In the matter of the
Commissions Of Inquiry Act 1950

Commission of Inquiry Order (No. 1) 2011

QUEENSLAND FLOODS COMMISSION OF INQUIRY

CLAYTON UTZ–(Ipswich City Council - PLUMBE)
Response to Req #1731389
#1747547 – 1747564 File 539764/1
Volume 1 OF 1 ORIGINAL

Witness Statement of Natalie Plumbe

Planner - Ipswich City Council

QFCI
Date: 19/10/11 JM
Exhibit Number: 859

WITNESS STATEMENT OF NATALIE PLUMBE

This written statement is provided in response to a Requirement, dated 23 September 2011, pursuant to section 5(1)(d) of the *Commissions of Inquiry Act 1950* (Qld) to provide a written statement, under oath or affirmation, to the Queensland Floods Commission of Inquiry.

I, Natalie Plumbe [redacted] Planner of 45 Roderick Street, Ipswich in the State of Queensland, swear as follows:

Introduction and Qualifications

1. I am employed by Ipswich City Council (**ICC**) as the Team Coordinator-Development (Central Team) for the City of Ipswich. I commenced in this role on 15 November 2010. I work in the Development Planning branch of the Planning and Development Department and report to the Development Planning Manager, Ms Joanne Pocock.

2. I hold a Bachelor of Regional and Town Planning from University of Queensland (1998). I am also eligible for full membership with the Planning Institute of Australia.

3. I commenced employment with ICC in October 2002. Prior to that, from February 1999 to October 2002 I worked for the Department of Local Government and Planning as a Planning Officer.

4. Upon commencing employment with ICC I worked for approximately two years as a Senior Development Planner in the East Development team. In that capacity I was involved in the assessment of development applications. Then, for a period of approximately six years until November 2010 I was the Team Coordinator-Development (East team), responsible for the day-to-day management of the planners in that team, and for the assessment and determination by the East (geographic) team of development applications made pursuant to the Ipswich Planning Scheme.

5. In my current role I have the day-to-day management of the planners in the Central team, and am responsible for the assessment and determination by the Central team of development applications made pursuant to the Planning Scheme.

6. In 2006, in my capacity as Development Team Coordinator - East I was the Delegated Officer involved in the consideration of a development application (RAL 1704/05) for 35 Eric Street, Goodna. The Development Planner primarily concerned with that application was [redacted] who reported to me.

7. The sources of information for the matters set out in this statement are:

   (a) my personal knowledge and recollection of relevant events; and

[redacted] [redacted]

(b) my review of the relevant ICC development application files, a copy of which I understand have been produced to the Commission pursuant to a Requirement notice dated 5 August 2011.

35 Eric Street, Goodna - Application No. 1704/05/RAL

Application Background and Overview

8. The subject land comprises a 3.88 hectare site located at the eastern end of Eric Street, Goodna. The site is bounded by Woogaroo Creek to the north. The surrounding area is generally low density development and the site is located within the residential low density (Sub-Area 2) Zone under the Ipswich Planning Scheme. Access to the site is from Eric Street via the construction of an internal road network terminating in three cul-de-sacs.

9. The application was submitted on 22 March 2005 for a development permit for RAL (Reconfiguring a Lot) from 2 lots into 36 lots, and carrying out building works for single residential (preliminary approval). The proposed lots ranged in size from 556 m^2 to 832 m^2.

10. The subsequent history of the application is that:

(a) on 17 November 2005 the proposal was amended in response to the Council's Information Request to 2 lots into 35 lots;

(b) on 4 April 2006 ICC approved a development permit for reconfiguring a lot (2 lots into 24 lots) and a preliminary approval for building works (single residential). This approval was for 11 lots less than applied for by the applicant;

(c) on 8 May 2006 the applicant appealed to the Planning and Environment Court; and

(d) on 21 March 2007 Judge Wilson SC of the Planning and Environment Court allowed the appeal (by consent) for a development permit for a reconfiguration of a lot (2 lots into 32 lots in two stages) subject to conditions.

11. Public notification of the application was not required.

12. Prior to the application and approval the site was vacant land. It is located adjacent to Woogaroo Creek, and a portion of the site is susceptible to inundation by flooding from the creek and from the Brisbane River (by backwater flow) during rare rainfall events.

13. The site is a steep block, with an average grade of 1 in 8, extending from approximately RL8m AHD adjacent to Woogaroo Creek to approximately 37m AHD near Eric Street. The adopted 1 in 100 flood level is RL14.7m AHD and the 100 year ARI flood event in Woogaroo Creek ranges from 12.55m AHD to 12.94m AHD.

[redacted] [redacted]

14. A small portion of the site was inundated during the 1974 flood event. I understand that no residences were inundated during the 2011 flood event. If the site was subjected to any inundation in 2011, the affected area would have been very minor.

15. Investigation of the site during the approval process showed that two Woogaroo Creek flood levels needed to be considered as part of the development assessment. The site is affected by a 100 year ARI water level in the Brisbane River, in which water from the river travels up Woogaroo Creek and inundates a portion of the property. This backwater from the Brisbane River is essentially ponding and velocities in Woogaroo Creek would be close to zero.

16. The site is also affected by a 100 year ARI flood event in Woogaroo Creek, during which the water level on the site ranges from 12.55m AHD to 12.94m AHD at the downstream and upstream boundaries respectively.

17. The original development application was not supported by a stormwater drainage report, and as part of its Information Request dated 31 March 2005 (annexure NP-2) Council requested preliminary hydraulic calculations for the major and minor storm events, prepared by a RPEQ in accordance with QUDM.

18. The proposal was approved by Council with a substantially reduced density from 35 to 24 lots. The deletion of 11 proposed lots allowed greater lot size and road frontage widths. Council's conditions of approval included provision for the dedication to Council of some land adjacent to Woogaroo Creek below the adopted flood level.

19. The applicant appealed the Council's decision. As part of the appeal process a series of expert witness conclaves were conducted with the Council Engineer (see annexure NP-10) with a view to identifying the matters in relation to which the experts were agreed, and narrowing the areas in dispute. Further expert reports as to stormwater management and hydrology were produced by the applicant during the appeal process with a view to addressing the Council's areas of concern (as detailed below), culminating in Council being satisfied as to the proposal, and the Court ordering, by consent, that the appeal be allowed subject to revised conditions (annexure NP-11). On the basis of these revised conditions, the Court order provided for reconfiguration of the site into 32 lots.

20. A combination of measures to address stormwater were conditioned as part of the Court order, including the dedication to Council of some land below the Q100 level, the creation of a detention/retention basin between the 100 year ARI Woogaroo Creek level and the 100 year ARI Brisbane River level, a roof water system and associated drainage system, and the creation of overland flow easements.

[redacted] [redacted]

21. As a result of the further investigations undertaken and the conditions imposed, ICC and the Court were satisfied that the proposed development would:

(a) not increase peak stormwater discharges in Woogaroo Creek;

(b) not reduce the conveyance capacity of Woogaroo Creek for up to a 100 year ARI event;

(c) not reduce the flood storage of Woogaroo Creek on the site for up to a 100 year ARI event; and

(d) not cause a worsening to upstream or downstream properties.

22. In addition, the approved site plan resulted in:

(a) all developed lots being located a minimum of 250mm above the regulated 1 in 100 flood line with the exception of lots 31 and 32, which were partly affected by this flood line, with the result that a drainage easement was placed over the affected portion of these lots to ensure that buildings were constructed above this flood line; and

(b) all road works and house allotments for the development being located a minimum 250mm above the regulated 1 in 100 flood line.

23. Attached to my statement are copies of the following key documents in relation to this application:

NP-1: Development application by DTS Group lodged 22 March 2005 and accompanying assessment report

NP-2: ICC Information Request dated 31 March 2005

NP-3: Letter DTS Group to ICC dated 14 November 2005 responding to the Information Request and enclosing ETS Group Slope Analysis and Stormwater Report

NP-4: Memorandum Assistant Development Engineer to Development Team Coordinator dated 27 February 2006

NP-5: Memorandum Development Planner to Acting Development Team Coordinator dated 21 March 2006

NP-6: ICC Assessment Checklist - Code Assessable Development

NP-7: Development Application Decision Notice dated 4 April 2006

[redacted] [redacted]

NP-8: Proposed Sub-Division Master Plan - detailed Site Based Stormwater Management Plan - Issue 2 - ETS Group December 2006

NP-9: MRG Water Consulting detailed Hydrologic Report (Version 3) dated August 2006

NP-10: Engineering Joint Statement - Expert Conclave - 26 October 2006

NP-11: MRG Water Consulting Pty Ltd - Expert Witness Report - Planning and Environment Court - December 2006

NP-12: Judgment - Wilson J - Planning and Environment Court and attached Development Approval Package/Conditions 21 March 2007

Question 1: The known Q100 and Q20 flood levels at or around the time of the application

24. These levels are:

- Q100 flood level - RL14.7m AHD
- Q20 flood level - RL14.0m AHD.

Question 2: The known site level or levels

25. The levels for the site range from approximately RL8.0m AHD to approximately RL37.0m AHD.

Question 3: What assessment process was followed specific to flood impacts

26. As part of the original application assessment process, Council's Development Engineer was responsible for the assessment of flood impacts and providing information and draft conditions to the assessing officer to inform the decision making process. Council's Information Request dated 31 March 2005 (annexure NP-2) requested information in relation to stormwater drainage resulting in the provision of a stormwater report (annexure NP-3). Council's Development Engineer recommended that development of the site occur in accordance with specific stormwater conditions to ensure pre-development flows were maintained and that no detrimental flood/stormwater impacts would be experienced upstream or downstream of the subject site as a result of the proposed development.

27. Additionally, conditions were imposed to require a drainage easement over part of some lots partially affected by the regulated 1 in 100 flood line.

28. As part of the subsequent appeal process a number of additional stormwater reports were obtained. These reports are detailed in my response to question 7 below. The reports were discussed and reviewed by the experts and by Council's Development Engineer in conclaves

[redacted] [redacted]

throughout the appeal process. As a result of this process Council and the Court were satisfied that the development would:

(a) not increase peak stormwater discharges in Woogaroo Creek;

(b) not reduce the conveyance capacity of Woogaroo Creek for up to a 100 year ARI event;

(c) not reduce the flood storage of Woogaroo Creek on the site for up to a 100 year ARI event;

(d) not cause a detrimental impact to upstream or downstream properties; and

(e) result in all lots being located a minimum of 250mm above the regulated 1 in 100 flood line with the exception of two lots which were partly affected, as a result of which conditions were imposed to require a drainage easement to be conferred over the affected portion of the lots to ensure that buildings were constructed above this flood line.

Question 4: What consideration was given to:

(a) the proximity of the site to the Brisbane River and/or Woogaroo Creek;

(b) the flood risk or the potential impact of flooding on the use proposed for the site;

(c) the frequency with which flooding has occurred at the site in the past.

(a) Proximity to the Brisbane River and/or Woogaroo Creek

29. Consideration was given to the sites proximity to Woogaroo Creek. The site is located immediately adjacent to Woogaroo Creek and partially subject to potential flooding as a result of events in the Brisbane River and/or Woogaroo Creek.

30. In both the Council's original decision notice and the Court order, land affected by the 1 in 100 flood line as a result of flooding from Woogaroo Creek or the Brisbane River was either required to be dedicated to Council as park or drainage, or made the subject of a drainage easement.

31. The expert report prepared by MRG Water Consulting Pty Ltd dated December 2006 details that:

"*The site is affected by a 100 year ARI water level in the Brisbane River. During this river flood event, water from the river travels up Woogaroo Creek and inundates a portion of the*

[redacted] [redacted]

property. This backwater from the river is essentially ponding and velocities in Woogaroo Creek would be close to zero.

The site is also affected by a 100 year ARI flood event in Woogaroo Creek. During this event the water level on the site is 12.55m AHD and 12.94m AHD at the downstream and upstream property boundaries respectively".

(b) Potential flood risk

32. Consideration of the flood risk and the potential impact of flooding on the development were considered in Council's assessment of the application and addressed by the conditions imposed in Council's original notice and subsequently by the conditions imposed in the Court order.

(c) The frequency of past flooding at the site

33. It is my understanding that the frequency with which flooding has occurred at the site in the past was a policy consideration in the formulation of the 1 in 100 flood line. This flood line, as it relates to the site, was applied in considering the application. Historical river heights in relation to the site were not obtained for the purpose of considering the application, the relevant policy consideration for those purposes being the location of the 1 in 100 flood line.

Question 5: The measures proposed to mitigate the potential for flooding at the site by reference to any requirements to locate the proposed habitable floor levels

34. All buildings were to be constructed above the 1 in 100 flood line as a result of the development approval, with all lots either being entirely located above the 1 in 100 flood line, or, in relation to 2 lots including area below the 1 in 100 line, a condition was imposed requiring a drainage easement be placed over the affected portion of those lots so as to ensure buildings were constructed above the 1 in 100 line. I am also aware that under a subsequent Operational Works approval for the development, some lots were filled in association with the earthworks for the construction of roads and services resulting in all lots achieving a minimum 250mm freeboard above the 1 in 100 line, thereby ensuring additional 1 in 100 flood immunity for all proposed dwellings.

Question 6: Whether the impacts on upstream or downstream properties were taken into account, particularly with respect to:

(a) the impact of any land filling or excavation work carried out as part of the application;

(b) the impact of any stormwater or overland flow management facilities.

[redacted]

(a) The impact of any land filling or excavation work

35. Minimal earthworks were proposed as a result of the development for road works and a detention basin. All earthworks associated with the road works were located above the regulated 1 in 100 flood line. The detention/retention basin was located between the 100 year ARI Woogaroo Creek level and the 100 ARI Brisbane River level.

36. The report prepared by MRG Water Consulting Pty Ltd dated December 2006 details that "*works in this area will not decrease the conveyance or flood storage of Woogaroo Creek and will not increase flood levels in the Brisbane River*".

(b) The impact of any stormwater or overland flow management facilities

37. A combination of measures to address stormwater were conditioned as part of the Court order including the development of a detention/retention basin, roof water system and associated drainage system. Following consideration of the expert reports Council, and the Court were satisfied that the development would:

(a) not increase peak stormwater discharges in Woogaroo Creek;

(b) not reduce the conveyance capacity of Woogaroo Creek for up to a 100 year ARI event;

(c) not reduce the flood storage of Woogaroo Creek on the site for up to a 100 year ARI event; and

(d) not cause a worsening to upstream or downstream properties.

Question 7: Details of any expert reports (particularly hydrologic or hydraulic reports) obtained by the applicant or the Council

38. The following expert reports were obtained in relation to the proposal.

(a) "Proposed Development at 35 Eric Street, Goodna: Information Request Reply Slope Analysis & Stormwater Report", prepared by ETS Group - 14 November 2005 –

This report was prepared on behalf of the applicant and lodged in response to Council's Information Request.

This report details calculations for pre and post development Q100 flows. Options identified for managing stormwater to ensure pre development flows were

[redacted] [redacted]

maintained included a detention basin and detention of stormwater using a combination of roof water tanks plus a smaller detention basin.

Council's original decision notice imposed conditions to manage stormwater as a result of the development including requirements for provision of a suitable roof water system and detention and/or retention device.

(b) "Proposed Subdivision at 35 Eric Street, Goodna: Master Plan Detailed Site Based Stormwater Management Plan", Issue 1, dated August 2006 and prepared by ETS Group–

This report was prepared on behalf of the applicant during the appeal process.

This report details at design level what treatment trains need to be incorporated into the design of the stormwater system to ensure water quality objectives are achieved.

(c) "Proposed Subdivision at 35 Eric Street, Goodna: Master Plan Detailed Site Based Stormwater Management Plan", Issue 2, dated December 2006 and prepared by ETS Group–

This report was prepared on behalf of the applicant during the appeal process and is a revision of Issue 1 to respond to the hydraulic report outlined below.

This report details at design level what treatment trains need to be incorporated into the design of the stormwater system to ensure water quality objectives are achieved.

(d) Detailed Hydrologic Report 35 & 37A Eric Street, Goodna" Versions 2 & 3, dated August 2006 and prepared by MRG Water Consulting Pty Ltd–

These two (2) reports were prepared on behalf of the applicant during the appeal process.

The purpose of these reports were to provide details of peak discharges from the developed site and the effect of development on downstream discharges in Woogaroo Creek.

Both reports conclude that:

- The development of the site will not increase peak stormwater discharges in Woogaroo Creek;
- Construction of a detention basin on the site could potentially increase water levels within Woogaroo Creek, due to coincident peak timing; and

[redacted] [redacted]

- The development does propose rainwater tanks and a retention area which will retain water for at least 24 hours and the combined effect of these measures will ensure that the total volume of stormwater entering Woogaroo Creek during a storm event will reduce by a minimum of $200m^3$.

(e) "Expert Witness Report: Rescom Property Group Pty Ltd v Ipswich City Council P&E Appeal No. BD1344/2006", prepared by MRG Water Consulting Pty Ltd and dated December 2006 -

This report was prepared on behalf of the applicant during the appeal process following a number of without prejudice conclaves between hydraulic experts and is described as superseding all previous reports regarding stormwater issues for the development.

The purpose of this report was to undertake the hydraulic modelling of Woogaroo Creek to determine the impacts of the development on downstream and upstream properties and devise a detention system for the development which would ensure no worsening to downstream properties.

The report concludes that by constructing a detention basin and fitting rainwater tanks as part of the development of the site, the development:

- Will not increase peak stormwater discharges in Woogaroo Creek;
- Will not reduce the conveyance capacity of Woogaroo Creek for up to a 100 year ARI event;
- Will not reduce the flood storage of Woogaroo Creek on the site for up to a 100 year ARI event; and
- Will not cause a worsening to upstream or downstream properties.

The Court's order imposed conditions to manage stormwater as a result of the development including requirements for provision of a suitable roof water system and detention and/or retention device.

Question 8: Details of any review undertaken by Council of the expert reports

39. Council's Development Engineer undertook detailed review of the various reports, including participating in expert witness conclaves in connection with the Planning and Environment

[redacted]

Court appeal. As a result of those reviews conditions were formulated in both the Council's original decision notice and for the purposes of the Court order approving the application.

Question 9: What conditions were included with respect to protection from impacts of flooding

40. Annexure NP-13 to my statement details the stormwater conditions included as part of the ICC development application decision notice dated 4 April 2006.

41. Annexure NP-14 to my statement details the stormwater conditions imposed as part of the Court order dated 21 March 2007 for the conditional approval of the application.

Question 10: The basis for Council's statement in relation to the 1974 flood "advice"

42. This is standard clause included in ICC development approvals where the subject site was inundated by the 1974 flood. I refer in that regard to paragraphs 37 - 42 of the witness statement of Ms Joanne Pocock. The advice has been included on development approvals for as long as I have been employed by ICC. I am unable to assist the Commission as to the genesis of the advice.

I make this statement conscientiously believing the same to be true, and by virtue of the provisions of the *Oaths Act 1867* (Qld).

Signed and declared by Natalie Plumbe at Ipswich in the State of Queensland this 7th day of October 2011 before me:

..... [redacted] .....
Deponent

..... [redacted] .....
Witness

J.P (Qualified)
Reg No [redacted]

Annexure NP-1

Form 1 Development Application idas

Common details

PART A

The completion of **all applicable questions** on Part A is **mandatory** for all applications.

Part A must be accompanied by one (1) or more other completed parts of the Form.

Any information requested in the form may be provided in an attachment to the application.

For further information about completing the following details, refer to Guide 1 *Making an IDAS Application*.

Description of land All land the subject of the application, must be identified. A description of the land is not required in relation to a mobile or temporary environmentally relevant activity. **Advice for completing Q2** Q2 applies if development is proposed within a water body or watercourse. **Advice for completing Q3** Most land can be identified by a lot on plan description. These details can be obtained from title documents or through the local government. However, if the land on which the development is proposed does *not* have a lot on plan description *(i.e. the development is proposed in a water body or watercourse)* provide – (i) the lot on plan description for the adjoining/adjacent land; or (ii) GPS coordinates where there is no adjoining/adjacent land *(eg. in Moreton Bay)*.	1. Street address: *(including house number, street name, suburb/locality name & postcode) (if applicable)* 35 Eric Street, Goodna 2. Name of water body or watercourse, within which the development is proposed: *(if applicable)* n/a 3. Lot on plan description *(eg. Lot 123 on RP 4567)* / GPS coordinates: Lot 1 on RP122040 and Lot 28 on RP802704 4. The above description is for: *(tick applicable box)* ☒ (i) the land on which the development is proposed; or ☐ (ii) the land adjoining the water body or watercourse, within which the development is proposed; or ☐ (iii) the water body or watercourse. 5. Shop / tenancy number: *(if applicable)* n/a 6. Storey / level: *(if applicable)* n/a
Advice for completing Q7 Q7 does not apply if the development is proposed within a water body or watercourse. **Advice for completing Q8** Q8 applies if development is proposed within a local government area. Note: Areas below high water mark are *not* within a local government's area unless provided for under the *Local Government Act 1993*. **Advice for completing Q9** Q9 applies if development is proposed on strategic port land or a strategic port land tidal area. For more information refer to Guide 11 *Development on strategic port land*	7. Total area of land: *(m² or ha) (if applicable)* 3.8664 ha 8. Local government area in which the land is situated: *(eg. Brisbane, Esk, Hervey Bay, Woocoo etc.) (if applicable)* Ipswich City Council 9. Port authority for the strategic port land or strategic port land tidal area on which the development is proposed *(eg. Port of Brisbane, Port of Townsville) (if applicable)* n/a
Proposal details	10. Existing use of the land: *(eg. vacant, single house, shop etc.)* Rural Residential 11. Proposed use of the land: *(eg. 6 unit apartment building, 30 lot residential subdivision, ERA for aquaculture in ponds with a total area of 7 ha for which wastes are released into waters etc).* As above

Other applicable parts of Form 1

Part A of Form 1 must **always** be accompanied by other completed parts of Form 1.

For information about when a part of Form 1 may apply for an application refer to Guide 1 *Making an IDAS development application.*

12. Other parts of Form 1 completed as part of this application: *(eg. Part D, Part I, etc)*
Part F

Applicant details

Clearly identify who is making the application. The applicant need not be the owner of the land.

When signing and lodging this application
The applicant is responsible for ensuring the information provided is correct. The assessment manager, any referral agency and the Chief Executive *(where applicable)* will rely on this information when assessing and deciding the application.

