516     9.047    10.802    59.364
 59.364     0.000
 22.0  481.32  481.22    69.286    43.531     9.078    10.560    63.170
 63.170     0.000
 23.0  481.32  481.22    71.818    47.434     9.107    10.361    66.902
 66.902     0.000
 24.0  481.32  481.22    74.032    51.180     9.134    10.196    70.510
 70.510     0.000
 25.0  481.32  481.22    75.940    54.732     9.158    10.060    73.950
 73.950     0.000
 26.0  433.62  433.52    77.364    58.047     9.098     9.785    76.931
 76.931     0.000
 27.0  433.62  433.52    78.496    61.064     9.044     9.558    79.667
 79.667     0.000
 28.0  433.62  433.52    79.360    63.803     8.995     9.371    82.169
 82.169     0.000
 29.0  433.62  433.52    79.960    66.255     8.950     9.216    84.421
 84.421     0.000
 30.0  433.62  433.52    80.370    68.421     8.909     9.088    86.419
 86.419     0.000
 31.0  351.24  351.14    80.279    70.287     8.725     8.702    87.715
 87.715     0.000
 32.0  351.24  351.14    80.006    71.840     8.559     8.384    88.783
 88.783     0.000
 33.0  351.24  351.14    79.568    73.098     8.408     8.120    89.626
 89.626     0.000
 34.0  351.24  351.14    78.989    74.079     8.271     7.903    90.253
 90.253     0.000
 35.0  351.24  351.14    78.291    74.778     8.146     7.723    90.648
 90.648     0.000
 36.0  229.82  229.72    77.010    75.219     7.825     7.162    90.206
 90.206     0.000
 37.0  229.82  229.72    75.566    75.383     7.534     6.698    89.615
 89.615     0.000
 38.0  229.82  229.72    74.007    75.292     7.270     6.315    88.877
 88.877     0.000
```

39.0	229.82	229.72	72.355	74.967	7.031	5.999	87.998
87.998	0.000						
40.0	229.82	229.72	70.639	74.435	6.815	5.737	86.987
86.987	0.000						
41.0	134.42	134.32	68.505	73.690	6.458	5.197	85.345
85.345	0.000						
42.0	134.42	134.32	66.313	72.694	6.137	4.751	83.582
83.582	0.000						
43.0	134.42	134.32	64.081	71.509	5.847	4.382	81.738
81.738	0.000						
44.0	134.42	134.32	61.832	70.162	5.584	4.077	79.823
79.823	0.000						
45.0	134.42	134.32	59.590	68.680	5.344	3.826	77.849
77.849	0.000						
46.0	0.00	0.00	56.854	67.048	4.914	3.161	75.122
75.122	0.000						
47.0	0.00	0.00	54.112	65.252	4.525	2.611	72.389
72.389	0.000						
48.0	0.00	0.00	51.376	63.322	4.174	2.158	69.654
69.654	0.000						
49.0	0.00	0.00	48.660	61.283	3.855	1.783	66.921
66.921	0.000						
50.0	0.00	0.00	45.985	59.159	3.566	1.473	64.198
64.198	0.000						
51.0	0.00	0.00	43.366	56.972	3.303	1.217	61.492
61.492	0.000						
52.0	0.00	0.00	40.806	54.743	3.064	1.005	58.812
58.812	0.000						
53.0	0.00	0.00	38.338	52.491	2.845	0.831	56.167
56.167	0.000						
54.0	0.00	0.00	35.974	50.235	2.646	0.686	53.567
53.567	0.000						
55.0	0.00	0.00	33.721	47.993	2.463	0.567	51.023
51.023	0.000						