If the applicant is a company
A contact person must be shown. All correspondence will be mailed to this address.

13. Name:
DTS Group QLD

14. Postal address:
Butterfield Commercial Centre 1/49 Butterfield St, Herston QLD 4006

15. Signature: [redacted]

16. Date: 17.3.05

17. Contact person: [redacted]

18. Telephone number: [redacted]

19. Mobile phone number: *(if applicable)*

20. Facsimile number: *(if applicable)* [redacted]

21. Email address: *(if applicable)*
mal@dtsgroupqld.com.au

Land owner's consent *(if applicable)*

Section 3.2.1(10)(a) of the IPA prescribes that an application can not be taken to be properly made without the land owner's consent.

For more information about land owner's consent refer to Guide 1 *Making an IDAS development application.*

An application ***must*** be supported by the consent of the land owner if the application involves:

(i) a material change of use;
(ii) reconfiguration of a lot;
(iii) work on land below high-water mark & not within a canal as defined under the *Coastal Protection and Management Act 1995*;or
(iv) work on rail corridor land defined under the *Transport Infrastructure Act 1994*.

For a mobile or temporary ERA
Land owner's consent is *not* required.

If an owner has signed this form as applicant
Their signature is not required again in this section.

If there are multiple owners
The consent of each owner is required.

If the owner is a company
Refer to Guide 1.

22. Name/s:
Rescom P/L

23. Signature/s: [redacted]

24. Date: 14/3/05

Resource entitlement *(if applicable)*

Section 3.2.1(10)(b) of the IPA prescribes that an application can *not* be taken to be properly made without evidence of the resource entitlement.

Advice for completing Q26

Refer to schedule 10 of the *Integrated Planning Regulation 1998* that prescribes the nature of evidence required by the State in support of the lodging of this development application.

25. Does this application involve taking or interfering with *(other than interfering with quarry material on State coastal land under the Coastal Protection and Management Act 1995)* a State resource?

☒ NO - *go to Q28* ☐ YES - *go to Q26*

26. This application is required by regulation to be accompanied by: *(tick the applicable box)*

☐ (i) evidence of the **allocation** of, or entitlement to, the resource – *attach evidence*

☐ (ii) evidence the chief executive of the department administering the resource is satisfied the development **is consistent with an allocation** of, or entitlement to, the resource – *go to Q 27*

☐ (iii) evidence the chief executive of the department administering the resource is satisfied the development application **may proceed in the absence of an allocation** of, or entitlement to, the resource – *go to Q 27*

Advice for completing Q27

The information in (i) – (v) is mandatory if evidence is required under Q26 (ii) or (iii) above.

The official stamp of the Department of Natural Resources and Mines is mandatory where the application involves taking or interfering with water or riverine quarry material under the *Water Act 2000*.

27. Evidence of the resource entitlement:

(i) Resource entitlement / authority details

(ii) Name of delegated officer

(iii) Position of delegated officer

(iv) Signature of delegated officer

(v) Date

(iv) Official stamp of the department administering the resource *(if applicable)*

Referral triggers

The Referrals Checklist must be completed and lodged with all IDAS development applications, other than those requiring the completion of Parts A and B of the Form only.

28. Is the Referrals Checklist completed and attached to this application?

☒ YES

☐ NO – *the assessment manager may refuse to accept this application on the grounds that the application has not been properly made*

Plans / drawings / reports

An application should be accompanied by details to support the proposal & enable the assessment manager, referral agencies and any person viewing the application during public scrutiny or public notification to understand the scope of the proposal and any potential impact.

29. Plans/drawings/reports accompanying this application:

	Plan / Drawing / Report Number	Title	Date
(i)	Subdivision Plan A2 905/2		
(ii)	BLE Plan A3 s3076-2		
(iii)	Town Planning Assessment Report		March 2005
(iv)			

Form 1 Development Application

Reconfiguring a lot

PART F

Completion of **all applicable questions** on Part F is **mandatory** for all applications involving the reconfiguring of a lot *(including freehold subdivision, community title subdivision, subdivision by lease, etc.)*.

Nature of the application

A development permit authorises development to occur, while a preliminary approval is a step in the approval process and does not authorise development to occur.

1. This application is for: *(tick one (1) or both if applicable)*

☒ **Development permit** - *provide details below eg. stage 1: freehold subdivision of 25 lots, realignment of a boundary, creation of an access easement)*

AND / OR

☐ **Preliminary approval** -*provide details below eg. stages 2, 3 and 4: freehold subdivision of 75 lots, realignment of a boundary, creation of an access easement)*

The subject land

The information requested in Q2 & 3 is necessary for statistical and planning purposes.

2. Number of existing lots: 2

3. Total area of land in application: *(if staged, total area of the land in this stage)*
3.8664 ha

4. How the subject land is identified in the planning scheme: *(name the zone, precinct etc.)*
Residential Low-Density RL2

5. Current use of the land: *(if vacant, also identify the previous use)*
Single Residential Dwellings

6. Are there buildings or structures existing on the land?
☐ NO
☒ YES – *complete Q 7*

7. Indicate which one of the following circumstances applies:
☐ All existing buildings and structures on the land will be **demolished** as part of the development / redevelopment of the site; or
☒ **Some** existing buildings and structures on the land are proposed to be **retained** as part of the development / redevelopment of the site - *indicate on the plans prepared in response to Question 6 above, those buildings or structures proposed to be retained*

8. Existing services on the land: *(eg. water & sewerage) - attach plan identifying location if appropriate)*
All services available

9. Are there any existing easements over the land?
☒ NO
☐ YES - *attach plan identifying easement location & purpose*

The proposal

The information requested in Q10-13 is necessary for statistical and planning purposes.

10. Total area of land in the development permit minus any balance area
3.8664 ha

11. Number of proposed lots: 36

12. Number of additional **residential** lots proposed in development permit: *(if applicable)*
34

13. Estate name & stage number: *(applicable if the application is for a stage or stages of an overall subdivision proposal)*
-

14. Area of land to be contributed for community purposes: *(if applicable)*
9593m²

15. Length of new road to be constructed: *(if applicable)*
459ml

PLEASE NOTE

This application **cannot** be accepted unless accompanied by Part A of Form 1.

The assessment manager may refuse to accept an application that, at the time of lodgement, fails to provide all applicable information requested by Part A and any other relevant part of Form 1.

OFFICE USE ONLY *(applicable to assessment manager)*

DATE RECEIVED		REFERENCE NUMBER/S	

Form 1 Development Application

Referrals checklist

Completion of **all questions** on the Referrals Checklist is **mandatory** for all applications, other than those requiring the completion of Parts A & B only.

It is the responsibility of the applicant to work with the assessment manager to correctly identify if an application involves referral to an IDAS referral agency for their assessment and determination, or comment and / or the coordination of any information request by the Chief Executive DLGP through the referral coordination process. The checklist contains a number of questions to aid in this determination. If your application does involve referral, the assessment manager will confirm in the acknowledgement notice the referral actions required. To assist you in answering the following questions a series of guides are available free from www.ipa.qld.gov.au.

REFERRALS THAT CAN APPLY TO DEVELOPMENT

- other than building work assessable against the Standard Building Regulation 1993

Environmentally relevant activity

For more information refer to Guide 4, schedule 8A of the IPA & schedule 2 of the IP Regulation. Unless you answered "none of the above" to Q1, the application requires assessment by the administering authority[1]. If an agency other than the administering authority is the assessment manager for the application, the administering authority is a concurrence agency for the application in relation to this matter.

Note: An application involving ERA 19 and/or 20 will also require completion of Part K of Form 1 for approval where an allocation under the Water Act 2000 is required.

1. The application involves *(tick applicable box/es)* –

☐ (i) an environmentally relevant activity (ERA) for which a code for environmental compliance has ***not*** been made- *complete Part G of Form 1*

☐ (ii) a mobile or temporary ERA for which a code of environmental compliance has ***not*** been made - *complete Part G of Form 1*

☒ (iii) none of the above

State-controlled road matters

For more information refer to Guide 3, schedule 8A of the IPA & schedule 2 of the IP Regulation. Unless you answered "none of the above" to Q2, the application triggers referral to Main Roads as referral agency.

In certain circumstances Main Roads will be an advice agency, while in other circumstances Main Roads will be a concurrence agency. Schedule 2 of the IP Regulation will assist you to determine where Main Roads is an advice or concurrence agency for the application.

2. The application involves development on land: *(tick applicable box/es)* -

(a) ***contiguous***[2] to a State controlled road that is for -

☐ (i) a material change of use assessable against the planning scheme;

☐ (ii) reconfiguring a lot - unless the number of lots does not increase and the number of lots abutting the State-controlled road does not increase;

☐ (iii) operational work not associated with a material change of use assessable against the planning scheme or reconfiguring a lot that–

- is associated with access to a State-controlled road;
- is for filling or excavation;

☐ (iv) operational work or building work *(for a non-residential purpose and not associated with an assessable reconfiguration or a material change of use assessable against a planning scheme)* that involves the redirection or intensification of site stormwater from the site, through a pipe with a cross-sectional area greater than 250mm² that directs stormwater to a State-controlled road;

(b) ***not contiguous*** to a State-controlled road that is –

☐ (iv) proposed within a local government area that has a transitional planning scheme and is for development -

- mentioned in schedule 5 of the IP Regulation and exceeds the thresholds set in that schedule

☐ (v) proposed within a local government area that has an IPA planning scheme and is for development -

- mentioned in schedule 5 of the IP Regulation and exceeds the thresholds set in that schedule
- inconsistent with plans for State-controlled road infrastructure

(c) ☒ none of the above

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1 The administering authority may be either the Environmental Protection Agency, the relevant local government (for a devolved ERA) or the Queensland Department of Primary Industries and Fisheries (for a delegated ERA).

2 Land contiguous to a State-controlled road is defined in schedule 14 of the IP Regulation to mean land if part of the land is within 100m of the State-controlled road or land that is part of a future State-controlled road)

Clearing vegetation

For more information refer to Guide 12, schedule 8A of the IPA & schedule 2 of the IP Regulation.
Unless you answered "none of the above" to Q3, the application requires assessment by NR&M[3]. If an agency other than NR&M is the assessment manager for the application, NR&M is a concurrence agency for the application in relation to this matter.

3. The application involves: *(tick applicable box)* -

☐ (a) ***operational work*** for the clearing of native vegetation where the vegetation clearing is made assessable under Schedule 8 of the IPA - *complete Part J of Form 1*

☐ (b) a ***material change of if*** –

(i) the lot contains –
- a category 1, 2 or 3 area shown on a property map of assessable vegetation; or
- if there is no property map of assessable vegetation for the lot - remnant vegetation; &

(ii) the existing use of the land is a rural or environmental use; and

(iii) the size of the land is 2 hectares or larger - *complete Part J of Form 1*

☐ (c) ***reconfiguration of a lot*** if –

(i) the lot contains –
- a category 1, 2 or 3 area shown on a property map of assessable vegetation; or
- there is no property map of assessable vegetation for the lot - remnant vegetation; &

(ii) the size of the lot before the reconfiguration is 2 hectares or larger; and

(iii) 2 or more lots are created; and

(iv) the size of any lot created is 25 hectares or smaller - *complete Part J of Form 1*

☒ (d) none of the above

Strategic port land

For more information refer to Guide 11, schedule 8A of the IPA & schedule 2 of the IP Regulation.
If you answered "YES" to Q4, the relevant Port Authority is the assessment manager and Queensland Transport is a concurrence agency for the application.

4. Does the application involve a material change of use on strategic port land that is ***inconsistent*** with the approved land use plan under the *Transport Infrastructure Act 1994*?

☒ NO

☐ YES - *complete Part I of Form 1*

Acid sulfate soils

For more information refer to Guide 10 & schedule 2 of the IP Regulation.
Unless you answered "none of the above" to Q5, the application requires assessment by NR&M. If an agency other than NR&M is the assessment manager for the application, NR&M is an advice agency for the application in relation to this matter.

5. The application involves assessable development *(other than building work only assessable against the Standard Building Regulation)* on land situated in an identified[4] local government area and where the surface of the land is: *(tick applicable box)* -

☐ (i) below 20m AHD[5] and the development involves the excavation of 1000m³ or more of soil or sediment at or below 5m AHD; or

☐ (ii) at or below 5m AHD and the development involves filling the site with 1000m³ or more of material

☒ (iii) none of the above

Major hazard facilities or possible major hazard facilities

For more information refer to Guide 17, schedule 8A of the IPA & schedule 2 of the IP Regulation.
If you answered "YES" to Q6, the application requires assessment by DES[6]. If an agency other than DES is the assessment manager for the application, DES is a concurrence agency for the application in relation to this matter.

6. Does the application involve a material change of use for a major hazard facility or possible major hazard facility as defined under the *Dangerous Goods Safety Management Act 2000*?

☒ NO

☐ YES - *complete Part L of Form 1*

Water related development

For more information about items (i) – (iv), refer to Guide 15, schedule 8A of the IPA & schedule 2 of the IP Regulation.
For more information about item (v), refer to Guide 14 *Does my application involve assessment of a referable dam?*, schedule 8A of the IPA & schedule 2 of the IP Regulation.
Unless you answered "none of the above", the application requires assessment by NR&M. If an agency other than NR&M is the assessment manager for the application, NR&M is a concurrence agency for the application in relation to this matter.

7. The application involves:

☐ (a) operational work that is: *(tick applicable box/es)*

☐ (i) in a watercourse *(eg. a pump, gravity diversion, stream re-direction, weir or dam)*

☐ (ii) for an artesian bore anywhere in the State, no matter what the use

☐ (iii) for a subartesian bore, in declared groundwater area[7], for use for purposes other than stock and/or domestic use

☐ (iv) for a subartesian bore, in certain declared groundwater area, for use for stock and/or domestic purposes

☐ (v) for a referable dam[8]

☐ (vi) for taking overland flow water;

☒ (b) none of the above.

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[3] Department of Natural Resources and Mines

[4] The identified local government areas are: Aurukun, Bowen, Brisbane, Broadsound, Bundaberg, Burdekin, Burke, Burnett, Caboolture, Cairns, Calliope, Caloundra, Cardwell, Carpentaria, Cook, Cooloola, Douglas, Fitzroy, Gladstone, Gold Coast, Harvey Bay, Hinchinbrooke, Isis, Johnstone, Livingstone, Logan, Mackay, Maroochy, Maryborough, Miriam Vale, Mornington, Noosa, Pine Rivers, Redcliffe, Redland, Rockhampton, Sarina, Thuringowa, Tiaro, Torres, Townsville, Whitsunday.

[5] Australian Height Datum (AHD)

[6] Department of Emergency Services

[7] The declared ground water areas are listed in Guide 13 *Development in a declared catchment area*

[8] Referable dam is defined under the *Water Act 2000*

Removal of quarry material from a watercourse

For more information refer to Guide 18, schedule 8A of the IPA & schedule 2 of the IP Regulation.
If you answered "YES" to Q8, the application requires assessment by NR&M. If an agency other than NR&M is the assessment manager for the application, NR&M is a concurrence agency for the application in relation to this matter.
Note: Part G of Form 1 is required to be completed as the activity of removing quarry material from a watercourse is also an Environmentally Relevant Activity (ERA).

8. Does the application involve development for the removal of quarry material from a watercourse[9] under an allocation notice given under the *Water Act 2000*?

☒ NO
☐ YES - *complete Part K, and G of Form 1*

Operational works in a tidal area or coastal management district

For more information refer to Guide 18, schedule 8A of the IPA & schedule 2 of the IP Regulation.
If you answered "YES" to Q9, the application requires assessment by EPA. If an agency other than EPA is the assessment manager for the application, EPA is a concurrence agency for the application in relation to this matter.

9. Does the application involve operational works in a tidal area or coastal management district as defined under the *Coastal Protection and Management Act 1995*?

☒ NO
☐ YES – *complete Part M of Form 1*

Tidal works and coastal management

For more information refer to Guide 18, schedule 8A of the IPA & schedule 2 of the IP Regulation.
Unless you answered "none of the above", the application triggers referral to QT[10](Maritime Safety Qld) as concurrence agency.

10. The application involves operational work that is: *(tick the applicable box/es)*

☐ (i) tidal work[11] – *complete Part M of Form 1*
☐ (ii) disposing of dredge spoil or other solid material in tidal water – *complete Part M of Form 1*
☐ (iii) reclaiming land under tidal water – *complete Part M of Form 1*
☐ (iv) constructing a canal[12] if the canal is associated with reconfiguring a lot – *complete Part M of Form 1*
☒ (v) none of the above.

Coastal management

For more information refer to Guide 18, schedule 8A of the IPA & schedule 2 of the IP Regulation.
Unless you answered "none of the above", the application requires assessment by EPA. If an agency other than EPA is the assessment manager for the application, EPA is a concurrence agency for the application in relation to this matter.

11. The application involves: *(tick the applicable box/es)*

☐ (i) a ***material change of use involving operational work*** carried out completely or partly in a coastal management district[13] and assessable under a planning scheme
☐ (ii) a ***material change of use involving building work*** carried out completely or partly in a coastal management district and assessable under a planning scheme that is –
- the construction of a new premises with a GFA[14] of at least 1000m²
- the enlargement of the GFA of an existing premises by more than 1000m²

☐ (iii) assessable ***reconfiguration*** of a lot where the land is situated completely or partly in a coastal management district – *complete Part M of Form 1*
☐ (iv) assessable ***reconfiguration*** of a lot[15] in connection with the construction of a canal – *complete Part M of Form 1*
☒ (v) none of the above

Development below high water mark

For more information refer to Guide 18, schedule 8A of the IPA & schedule 2 of the IP Regulation.
If you answered "YES" to Q12, the application triggers referral to the Port Authority.
The Port Authority is concurrence agency if the development is –
- within 200m of a shipping channal or an entry and exit shipping corridor for the port
- within 1000m of a swing basin, a commercial shipping wharf, a mooring, anchorage or spoil grounds;
- within 1000m of a planned port facility identified in a land use plan approved under the *Transport Infrastructure Act 1994*.

In all other situation the Port Authority is advice agency.

12. Does the application involve development below high water mark[16] and within the limits of a port under the *Transport Infrastructure Act 1994*?

☒ NO
☐ YES – *complete Part M of Form 1*

Marinas

For more information refer to Guide 18, schedule 8A of the IPA & schedule 2 of the IP Regulation.
If you answered "YES" to Q13, the application triggers referral to Queensland Fire and Rescue Service as an advice agency.

13. Does the application involve operational work that is tidal work for a marina[17] with more than 6 vessel berths?

☒ NO
☐ YES - *complete Part M of Form 1*

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9 Watercourse is defined in sch 10 of the IPA
10 Queensland Transport
11 Tidal work is defined in sch 10 of the IPA
12 Canal means canal as defined under the *Coastal Protection and Management Act 1995*
13 Coastal management district is defined in sch 10 of the IPA and means a coastal management district under the *Coastal Protection and Management Act 1995*, other than an area declared as a coastal management district under section 47(2) of that Act
14 GFA is defined in sch 14 of the IPA to mean the gross floor area. For a definition of how to calculated GFA, go to the planning scheme against which the application is being assessed.
15 Under s117 of the *Coastal Protection and Management Act 1995*, an application for reconfiguration, where the reconfiguration is associated with the construction of an artificial waterway, must be accompanied by the application for the operational works to construct the artificial waterway.
16 High water mark is defined in the *Coastal Protection and Management Act 1995* and means the ordinary high water mark at spring tide
17 Marina is defined in the *Transport Operations (Maritime Pollution) Regulation 1995*

Tidal works in strategic port land tidal areas

For more information refer to Guide 18, schedule 8A of the IPA & schedule 2 of the IP Regulation.
If you answered "YES" to Q14, the relevant port authority is the assessment manager for the application and EPA and Queensland Transport are concurrence agencies for the application.

14. Does the application involve tidal works within the limits of strategic port land tidal areas[18]?

☒ NO

☐ YES - *complete Part M of Form 1*

Heritage

For further information refer to Guide 19, schedule 8A of the IPA & schedule 2 of the IP Regulation.
If you answered "YES" to Q15, the application triggers referral to the Queensland Heritage Council as concurrence agency for the application.

15. Does the application involve development in a heritage registered place as defined under the *Queensland Heritage Act 1992*?

☒ NO

☐ YES – *complete Part C of Form 1*

Declared catchment areas

For more information, including a list of the declared catchment areas within Queensland, refer to Guide 13, schedule 8A of the IPA & schedule 2 of the IP Regulation.
Unless you answered "none of the above", the application requires assessment by NR&M. If an agency other than NR&M is the assessment manager for the application, NR&M is a concurrence agency for the application in relation to this matter.

16. The application involves development in an areas declared to be a catchment area under the *Water Act 2000* for: *(tick the applicable box/es)*

☐ (i) reconfiguration of a lot, if any lot resulting from the reconfiguration is less than 16 hectares;

☐ (ii) the establishment or expansion of a waste water disposal system, other than a disposal system for carrying out an environmentally relevant activity under the *Environmental Protection Act 1994*

☒ (iii) none of the above

Contaminated land

Applications involving material change of use and / or reconfiguring a lot may trigger this referral.
For more information refer to Guide 5, schedule 8A of the IPA & schedule 2 of the IP Regulation.
If you answered "YES" to Q17, the application requires assessment by EPA. If an agency other than EPA is the assessment manager for the application, EPA will be a concurrence agency for the application in relation to this matter.

17. This application involves: *(tick the applicable box/es)* –

☐ (a) ***reconfiguring a lot*** for which all of part of the premises are –

(i) premises mentioned in the IPA, schedule 8, part 1, table 2 –
- item 5, including the exemption otherwise provided for by paragraph (d);
- item 6, including the exemption otherwise provided for by paragraph (e); or
- item 7,
- including the exemption otherwise provided for a mining activity or petroleum activity; or

(ii) in an area for which an area management advice has been given for unexploded ordnance - *complete Part N of Form 1*

☐ (b) a ***material change of use*** –

(i) made assessable under the IPA, schedule 8, part 1, table 2, items 5 to 7; or

(ii) if all or part of the premises is in an area for which an area management advice has been given for unexploded ordnance - *complete Part N of Form 1*

☒ (c) none of the ebove

Electricity infrastructure

For more information refer to schedule 2of the IP Regulation.
Unless you answered "none of the above", the application triggers referral to the agency to which the easement is granted in favour of as advice agency.

18. The application involves: *(tick the applicable box/es)*

☐ (i) reconfiguration of a lot where any part of the lot is –
- subject to an easement in favour of a distribution entity or transmission entity under the *Electricity Act 1994* and the easement is for a transmission grid or supply network under that Act; or
- situated within 100m of a substation site;

☐ (ii) a material change of use, assessable against a planning scheme and not associated with reconfiguring a lot if –
- any part of the premises is subject to an easement in favour of a distribution entity or transmission entity under the *Electricity Act 1994* and the easement is for a transmission grid or supply network under that Act; and
- any structure or work that is the natural and ordinary consequence of the use is, or will be, located wholly or partly in the easement;

☐ (iii) a material change of use, assessable against a planning scheme and not associated with reconfiguring a lot if any part of the premises is situated within 100m of a substation site

☐ (iv) operational work that is filling or excavation, not associated with reconfiguring e lot, if –
- any part of the premises is subject to an easement in favour of a distribution entity or transmission entity under the *Electricity Act 1994*; and
- the work is located wholly or partly in the easement

☒ (v) none of the above.

[18] Strategic port land tidal areas are the areas generally 50 meters seaward of high water mark adjacent to strategic port land.

Land designated for community infrastructure Applications involving development on land designated for community infrastructure may trigger this referral. For more information refer to schedule 2 of the IP Regulation. If you answered "YES" to Q19, the application requires assessment by the chief executive of the department administering the Act authorising the development for the designated purpose. If an agency other than the designator is the assessment manager for the application, the designating agency will be a concurrence agency for the application in relation to this matter.	19. Does the application involve development on land designated for community infrastructure – (i) intended to be supplied by a public sector entity; and (ii) on land not owned by or on behalf of the State; and (iii) other than development – • for the designated purpose; or • carried out by, or on behalf of, the designator ☒ NO ☐ YES
SEQ Regional Plan For more information refer to schedule 2 of the IP Regulation. If you answered "YES" to Q20, the application requires assessment by the chief executive of the department administering the IPA.	20. Does the application involve a material change of use for urban purposes[19] in the SEQ Region[20], other than for a single dwelling on an existing lot, for which all or part of the premises, the subject of the development, is in the – (i) Regional Landscape and Rural Production Area; (ii) Rural Living Area; (iii) Investigation Area; or (iv) Mt Lindesay/North Beaudesert Investigation Area, unless the premises is designated or zoned for urban purposes in the relevant planning scheme. ☒ NO ☐ YES
Referral coordination An information request requires referral coordination if the application involves – (i) 3 or more concurrence agencies; or (ii) a facility or area assessable under a planning scheme and prescribed in schedule7 or 8 of the IP Regulation; or (iii) development which is subject to an application for preliminary approval mentioned in section 3.1.6 of the IPA. For more information go to Guide2 & Guide 6.	21. Does the application trigger referral coordination? ☒ NO ☐ YES, as the application: ☐ (i) triggers 3 or more concurrence agencies; ☐ (ii) involves a facility made assessable under a planning scheme and prescribed in schedule 7 of the IP Regulation; ☐ (iii) involves development made assessable under a planning scheme and in an area prescribed in schedule 8 of the IP Regulation; ☐ (iv) is for a preliminary approval mentioned is section 3.1.6 of the IPA
Referral agency responses prior to lodgement Under section 3.3.2 of IPA a referral agency may give a referral agency response on a matter within its jurisdiction about a proposal before an application for the proposal is made to the assessment manager. This is commonly the case where an application requires referral to a building referral agency *(eg. Qld Fire and Rescue Service)*.	22. Did a referral agency give a referral agency response under s3.3.2 of the IPA ***before*** the application was made to the assessment manager? ☒ NO ☐ YES - *attach a copy of the referral agency/s response/s*

PLEASE NOTE: The assessment manager may refuse to accept an application, which, at the time of lodgement, fails to provide the completed Referrals Checklist (if applicable).

OFFICE USE ONLY *(applicable to assessment manager)*

DATE RECEIVED		REFERENCE NUMBER/S	

BUILDING REFERRALS (*advice only*)

Below is a list of the referrals that can apply to an application involving building work assessable against the Standard Building Regulation. This information is provided for **advice purposes only** and this section of the referrals checklist if **not** required to be completed and lodged with an application.

Fire safety For more information go to schedule 2 of the IP Regulation	1. An application may trigger referral to Qld Fire and Rescue Services as an advice agency if the building work the subject of the application requires the installation of a fire safety system.
Fire safety for budget accommodation For more information go to schedule 2 of the IP Regulation	2. An application may trigger referral to Qld Fire and Rescue Services as an advice agency if the building work the subject of the application requires the installation of a fire safety system for a budget accommodation building.
Spray painting For more information go to schedule 2 of the IP Regulation	3. An application may trigger referral to the Chief Executive under the *Workplace Health and Safety Act 1995* as a concurrence agency in the application involves a workplace

[19] Urban purposes is defined in schedule 10 of the IPA. To make it clear, urban purposes does not include rural residential purposes as defined in schedule 2 of the Draft South East Queensland Regional Plan

[20] Local Governments within the SEQ Region are identified in the Draft South East Queensland Regional Plan as Beaudesert Shire, Boonah Shire, Brisbane City, Caboolture Shire, Caloundra City, Esk Shire, Gatton Shire, Gold Coast City, Ipswich City, Kilcoy Shire, Laidley Shire, Logan City, Maroochy Shire, Noosa Shire, Pine Rivers Shire, Redcliffe City, Redland Shire and Toowoomba City.

	incorporating spray painting.
Retail meat premises For more information go to schedule 2 of the IP Regulation	4. An application may trigger referral to Safe Food Qld as a concurrence agency if the application involves a retail meat premises.
Private health facilities For more information go to schedule 2 of the IP Regulation	5. An application may trigger referral to the Chief Executive under the *Health Act 1937* as a concurrence agency is the application involves a private health facility.
Workplace area less than 2.3m² For more information go to schedule 2 of the IP Regulation	6. An application may trigger referral to the Chief Executive under the *Workplace Health and Safety Act 1995* as an advice agency if the application involves a work place area less that 2.3m².
Land contiguous to a State-controlled road For more information go to schedule 2 of the IP Regulation	7. An application may trigger referral to the Chief Executive under the *Transport Infrastructure Act 1994* as a concurrence agency or advice agency if the application involves land contiguous to a State-controlled road.
Pastoral workers accommodation For more information go to schedule 2 of the IP Regulation	8. An application may trigger referral to the Chief Executive under the *Pastoral Works' Accommodation Act 1980* as a concurrence agency is the application involves pastoral workers accommodation.
Child care centre For more information go to schedule 2 of the IP Regulation	9. An application may trigger referral to the Chief Executive under the Child Care Act 2002 as a concurrence agency if the application involves a child care centre.
Coastal development For more information go to schedule 2 of the IP Regulation	10. An application may trigger referral to the Chief Executive under the *Coastal Protection and Management Act 1995* as a concurrence agency if the application involves land completely or partly seaward of a coastal building line[21].
Heritage For more information go to schedule 2 of the IP Regulation	11. An application may trigger referral to the Heritage Council as a concurrence agency if the application involves a heritage registered place.

[21] Coastal building lines are prescribed under the *Coastal Protection and Management Act 1995*.

DTS GROUP QLD

RECONFIGURATION OF AN ALLOTMENT

ASSESSMENT REPORT

In support of an application for a

2 into 36 Lot Staged Subdivision

At

35 Eric Street, Goodna
Being described as Lot 1 on RP122040 7 Lot 28 on RP802704

Prepared by DTS GROUP QLD
1/49 Butterfield Street, Herston

On behalf of Rescom Property Group P/L

March 2005

Local Authority: Ipswich City Council

Table of Contents

1 EXECUTIVE SUMMARY

1.1 Site Details

Local Government Authority :	Ipswich City Council
Address of Site :	35 Eric Street, Goodna
Real Property Description :	Lot 1 on RP122040 7 Lot 28 on RP802704
Area of Site :	3.866 ha
Area Classification :	Low density – RL2
Name of Owners :	Rescom Property Group Pty Ltd Atf Rescom Property Trust

1.2 Application Details

Type of Application :	Development Permit for Reconfiguration of an Allotment and Preliminary Approval for Operational Works.
Description of Proposal :	Code Assessment
Purpose of Proposal Under Planning Scheme:	2 into 36 lot subdivision
Applicant :	DTS GROUP QLD
Contact Person and Phone :	Rodney James or Mal Thoms when unavailable.
Our Reference :	A04332

1.3 Introduction

This planning assessment report accompanies a development application for Reconfiguration (2 into 36 Lot Subdivision) at the subject property. The development is to be assessed against the Ipswich City Council Planning scheme. The applicant is seeking a Two Staged Development Permit for Reconfiguration and a Preliminary Approval for Operational Works. The division of stages is illustrated on the attached subdivision plan.

The subject allotment is located at the eastern end of Eric Street. The subject land area is bound by Woogaroo Creek to the north, adjoining Lots 2 and 3 on RP 122040 to the east and Lot 3 on RP 116986 to the west. This is best illustrated in the locality plan under section 2.

The proposal promotes the ideals of consolidation of densities in 'greenfield' development, particularly considering the areas significance to the Western Corridor Growth Area and as such is compliant with the principles of the Draft Regional Plan for South East Queensland.

Accompanying this report is the DTS Group Subdivision Plan A2 905/2 is attached under **Appendix A.**

This report includes an assessment of the proposed development against the applicable desired environmental outcomes, zoning intent and development codes.

1. Urban Areas Code (Part 4) – particularly the specific outcomes in section 4.3.3

2. Low Density Residential Zone (division 10)

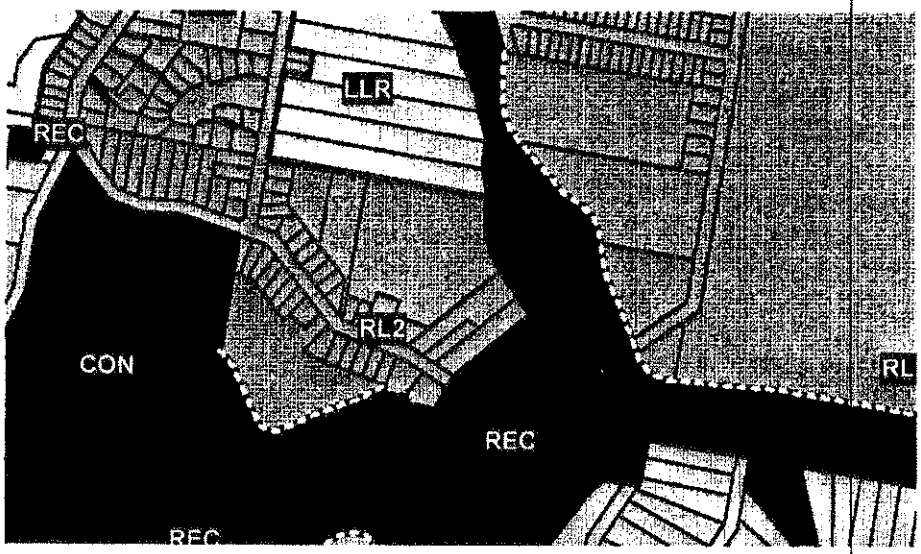
3. Reconfiguration of a Lot Code

2 SITE INFORMATION & LOCALITY

2.1 Site Characteristics

2.1.1 Planning Scheme Classifications

Zoning Map 17 – Designates the land area as being located within the Residential Low Density – RL2 zoning.



Overlay Map 1 – Identifies the areas within the planning scheme earmarked as 'difficult topography'.

Overlay Map 2 – Is associated with flood lines and urban stormwater flow paths. These issues are addressed in the Site Based Stormwater Management Plan attached under Appendix C to this report.

2.1.2 Adjoining Areas

The surrounding lots have been designated for lower density residential development and has subsequently been zoned within the sub precinct RL2.

2.1.3 Topography

As illustrated on the attached site plan, the subject allotments have levels varying between approximately RL35m on the Eric Street frontage and approximately RL 10m along the Woogaroo Creek boundary. The proposed road is positioned to run along the Q100 flood regulation line at RL14.75m located in the field by survey.

2.1.4 Stormwater Discharge:

It is anticipated that the development stormwater will be capable of discharging into Woogaroo Creek with minimal impact on the environment. The exact location of internal stormwater lines and internal road drainage outlets will be determined during operational works phase of development.

2.1.5 Shape of Site :

The site consists of two (2) discrete allotments. As a collective the site is irregular in shape with dimensions as shown on the attached subdivisional plan.

2.1.6 Road Frontage & Type:

The subject site has approximately a 50.5 m frontage to Eric Street. All access to the proposed allotments will be from a single access road from Eric Street

2.1.7 Existing Vegetation

Council's Local Law no 49 does not affect the allotment. It is not considered that site vegetation is included within the "of concern" and as such the clearing of the land for urban purposes is exempt from assessment by DNRM. Vegetation on allotments that does not interfere with the application of services will be retained. A substantial amount of parkland vegetation will also be retained.

2.1.8 Site Contamination

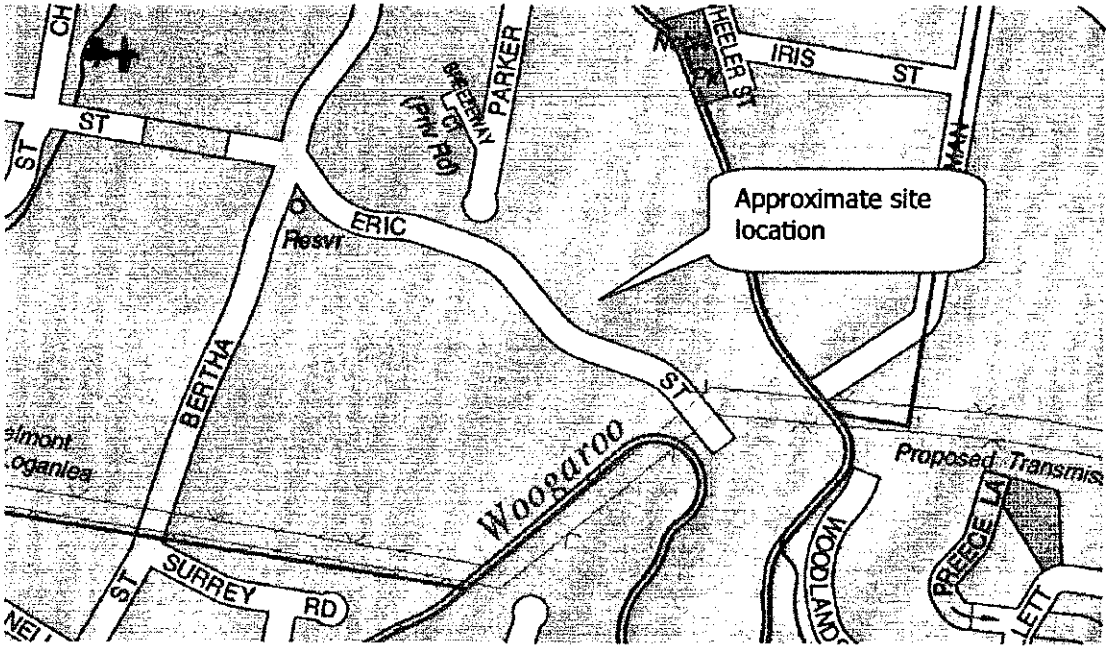
Information from the department of Natural Resources & Mines indicates that the subject site is not contaminated.

2.1.9 Anticipated Future Development in Area :

Residential housing at a mixture of densities to provide for a diverse population.

2.2 Locality Plan

Below illustrates the location of the subject site in the greater context of the Goodna Area.



Client: Rescom Property Group	**Instruction No:** A04332
Plan Showing: Locality Plan	**Date:** March 2005
Application: Reconfiguration of an Allotment (2 into 39 Lot Subdivision)	

DTS GROUP

3 PROPOSAL

3.1 Details:

It is proposed to reconfigure the described allotments in two stages into 36 residential allotments, ancillary road, and parkland. Stage 1 of the development will excise and single allotment and existing dwelling on the Eric Street frontage. Stage 2 of the development will be for the balance of the allotment.

Residential allotments will vary in size from between 475 m² and 850 m², which is considered appropriate for the subject allotments and common in surrounding allotments fronting Eric Street. The proposed lot sizes are commensurate with the requirements for Low-Density development and the provisions of the Reconfiguring a Lot Code.

Vehicular access to the proposed Stage two (2) area will be facilitated by the construction of a new road from Eric Street. As the plans illustrate, this street will act as the main collector with access roads and cul-de-sacs connecting. This arrangement provides:

- Higher level of integration between existing roads.
- Equitable access to higher order roads
- Enables a road hierarchy that integrates with future subdivisional applications in neighbouring lots.

As illustrated on the subdivision plan a significant balance allotment is made as part of the application. The majority of the area is allocated at the allotment's juncture with Woogaroo Creek as required by hydrological characteristics of the site that fal below the Q100 flood line.

3.2 Statistics

Area subject to Development Approval	
Low Density Residential Development	
Area	**No of Lots**
Stage 1 - 725m²	1
Stage 2 – 3.792 ha	35
Parkland	
Area	**No of Lots**
9593m² (24.8%)	N/a

3.3 Level of Assessment:

Under section 4.5.1 "Level of Assessment Tables" Division 5 - Low Density Residential Zone an application for Reconfiguration triggers an Code Assessment application.

4 TOWN PLANNING FRAMEWORK

4.1 Integrated Planning Act 1997

The Integrated Planning Act 1997 (IPA) provides an all encompassing statutory planning framework for the State of Queensland. The Integrated Planning Act complaint Ipswich City Council Planning Scheme effective as of the 5th April 2004, should accordingly be read in conjunction with the IPA.

Section 3.5.5 of IPA sets out the provisions for assessing and deciding applications.

Section 3.5.4.(2) *requires that the assessment manager must assess the part of the application only against –*

(a) the common material; and
(b) applicable codes (other than codes, or parts of codes, a concurrence agency is required to assess the application against)

This application complies with the relevant provisions of the Ipswich Planning Scheme, with regards to the development of land in the Low Density Residential RL2 Zoning.

4.2 Referral Coordination

The application does not trigger referral co-ordination.

4.3 Public Notification Process

Since the application requires code assessment – no formal public notification of the application is required.

4.4 State Planning Policies

No state planning policies impact on this application.

4.5 State Planning Policies

No state planning policies impact on this application.

4.6 Draft Regional Plan for South East Queensland

The above-mentioned plan whilst only in draft format places a strong emphasis on the Western Growth Corridor where it states that:

"The western growth corridor through Ipswich City provides extensive areas of relatively unconstrained land already designated for a wide range of urban

purposes...Evaluation of the Western Corridor pattern demonstrated that encouraging a higher proportion of regional growth in the Western Corridor could also achieve more sustainable outcomes for the region, including reduced pressures on a range of natural and environmental resources."

In accordance with Page 32 of the regional plan under "Efficient use of land" and principle 2.6 of the "Urban Form" intent statements the proposed development applies a lot density that is within the requirements of the regional plan and Council zoning.

5 PLANNING SCHEME PROVISIONS

5.1 Strategic Intent

Under division 3 of Part 4 – Urban Areas the planning Scheme states in section 4.3.3 that specific outcomes which are sought to apply generally throughout the Urban Areas are set out below.

5.2 Urban Areas Code – Specific Outcomes

Performance Criteria	Acceptable Solutions	Proposal Comment
Centres **(1) Specific Outcomes** (a) A network of centres is established which— (i) supports the development of the Ipswich City Centre as a Key Centre for the Western Sub Region of South East Queensland; (ii) supports and provides for Major Centres at Booval, Brassall, Goodna, Redbank Plains, Redbank Plaza, Ripley, Rosewood, Springfield Town Centre (refer Part 14), Yamanto and Walloon, to service the main convenience and comparison shopping needs of the City's residents; (iii) Supports and provides for the distribution of neighbourhood centres and local shopping areas, which mainly cater for convenience shopping and local services, across the City and generally within the locations depicted on Map 3 in Schedule 7. (b) Neighbourhood Centres and local shopping areas are designed and located— (i) to take advantage of major entry/exit points to residential communities with good visibility and access from major roads; (ii) to be conveniently accessible to the catchment area they are intended to serve; (iii) to be conveniently accessible, where possible, to public transport and	**Centres** No probable solutions are given.	***Not Applicable*** The subject proposal is considered infill development. The proposal does not compromise the achievement of the planning scheme centre hierarchy.

Performance Criteria	Acceptable Solutions	Proposal Statement
pedestrian and cycle routes; (iv) to provide a focus for community interaction and meet demonstrated community needs; (v) where possible, to be near schools, parkland and community facilities in order to form part of a community node; and (vi) Sized so as not to compromise the viability of higher order centres or other existing or planned neighbourhood centres.		
Transport and Access **(2) Specific Outcomes** (a) A strategic transport network is provided, as outlined in Map 4 in Schedule 7. (b) Where possible, sensitive land uses are located away from major transport corridors and haul roads. (c) Alternatively, where necessary, acoustic assessments are undertaken together with appropriate ameliorative measures to reduce noise levels within sensitive uses to appropriate levels commensurate with the Environmental Protection Policy (Noise). (d) Carparking is provided in accordance with the demand generated by uses or works, and may include shared parking and access arrangements. (e) The design and layout of parking facilities is— (i) integrated (particularly for adjoining carparks); (ii) located to minimise disruption to traffic flow; and (iii) Located and designed to minimise pedestrian and vehicle conflicts. (f) Service and delivery areas— (i) provide safe and efficient access to sites; (ii) are combined, where possible for adjoining uses; (iii) minimise disruptions to local traffic; and (iv) Reduce pedestrian/vehicular conflicts.	**Transport and Access** No probable solutions are given.	***Complies (✓) & Not Applicable*** A road layout has been provided that integrates well with the existing road network and facilitates the expansion of development into neighbouring properties. The layout facilitates large lot frontages for access and street parking.
Environmental Management **(3) Specific Outcomes** (a) The quality of stormwater runoff from a use or site is similar to or better than the established water quality standards for the receiving waters or lawful point of discharge. (b) Uses and works are designed to support integrated catchment management, including— (i) protection and rehabilitation of natural drainage patterns and riparian vegetation;	**Environmental Management** No probable solutions are given.	***Complies (✓)*** A lawful point of discharge for all proposed allotment can be accommodated. A SBSMP will be attached under separate cover.