56.0	0.00	0.00	31.582	45.780	2.296	0.468	48.544
48.544	0.000						
57.0	0.00	0.00	29.560	43.608	2.142	0.387	46.137
46.137	0.000						
58.0	0.00	0.00	27.654	41.488	2.001	0.320	43.809
43.809	0.000						
59.0	0.00	0.00	25.864	39.430	1.871	0.264	41.565
41.565	0.000						
60.0	0.00	0.00	24.185	37.438	1.751	0.218	39.407
39.407	0.000						
61.0	0.00	0.00	22.614	35.519	1.641	0.180	37.340
37.340	0.000						
62.0	0.00	0.00	21.147	33.675	1.539	0.149	35.363
35.363	0.000						
63.0	0.00	0.00	19.777	31.895	1.445	0.123	33.463
33.463	0.000						
64.0	0.00	0.00	18.501	30.197	1.357	0.102	31.656
31.656	0.000						
65.0	0.00	0.00	17.312	28.580	1.277	0.084	29.941
29.941	0.000						
66.0	0.00	0.00	16.206	27.043	1.202	0.069	28.314

```
 28.314     0.000
 67.0    0.00    0.00    15.176    25.585     1.132     0.057    26.774
 26.774     0.000
 68.0    0.00    0.00    14.219    24.203     1.067     0.047    25.317
 25.317     0.000
 69.0    0.00    0.00    13.329    22.895     1.007     0.039    23.941
 23.941     0.000
 70.0    0.00    0.00    12.501    21.658     0.951     0.032    22.641
 22.641     0.000
 71.0    0.00    0.00    11.731    20.489     0.898     0.027    21.414
 21.414     0.000
 72.0    0.00    0.00    11.015    19.386     0.850     0.022    20.258
 20.258     0.000
 73.0    0.00    0.00    10.349    18.345     0.804     0.018    19.167
 19.167     0.000
 74.0    0.00    0.00     9.729    17.364     0.761     0.015    18.140
 18.140     0.000
 75.0    0.00    0.00     9.152    16.439     0.721     0.012    17.173
 17.173     0.000
 76.0    0.00    0.00     8.615    15.567     0.684     0.010    16.261
 16.261     0.000
 77.0    0.00    0.00     8.114    14.746     0.649     0.009    15.403
 15.403     0.000
 78.0    0.00    0.00     7.647    13.972     0.616     0.007    14.595
 14.595     0.000
 79.0    0.00    0.00     7.212    13.243     0.585     0.006    13.834
 13.834     0.000
 80.0    0.00    0.00     6.806    12.557     0.557     0.005    13.118
 13.118     0.000
 81.0    0.00    0.00     6.427    11.910     0.530     0.004    12.444
 12.444     0.000
 82.0    0.00    0.00     6.072    11.306     0.504     0.003    11.813
 11.813     0.000
 83.0    0.00    0.00     5.741    10.736     0.480     0.003    11.219
 11.219     0.000
 84.0    0.00    0.00     5.431    10.199     0.458     0.002    10.659
 10.659     0.000
 85.0    0.00    0.00     5.141     9.692     0.437     0.002    10.130
 10.130     0.000
 86.0    0.00    0.00     4.870     9.214     0.417     0.002     9.632
 9.632      0.000
 87.0    0.00    0.00     4.615     8.762     0.398     0.001     9.161
 9.161      0.000
 88.0    0.00    0.00     4.379     8.336     0.380     0.001     8.717
 8.717      0.000
 89.0    0.00    0.00     4.157     7.935     0.363     0.001     8.298