Performance Criteria	Acceptable Solutions	Council Comment
(ii) environmentally acceptable effluent and runoff management systems or techniques which prevent pollution of water sources; and (iii) Appropriate buffering along any adjoining major watercourses. (c) Uses and works with the potential for material or serious environmental harm or environmental nuisance, establish and implement a site specific Environmental Management Plan, which describes the measures to be used to avoid or minimise adverse impacts, and how such measures are to be implemented during the life of the development.		
Visual Framework **(4) Specific Outcomes** (a) Uses and works which adjoin a Designated Road or approach a route listed in Table 4.3.1 or depicted on Figure 4.3.1, are designed to enhance— (i) the overall visual impression of the City; and (ii) The character of the particular area in which the site is located. (b) Uses and works which adjoin a gateway listed in Table 4.3.1 or depicted in Figure4.3.1 are designed to enhance the sense of arrival and the overall character of the particular area in which the site is located. (c) The major city landmarks and local landmark sites (including those listed inTable 4.3.2 and depicted on Figure 4.3.1) are retained, and where possible enhanced. (d) New uses or works— (i) do not obstruct a significant view of a major or local landmark; (ii) do not significantly alter the context of an existing landmark; and (iii) Create an attractive landmark feature on a potential landmark site.	**Visual Framework** No probable solutions are given.	***Not Applicable*** No building work proposed as part of this application. The subdivision integrates within the existing neighbourhood and provides lot sizes that maintains uniformity

5.3 Residential Designation

5.3.1 Residential Low Density Zone

Performance Criteria	Acceptable Solutions	Council Comment
Overall The overall outcomes sought for the Residential Low Density Zone are the following— (a) The Residential Low Density Zone caters primarily for low density, sewered, urban residential development and associated uses, to the general exclusion of most other uses including unsewered,	**Overall** No probable solutions are given.	***Complies (✓)*** All services are provided as part of the proposed reconfiguration

Performance Criteria	Acceptable Solutions	Planner Response
acreage housing. (b) Uses within the Residential Low Density Zone are provided with full urban services such as reticulated water, sewerage, sealed roads, parks and other community facilities. (c) Uses within the Residential Low Density Zone provide a mix of low to medium density housing types and allotment sizes in response to community housing needs. (d) Uses and works within the Residential Low Density Zone are located and designed to maximise the efficient extension and safe operation of infrastructure. (e) Uses and works within the Residential Low Density Zone are located, designed and managed to— (i) maintain residential amenity; (ii) maintain or enhance important aspects of local character and places of cultural significance or streetscape value; (iii) be compatible with other uses and works; (iv) avoid significant adverse effects on the natural environment; and (v) Maintain the safety of people, buildings and works.		
Residential Uses – Density and Character **(1) Specific Outcomes** Uses and works reflect the established built character, maintain amenity and protect and enhance important townscape and landscape elements within local areas having regard to— (a) building height; (b) dwelling density; (c) lot sizes and dimensions; (d) boundary clearances and the provision of space around buildings; (e) access to natural light and ventilation; (f) privacy; (g) noise attenuation; (h) vegetation protection; (i) landscape treatment; (j) places of cultural significance or streetscape value; and (k) the form, scale, bulk, style, siting, orientation, roof lines, materials and detailing of buildings.	**Probable Solution – for sub-section (1)(a)** (a) For infill development, where nearby uses are predominantly single storeys, buildings are one storey in height. (b) A second storey is not provided unless appropriate with— (i) the scale of adjoining development; and (ii) the extent of fall across the land; and (iii) the character and amenity of the area and overall townscape.	***Complies (✓)*** The density per hectare applied as part of the proposed development is within the 15 dwellings per hectare requirement for sub precinct RL2.
Non Residential Uses **(3) Specific Outcomes** Each non-residential use— (a) fulfils a local community need; and (b) is accessible to the population it	**Non Residential Uses** No probable solutions are given.	***Not Applicable***

Performance Criteria	Acceptable Solutions	Proposal Solutions
serves; and (c) where possible co-locates with other non residential uses but does not contribute to undesirable commercial ribbon development; and (d) does not have a significant detrimental impact on the amenity of nearby residents, including through the generation of— (i) odours; (ii) noise; (iii) waste products; (iv) dust; (v) traffic; (vi) electrical interference; or (vii) lighting; and (e) maintains a scale and appearance in keeping with the residential amenity and character of the locality with adequate buffering or screening to nearby residential uses (both existing and proposed).		
Vegetation and Landscaping **(4) Specific Outcomes** (a) Appropriate landscaping, including street trees, is used to soften building outlines and enhance the overall appearance of the area. (b) Buildings on stumps/piers are provided in preference to slab on ground construction, where located within vegetated areas and on steeply sloping land. (c) All significant trees are retained, where possible, particularly on heavily treed, large lots. (d) Uses and works at the rear of existing dwellings are designed to avoid adverse impact on established vegetation and the amenity of neighbouring properties.	**Vegetation and Landscaping** No probable solutions are given.	***Complies (✓)*** Street planting will be provided in some areas in accordance with conditions of approval.
Building Setbacks **(5) Specific Outcome** New buildings are setback to the alignment of adjoining buildings unless an alternative setback does not detrimentally affect the character and amenity of the area and the overall townscape.	**Building Setbacks** No probable solutions are given.	***Not Applicable*** No building work proposed
Operation of Road Network and Access **(6) Specific Outcomes** Uses and works are located and designed to— (a) ensure the safe and efficient operation of the road network; and (b) avoid multiple access points along	**Operation of Road Network and Access** No probable solutions are given.	***Complies (✓)*** The proposal provides a safe and efficient road network that uses an appropriate hierarchy of roads to efficiently distribute traffic to and

Performance Criteria	Acceptable Solutions	Proposed Solutions
major roads; and (c) ensure that the principal access for the area between Melrose Drive and Reif Street, Flinders View is via Fischer Road, to avoid amenity concerns and traffic congestion within the residential area to the north of Melrose Drive, Flinders View; and (d) avoid significant adverse effects (e.g. by noise or dust generated) from use of the road network; and (e) ensure reconfiguration of the existing historic lots to the south of Berry Street and in the vicinity of Phoenix Court, Churchill provide for the construction of appropriate road reserves and suitable building envelopes.		from major roads (i.e. designated roads).
Provision of Infrastructure **(7) Specific Outcomes** Infrastructure is— (a) provided to meet appropriate standards at the least whole-of-life cost, including avoiding unnecessary duplication; and (b) comprised of components and materials that are readily accessible and available from local sources; and (c) readily integrated with existing systems and facilitates the orderly provision of future systems.	**Probable Solutions – for sub-section (7)** Infrastructure is provided to the standards stated in Planning Scheme Policy 3—General Works.	***Complies (✓)*** Infrastructure will be applied to the subdivision area in accordance with Council standards.

5.3.2 Sub Precinct RL2

Performance Criteria	Acceptable Solutions	Proposed Solutions
(a) Specific Outcomes (i) The established traditional inner suburban residential character is maintained. (ii) Uses and reconfiguring of lots provide for select residential consolidation (infill) within 500 metres of existing or committed centres, major open space areas, major employment nodes, concentrations of community facilities, schools and public transport routes and nodes. (iii) A mix of housing types and lot sizes are provided in greenfield and outer infill areas. (iv) The creation of additional large lots and the placement of buildings and infrastructure does not prejudice the future rational and orderly conversion of lands for urban residential purposes. **NOTE 4.5.4B** (1) The southern portion of the land identified below in (v) may be affected by the operations of the Purga Rifle Range.	**Probable Solution – for sub-section (2)(a)** The overall dwelling density is 10 to 15 dwellings per hectare. +	***Complies (✓)*** The overall dwelling density is 10 to 15 dwellings per hectare.

(2) Discussions should be held with the Department of Defence and relevant acoustic assessments undertaken in order to determine an appropriate lot layout. (3) The land also includes prominent vegetated ridgelines. (v) In respect of Lot 207 on CH31135, off South Deebing Creek Road, Deebing Heights— (A) the lot layout is designed and building envelopes are positioned to ameliorate any adverse impacts from the operations of the Purga Rifle Range; and (B) whilst it is desired to achieve an average density of 10 dwellings per hectare within the RL2 Sub Area, constrained lands (e.g. slopes in excess of 10%) may require larger lots; and (C) further opportunities for increased densities may be achieved, principally in the northern portion of the site and depending upon the location and design of the South West Regional Transport Corridor and associated uses, particularly where involving the development of a neighbourhood centre; and (D) the lot layout and placement of buildings and infrastructure is designed to protect, where possible, the appearance of the vegetated hillsides and ridgelines.		

6 RELEVANT DEVELOPMENT CODES

According to section 4.5.1 Assessment Categories and Relevant Assessment Criteria, column three (3) under "Residential" the planning scheme states that application for Reconfiguring a Lot requires compliance with / assessment against:

- Reconfiguration of a Lot Code

6.1 reconfiguring a lot code

6.1.1 Specific Outcomes and Probable Solutions for Moderate and Major Subdivisions

Performance Criteria	Acceptable Solutions	Proposed Solutions
Residential/Industrial Estate Design (MAJOR SUBDIVISIONS ONLY) **(1) For Major Subdivisions**, the layout and design— (a) gives a residential neighbourhood or a commercial/industrial location a strong and positive identity, by responding to site characteristics, setting, landmarks, views and places of cultural significance and through clearly legible streets and streetscaping themes, and in the case of residential neighbourhoods, open space networks; (b) provides a mix of lot sizes and enables a variety of housing types, commercial and industrial establishments and other compatible land uses; (c) distributes land uses so as to minimise infrastructure costs; (d) is to be cognisant of linear open spaces, and, in the case of residential neighbourhoods ensure they are located to define the boundaries of neighbourhoods and, where appropriate, provide community focal points; (e) reinforces residential neighbourhood identity by locating community, retail and commercial facilities at focal points within convenient walking distance for residents; (f) enhances for residential neighbourhoods personal safety and perceptions of safety, and minimise potential for crime, vandalism and fear through achievement of casual surveillance and, for commercial and industrial development, the layout enhances safety through the provision of	**Residential/Industrial Estate Design** **(1)** There are no recommended probable solutions for this specific outcome as each situation requires an individual approach.	***Complies (✓)*** The proposal creates a positive identity for residents, by providing an infill development that enhances the amenity of the area and facilitates the future development of land in an orderly manner. The street network provides good internal accessibility for vehicles, cyclists and pedestrians within the proposed development and pending future development. A wide variety of Lot sizes are achieved by the development (ranging from 475m² to 850m²) in order to facilitate a range of innovative housing types and designs. Proposed road and Lot configuration is designed in the most efficient manner so as to minimise infrastructure costs. As indicated on the Council zoning plans, ample parkland is/will be available to future residents primarily along the Goodna Creek corridor and banks of the Brisbane River. Development achieves a well-structured, safe pedestrian network that is intended to integrate with existing and future surrounding networks.

Performance Criteria	Acceptable Solutions	Proposed Solutions
alternative through routes (i.e. culs-de-sacs are avoided); (g) provides a pedestrian network that is safe, attractive and efficient, running largely along public spaces (including streets and open spaces) fronted by houses or other development and avoiding areas or uses with major breaks in surveillance; (h) provides well-distributed public open spaces that contribute to the legibility and character of the locality, provide for a range of uses and activities, are cost-effective to maintain, and contribute to stormwater management and environmental care; and (i) provides well located vehicle, cyclist and pedestrian networks that minimise local vehicle trips, maximise public transport effectiveness, and encourage walking and cycling to daily activities and to provide a recreation resource. **NOTE 1** (1) Refer to AMCORD Element 1.1 Neighbourhood Design and Chapter 7 'Development Concept Design' of *Queensland Streets* which provide a very concise and practical summary of the concept design process for residential subdivisions. (2) For applicants designing a residential lot layout where it is anticipated or proposed that lots will be used for other than single residential uses (e.g. dual occupancy, multiple residential, etc) it is recommended that reference be made to the relevant use-specific planning scheme codes, which provide specific design measures and criteria.		

Performance Criteria	Acceptable Solutions	Proposed Solutions
Lot Layout and Design **(2)** Lots (including hatchet lots) have the appropriate layout, area and dimensions to— (a) enable the siting and construction of a dwelling and ancillary outbuildings, where for the purposes of residential use; (b) enable the siting and construction of commercial or industrial buildings, where for the purposes of commercial or industrial use; (c) provide for landscaping, including private outdoor recreational space; (d) provide convenient vehicle access and parking; (e) take into account the slope of the land, in particular the desirability of minimising earthworks/retaining walls associated with building construction; (f) overcome site constraints (e.g. undermining, flooding, drainage, bushfire risk, buffers to incompatible land uses etc); (g) conserve natural, cultural or special features (e.g. trees, buildings, views etc); (h) provide within residential areas housing diversity and choice and within commercial/industrial areas a variety of choice for the different commercial and industrial development types; (i) avoid large concentrations of cottage lots and courtyard lots in the Low Density Residential Zones or Sub Areas; (j) ensure that cottage lots, courtyard lots, dual occupancy lots and multiple residential lots are located in close proximity to parks, shops, employment areas or community facilities; (k) enable lot frontages to be oriented towards the street and open spaces to facilitate personal safety,	**Lot Layout and Design** **(2)** (a) The lot size, frontage and special characteristics for the different residential lot types are as outlined in Appendix A. **NOTE 3** For any specific density or special lot characteristic attribute (including lot size) refer to the applicable Zone Code. (b) The requirements for access easements for residential lots are to be those applicable for hatchet lots [see Probable Solution (4) below]. (c) The lot size, frontage and special characteristics for the different commercial and industrial lot types are as outlined in Appendix B. (d) The requirements for access easements, for commercial or industrial lots, although undesirable, are to be those applicable for hatchet lots [see	***Complies (✓)*** Proposed Lot sizes and configurations are in accordance with Council's minimum requirements for a Low-Density Residential area. Compliance of Council requirements in effect demonstrates the developments' ability to take into consideration all mentioned 'Specific Outcomes' when construction of dwellings is to occurring, including the ability to provide Lots that are capable of siting dwellings in an appropriate manner, accommodate sufficient landscape buffering, safe vehicle access and parking etc.

Performance Criteria	Acceptable Solutions	Proposed Solutions
property security and casual surveillance of footpaths and public open space areas; (l) facilitate, within residential areas (via street and lot orientation), the siting of dwellings to take advantage of microclimatic benefits and to allow adequate on-site solar access and access to breezes taking into account likely dwelling size and the relationship of each lot to the street; (m) integrate with the surrounding urban environment, and in particular complement existing streetscapes and landscapes and, where possible in residential areas, provide connectivity to facilitate shared use of public facilities by adjoining communities; (n) facilitate the integration of commercial and industrial development into its surroundings ensuring minimal impact on the amenity of adjacent or nearby areas; (o) ensure that the layout of commercial or industrial development abutting areas of residential development allows lots to be configured for the siting and design of development that can incorporate visual, noise pollution and other ameliorative measures, in order to reduce impacts on nearby residential amenity. **NOTE 2** The area of a hatchet lot is not to include reference to the access strip (handle of the lot).		
(3) A reconfiguration of land may produce one or more hatchet lots, provided— (a) it is not likely to prejudice the subsequent reconfiguration or use of adjoining land; (b) it is not desirable nor practicable for the subject and adjoining land to be otherwise reconfigured so as to have a frontage to another road which may	**(3)** (a) The following apply in respect of residential lots— (i) any lot having a common boundary with an access strip of a hatchet lot is to have a width of 20m at any point throughout its depth or is capable of providing an area containing a rectangle (suitable for building purposes)	***Complies (✓)*** The development proposes 3 Hatchet Lots due to restrictions in site shape and potential road layout. All proposed Lots (including those sharing a common boundary with an access strip) have frontages and widths in excess of 16m and are

Performance Criteria	Acceptable Solutions	Proposed Solutions
be subsequently constructed; (c) the siting of buildings on a proposed hatchet lot will not be detrimental to the amenity of the area; (d) existing development of land in the area will not have a detrimental effect on buildings to be sited on the proposed hatchet lots; and (e) there is no reasonable alternative to the hatchet lot having regard to the sites's topography, access, location, shape and size.	measuring 9m by 15m; (ii) hatchet lots are not used for multiple residential use; and (iii) the proposed lot will have no greater than five (5) adjoining neighbours. (b) The following apply in respect of commercial or industrial lots— (i) any lot having a common boundary with an access strip of a hatchet lot is to have a width of 25m at any point throughout its depth or is capable of providing an area containing a rectangle (suitable for building purposes) measuring 14m by 28m; (ii) hatchet lots are not used for commercial or industrial uses.	freely capable of accommodating a rectangle of 9x15m suitable for building purposes. Drive access meet the requirements of the acceptable solutions
(4) Hatchets lots— (a) do not dominate or intrude within the existing subdivision pattern; (b) provide an access strip capable of accommodating adequate vehicular access and utility services; and (c) provide an access strip which does not unduly affect or restrict on-street parking.	**(4)** (a) The number of hatchet lots is generally limited to one (1) behind any full frontage lot. (b) The access strip is located on only one (1) side of a lot with direct frontage to the street. (c) The shape of the access strip (including the construction of the driveway) for a residential or commercial lot enables a single unit truck to enter and leave the lot in forward gear. (d) The shape of the access strip (including the construction of the driveway) for an industrial use enables a semi-trailer to enter and leave the lot in forward gear. (e) The minimum width of the access strip is as follows— (i) Traditional Lots – 4m (3) ; (ii) Hillside, Homestead or Township Lots – 5m (3) ;	***Complies (✓)*** The number of hatchet Lots has been limited to one behind any full frontage Lot. An access strip is located on only one side of any full frontage Lot. The proposed access strips are in accordance with Council's minimum requirements.

Performance Criteria	Acceptable Solutions	Problem Solutions
	(iii) Dual Occupancy Dwelling Lots – 5m (4) . **NOTE 5** (1) Where unavoidable, the width of the access strip for a multiple residential, commercial or industrial lot is as follows— (a) Multiple Residential Lots – 6m (4) ; (b) Commercial Lots – 7m (3) ; (c) Mixed Business and Industry Lots – 9m (3) ; (d) Industry Lots – 11m (3) . (2) In spite of the recommended minimum width of the access strip, it must be of sufficient width to accommodate a driveway, utility services and the provision of landscaping. (3) In the case of telecommunications and electricity services, these services are to be via underground cable for the full length of the access strip. (f) The type of reciprocal easements comply with the requirements shown in Diagram A, below. **Diagram A** (g) For residential lots, the minimum width of the constructed driveway in the access strip is three (3) metres. (h) The driveway is to be constructed from the kerb for the full length of the access strip. **NOTE 6** Where unavoidable, the minimum width of the constructed driveway in the access strip (which is to be constructed from the kerb for the full	
	length of the access strip) for multiple residential, commercial or industrial lots is as follows— (a) multiple residential purposes – 7 metres; (b) commercial lots – 6 metres; (c) industrial lots – 7 metres. (i) For residential lots, other than homestead or township lots, a drainage system is provided so	

Performance Criteria	Acceptable Solutions	Proposed Solutions
	that no part of the driveway is below the 1 in 100 Average Recurrence Interval (ARI). (j) For homestead or township lots no part of the driveway is below the 1 in 10 Average Recurrence Interval (ARI). **NOTE 7** Where unavoidable, for commercial or industrial lots, a drainage system is provided so that no part of the driveway is below the 1 in 10 Average Recurrence Interval (ARI).	
Designated Roads **(5) For major subdivisions**, the road network has a clear structure and component roads conform to their function in the system.	**Designated Roads** **(5)** Roads link with other roads that are no more than one level higher or lower in the hierarchy.	***Complies (✓)*** Proposed road layout and type is appropriate for the intended function of each road proposed. Design achieves effective movement of residents to higher order roads in an efficient manner.
(6) For major subdivisions, the road system is located so that it provides routes which are more convenient for external traffic than the residential or commercial/industrial street network.	**(6)** The road network is generally located as outlined in Map 4 of Schedule 7. **NOTE 8** (1) Refer to Map 4 of Schedule 7 for the general location of Designated Roads (both existing and future). (2) Where a Designated Road traverses a development site, refer to the locational design requirements of Section 6 'The Road System' of Queensland Streets to ensure that the most satisfactory location is obtained in respect of both planning and engineering requirements.	***Complies (✓)*** The road network is generally located as outlined in Map 4 of Schedule 7.
	(3) Where a developer provides land for the purpose of the road system or constructs trunk roadworks infrastructure, an infrastructure credit is to apply as outlined in Planning Scheme Policy 5—Infrastructure.	