 8.298      0.000
 90.0    0.00    0.00     3.949     7.555     0.347     0.000     7.902
 7.902      0.000
 91.0    0.00    0.00     3.753     7.197     0.332     0.000     7.529
 7.529      0.000
 92.0    0.00    0.00     3.569     6.859     0.318     0.000     7.177
 7.177      0.000
 93.0    0.00    0.00     3.395     6.539     0.304     0.000     6.843
 6.843      0.000
```

```
     94.0    0.00    0.00     3.232     6.237     0.291     0.000     6.528
     6.528     0.000
     95.0    0.00    0.00     3.079     5.952     0.279     0.000     6.231
     6.231     0.000
     96.0    0.00    0.00     2.934     5.681     0.267     0.000     5.949
     5.949     0.000
     97.0    0.00    0.00     2.797     5.426     0.256     0.000     5.682
     5.682     0.000
     98.0    0.00    0.00     2.668     5.183     0.246     0.000     5.429
     5.429     0.000
     99.0    0.00    0.00     2.546     4.954     0.236     0.000     5.190
     5.190     0.000
    100.0    0.00    0.00     2.431     4.737     0.227     0.000     4.963
    4.963     0.000
    101.0    0.00    0.00     2.323     4.531     0.218     0.000     4.748
    4.748     0.000
    102.0    0.00    0.00     2.220     4.336     0.209     0.000     4.545
    4.545     0.000
    103.0    0.00    0.00     2.122     4.150     0.201     0.000     4.351
    4.351     0.000
#####END_HYDROGRAPHS_V


#####START_CATCHMENT_SUMMARY################################################
Catchment area   (hectares) =        76.29
Impervious percent      (%) =        47.75
Rainfall depth         (mm) =       325.22
Excess rainfall        (mm) =       325.13
Calc. runoff depth     (mm) =       325.61  - from bottom subarea
Recd. runoff depth     (mm) =         0.00  - from bottom subarea
Calc. peak discharge (m3/s) =        90.648 - from bottom subarea
Recd. peak discharge (m3/s) =         0.000 - from bottom subarea
#####END_CATCHMENT_SUMMARY##################################################


#####START_VOLUME_SUMMARY#####################################################
#############
SUBAREA DIRECTED IMPORTED      LOCAL       LOCAL    DIRECTED    IMPORTED
OUTFLOW     BALANCE
          TO TOP   TO TOP   PERVIOUS  IMPERVIOUS   TO BOTTOM   TO BOTTOM
                  (Volumes in thousands m3)
          F
       0.000       0.000       1.536       2.853       0.000       0.000
       4.389       0.000
K
       4.389       0.000       0.292       1.170       0.000       0.000
       5.851       0.000
H
       0.000       0.000       0.455       0.455       0.000       0.000
       0.910       0.000
E
       0.000       0.000      13.972       0.735       0.000       0.000
       14.707       0.000
G
      14.707       0.000       1.547       6.190       0.000       0.000