Performance Criteria	Acceptable Solutions	Proposed Solutions
(7) For major subdivisions, the road system has the capability to accommodate public transport services and has capacity to safely and efficiently accommodate projected movements.	**(7)** The Designated Road system is provided as outlined in Map 4 of Schedule 7.	***Not Applicable*** Not considered a major subdivision. Public Transport services are readily available in the area.
(8) For major subdivisions, the road network is provided in a manner where it complements the street network, public transport, pedestrians and cycleways.	**(8)** Where a Land Use Concept Master Plan, Town Centre Concept Plan or other approved Plan of Development exists, the road network conforms with this plan.	***Not Applicable*** Not considered a major subdivision. Street network, public transport options and pedestrian movements have been considered by the development and will be facilitated where necessary.
(9) For major subdivisions, safe and convenient links are provided for pedestrians and cyclists across Designated Roads.	**(9)** Pedestrian and cyclist crossings of Designated Roads adjacent to residential and industrial areas are provided at intervals of not less than 500m and for commercial areas at intervals of not less than 200m in locations related to movement desire lines.	***Not Applicable*** Not considered a major subdivision.
(10) Intersections are located to provide safe and efficient connection and traffic interface between the street network and Designated Roads.	**(10)** The location of intersections to Designated Roads is in accordance with the following Austroad publication— "Guide to Traffic Engineering Practice" (a) Part 5 Intersections at Grade; (b) Part 6 Roundabouts; (c) Part 7 Traffic Signals.	***Complies (✓)*** Intersections to Designated Roads will be in accordance with the following Austroad publication— "Guide to Traffic Engineering Practice" (a) Part 5 Intersections at Grade; (b) Part 6 Roundabouts; (c) Part 7 Traffic Signals.
(11) Access arrangements do not impede the traffic performance of Designated Roads.	**(11)** (a) Residential lots do not have direct vehicle access to the road system unless there are no suitable access alternatives (provided by the street system), in which case vehicle access onto the Designated Road is capable of being made in a forward direction.	***Complies (✓)*** No net increase in direct access to Eric Street is proposed The development proposes all created Lots to gain access via the proposed new road

Performance Criteria	Acceptable Solutions	Proposed Solutions
	NOTE 9 See element 5.13 of AMCORD for possible means of achieving vehicle access. (b) Any vehicle access for a residential lot is limited to one (1) point only (where direct access to the Designated Road is unavoidable). (c) Commercial or industrial lots do not have direct vehicle access to the road system unless there are no suitable access alternatives (provided by the street system), in which case vehicle access onto the Designated Road must be capable of being made in a forward direction using a left turn only. (d) Any vehicle access is sited to obtain the maximum visibility (i.e. sightlines). **NOTE 10** For neighbourhood and district shopping centres access from the road system to the parking area may be permitted at specifically designed access points.	
(11A) Road networks in areas within 6km of the RAAF Base Amberley runway do not include configurations of lights that replicate the appearance of airport runways at night.	**(11A)** Road networks do not include configurations of lights in straight parallel lines 500m – 1000m long in areas within 6km of the RAAF Base Amberley runway.	***Not Applicable*** (Development in excess of 17kms radially from RAAF Base, Amberley).
(12) Residential premises are— (a) not exposed to unacceptable traffic noise 5 ; or (b) (b) able to be designed and constructed to ensure that acceptable living conditions within the dwelling can be created.	**(12)** There are no recommended probable solutions for this specific outcome as each situation requires an individual approach.	***Not Applicable*** All allotments are appropriately distanced from higher order roads.
NOTE 11 (1) If the predicted road traffic noise at a residential building exceeds the noise criterion, acoustic barriers are the initial preferred option for noise amelioration. (2) If the predicted road traffic noise still exceeds		

Performance Criteria	Acceptable Solutions	Proposed Solutions
the noise criterion after the noise barriers have been designed for maximum effect, a treatment option is to incorporate noise control measures into the building design to ameliorate road traffic noise to the interior of the dwellings.		
Street Networks and Design **(13) For major subdivisions**, the street network is to— (a) for residential development, meet local needs and allow for the provision of public transport, for pedestrians and cyclists, and for expected vehicle traffic; (b) for commercial and industrial development, provide for the mixed functions of moving traffic, vehicles accessing lots and parked vehicles whilst allowing for the provision of public transport, for pedestrians and cyclists, and for expected vehicle traffic (including heavy vehicles).	**Street Networks and Design** **(13)** Where a Land Use Concept Master Plan, Town Centre Concept Plan or other approved Plan of Development exists, the road network conforms with this plan.	***Complies (✓)*** The proposed road and Lot configuration is seen as considerate of future development needs. Considering the nature of the site and its proximity to higher order roads, the site itself is not expected to accommodate public transport routes.
(14) For major subdivisions, the street network connects with Designated Roads to maximise movement efficiency on the main traffic routes, whilst at the same time minimising internal traffic volumes.	**(14)** (a) Intersections between Designated Roads and the internal street network are located so as to minimise restriction of movement on the Designated Roads, and to avoid traffic volumes in excess of 12,000 vpd on industrial avenues, 10,000 vpd on trunk collector streets, 5,000 vpd on internal connecting roads and 3,000 vpd on collector streets. (b) For residential development, connections	***Complies (✓)*** Designing and specifications of the proposed intersection will be in accordance with Council requirements and will be addressed at the engineering stage.
	between residential streets and the road system are in accordance with the requirements of Section 3.3 'The Street/Road Interface' of Queensland Streets. (c) For commercial and industrial development, intersection spacings between commercial/ industrial streets and the road system are in	

Performance Criteria	Acceptable Solutions	Proposed Solutions
	accordance with Table 3.3A of Section 3.3 'The Street/Road Interface' of Queensland Streets.	
(15) The street network has a clear structure and component streets conform to their function in the network.	**(15)** Streets link with other streets that are no more than one level higher in the hierarchy.	***Complies (✓)*** All proposed road intersections are between compatible road types.
(16) The layout of the street network has clear physical distinctions between each type of street, based on function, economy, convenience, traffic volumes, vehicle speeds, public safety, amenity and in the case of commercial or industrial development, parking demand.	**(16)** The street network reflects the characteristics outlined in Appendix C.	***Complies (✓)*** The proposed road conforms to Councils minimum requirements and is appropriate for the primary function to which it is allocated. Road layout has considered characteristics outlined in Appendix C.
(17) The design features of each type of street encourage driver behaviour appropriate to the primary function of the street in the network.	**(17)** There are no recommended Probable Solutions for this specific outcome as each situation requires an individual approach.	***Complies (✓)*** The proposal creates 459m of new road, which will solely be used for residential access.
(18) Intersections are spaced to create safe and convenient vehicle movements.	**(18)** Intersections are spaced in accordance with Section 2.11 'Intersections' of Queensland Streets. **NOTE 13** (1) Driveway access points should not be provided on roundabout/channelisation approaches and this matter should be addressed as part of the detailed design process.	***Complies (✓)*** Specific design elements will be addressed by the engineer at the appropriate stage.
	(2) The minimum truncation distance of the real property boundary at an intersection between the following street types is to be— Access Place to Access Street 3.5 m Access Place/Access Street to Collector Street 4.0 m Access Street/Collector Street to Trunk Collector	

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	Street 6.0 m Collector/Trunk Collector Streets to Designated Roads **(major subdivisions only)** 8.0m Local Industrial Street to Local Industrial Street 8.0 m Local Industrial Street to Industrial Collector 8.0 m Industrial Collector to Designated Road **(major subdivision only)** 10.0m (3) Where the intersection angle is other than 90 degrees, the truncation is to be by a chord or chords to a circle of radius equal to the above truncation lengths. (4) Where the intersection is constructed as a roundabout, the truncation is to be the area required to accommodate the relevant roundabout template as outlined in the Standard Drawings forming part of Planning Scheme Policy 3—General Works. (5) The area truncated is to be dedicated as road reserve free of cost to, or compensation by, the local government.	
(19) The street network provides— (a) convenient movement for residents between their homes and Designated Roads; and (b) for commercial or industrial development, convenient movement for vehicles (including heavy vehicles).	**(19)** (a) For residential development, the driving distance from any dwelling to a Designated Road or Trunk Collector Street is no more than 700 metres (or 2,000 metres for 'Large Lot' Residential Development). (b) No more than three intersections are required to be negotiated in order to travel from any home to the most convenient collector street or	***Complies (✓)*** All proposed Lots are well within the Council required 700m minimum distance to a Designated Road or Trunk Collector Street. The maximum number of intersections required to be negotiated by any vehicle exiting (or entering) a
	Designated Road. (c) All precincts of more than 100 lots/dwellings are provided with an alternative street access. **NOTE 14** Within 'Bushfire Risk Areas' all lots are provided with an alternative street access.	Lot to reach a Collector Street or Designated Road below three (3). An access point for future development of land to the west of the subject site has been provided. It is expected that upon eventual subdivision of this land, the new road will perform the function of a

Performance Criteria	Acceptable Solutions	Specific Solutions
	(d) For industrial development, the subdivision layout should use culs-de-sac only when unavoidable. (e) For both residential and industrial development the cul-de- sac length should be as short as possible and the turning area should provide for a single movement turn (refer to Section 9.12 'Turning Areas' of Queensland Streets) based on the typical manoeuvring areas for Council's design garbage truck. **NOTE 15** (1) The cul-de-sac design should, where possible, maximise the number of lots with regular road frontages (i.e. standard or average widths parallel to the street frontage rather than narrow or angled frontages). (2) The turning area is to be capable of accommodating most vehicles with a single movement turn based on a minimum turning circle of a minimum 9m radius. (3) Circular turning heads are preferred and "T" and "Y" shaped turning heads are generally not to be used. (4) Generally a pathway should be provided at the end of every cul-de-sac to connect to the open space system, pedestrian or street network or the Designated Road system. (5) A minimum length of kerb frontage is required for each lot to provide for on-street parking unless alternative provision for on-street parking is made (e.g. parking bays in cul-de-sac heads indented parking, centre parking etc).	residential access street.

Performance Criteria	Acceptable Solutions	Proposed Solutions
(20) For major subdivisions— (a) There is provision for bus routes which are direct and safely accessible by foot from all dwellings, activity centres, commercial centres or industrial estates and which provide links with external areas and are efficient to operate. (b) Streets carrying bus routes provide for ease of movement of buses between residential neighbourhoods and for links to centres within and external to the neighbourhood without complicated turning manoeuvres. (c) The alignment of the streets that form the bus route allow for efficient and unimpeded movement of buses without facilitating high traffic speeds. (d) The street network offers opportunities for cost-effective operation of demand-responsive public transport services should the need arise, providing for both peak and off-peak regular services and the potential future provision of demand-responsive services. (e) Bus stops are located— (i) to provide for pedestrian safety, security, comfort and convenience; (ii) to be able to be overlooked from nearby buildings; (iii) to be in keeping with the character of the locality; and (iv) for residential development, to minimise adverse impact on the amenity of nearby dwellings. **NOTE 16** (1) A network of public transport routes should be provided that takes account of— (a) projected travel demand;	**(20)** (a) Where a Land Use Concept Master Plan, Town Centre Concept Plan or other Plan of Development exists, public transport routes conform with that plan. (b) At least 90% of dwellings or businesses are within 400m walking distance from an existing or potential bus route (or 500m walking distance of a bus stop where identified), or 200m walking distance from an existing or proposed demand-responsive public transport route. (c) Where bus routes link residential neighbourhoods or employment areas across any road or street which carries in excess of 6,000 vpd, the intersection is designed as a roundabout/traffic signals or enables a left turn into the road from one neighbourhood followed by a right turn from the road into the adjoining residential neighbourhood. (d) Bus routes linking residential areas with employment areas are designed as a transit only link to prevent use of the link by through traffic. (e) For streets within residential areas, routes for regular bus services comply with the following standards for bus routes— (i) Street Carriageway Widths Two-Way: 7.50m (ii) Minimum Geometric Layout R12.5m for Single Bus Unit **NOTE 17** Some routes may require geometry to suit an articulated bus. (iii) Roundabouts Maximum Desirable Pavement Crossfall: 3% Maximum Desirable Gradient: 6% (f) Bus stops for regular peak services are, or are projected to be, at 300m spacings where the route serves residential uses, 200m spacings	***Complies (✓) & Not Applicable*** Considering the nature of the site and its proximity major transport routes in the area, the site itself is not expected to accommodate public transport. All proposed Lots (and future dwellings) are within 400m walking to public transport.

Performance Criteria	Acceptable Solutions	Proposed Solutions
(b) distribution of likely demand; (c) scale and time of demand; (d) characteristics of travellers; (e) travel time; (f) operating characteristics; (g) cost of providing the service; (h) route location and design. (2) For residential lot reconfigurations, section 3.5 'New Residential Subdivisions' and section 3.6 'Medium Density Developments' of the 'Shaping Up' guidelines provide some practicable applications (the do's and don'ts) for encouraging a more public transport focus within the residential environment. (3) For commercial and industrial lot reconfigurations, section 3.2 'Business and Activity Centres', section 3.3 'Existing Public Transport Interchanges', section 3.4 'New Public Transport Interchanges' and section 3.7 'Business Centre Intersections' of the 'Shaping Up' guidelines provide some practicable applications (the do's and don'ts) for encouraging a public transport focus at these activity centres.	where the route serves commercial uses and 500m spacings where the route serves industrial uses. (g) The siting of bus stops is, where possible, coincident to the pedestrian path network.	
(21) (a) The street layout facilitates walking and cycling within the residential neighbourhood and to activity centres without encouraging external traffic into the residential neighbourhood. (b) The street and path network provides an overall network of pedestrian routes and routes for cyclists, with connections to adjoining streets, open	**(21)** (a) **For major subdivisions**, the cycleway network is located and provided as outlined in the Ipswich Cycle Strategy or Ipswich Open Space and Recreation Development Plan Review or where an approved Land Use Concept Master Plan or Town Centre Concept Plan or other Plan of Development exists, pedestrian/cyclist paths	***Not Applicable***

spaces, neighbouring residential areas and activity centres. (c) The location of paths is aligned to conserve trees and other significant features and where they exist, focus on vistas and landmarks whilst ensuring safe and convenient use by pedestrians and cyclists. (d) Pedestrian paths and cycleways are located where there is casual surveillance and potential for the areas to be well lit. (e) Pedestrian, cycle and vehicular movement systems are co-located to encourage maximum surveillance of public areas. **NOTE 19 (FOR MAJOR SUBDIVISIONS ONLY)** (1) A network of pedestrian ways and cycle routes is provided having regard to— (a) the need to encourage walking and cycling; (b) likely users (e.g. school children, parents with prams, the aged, people with disabilities, commuters and recreational cyclists); (c) opportunities to link open space networks and community facilities, public transport stations/stops, local activity centres, schools and neighbourhood areas; (d) topography; (e) cyclist and pedestrian safety, in particular whether there is any casual surveillance/passing traffic adjacent to the pathway; and (f) cost effective provision. (2) For residential lot reconfigurations, section 3.5 'New Residential Subdivisions' and section 3.6 'Medium Density	are provided in accordance with that plan. **NOTE 18** No direct residential street link should be provided between an adjacent residential area and an industrial estate/major commercial centre, instead a pathway only link is to be provided. (b) Footpaths and cyclepaths are provided as specified in Appendices D, E, F and G. (c) For residential development, pedestrian/cyclist connections are provided between the ends of culs-de-sac, from streets to open space areas, or from streets to Designated Roads (refer section 4.5 of Queensland Streets). (d) For commercial or industrial development pedestrian/cyclist connections are provided from local industrial streets to industrial collectors, to residential streets or to Designated Roads. **NOTE 20** (1) Pathway connections are to be concrete paved (full width of reserve) and suitably drained and may incorporate overland drainage flow corridors. (2) The construction of footpaths, cycleways or dual use paths should be delayed until all utilities have been installed.	

Performance Criteria	Acceptable Solutions	Proposed Solution
Developments' of the 'Shaping Up' guidelines provide some practicable applications (the do's and don'ts) for encouraging a pedestrian and cycling oriented environment. (3) For commercial and industrial lot reconfigurations, section 3.2 'Business Activity Centres', section 3.3 'Existing Public Transport Interchanges', section 3.4 'New Public Transport Interchanges' and section 3.7 'Business Centre Intersections' of the 'Shaping Up' guidelines provide some practicable applications (the do's and don'ts) for encouraging a pedestrian and cycling focus at these activity centres.		
(22) The street layout and design— (a) takes account of the topography (especially steep land) and significant vegetation; (b) avoids steep slopes (i.e. greater than 15%) so as to minimise landscape disturbance and vegetation loss; (c) avoids penetrating and fragmenting large tracts of remnant vegetation; (d) respects and protects places of cultural significance or streetscape value; (e) takes advantage of opportunities for views and vistas; (f) takes account of streetscapes that may be created or that already exist; (g) permits the establishment of streetscapes that blend with existing streetscapes or comply with any approved public streetscape an; (l) locates the streets to the least environmentally sensitive sites; (m) avoids extensive use of cut and fill; (n) avoids important stands of vegetation to minimise the loss of important trees or ecosystems;	**(22)** There are no recommended probable solutions for this specific outcome as each situation requires an individual approach. **NOTE 21** The streetscape is to achieve— (a) the creation of attractive residential, commercial or industrial streetscape environments with clear character and identity; (b) respect for existing attractive streetscapes in established areas; (c) appropriate streetscapes in areas where desired future character has been defined; (d) provision for appropriate street tree planting taking into account the image and role of the street, the environmental values of the local area, solar access requirements, soils, selection of appropriate species, and services; (e) use of such features of the site as views, vistas, existing vegetation, landmarks and places of cultural heritage significance. (h) where practical, is orientated to promote efficient solar access for	***Complies (✓)*** The proposed new road is responsive to the topographical characteristics of the site in terms of effective stormwater discharge. Council's Local Law no 49 does not affect the allotment. It is not considered that site vegetation is included within the "of concern" and as such the clearing of the land for urban purposes is exempt from assessment by DNRM. Vegetation on allotments that does not interfere with the application of services will be retained. A substantial amount of parkland vegetation will also be retained. The existing and future intended character of the area has been taken into account by the development which proposes wide street frontage to single residential Lots.

Performance Criteria	Acceptable Solutions	Proposed Solutions
(o) maintains interlocking tree canopies over fauna corridors, where possible, to allow for the movement of arboreal fauna and birds; (p) narrows the width of the carriageway or provides a wildlife underpass/bridge where it crosses wildlife movement corridors, such as riparian zones; (q) at known wildlife crossing points, streets are narrowed and appropriate pavement surfacing, lighting, signage and fencing are provided to reflect the low-speed environment; (r) provides a high level of internal accessibility and good external connections for vehicles (including heavy vehicles in commercial and industrial areas), pedestrian and cycle movements, maintains appropriate traffic speeds, deters through-traffic, creates safe conditions for road users and **for major subdivisions**, limit the length of time local drivers need to spend in a low-speed environment; (s) for residential development, traffic speeds and volumes are restrained through such measures as— (i) limiting street length; (ii) introducing bends; (iii) introducing slow points; and (iv) intersections; **NOTE 22** Any measures used to limit traffic speeds and volumes—	dwellings; (i) takes account of natural drainage and open space systems; (j) avoids crossing drainage features or open space areas, particularly for access places and access streets; (k) is located, designed and managed to enhance the habitat and corridor requirements of native wildlife (plants and animals);	Street Tree planting or monetary contributions will be made by the development. No significant cut and fill operations are expected to be required other than the usual minor operations undertaken for the construction of a residential development. No environmentally sensitive areas or significant wildlife habitats/movement corridors have been detected on proposed Lot and road component of the site. The subdivision layout aims to achieve high internal accessibility for vehicle and pedestrian/cycle movements upon the eventual development of adjoining land. Unnecessary through traffic is not expected to be an issue .
(a) take into account the needs of street users and convenience of access by local residents (including not requiring local traffic to negotiate unnecessary complicated routes); (b) avoid stop-start conditions, unacceptable traffic noise to adjoining dwellings and devices which reduce the convenience or safety levels for cyclists		Proposed road layout has taken into account the efficient and effective provision of services and infrastructure including water, sewerage, telecommunications and electricity supply.

Performance Criteria	Acceptable Solutions	Proposed Solutions
and pedestrians. (t) **for major subdivisions**, ensure that traffic generated by a development is within the acceptable environmental capacity of the street network; (u) ensures that where within or abutting bushfire risk areas streets are deigned, located and connected to allow safe and efficient movement of fire emergency vehicles; and (v) provides for the cost effective provision of public utilities, including water, sewerage, electricity, telecommunications and gas.		
(22A) Street networks in areas within 6km of the RAAF Base Amberley runway do not include configurations of light that replicate the appearance of airport runways at night.	**(22A)** Street networks do not include configurations of light in straight parallel lines 500m – 1000m long, in areas within 6km of the RAAF Base Amberley runway.	***Not Applicable*** (Development is in excess of 17km radially from RAAF Base, Amberley).
(22B) Recessed landscaped areas are to be provided at regular intervals to soften the visual impact of long portions of acoustic or screen fencing along a street or road.	**(22B)** (a) Where fences are >50m in length, landscaped recesses are to be provided. (b) These are to be a minimum of 1.5m deep, andcomprise 10% of the total length of the fence.	***Not Applicable***
(23) Streets and lots are located so that dwellings are not subject to unacceptable levels of traffic noise.	**(23)** (a) Traffic noise in residential streets does not exceed 55 dB(A) L10 at the affected facade of dwellings. (b) For 'Large Lot' Residential Development, acceptable noise levels at potential house sites is achieved in accordance with Table 8.5A of Section 8 'Rural Residential Streets' of Queensland Streets.	***Complies (✓)*** Traffic noise in residential streets does not exceed 55 dB(A) L10 at the affected facade of dwellings.
(24) The design of each type of street conveys the street's primary function and the street reserve width is sufficient to cater for all street functions, including— (a) safe and efficient movement of all users, including	**(24)** (a) The following street components for each type of street are as specified in Appendices D, E, F and G— (i) carriageway widths; (ii) verge widths; (iii) street reserve widths;	***Complies (✓)*** The proposed new road is designed for a primary function and conforms to Council regulations in terms of minimum road reserve widths, etc.

Performance Criteria	Acceptable Solutions	Proposed Solutions
pedestrians and cyclists; (b) provision for parked vehicles; (c) provision of landscaping; and (d) location, construction and maintenance of public utilities.	(iv) parking within the street reserve; (v) provision for parking lanes; (vi) kerb type; (vii) pedestrian and cyclist facilities; (viii) longitudinal gradients. **NOTE 23** (1) The Local Government will determine those design features and street components, based on the street components specified in Appendices D, E, F and G and the provision of 'external works' as outlined in Planning Scheme Policy 5—Infrastructure, that are to apply where— (a) an existing, dedicated street, fronting or gaining access to the proposed reconfigured lot is required; or (b) a new street is proposed to be constructed along the common boundary of land in two or more ownerships. (2) The verge width may need to be increased when required to allow space for larger-scale landscaping, utility services, future carriageway widening, retaining walls, cycle paths, footpaths or dual use paths. (3) In residential streets the verge width may also need to be increased to allow space for noise attenuation works, indented parking and to enable adequate width to be maintained around slow points.	Specific design elements will be addressed during the engineering phase of the development.
	(4) Where street grades in excess of 12% (residential) or 6% (commercial or industrial) are proposed, the number of lot frontages to that section should be limited. (5) Where frontage to steep grades is proposed, the feasibility of gaining safe property access/egress is to be demonstrated.	

Performance Criteria	Acceptable Solutions	Proposed Solutions
	(6) The location, design and construction of frontage and streetworks are to be in accordance with the requirements and specifications outlined in Planning Scheme Policy 3—General Works. (b) All frontage and street construction works are to be in place or sufficient security provided before the Plan of Subdivision is approved by the local government.	
(25) Provision of on-street carparking to ensure— (a) for residential development— (i) convenience and safety for users; (ii) the efficient use of car spaces; (iii) compatibility with the street's function; and (iv) the achievement of relevant streetscape outcomes; and (b) for commercial or industrial development— (i) sufficient and convenient short-term parking to accommodate vehicles not catered for on-site; (ii) parked vehicles do not obstruct the passage of vehicles on the carriageway or create traffic hazards. **NOTE 24** For residential development, the provision of on-street carparking should be assessed according to projected needs which are determined by— (a) the number of lots and dwelling units proposed; (b) availability of public transport; (c) the provision of on-site car parking; (d) locations of non-residential uses such as schools and local shops; and (e) the occasional need for overflow parking.	**(25)** (a) For residential development, provision within the street reserve of areas sufficient to provide 0.5 spaces per single residential lot or dual occupancy lot and parking spaces per dwelling for other residential uses as outlined in Table 10.5B of Queensland Streets. (b) For industrial development, provision within the carriageway of parking lanes on both sides of all Industrial Streets, with widths as outlined in Appendix G. (c) For residential development, one car space is available within 25m of each single residential or dual occupancy lot. (d) For multiple residential uses, on-street parking is located within 40m of the lot. (e) For residential development, the dimensions of on-street carparking spaces and access comply with the requirements outlined in the Parking Code as applicable to on-site parking. **NOTE 25** (1) For single residential or dual occupancy uses, on-street carparking spaces may either be provided on the carriageway (in which case provision shall be made for vehicle passing in accordance with Section 2.5 'Provision for Passing' of Queensland Streets) or in constructed bays within the verge.	***Complies (✓)*** Appropriate road type and resultant road reserve width ensures the provision of adequate on-street carparking spaces to service the proposed Lots. Proposed Lots provide Lot frontages in excess of 16m thereby accounting for the required on-street car parking spaces. Three hatchet lots are proposed that comply with the requirements of the code.

Performance Criteria	Acceptable Solutions	Proposed Solutions
	(2) For multiple residential uses, on-street carparking spaces may be either parallel or angle provided within the carriageway and designed in accordance with Section 10.5 'Parking' of Queensland Streets. (3) For industrial development, within turning areas at least 20 metres of kerb frontage is to be provided for each lot for access and on-street parking. (4) The "credit" for tandem parking as cited in Queensland Streets for single residential or dual occupancy uses having frontage to Access Streets and Access Places does not apply for development within Ipswich City. (5) The "credit" for Tandem Parking for single residential or dual occupancy uses having frontage to access streets and access places will only apply where there is a 6 metre setback between a garage/carport and the property boundary.	
Public Open Space **(26)** Parks— (a) are provided in the general locations as outlined in Map 6.2 of Planning Scheme Policy 5—Infrastructure and Map 1 in Schedule 7; (b) provide opportunities for casual surveillance; (c) are, with the exception of linear or waterside parkland, easily visible from the street; (d) are located away from excessive noise; (e) are located and designed in accordance with the desired standards of service for each recreation setting outlined in Planning Scheme Policy 5—Infrastructure. **NOTE 26** As an aid in determining whether parkland dedications could be required for any proposed lot	**(26)** (a) Where a Land Use Concept Master Plan, Town Centre Concept Plan, Open Space Master Plan or other Plan of Development exists, public open space is provided in accordance with that plan. (b) In those lot reconfigurations where it is proposed that parkland be secured— (i) land dedications are provided (and are indicated on the Plan of Subdivision); and (ii) the areas of public open space are appropriate for their intended purpose; and **NOTE 27** Reference should be made to the issues outlined in the section entitled 'criteria for on-site land dedication' in Appendix H – Land Dedications for Public Parks.	***Complies (✓)*** A parkland contribution is made that constitutes approximately24.8% of the site area.

Performance Criteria	Acceptable Solutions	Proposed Solutions
reconfiguration the explanatory note detailed in Appendix H should be used. **Public Open Space**	(iii) the land is not constrained by encumbrances from providing public recreation uses; and **NOTE 28** This includes cultural significance, conservation or infrastructure encumbrances (e.g. high voltage overhead power transmission lines) except where these can be incorporated to supplement or enhance the uses intended for the land. (iv) the edges of the parkland are overlooked by housing or commercial or other development with active frontages that can provide effective informal surveillance, rather than adjoining the rear of the dwellings; and (v) for linear or waterside parkland— (A) the lot layout aligns the parkland reserve along the river or creek edge; (B) the extent of the parkland correlates with the adopted flood level or is a minimum width of 30 metres (measured from the banks of the watercourse) or as much in addition to the 30 metres to achieve at least a 10 metre width with slopes less than 1 in 20 (5%) to enable construction of a walking/bicycle path and to facilitate maintenance; and (C) the land is stable and useable for recreation and pedestrian/cycle movement, within the broader functions of drainage, conservation and visual amenity. **NOTE 29**	
	(1) Where land is dedicated which forms part of the adopted open space system, an infrastructure credit will apply as outlined in Planning Scheme Policy 5—Infrastructure. (2) Where the value of the land to be dedicated exceeds the public parks infrastructure	

Performance Criteria	Acceptable Solutions	Proposed Solutions
	contribution obligation associated with the reconfiguration, the applicant is entitled to cash reimbursement of the infrastructure credit as outlined in Planning Scheme Policy 5—Infrastructure. (3) Land below the 1 in 10 Average Recurrence Interval (ARI) is considered to represent a primary drainage function and is not to be included in any public parks infrastructure credit calculations unless the land is stable, useable and free from encumbrances to provide public recreation uses. (4) Where the proposed open space does not immediately adjoin existing open space or land in the process of being dedicated as open space it may be necessary to include in the dedication the provision of access easements (either temporary or permanent) to the proposed (B) open space.	
Utilities **(27)** Cost effective and environmentally sustainable utilities (including effluent treatment and disposal, water, electricity, gas, street lighting and communication services) are provided to each lot. **NOTE 30** (1) Applicants should determine the likely demand for water from the final development layout – not just the first stage of development. (2) At an early stage, applicants should obtain advice on existing system heads and reserve capacity at the nominated point of connection. (3) At an early stage it should be determined whether any existing water supply or sewerage trunk infrastructure within the property should be relocated or suitably protected.	**Utilities** **(27)** (a) Provision is made for the— (i) reticulation of water supply to each lot; (ii) reticulation of sewerage to each lot. For Homestead or Township lots (including unsewered township commercial or industrial lots), measures to treat and dispose of effluent on-site in compliance within the Standard Sewerage Law and the On-Site Sewerage Code; (iii) supply of electricity (and where applicable the supply of natural gas) to each lot; (iv) supply of telecommunication services to each lot; and (v) installation of street lighting on that side of the street or road as the existing or planned location of the footpath.	***Complies (✓)*** The development is proposed to be fully serviced, including the provision of reticulated water supply and sewerage, electricity, street lighting and telecommunications.

Performance Criteria	Acceptable Solutions	Proposed Solutions
(4) Adequate water supply for fire fighting purposes is to be provided. (5) The layout of the reconfiguration is to ensure sewerage feasibility, otherwise there may be a reduction in the area of the lot available for building construction. (6) Sewerage pumping stations should not obstruct existing traffic corridors for cyclist or pedestrians or be located on footpaths or within close proximity to residential, commercial or industrial development. (7) For Homestead or Township Lots (including unsewered township commercial or industrial lots) all sullage and septic waste water is to be capable of being treated and disposed of on-site without it entering any adjoining premises, stormwater system or watercourse and without ponding or causing a health nuisance.	**NOTE 31** (1) The location, design and construction of sewerage facilities, water supply mains and fixtures, electricity, gas and communication services are in accordance with the requirements and specifications outlined in Planning Scheme Policy 3—General Works. (2) Wherever possible, compatible public utility services are co-located in common trenching in order to minimise the land required and the costs for underground services. (3) Where development is staged, each stage is to be fully serviced before a new stage is released. (4) Adequate buffers or separation distances are maintained between utilities and dwellings to protect residential amenity and public health. (b) All utilities are to be in place or sufficient security provided before the Plan of Subdivision is approved by the local government.	
Stormwater Drainage **(28)** The major stormwater drainage system— (a) has the capacity to safely convey stormwater flows resulting from the adopted design storm under normal operating conditions; (b) is located and designed to ensure that there are no flow paths that would increase risk to public safety and property; (c) is to maximise community benefit through the retention of natural streams and vegetation wherever practicable, the incorporation of parks	**Stormwater Drainage** **(28)** (a) The design of the major stormwater drainage system is— (i) in accordance with the individual adopted Drainage Master Plans or where no Drainage Master Plan exists the major drainage system is designed to safely convey stormwater flows under normal operating conditions for ARI = 100 years; **NOTE 33** The major drainage system design is based on the provisions of QUDM and Planning Scheme Policy 3—General	***Complies (✓)*** It is anticipated that the development stormwater will be capable of discharging into Woogaroo Creek with minimal impact on the environment. The exact location of internal stormwater lines and internal road drainage outlets will be determined during operational works phase of development. A SBSMP will be forwarded under separate cover.

Performance Criteria	Acceptable Solutions	Proposed Solutions
and other less flood-sensitive land uses into the drainage corridor and the placement of detention basins for amenity and function. **NOTE 32** (1) The essential drainage considerations for issuance of an approval to reconfigure a lot are— (a) that the proposed development, as a whole, can actually be drained; (b) that the stormwater management system can mimic (and use) the features and functions of the natural drainage system which is largely capital, energy and maintenance cost free; (c) that the volume, timing, velocity and pollutant load of stormwater discharged from the subdivision will closely approximate the conditions which occur before development; (d) that the development addresses drainage from any foreshadowed development in upstream catchments which may contribute to the runoff through the development as a whole (refer to the individual drainage master plans);	Works. (ii) matched to the conditions which occurred before development; **NOTE 34** It will be sufficient at the reconfiguring a lot application stage to nominate the major drainage paths through the development and provide broad Rational Method calculations for the ARI 100 runoff in these paths. (iii) to be sufficient to hydraulically convey this design flow (ARI 100) through the subdivision to the lawful point of discharge; and (b) The width of the drainage path is— (i) sufficient to contain design flows; and (ii) allow maintenance access. (e) where a drainage master plan does not exist, applicants may be required to analyse the whole catchment or sub-catchment taking account of the likely future development, as outlined in the Strategic Plan, to ensure that no worsening will occur as a result of the proposed development on the land; and (f) that suitable provision has been made in the lot layout to accommodate Major Drainage (as defined in QUDM). (2) Minor Drainage (as defined in QUDM) detailed design, whilst not required to be addressed at the reconfiguring a lot application stage is to be addressed at the Operational Works Application Stage. (3) The Catchment Plan should encompass the development itself plus any upstream catchments delivering runoff into the development site,	

Performance Criteria	Acceptable Solutions	Proposed Solutions
	and extend sufficiently downstream to indicate a lawful point of discharge for any concentrated or modified water flows leaving the development site (N.B. Increased water flows should not leave a development site unless it is part of an overall, approved drainage master plan). (4) Unless approved as parkland by the Local Government, detention basins are to be dedicated as 'drainage reserve' and not included within any parkland dedication.	
(29) All lots are located above the adopted flood level to provide protection of property in accordance with the accepted level of risk.	**(29)** (a) All Cottage Lots, Courtyard Lots, Traditional Lots, Hillside Lots and Dual Occupancy Lots are located above the adopted flood level. (b) For Homestead or Township Lots, an area which is suitable for a building platform comprising at least 600m² of each lot is to be located above the 1 in 100 Average Recurrence Interval (ARI). Also, an additional area is to be available on each lot that is suitable to treat and dispose of effluent on-site in compliance with the Standard Sewerage Law and the On-Site Sewerage Code. (c) All multiple residential lots, commercial lots, mixed business and industry lots and industrial lots are located above the adopted flood level for the respective zone or Sub Area.	***Complies (✓)*** All proposed Lots are Traditional Lots and are therefore located above the Q100 and Q20 Flood lines.
	NOTE 35 (1) Those areas of residential lots below the adopted flood level for the applicable zone or Sub Area which are affected by a 'significant flood flow' are to be subject to a drainage easement. (2) A Drainage Reserve may be required for any	

Performance Criteria	Acceptable Solutions	Proposed Solutions
	part of the land conveying stormwater drainage flows to the lawful point of discharge or where significant overland flows occur.	
(30) Design of the lot layout provides for— (a) drainage which does not cause damage or nuisance flows to adjoining properties; (b) a drainage system that can be economically maintained; (c) maximum use of on-site infiltration; (d) the safety and convenience of people using the site; and (e) for homestead lots or township lots, any dams are to be wholly located within lot boundaries.	**(30)** (a) Lot drainage is to be directed into the street drainage system. **NOTE 36** (1) Where site conditions do not permit lot drainage into the street drainage system, lot drainage accords with the design criteria outlined in Planning Scheme Policy 3—General Works. (2) The procedure for both providing and protecting Inter Lot Drainage is outlined in Planning Scheme Policy 3—General Works. (b) For homestead lots or township lots, the high water level of any dam and the top and toe of all dam walls and embankments are not to be closer than 2 metres to any lot boundary.	***Complies (✓)*** The proposed subdivision layout is responsive to the topographical characteristics of the land in terms of providing appropriate Lot drainage and discharge. The majority of the proposed Lots are able to discharge stormwater runoff onto the street. A SBSMP will be forwarded under separate cover.
(31) The stormwater drainage system— (a) minimises the environmental impact of urban run-off on surface receiving water quality and on other aspects of the natural environment; (b) optimises the interception, retention and removal of water-borne pollutants through the use of appropriate 'fitness for use' criteria, prior to the stormwater's discharge to receiving waters; (c) ensures the continuation, in healthy condition, of a wide diversity of wetland environments in the urban landscape; (d) ensures that 'first flush' diversion or treatment systems are able to be installed to lessen the impact of shock pollution loadings to receiving waters; (e) optimises the integration of stormwater infrastructure with open space management objectives.	**(31)** (a) The design and proposed implementation of the water quality control systems are in accordance with an adopted Drainage Master Plan or Catchment Management Strategy. (b) If there is no adopted Drainage Master Plan or Catchment Management Strategy, there are no recommended probable solutions for this specific outcome as each situation requires an individual approach.	***Complies (✓)*** The Stormwater drainage system will be in accordance with Council regulations in terms of impact on the environment.

7 PLANNING SCHEME POLICIES

7.1 Planning Scheme Policy 5

Infrastructure will be applied and constructed as required by the planning scheme. Contributions will applied in accordance with the mentioned policy.

8 CONCLUSIONS

This assessment report has identified and analysed the relevant planning issues of this proposed development that requires a Development Permit for Reconfiguration of an Allotment and Preliminary approval for Operational Works (2 into 36 lot staged subdivision, road and associated parkland) requiring Impact Assessment.

The conclusions that can be drawn from this assessment report are as follows:

- The development application has been made in accordance with the requirements for development under IDAS.
- The proposed density and layout is in accordance with the intent of the sub-precinct classification.
- The proposal complies with the applicable desired environmental outcomes, zoning intent and development codes.

1. Urban Areas Code (Part 4) – particularly the specific outcomes in section 4.3.3

2. Low Density Residential Zone (division 10)

3. Reconfiguration of a Lot Code

This Assessment Report supports the development application and is recommended to Council as the Assessment Manager for approval subject to reasonable and relevant conditions.

Annexure NP-2

A04332
1704/05 NRR
Nathan Rule
3810 6957

31 March 2005

Dear Sir/Madam

Re: Development Application Information Request (Section 3.3.6)
Application Number: 1704/05
Proposal: Reconfigure a Lot (2 lots into 36 lots)
Property Location: 35 Eric Street, Goodna

Upon review of the abovementioned Development Application and supporting information we require further information to satisfactorily assess this application. The information requested is set-out below.

1. Lot Layout and Design

(a) The Developer is requested to demonstrate compliance with the Reconfiguring a Lot Code's requirements for corner allotments, with regard to proposed Lots 8, 14 ,21 and 24.

(b) The Developer is requested to justify how the proposed cul-de-sac giving access to proposed Lots 10 – 13 provides for the future orderly development (Reconfiguring a Lot) on the adjoining properties at 31 and 33 Eric Street, Goodna (Lots 2 and 3 on RP122040).

An extension to the proposed road is suggested (without the proposed cul-de-sac), as indicated in red on the attached plan and marked "Area to be further investigated". Such a configuration would not prejudice the subsequent reconfiguration of the adjoining properties as is potentially proposed by the current layout.

(c) Appendix A of the Reconfiguring a Lot Code identifies five (5) different types of residential lots. Given the slope of the site, some of the future dwellings would be constructed on lots described as 'Hillside Lots'. This generally involves one to two storey structures on land with a site area in the range of 800 m^2 - 2,000 m^2 and slopes in excess of 10%, but not exceeding 20%.

DTS Group
1/49 Butterfield Street
HERSTON QLD 4006

The Developer is requested to indicate on the proposal plan the building location envelopes for each of the proposed lots that conforms with the Specific Outcomes of the Reconfiguring a Lot Code. It would be beneficial if this information was presented as an overlay of the slope analysis to allow cross checking of the Code requirements.

As required by Appendix A of the Reconfiguring a Lot Code, all residential lots must be capable of containing a rectangle suitable for building purposes, measuring 10 m x 15 m on a ground slope not exceeding 20% although the balance of the lot may be steeper.

Any allotment with a building envelope on a ground slope in excess of 20% must be accompanied by a geotechnical report to support the location of the dwelling in this location.

Additionally, under these requirements individual lot access and on-site parking must be feasible without involving the future purchasers in major earthworks or engineering structures.

(d) The intention of the Hillside Lots category is to minimise site disturbance, erosion, drainage problems, retaining wall amenity issues and other similar issues. As such, it is imperative at this stage to submit any proposals for reshaping of the land or preliminary details of any proposed earthworks (including retaining walls, benching and other associated works).

(e) For lots where the slope exceeds 10%, the Developer is requested to provide preliminary details of the types and nature of housing proposed for each allotment that responds to the slope of the land, amenity of the surrounding area and any engineering or geotechnical issues present on the site.

2. Slope Analysis

The subject site is partially impacted by the Difficult Topography Overlay (OV4 Slope 15% to 20%). As such, the Developer is requested to demonstrate that all proposed lots with a slope of greater than 15% are capable of complying with the requirements of section 11.4.6 of the Development Constraints Overlay Code and the sections of *Lot Layout and Design (2)* and *Street Networks and Design (22)* under the Reconfiguring a Lot Code.

To this extent, the Developer is requested to submit a technical assessment in accordance with the requirements of Planning Scheme Policy 2, Section 1.(1) relating to Difficult Topography (Geologically Unstable Lands and Steep Slopes). Any such assessment shall also include a proposal plan which details the location of all significant trees and any tree stands or other landscape features, and clearly indicates those to be removed as a result of the proposed subdivision and those to be retained.

3. Traffic

The Developer is requested to submit a traffic impact assessment report, prepared by a RPEQ, to address the impact of the potential ultimate traffic generation by the proposal on the external road network.

Amongst other matters, the study shall address the following:

(i) a review of the traffic generated by the proposal;

(ii) recommendation of specific measures to be undertaken to improve the alignment, sight distances, and signage of the external roads which will result in safe movements of light and heavy vehicles, and reduce delays and queuing distances; and

(iii) recommendations of specific measures to be undertaken to define and improve the intersection and alignment of the external roads including assessment of the impact on the existing intersection of Eric Street and Bertha Street.

Any terminating roads, which provides a link for future development on property under separate private ownership, should be provided with a turn-around area of sufficient size to enable Council's refuse vehicle to negotiate a clear turn. Should the location of the turn-around area be within adjoining property, which is under separate private ownership, then the Developer should provide a turn-around area contained within an easement in favour of Council. With reference to the easement and works on land under other private ownership, written permission should be obtained from the relevant property owner and forwarded to Council. Alternatively the turn-around area should be provided by the Developer within the subject property and contained within an easement in favour of Council. The Developer should identify the location of the vehicle turn around areas on the development plan for all terminating roads.

4. Stormwater Drainage

The Developer is requested to submit preliminary hydraulic calculations for the major and minor storm events prepared by an RPEQ in accordance with QUDM which identifies the increase in stormwater runoff generated by the full development, the location and treatment of discharge points such that the proposed development will not adversely effect the down stream properties. The stormwater discharge from the proposed development is to be maintained at pre development flows. Land required for detention basins or equivalent should be identified on the development plan and the lot layout amended accordingly. Stormwater detention basins or equivalent should be contained within drainage reserve and not within land to be dedicated as park.

Under the provisions of the *Integrated Planning Act 1997*, the applicant has three (3) options available in response to this Information Request. The Applicant must give the Development Manager and each Referral Agency (if applicable):

1. all of the information requested; or

2. part of the information requested together with a notice asking the Development Manager and each Referral Agency (if applicable) to proceed with the assessment of the application; or

3. a notice:

(a) stating that the applicant does not intend to supply any of the information requested; and

(b) asking the Development Manager and each Referral Agency (if applicable) to proceed with the assessment of the application.

Response to this Information Request should be forwarded to:-

The Development Manager
Development Branch
Ipswich City Council
PO Box 191
IPSWICH QLD 4305

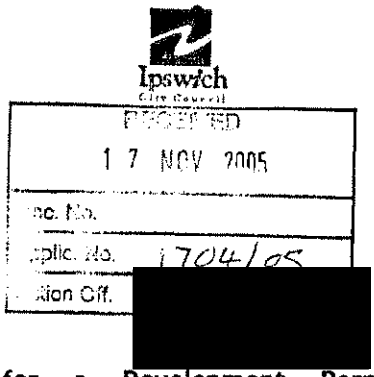
Yours faithfully

[redacted]
DEVELOPMENT TEAM CO-ORDINATOR EAST

Annexure NP-3

A04332

14th November, 2005



The Chief Executive Officer
Ipswich City Council
50 South Street
PO Box 191
IPSWICH QLD 4305

Attention [redacted]

RE: Development Application for a Development Permit for Reconfiguration (2 into 35 Lot Staged Subdivision) at 35 Eric Street, Goodna being described as Lots 1 on RP122040 and Lot 28 on RP802704

Client: Rescom Property Group P/L
Council Reference: 1704/05

With reference to Council's information requests dated 31st March, 2005 and 9th August, 2005 we wish to advise that DTS Group herewith respond to all of the information requested by Council in accordance with s3.3.8 of the Integrated Planning Act 1997. Attached to this report is:

- DTS Subdivision Plan A2 905/6
- JW Landscape Design Plan showing rehabilitation of proposed parkland.
- Terra Ark Vegetation Assessment & Preliminary Management Plan
- ETS Group Slope Analysis and Stormwater Assessment
- Adam Pekol Traffic Impact Assessment

1 Request dated - 9th August, 2005

1.1 Vegetation Retention

In response to the specific requirements listed in the request, please find attached a vegetation assessment and preliminary management report undertaken by Terra Ark. It should also be noted with regards to concerns raised over the issue of exiting estate traffic affecting the property owner on the opposite side of Eric Street that amelioration will be applied. It is proposed to relocate a large feature tree to be placed within an entrance island that both screens headlights and diverts traffic from a direct path with the properties on the opposite side of the street.