```

```
      22.447      -0.003
J
      23.357       0.000       1.053       4.213       0.000       0.000
      28.628      -0.005
I
       0.000       0.000       0.179       0.179       0.000       0.000
       0.357       0.000
R
      34.837       0.000       7.878       0.414       0.000       0.000
      43.137      -0.008
S
      43.137       0.000      10.508       0.553       0.000       0.000
      54.210      -0.013
D
       0.000       0.000       2.833       5.262       0.000       0.000
       8.095       0.000
A
       0.000       0.000       6.470       6.470       0.000       0.000
      12.940       0.000
B
      12.940       0.000      10.850      10.843       0.000       0.000
      34.637      -0.004
C
      34.637       0.000       3.129       5.811       0.000       0.000
      43.586      -0.009
T
     105.891       0.000      17.655       0.928       0.000       0.000
     124.503      -0.029
Q
       0.000       0.000       0.890       3.563       0.000       0.000
       4.454       0.000
O
       0.000       0.000       2.659      10.638       0.000       0.000
      13.297       0.000
N
       0.000       0.000       0.754       3.017       0.000       0.000
       3.771       0.000
L
       0.000       0.000       3.608      14.435       0.000       0.000
      18.043       0.000
M
      18.043       0.000       0.877       0.585       0.000       0.000
      19.507      -0.001
P
      36.574       0.000      10.981       1.219       0.000       0.000
      48.784      -0.010
U
     177.740       0.000       8.630      16.018       0.000       0.000
     202.448      -0.059
V
     202.448       0.000      22.912      22.888       0.000       0.000
     248.407      -0.159
#####END_VOLUME_SUMMARY#########################################################
#############
```

#####START_PEAK_SUMMARY##
###

SUBAREA OUTLET_STRUCTURE	OUT_STR 1=exist OUTFLOW	STREAM TOP including imported to TOP	STREAM BOTTOM	LOCAL PERVIOUS	LOCAL IMPERVIOUS	DIRECTED TO BOTTOM including imported to BOTTOM	INFLOW
		(Discharges in m3/s)					
F	0	0.000	0.000	0.771	1.473	0.000	2.244
2.244							
K	0	2.244	2.216	0.153	0.611	0.000	2.965
2.965							
H	0	0.000	0.000	0.236	0.243	0.000	0.476
0.476							
E	0	0.000	0.000	6.054	0.388	0.000	6.413
6.413							
G	0	6.413	6.164	0.777	3.159	0.000	9.590
9.590							
J	0	10.035	9.856	0.536	2.164	0.000	12.132
12.132							
I	0	0.000	0.000	0.095	0.097	0.000	0.192
0.192							
R	0	15.050	14.717	3.614	0.221	0.000	18.303
18.303							
S	0	18.303	17.853	4.698	0.294	0.000	22.352
22.352							
D	0	0.000	0.000	1.373	2.693	0.000	4.062
4.062							
A	0	0.000	0.000	3.013	3.298	0.000	6.192
6.192							
B	0	6.192	5.508	4.835	5.456	0.000	15.313
15.313							
C	0	15.313	14.842	1.511	2.969	0.000	18.749
18.749							
T	0	44.345	43.105	7.423	0.488	0.000	50.465
50.465							
Q	0	0.000	0.000	0.456	1.835	0.000	2.291
2.291							
O	0	0.000	0.000	1.291	5.356	0.000	6.647
6.647							
N	0	0.000	0.000	0.388	1.556	0.000	1.944
1.944							
L	0	0.000	0.000	1.734	7.196	0.000	8.903
8.903							
M	0	8.903	8.841	0.449	0.311	0.000	9.571
9.571							
P	0	18.075	17.418	4.888	0.635	0.000	22.824
22.824							
U	0	73.218	70.946	3.866	7.878	0.000	80.370
80.370							

```
V            0      80.370    75.383     9.158    11.094     0.000    90.648
90.648
#####END_PEAK_SUMMARY#########################################################
###


#####START_TIME_SUMMARY#########################################################
SUBAREA OUT_STR   STREAM   STREAM    LOCAL    LOCAL   DIRECTED  OUTLET_STRUCTURE
        1=exist      TOP   BOTTOM PERVIOUS IMPERVIOUS TO BOTTOM INFLOW   OUTFLOW
                  (Times in minutes)
F            0        0.0      0.0     15.0     15.0      0.0     15.0     15.0
K            0       15.0     16.0     10.0     10.0      0.0     15.0     15.0
H            0        0.0      0.0     15.0     10.0      0.0     10.0     10.0
E            0        0.0      0.0     20.0     10.0      0.0     20.0     20.0
G            0       20.0     26.0     15.0     15.0      0.0     20.0     20.0
J            0       20.0     25.0     15.0     15.0      0.0     23.0     23.0
I            0        0.0      0.0     10.0     10.0      0.0     10.0     10.0
R            0       21.0     26.0     20.0     10.0      0.0     25.0     25.0
S            0       25.0     29.0     20.0     10.0      0.0     28.0     28.0
D            0        0.0      0.0     20.0     15.0      0.0     15.0     15.0
A            0        0.0      0.0     20.0     15.0      0.0     20.0     20.0
B            0       20.0     26.0     20.0     15.0      0.0     20.0     20.0
C            0       20.0     25.0     20.0     15.0      0.0     23.0     23.0
T            0       25.0     30.0     20.0     10.0      0.0     30.0     30.0
Q            0        0.0      0.0     15.0     15.0      0.0     15.0     15.0
O            0        0.0      0.0     15.0     15.0      0.0     15.0     15.0
N            0        0.0      0.0     15.0     15.0      0.0     15.0     15.0
L            0        0.0      0.0     20.0     15.0      0.0     15.0     15.0
M            0       15.0     17.0     15.0     10.0      0.0     17.0     17.0
P            0       15.0     21.0     20.0     10.0      0.0     21.0     21.0
U            0       26.0     32.0     20.0     15.0      0.0     30.0     30.0
V            0       30.0     37.0     25.0     20.0      0.0     35.0     35.0
#####END_TIME_SUMMARY###########################################################