In addition it is noted that our client is prepared to carry out improvement works in the parkland and will provide community facilities as shown on the JW Concepts landscape plan attached.

2 Request dated - 31st March, 2005

2.1 Lot Layout & Design

(a) All corner allotments have been amended to comply with the minimum 600m² area.
(b) Road layout has been amended in order to provide an extension of the proposed road at the juncture with Lot 3 on RP12240 rather than cul-de-sac head as suggested.
(c) The response outlining the appropriateness of the allotment sizes and the proposed earthworks is outlined in the ETS Report prepared in response to point 4 of the information request.
(d) Refer to ETS Report
(e) Refer to ETS Report

2.2 Slope Analysis

The proposed details regarding slope within the estate is addressed within the ETS Report attached. The report also outlines the proposed earthworks to be undertaken and compliance with 11.4.6 of the Development Constraints Overlay Code.

2.3 Traffic

Please refer to the attached Traffic Impact Assessment undertaken by Adam Pekol Consulting.

2.4 Stormwater Discharge

Please refer to the stormwater comments within the ETS Group Report.

We trust that this application will be given the utmost attention and consideration.

Should you require any further information, we would be pleased to assist.

Regards

[redacted]

DTS GROUP QLD

PROPOSED DEVELOPMENT AT 35 ERIC STREET, GOODNA

INFORMATION REQUEST REPLY SLOPE ANALYSIS & STORMWATER

Prepared by
ETS GROUP

APPLICATION NUMBER: 1704/05
PROPOSAL: RECONFIGURATION OF A LOT
PROPERTY LOCATION: 35 ERIC STREET, GOODNA

Overlay Map 4

From ICC overlay map 4 Difficult Topography, we found that lots 2,3 and 4 have been identified as have slope greater that 15%. Subsequent detailed survey has fond that the slopes on these lots dose not exceed 15% and as such fall outside the difficult topography constraints. However it is recommended that the housing product on these lots be of the split-level or post construction type.

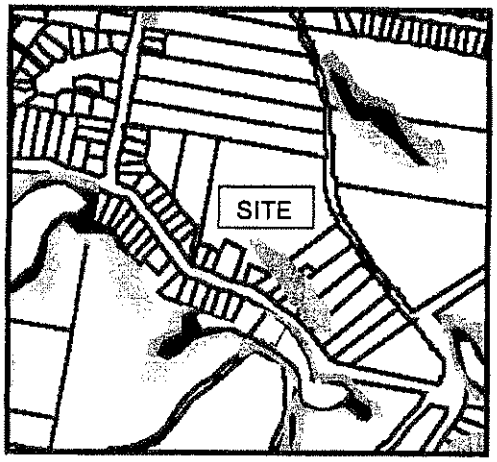


Figure 1 – Extract from ICC overlay map 4 Difficult Topography Slopes 15 - 20%

Difficult Topography 11.4.6

From the survey lots 30 and 31 were identified as having slopes steeper than 15% and as such we have proposed to bench these lots, to minimize earthworks, keep retaining wall heights to a minimum and have no adverse impacts on the adjoining properties. The housing product for these two lots will have to be designed to suit. Refer plan SK01 for benching details.

All other lots have slopes less than 15% and are capable of containing the required 10m x 15m rectangular building envelope. Vegetation removal will be kept to a minimum through the use of selective clearing and all significant trees identified in terrarc's report will be retained if possible.

Ground Stability

No soil investigation has been undertaken at this time but all earthworks will be conducted in accordance with I.C.C. Earthworks code and be certified by a registered geotechnical engineer. Retaining walls will also be certified as to their structural integrity and stability.

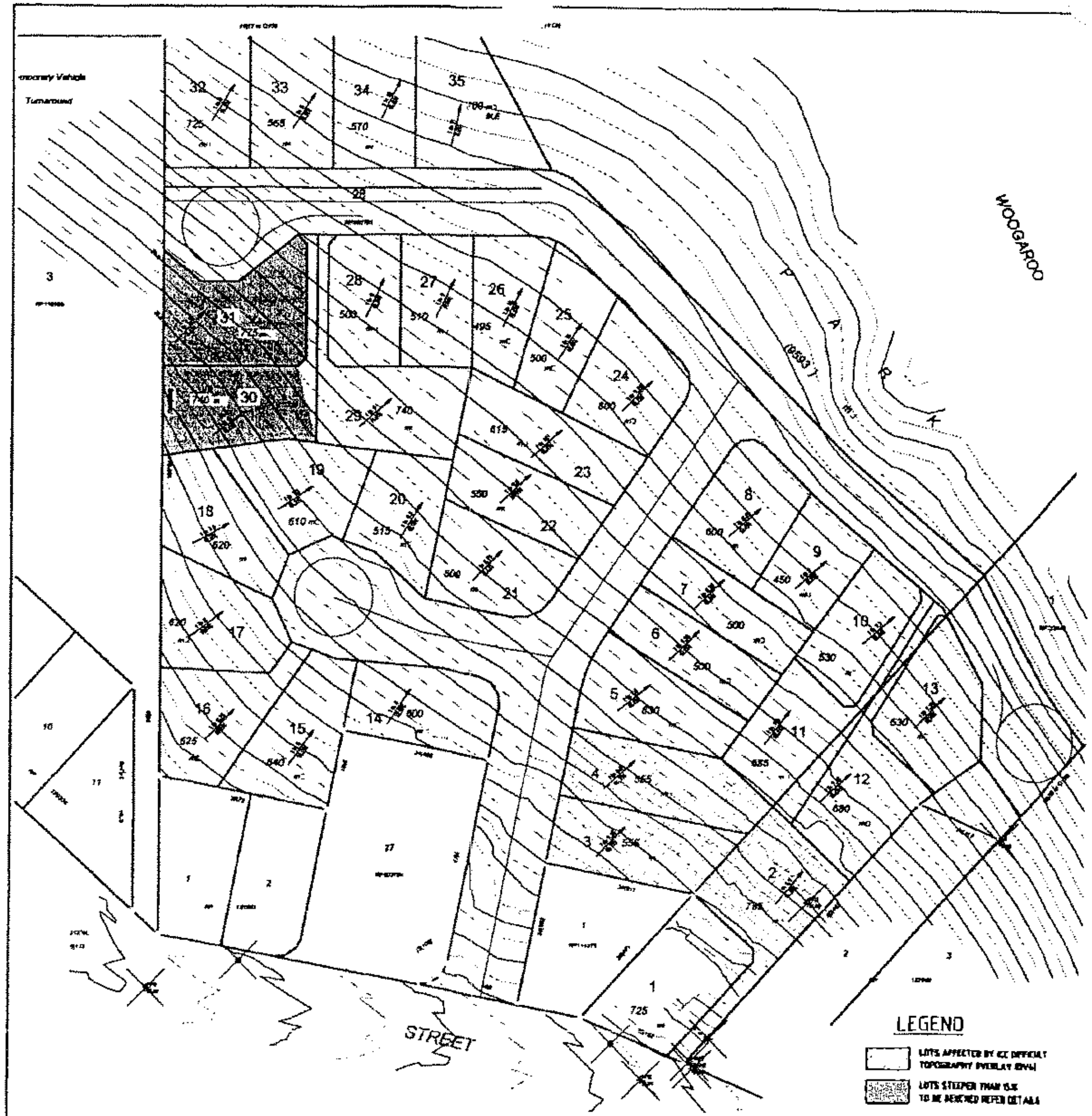
Stormwater Drainage

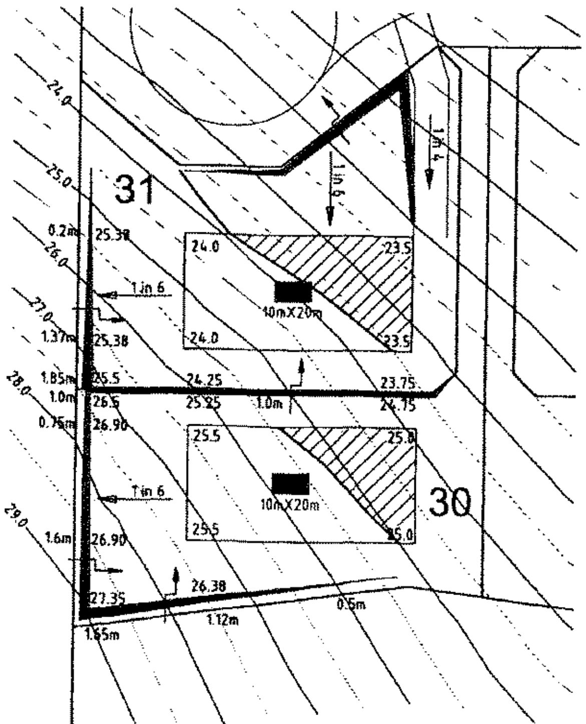
Attached are our calculations for pre and post development Q100 flows and also for the size of a detention basin required to maintain flows from the site at pre development levels. The size will depend on the depth of the basin.

Alternatively it should be possible to detain stormwater using a combination of roofwater tanks plus a smaller detention basin that could be at ground level or underground.

Discharge would be via a single outlet pipe from the site's detention basin, through a grassed swale then into Woogaroo Creek. Calculations of Pre and Post Development flows using the Rational Method have been attached.

We have shown a possible detention basin site/drainage reserve on the drawing SK02, attached. This size is based on a 1.5m deep basin with no roofwater tanks as mentioned above. The final location of the detention basin will be determined by the vegetation management plan. It is to be place where the minimum vegetation disturbance will occur.





ERIC STREET
LOTS 30 & 31 PROPOSED BENCHING

LEGEND

LOTS AFFECTED BY ICC DIFFICULT TOPOGRAPHY OVERLAY (DV4)

LOTS STEEPER THAN 15% TO BE BENCHED REFER DET A&A

ASSOCIATED CONSULTANTS: DTS GROUP

PRELIMINARY

REVISIONS

CLIENT: RESCOM PROPERTY GROUP PTY LTD

PROJECT: PROPOSED RESIDENTIAL SUBDIVISION

LOCATION: 35 ERIC STREET, GOODNA

SHEET TITLE: PROPOSED EARTHWORX TO LOTS STEEPER THAT 15% NATURAL SLOPE

DATE: AUGUST 2005

ETS GROUP

- ARCHITECTS
- ENGINEERS
- INTERIOR DESIGNERS

AUSTRALIA

PAPUA NEW GUINEA

SINGAPORE • NEW ZEALAND • INDONESIA
UNITED ARAB EMIRATES

JOB CODE: RESSGO

SHEET NUMBER: SK01

REV: A

RATIONAL METHOD CALCULATIONS

Pre-Development

Project: Proposed development
Location of Discharge: Eric Street, Goodna
Catchment Condition: Grassed steep
Other Comments:

Time of Concentration:	17.0	minutes

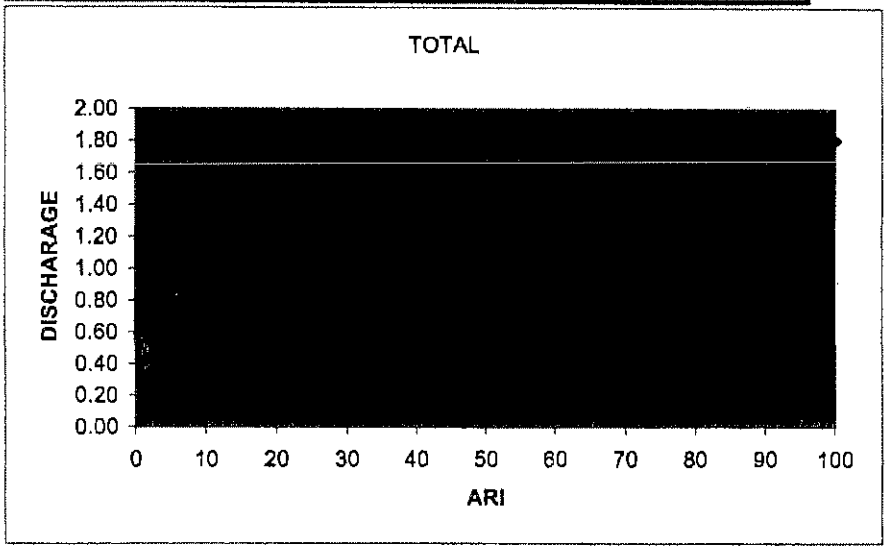
	Res A	Parks	Total
Sub-Catchment Areas			3.87 ha
C10 Runoff Coefficients			

ARI (years)	Rainfall Intensity (mm/hr)	Rainfall Depth (mm)	Fy	Runof Coefficient Res A	Parks	0	Discharges (cumecs) Res A	Parks	0	TOTAL
1	68	19	0.80	0.56	0.56	0.0	0.409	0.000	0.0	**0.41**
2	88	25	0.85	0.60	0.60	0.0	0.562	0.000	0.0	**0.56**
5	114	32	0.95	0.67	0.67	0.0	0.814	0.000	0.0	**0.81**
10	129	37	1.00	0.70	0.70	0.0	0.969	0.000	0.0	**0.97**
20	150	43	1.05	0.74	0.74	0.0	1.184	0.000	0.0	**1.18**
50	178	50	1.15	0.81	0.81	0.0	1.538	0.000	0.0	**1.54**
100	200	57	1.20	0.84	0.84	0.0	1.804	0.000	0.0	**1.80**

Friend's Equation for shallow overland flow		
Travel Length:		metres
Fall:		metres
Cathcment Slope:	12	%
Horton's roughness value (n)		
Travel Time (from QUDM fig. 5.05.2)	17.4	min
Pipe and Channel Flow		
Flow Distance:		metres
Fall of Pipe/Channel		m
Travel Time (from QUDM Chart 5.05.6) **lookup**		min
Standard Inlet Times		
Time from QUDM tab. 5.05.1		min
TIME OF CONCENTRATION	17.4	min

ARI	% of Q100
1	22%
2	30%
5	44%
10	53%
20	65%
50	85%
100	100%

Frequent Discharge ARI's		% of Q1
1mth	0.165	25%
2mth	0.264	40%
3mth	0.330	50%
4mth	0.396	60%
6mth	0.495	75%
9mth	0.594	90%
12mth	0.660	100%



HORTON'S 'n'

Paved Surface	0.015
Bare Soil	0.0275
Poorly Grassed	0.035
Average Grassed	0.045
Densely Grassed	0.06

RATIONAL METHOD CALCULATIONS

Post Development

Project: Proposed development
Location of Discharge: Eric Street, Goodna
Catchment Condition: Grassed steep
Other Comments:

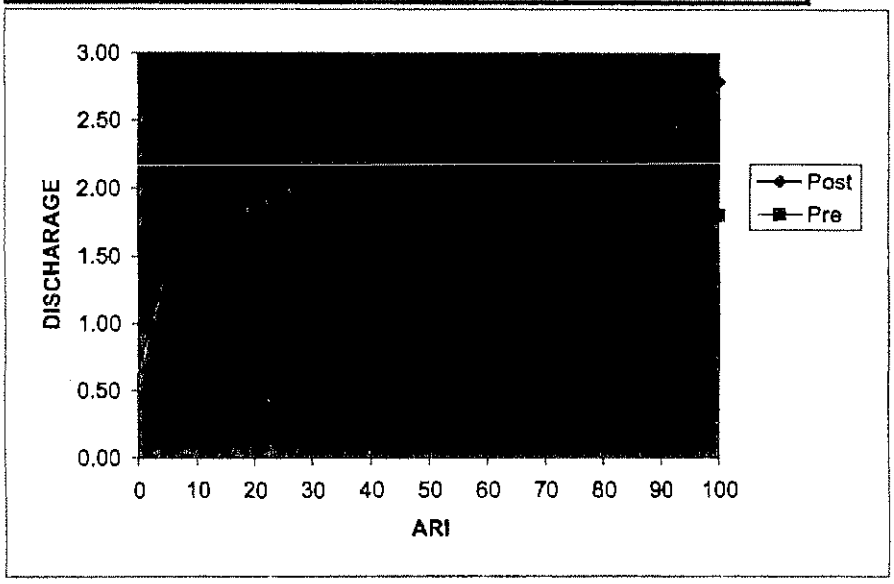
Time of Concentration:	8.0	minutes		
		Res A	Parks	Total
Sub-Catchment Areas				3.87 ha
C10 Runoff Coefficients				

ARI (years)	Rainfall Intensity (mm/hr)	Rainfall Depth (mm)	Fy	Runof Coefficient Res A	Parks	0	Discharges (cumecs) Res A	Parks	0	TOTAL
1	95	13	0.80	0.64	0.56	0.0	0.653	0.000	0.0	**0.65**
2	122	16	0.85	0.68	0.60	0.0	0.891	0.000	0.0	**0.89**
5	156	21	0.95	0.76	0.67	0.0	1.273	0.000	0.0	**1.27**
10	177	24	1.00	0.80	0.70	0.0	1.520	0.000	0.0	**1.52**
20	204	27	1.05	0.84	0.74	0.0	1.840	0.000	0.0	**1.84**
50	242	32	1.15	0.92	0.81	0.0	2.390	0.000	0.0	**2.39**
100	271	36	1.20	0.96	0.84	0.0	2.793	0.000	0.0	**2.79**

Friend's Equation for shallow overland flow		
Travel Length:		metres
Fall:		metres
Cathcment Slope:	0	%
Horton's roughness value (n)		
Travel Time (from QUDM fig. 5.05.2)		min
Pipe and Channel Flow		
Flow Distance:		metres
Fall of Pipe/Channel		m
Travel Time (from QUDM Chart 5.05.6) **lookup**		min
Standard Inlet Times		
Time from QUDM tab. 5.05.1		min
TIME OF CONCENTRATION	8.0	min

ARI	% of Q100
1	22%
2	30%
5	44%
10	53%
20	65%
50	85%
100	100%

Frequent Discharge ARI's		% of Q1
1mth	0.165	25%
2mth	0.264	40%
3mth	0.330	50%
4mth	0.396	60%
6mth	0.495	75%
9mth	0.594	90%
12mth	0.660	100%



HORTON'S 'n'

Paved Surface	0.015
Bare Soil	0.0275
Poorly Grassed	0.035
Average Grassed	0.045
Densely Grassed	0.06

DETENTION BASIN SIZE ESTIMATE

$$V_s = 0.5\ t_b\ (Q_i - Q_o)$$

V_s = reqired storage volume (max.) m^3

t_b = duration of basin inflow (s) (assume = $2.67t_c$ if not know)

Q_i = peak inflow discharge (m^3/s)

Q_o = peak outflow discharge (m^3/s)

ARI (years)	1	2	5	10	20	50	100
t_b =	1281.6	1281.6	1281.6	1281.6	1281.6	1281.6	1281.6
Q_i =	0.65	0.89	1.27	1.52	1.84	2.39	2.79
Q_o =	0.41	0.56	0.81	0.97	1.18	1.54	1.80
V_s =	156	211	294	353	420	546	[illegible]

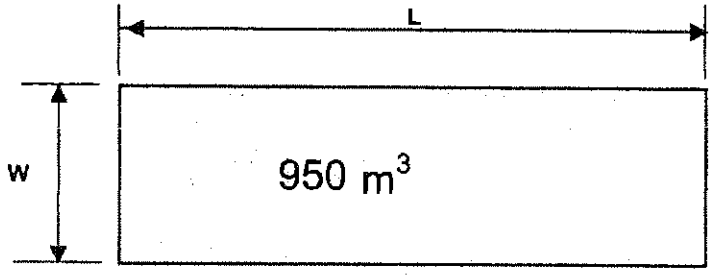
QUDM - BOYD FORMULA

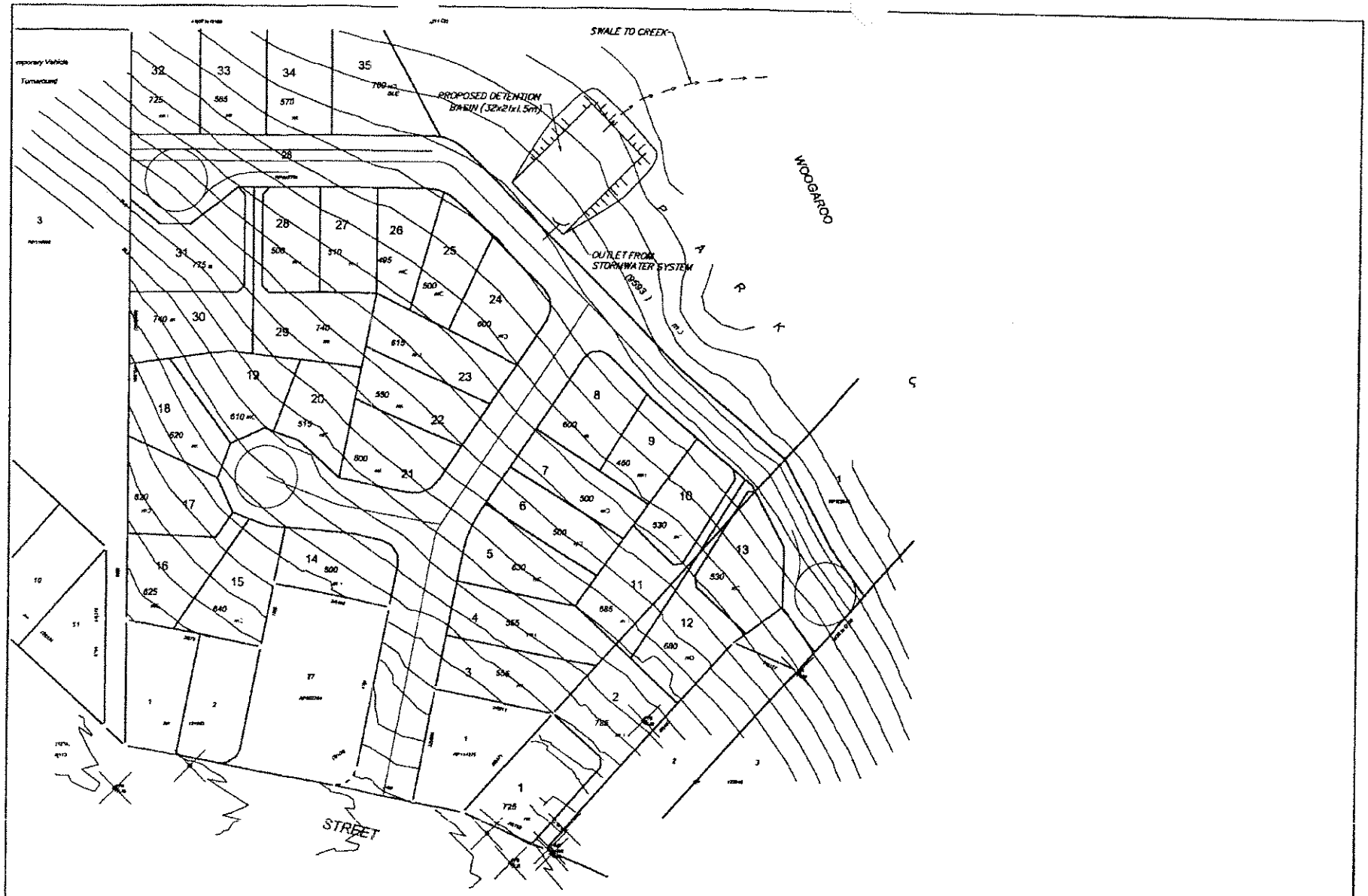
$$V_s = ((Q_i - Q_o)/Q_i) \times ((4\ t_c\ Q_i)/3)$$

V_s =	156	210	294	352	420	545	[illegible]
Safety Factor	234	316	441	529	630	818	[illegible]
1.5							

Dimensions

Length (L)	17	20	23	26	28	[illegible]	29
Width (W)	11	13	16	17	19	[illegible]	19
Depth (D)	1.2	1.2	1.2	1.2	1.2	1.2	1.7





Annexure NP-4

1704/2005 [redacted]

27 February 2006

MEMORANDUM

TO: DEVELOPMENT TEAM CO-ORDINATOR - EAST

FROM: ASSISTANT DEVELOPMENT ENGINEER - KEN DENMAN

RE: DEVELOPMENT APPLICATION
***INTEGRATED PLANNING ACT 1997* - SECTION 3.2.1(1)**
ENGINEERING ASSESSMENT REPORT

Appn No: 1704/2005

Applicant: DTS Group

Property Location: 35 Eric Street, Goodna

Proposal	Development	Approval Type
Reconfigure a Lot (2 into 36) Stage 1 – 1 lot Stage 2 – 35 lots	Carrying out building work Carrying out plumbing or drainage work Carrying out operational work Making a material change of use of premises Reconfiguring a lot Stages 1 & 2	N/A. N/A. N/A. N/A. Development Permit.