#####START_OUTLET_STRUCTURE_SUMMARY#############################################
SUBAREA               INITIAL     INFLOW    OUTFLOW      FINAL    BALANCE
                      STORAGE                           STORAGE
                      (Volumes in thousands m3)


SUBAREA                INFLOW    OUTFLOW     INFLOW    MAX.VOL  MAX.WATER
                         PEAK       PEAK     VOLUME     STORED  ELEVATION
                       (m3/s)     (m3/s)    (m3 E3)    (m3 E3)   (metres)

#####END_OUTLET_STRUCTURE_SUMMARY###############################################


#####START_LOCAL_STRUCTURE_SUMMARY##############################################
SUBAREA               INITIAL     INFLOW    OUTFLOW      FINAL    BALANCE
                      STORAGE                           STORAGE
                      (Volumes in thousands m3)


SUBAREA                INFLOW    OUTFLOW     INFLOW    MAX.VOL  MAX.WATER
```

	PEAK (m3/s)	PEAK (m3/s)	VOLUME (m3 E3)	STORED (m3 E3)	ELEVATION (metres)

#####END_LOCAL_STRUCTURE_SUMMARY##

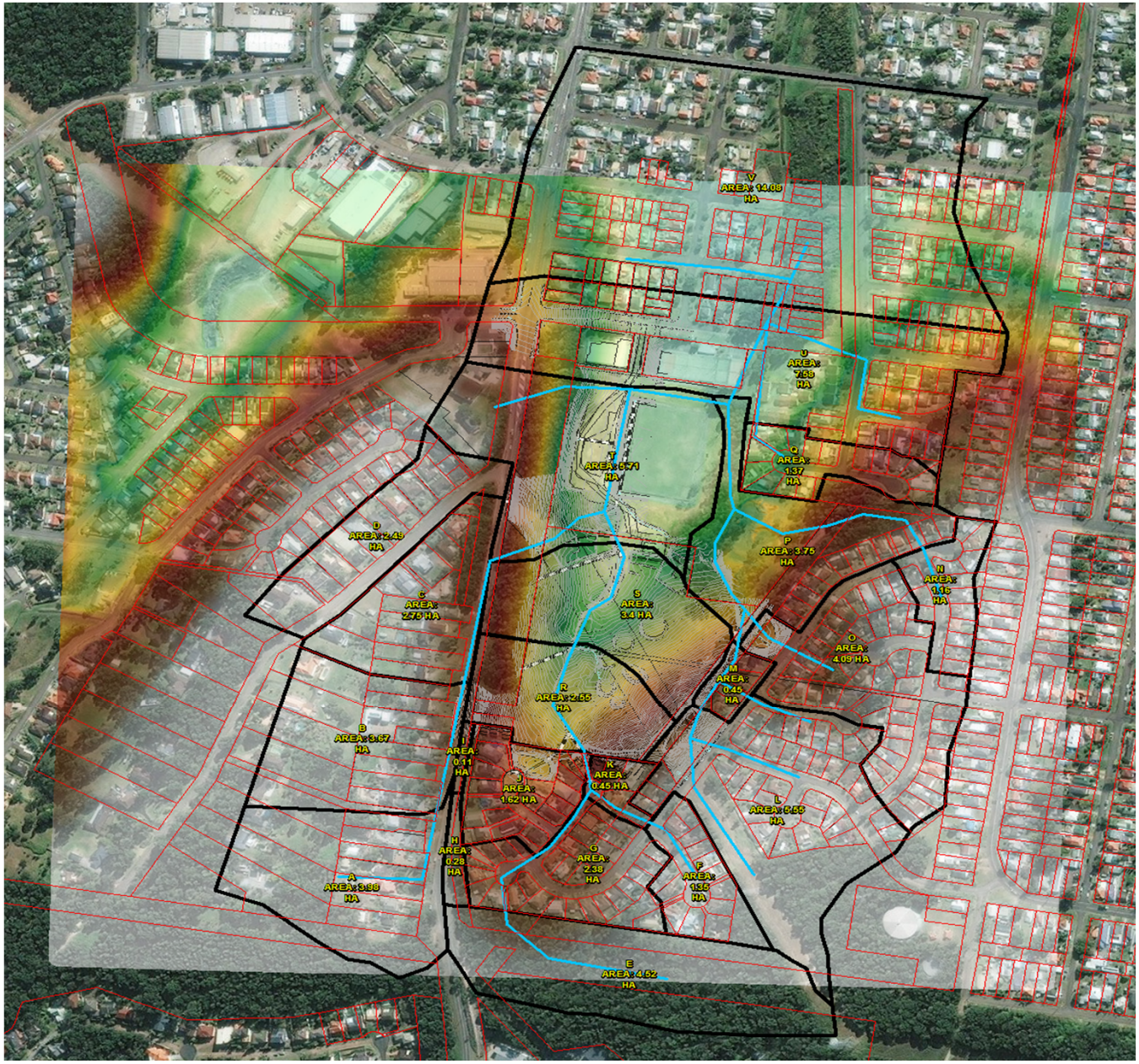
#####END_RESULTS_STORM_1

#####END_QA_SUMMARY_FILE###

Hammondcare - Cardiff

Hydrological Catchmnet Data

Catchment	Area (ha)	Impervious (%)
F	1.35	65
K	0.45	80
H	0.28	50
E	4.52	5
G	2.38	80
J	1.62	80
I	0.11	50
R	2.55	5
S	3.4	5
D	2.49	65
A	3.98	50
B	3.67	50
C	2.75	65
T	5.71	5
Q	1.37	80
O	4.09	80
N	1.16	80
L	5.55	80
M	0.45	40
P	3.75	10
U	7.58	65
V	14.08	50



CLAYTON UTZ

Email

28 April 2017

Planning Panels Secretariat
Hunter and Central Coast Joint Regional Planning Panel
320 Pitt Street
SYDNEY NSW 2000

enquiry@planningpanels.nsw.gov.au

Dear Secretariat

JRPP reference 2015HCC020
158 Macquarie Road, Cardiff - 99 Bed Aged Care Facility Proposal
Development application DA/1043/2015

As the JRPP may recall, we act for HammondCare, the owner of Lot 2 in Deposited Plan 788892, in relation to Development Application **DA/1043/2015** (**HammondCare DA**) for an aged care facility on that land (**HammondCare Land**). Misonpet Pty Ltd is the owner of Lot 1 in Deposited Plan 788892, which adjoins the northern boundary of the HammondCare Land.

This letter responds to the letter from Dibbs Barker, lawyers for Misonpet Pty Ltd, to the JRPP dated 20 April 2017 in relation to the HammondCare DA.

In that letter, Dibbs Barker provided comments on the information which HammondCare provided to the JRPP in answer to the Dibbs Barker letter to the JRPP dated 16 February 2017. Dibbs Barker also said that they were obtaining additional input from Misonpet's hydrology consultant, Cardno, and "anticipated" that they would provide that additional input to the JRPP by the end of this week (ie. today). As far as we and HammondCare are aware, no further input has been provided at this stage.

The HammondCare DA was lodged on 3 July 2015. Since that time, Misonpet has made the following written submissions in relation to the HammondCare DA:

- letter dated 24 July 2015 from Misonpet's solicitors Bray Jackson & Co, in response to the initial notification of the HammondCare DA;
- letter dated 15 January 2016 from Misonpet's solicitors Bray Jackson & Co, in relation to the HammondCare DA and the preparation of the (then) draft DCP;
- letter dated 18 March 2016 from Misonpet's solicitors Kennedys Lawyers, in response to a further notification of the HammondCare DA;
- letter dated 9 February 2017 from Misonpet's solicitors Dibbs Barker, in response to the public notification of the JRPP's public meeting on that day in relation to the HammondCare DA; and
- letter dated 16 February 2017 from Dibbs Barker, in response to the documents which the JRPP made available in connection with its public notification of the JRPP's public meeting.

The JRPP specifically permitted the 16 February Dibbs Barker letter, because some of the documents which the JRPP made available for its public meeting did not appear on the JRPP's website within the usual time frame before the public hearing. The JRPP deferred its decision on the HammondCare DA to allow Misonpet to provide the 16 February Dibbs Barker letter.

Misonpet, a representative of Dibbs Barker and a representative of Cardno also attended the JRPP public meeting on 9 February, where they made an oral presentation to the JRPP and handed up documents in support of their presentation.

Level 15, 1 Bligh Street
Sydney NSW 2000

GPO Box 9806
Sydney NSW 2001
DX 370 Sydney

T +61 2 9353 4000
F +61 2 8220 6700
www.claytonutz.com

In addition, we are instructed that HammondCare and Misonpet have communicated on many other occasions in relation to the HammondCare DA, and Misonpet and its representatives have communicated with Council personnel (including attending meetings with Council personnel) at various other times in relation to the HammondCare DA.

As the outline above demonstrates, Misonpet has been given an extensive opportunity to make oral and written submissions in relation to the HammondCare DA at various stages of the Council's and the JRPP's consideration of the HammondCare DA, and Misonpet has taken full advantage of those opportunities.

In response to the Misonpet submissions (from Dibbs Barker and Cardno) in February:

- HammondCare wrote to the JRPP Secretariat on 21 February 2017 responding to most of the matters in the JRPP's deferral notice; and
- HammondCare also invested considerable time and effort in obtaining further expert evidence from its hydrology consultants, TTW, to address Misonpet's concerns, and those concerns were also addressed in detail in a letter from us to the JRPP dated 12 April 2017 attaching a further letter from TTW.

The HammondCare DA has been awaiting determination for almost 2 years. During this time, Misonpet has been given (and has taken) every opportunity to make submissions to the HammondCare DA. There can be no doubt that the JRPP has more than satisfied any obligation it might have had to Misonpet to afford it the opportunity to comment on the HammondCare DA.

The JRPP is not bound to ensure that all concerns raised by all objectors must be satisfied before a development application can be determined. Instead, as the JRPP no doubt appreciates, it has a duty to provide interested parties such as Misonpet with a reasonable opportunity to make submissions on the HammondCare DA and then a duty to determine the HammondCare DA.

While HammondCare, as applicant, should have the opportunity to respond to any information or submissions from other parties, it should not need to do so, because there should be no further information or submissions.

Accordingly, we submit that the JRPP has all the information it should need in order to make a determination, and it should not accept any further information or submissions from Misonpet or its representatives.

We are instructed respectfully to request that, unless the JRPP considers it would be assisted by anything further from HammondCare as applicant, the JRPP determine the HammondCare DA as soon as practicable.

Please do not hesitate to contact us regarding anything contained in this letter.

Yours faithfully

Nick Thomas, Partner
+61 2 9353 4751
nthomas@claytonutz.com

Janelle Reid, Lawyer
+61 2 9353 4725
jareid@claytonutz.com

Copy - Lake Macquarie City Council

Our ref 751/17537/80175181