Date Received: 22 March 2005

The following comments are made in respect of the above proposed development.

1. APPLICABLE CODES

This application has been assessed against the following codes:-

(a) Ipswich Planning Scheme (Parts 1-6, including Strategic Plan and Zoning Scheme);
(b) Subdivision Code;
(c) Residential Development Code;
(d) Parking Code;
(e) Planning Scheme Policy for Ipswich Social Infrastructure Contributions;
(f) Planning Scheme Policy for Water Supply and Sewerage Infrastructure Contributions;
(g) Planning Scheme Policy for Ipswich Roadworks Infrastructure Contributions;
(h) Amendments to Australian Model Code for Residential Development (Amcord) Edition 2 - 1990;
(i) Planning Scheme Policy 3 General Works;
(j) Queensland Urban Drainage Manual;

(k) Australian Rainfall and Runoff (The Institution of Engineers, Australia);
(l) Queensland Streets;
(m) Austroads Guide to Traffic Engineering Practice - Intersections at Grade;
(n) Ipswich City Council Standards Drawings;
(o) Manual of Uniform Traffic Control Devices (Department of Main Roads);
(p) Australian Standard 3798 - Guidelines on Earthworks for Commercial and Residential Developments;
(q) Guidelines for Planning and Design of Urban Water Supply Schemes (Water Resources);
(r) Guidelines for Planning and Design of Sewerage Schemes (Water Resources);
(s) Policy Guidelines for Earthworks (including allotment filling);
(t) Sewerage and Water Supply Act.

The proposal generally complies with or has been conditioned to comply with the above codes.

2. EXISTING CONDITIONS AND COMMENTS

(a) Background

There is no significant history to this site from an engineering point of view.

(b) Outstanding Matters Relating to Previous Approvals

There are no outstanding engineering matters relating to previous approvals.

(c) Allotments

The subject property is described as Lot 1 RP 122040 & Lot 28 RP 802704. The Developer proposes to reconfigure the subject property into 36 lots in two stages. The Development plan has been amended for the approval of 24 lots only.

(d) Roads/Traffic/Parking

(i) External

The subject property has frontage to Eric Street on the southern property boundary. Eric Street a is 9.0m wide asphaltic concrete sealed pavement with kerb and channel on the both sides of the road. There are no constructed footpaths along the frontage of the subject property.

The Developer provided a traffic report prepared by Adam Pekol Consulting dated 15 November 2005 which identified that the proposed development will not have significant adverse impact on the future year (ie 2016) peak hour operations of Bertha Street and Eric Street proximate to the site and no significant adverse impact on future year (ie 2016) peak hour operations of Bertha Street/Eric Street intersection in its current form. The sight distance requirements of Austroads are satisfied both to the east and west of the proposed new intersection with Eric Street.

(iv) Future Road System

Based on the Ipswich City Road Transportation Study, it is unlikely that any part of the land will be required for any future road system.

(v) Pathways

Not applicable.

(e) Stormwater

The subject property is affected by the Q100 flood level of RL 14.7m AHD. The Developer has identified the development is above the Q100 level.

The Developer provided a stormwater drainage report prepared by ETS Group which contained preliminary calculations for pre and post development Q100 flows and also size of a detention basin required to maintain pre development flows.

(f) Sewerage

The property is in a sewered area. A 450mm diameter RCP sewer trunk main is located along the common boundary of the subject property and Woogaroo Creek. A 150mm diameter AC sewer main traverses the subject property near the Eric Street frontage.

(g) Water Supply

The property is in a water supply area. A 100mm diameter AC water main is located on the northern side of Eric Street along the frontage of the subject property.

(h) Energex and Street Lighting

Power is available to the development. The subdivision is to be reticulated with power, and street lighting is to be provided in accordance with the relevant Australian Standards.

(i) Mining

Council records indicate that the subject site is located within an area that has not been mined.

(j) Others

(i) Easements

Not applicable

(ii) Oil/Gas Pipelines

Not applicable.

(iii) Service Corridors

Not applicable.

(k) **General**

Not Applicable.

3. CONTRIBUTIONS

Development plan amended to create 24 lots only.

Headworks Contributions

Application Type:	Reconfiguring a lot

1. Existing Equivalent Persons (the greater of)

Deemed Credit

Town Planning Zone:	Residential Low Density
Category:	Urban Areas
Water Rate:	3.300 per lot
Sewerage Rate:	3.300 per lot
Road Rate:	3.100 per lot
Public Parks Infrastructure Rate:	3.080 per lot
Local Community Facilities Rate:	3.080 per lot
Number of lots:	2.000
Water EPs:	3.300 (one lot only connected to water)
Sewerage EPs:	3.300 (one lot only connected to sewer)
Road EPs:	6.200
Public Parks Infrastructure EPs:	6.160
Local Community Facilities EPs:	6.160

Land Use

1. Land Use:	Single Residential - Site > 450m²
Water Rate:	3.300 EPs per lot
Sewerage Rate:	3.300 EPs per lot
Road Rate:	3.100 EPs per lot
Public Parks Infrastructure Rate:	3.080 EPs per lot
Local Community Facilities Rate:	3.080 EPs per lot
Number of Lots (> 450m²):	2.000
EPs for Water:	3.300 (one lot only connected to water)
EPs for Sewerage:	3.300 (one lot only connected to sewer)
EPs for Roads:	6.200
EPs for Public Parks Infrastructure:	6.160
EPs for Local Community Facilities:	6.160

Total Water EPs:	3.300
Total Sewerage EPs:	3.300
Total Road EP:	6.200
Total Public Parks Infrastructure EP:	6.160
Total Local Community Facilities EP:	6.160

Previous Contributions

Previous Contributions For Water & Sewerage:	No
Previous Contributions For Roads:	No
Deemed Credit Exempt For Water:	No
Deemed Credit Exempt For Sewerage:	No
Deemed Credit Exempt For Roads:	Yes
Reason for Road Exemption:	not on map
Existing Credit EPs for Water:	3.300
Existing Credit EPs for Sewerage:	3.300
Existing Credit EPs for Roads:	6.200
Existing Credit EPs for Public Parks Infra.:	6.160
Existing Credit EPs for Local Community Fac:	6.160

2. Proposed Equivalent Persons

Proposed Land Use

1. Land Use:	Single Residential - Site > 450m²
Water Rate:	3.300 EPs per lot
Sewerage Rate:	3.300 EPs per lot
Road Rate:	3.100 EPs per lot
Total Public Parks Infrastructure:	3.080 EPs per lot
Total Local Community Facilities:	3.080 EPs per lot
Number of Lots (> 450m²):	1.000 (Stage 1)
Number of Lots (> 450m²):	23.000 (Stage 2)
Proposed EPs for Water:	3.300 (Stage 1)
Proposed EPs for Sewerage:	3.300 (Stage 1)
Proposed EPs for Roads:	3.100 (Stage 1)
Proposed EPs for Public Parks Infra.:	3.080 (Stage 1)
Proposed EPs for Local Community Fac.:	3.080 (Stage 1)
Proposed EPs for Water:	75.900 (Stage 2)
Proposed EPs for Sewerage:	75.900 (Stage 2)
Proposed EPs for Road:	71.300 (Stage 2)
Proposed EPs for Public Parks Infra.:	70.840 (Stage 2)
Proposed EPs for Local Community Fac.:	70.840 (Stage 2)

Stage 1

Total Water EPs:	3.300
Total Sewerage EPs:	3.300
Total Road EP:	3.100
Total Public Parks Infrastructure EP:	3.080
Total Local Community Facilities EP:	3.080

Stage 2

Total Water EPs:	75.900
Total Sewerage EPs:	75.900
Total Road EP:	71.300
Total Public Parks Infrastructure EP:	70.840
Total Local Community Facilities EP:	70.840

3. Headworks Charges

Difference in Equivalent Persons:	Proposed Equivalent Persons - Existing Credit EP

Stage 1

Water EPs: 0.000

Water contributions are not applicable for this stage.

Sewerage EPs: 0.000

Sewerage contributions are not applicable for this stage.

Road EPs = 0.000

Road contributions are not applicable for this stage.

Public Parks Infrastructure EPs = 0.000

Public Parks Infrastructure contributions are not applicable for this stage.

Local Community Facilities EPs = 0.000

Local Community Facilities contributions are not applicable for this stage.

Stage 2

Water EPs =	75.900
Sewerage EPs =	75.900
Road EPs =	68.200
Public Parks Infrastructure EPs =	67.760
Local Community Facilities EPs =	67.760

Water

Water Zone:	Goodna High Level Water Zone
Unit Charge:	1.088
Contribution per EP:	$707.33
Water Headworks Charge:	**$0.00 (WT-TM1) Stage 1** **$58,410.00 (WT-TM1) Stage 2**

Sewerage

Sewerage Catchment:	Goodna Catchment (excluding Springfield)
Unit Charge:	1.088
Contribution per EP:	$629.36
Sewerage Headworks Charge:	**$0.00 (SW-RC2) Stage 1** **$51,972.00 (SW-RC2) Stage 2**

Roads

Headworks Road:	No
Road Contribution Sector:	Goodna
Unit Charge:	1.026
Contribution per EP:	$1,437.77
Road Headworks Charge:	**$0.00 (RD-WAQ) Stage 1** **$100,605.00 (RD-WAQ) Stage 2**

Public Parks Infrastructure

Park Sector:	Goodna - Gailes (3)
Unit Charge:	1.026
Contribution per EP:	$110.43 (Level1)
	$572.86 (Level2)
	$593.42 (Level3)
Public Parks Infrastructure Headworks Charge:	**$0.00 Stage 1 (Level1 - PK-UAC)**
	$0.00 Stage 1 (Level2 - PK-UDC)
	$0.00 Stage 1 (Level3 - PK-ULC)
Total	**$0.00 Stage 1**
	$7,677.00 Stage 2 (Level1 - PK-UAC)
	$39,826.00 Stage 2 (Level2 - PK-UDC)
	$41,256.00 Stage 2 (Level3 - PK-ULC)
Total	**$88,759.00 Stage 2**

Local Community Facilities

Community Sector:	Goodna - Gailes (14)
Unit Charge:	1.088
Contribution per EP:	44.940 (Level1)
	62.350 (Level2)
	36.470 (Level3)
Local Community Facilities Headworks Charge:	**$0.00 Stage 1 (Level1 - SI-VAN)**
	$0.00 Stage 1 (Level2 - SI-VDN)
	$0.00 Stage 1 (Level3 - SI-ULN)
Total	**$0.00 Stage 1**
	$3,313.00 Stage 2 (Level1 - SI-VAN)
	$4,597.00 Stage 2 (Level2 - SI-VDN)
	$2,689.00 Stage 2 (Level3 - SI-ULN)
Total	**$10,599.00 Stage 2**

4. OTHER DEVELOPMENT APPROVALS REQUIRED

From an engineering perspective, further Development Permits, as required by the *Integrated Planning Act 1997,* shall be obtained in respect of any Operational Works in relation to this approval before any such works are commenced.

RECOMMENDATION

A. Development Permit

Based on engineering grounds only, it is recommended that the application for Code Assessment - Development Permit - Reconfiguring a Lot for Stages 1& 2 of land at 35 Eric Street, Goodna as proposed by DTS Group and detailed on plan number A2 905/6, dated 1 November 2005 with amendments shown in red (2 into 24 lots), be approved, subject to the following terms and conditions being completed by the Developer, to the satisfaction of the Senior Development Engineer:

1. Terms

(a) RPEQ - A Registered Professional Engineer of Queensland, suitably qualified and experienced in the particular area of expertise required.

(b) QUDM - The Queensland Urban Drainage Manual, produced by the Queensland Department of Primary Industries.

(c) Queensland Streets - The Design Guidelines for Subdivisional Street Works, prepared for the Institute of Municipal Engineers of Australia (QLD).

(d) MUTCD - The Manual of Uniform Traffic Control Devices, published by DMR.

(e) Ipswich Water - Commercial Business Unit of Ipswich City Council providing water and sewerage services.

(f) DNRM – Department of Natural Resources and Mines.

2. Roadworks

(a) The roads shall be constructed with concrete kerb and channel and asphaltic concrete surfacing, together with associated works for the full length of all property frontages.

(b) Roadworks shall be designed and constructed in accordance with Council's Standards, Queensland Streets, Austroads Publications, the relevant and appropriate roadworks design standards and guidelines, and any other documentation deemed appropriate by Council. Such design and construction shall ensure that road carriageway widths are consistent with the road function and position in the road hierarchy and are in accordance with the relevant design speed environment. Threshold treatments shall be highly visible, and shall only be constructed after approval of the proposed surface treatment by the Senior Development Engineer.

(c) The pavement designs shall be in accordance with the Ipswich City Council's Planning Scheme Policy 3 General Works. All roads shall have two way crossfalls in accordance with Council's adopted standards.

The minimum dedicated road widths, pavement widths and footpath requirements shall be in accordance with Ipswich City Council's Subdivision Code as set out below:

Road Type	Dedication Width	Pavement Width	Footpath	Path Width
Access place	15.0 m	6.5 m	1 Path	1.5 m
Access street	15.0 m	6.5 m	1 Path	1.5 m
Collector	17.0 m	8.5 m	1 Path	1.5 m
Trunk collector	20.0 m	9.0 m	2 Cycleway	2.0 m
		or 2 x 5.0 m	or 1 Path + 1 Cycleway	1.5 m 2.0 m

(d) The road pavement widths and geometric layout shall be sufficient to make adequate provision for Council's refuse collection vehicles and public transport movements.

(e) The Developer shall provide a maximum 4.25m wide verge along the western property boundary of Lot 28 RP 802704 adjacent to lot 27 RP 802704 (39 Eric Street). The proposed road pavement width for the road to be constructed between Lot 27 RP 802704 and Lot 1 RP 114375 shall be a minimum 6.5m.

(f) A vehicle turning area shall be provided at the end of all "No through" roads and cul-de-sacs. Circular cul-de-sac turning heads, based on a minimum turning circle of 9.0 m radius, are preferred . "T" and "Y" shaped turning heads are generally not to be used.

(g) Traffic slow down devices shall be provided generally in accordance with Queensland Streets and Council approved alternatives.

(h) "No Through Road" signs shall be erected at the entries to cul-de-sacs and terminating roads.

(i) All traffic signs and delineation shall be installed in accordance with MUTCD.

(j) The Developer shall provide minimum 1.5 m wide concrete footpaths on one side of all the streets and extending past the mid point in cul-de-sacs to the next property boundary.

The construction of footpaths shall be in accordance with Council's Standard Drawing SR.19. The concrete footpaths shall be on the same side as the street lights, and the maximum longitudinal grade shall not exceed 1:8 where possible.

(k) Kerb ramps are to be constructed in accordance with Council's Standard Drawing SR.18 at all intersections and at additional locations where required to connect the concrete pathways and cycleways. Generally at "T" intersections, 4 kerb ramps are required. Kerb ramps are to generally be set such that impaired pedestrians will move through an intersection on a straight road in a continuous straight line with the kerb ramps "pointing" at the destination ramp.

(l) Vehicular access from the roadways to all allotments shall be capable of being provided.

(m) Provision shall be made for minimum 6.0m, three chord truncations at intersections. The 6.0m distance is measured along each frontage from the property corner.

3. Access

(a) The access driveway to all hatchet shaped Lots shall be constructed from the property boundary for the full length of the access strip with the following design criteria:

(i) the maximum longitudinal grade shall be 1 in 6 and the maximum crossfall shall be 1 in 20, except that the Senior Development Engineer may allow a longitudinal grade of 1 in 4 for a distance not exceeding 60 m in total in special circumstances.

(ii) a drainage system shall be provided so that no part of the driveway shall be inundated in the runoff resulting from a storm event with an ARI of 2 years, and the runoff from the driveway shall be discharged to the satisfaction of the Senior Development Engineer.

(iv) The driveway construction within the access strip to all hatchet lots shall be reinforced concrete not less than 100 mm deep and 3.0 m wide.

(v) The water services for the allotments, together with stormwater pipes and conduits for electricity and telephone (with draw string), shall be installed for the full length of all access strips.

(b) A concrete layback and driveway slab 3-m wide, from the layback to the property boundary, shall be constructed for access to all hatchet lots in accordance with Council's Standard Drawing Nos. SR.12.

(c) The Developer shall relocate the existing driveway for lot 1 RP 122040 such that a concrete layback and driveway slab 3.0m wide, from the layback to the property boundary, shall be constructed for access to proposed lot 1, with in the frontage of proposed lot 1, and in accordance with Council's Standard Drawing SR. 12.

(d) Where applicable, the concrete kerb shall be reinstated for any redundant driveway layback.

(e) The footpath shall be re-levelled over those areas where the existing driveways/laybacks are redundant to match existing levels.

4. Sewerage

(a) The Developer shall provide a sewerage reticulation system with appropriate house connection branches, designed so as to command the whole of each of the proposed allotments.

(b) The Developer shall pay the full cost for Council to provide a suitable connection into the existing sewerage reticulation system. All works on live sewers are to be carried out by Council at the Developer's expense, unless arranged otherwise with Ipswich Water.

(c) The Developer shall demonstrate that the proposed pipe sizes and connection points are adequate for the total upstream catchment and the proposed development.

(d) No work on the sewerage reticulation system shall commence prior to the approval of the Operational Works application.

(e) New Council sewer ends are to be extended to or past the boundary of new allotments to enable the future developments to connect to these drains without undue control or hindrance by the property owner in which the end line lies.

5. Water

(a) The Developer shall provide a reticulated water supply system together with valves and fire hydrants, in accordance with the "Guidelines for Planning and Design of Urban Water Supply Systems", which connects into Council's existing reticulation system.

(b) A blue, bi-directional raised reflective pavement marker (RRPM) shall be provided to all hydrants. The marker shall be installed in accordance with the Department of Main Roads Fire Hydrant Indication System Technical Guideline.

(c) The Developer shall demonstrate that the pipe sizes proposed and the available pressure head complies with the requirements of Ipswich Water's "Water Supply Planning Guidelines", and the "Guidelines for Planning and Design of Urban Water Supply Systems" and are adequate to cater for the proposed development. Such demonstration is to cover as a minimum:

(i) available pressure during maximum hour;

(ii) available pressure and flows for fire fighting and other purposes, and any recommendations pertaining thereto; and

(iii) comments regarding the situation at various stages of the development.

Note:
Details regarding available pressure heads at various points in the existing water reticulation network for use in the calculations to be produced for such demonstration may be obtained from the Senior Development Engineer on submission of completed application forms and payment of the relevant fees.

(c) All works on live water mains are to be carried out by Council in accordance with Council's policy, and at the Developer's expense.

(d) Where concrete footpaths are to be constructed, the Developer shall provide 100 mm diameter conduits under the footpath and in line with the conduits under the road, for future ease of installing the individual water services. The letter "W" shall be embossed in the concrete to mark the location of the conduit.

(e) Wherever possible, the water main shall be constructed on the opposite side to the concrete footpaths. Where the water main is under a concrete footpath, the Developer shall provide a water connection (including the provision of meters) to each allotment, including the provision of approved pre-cast concrete or cast iron boxes over the stop cock.

(f) Where the water reticulation network is serving in excess of 20 allotments in any one stage, the site shall be served from two directions and shall not be in the form of a single dead end supply. All other mains shall be looped around the cul-de-sac head to join back on to itself.

(g) Sufficient stop valves shall be installed so that in the event of any break in the supply, the maximum number of allotments to be without water is 20.

(h) The Developer shall provide a water connection and meter to all proposed lots.

(i) The fire fighting water supply demand on Council's reticulation system from this development shall not exceed 15 litres/second for residential precinct.

(j) A Fire Hydrant shall be provided within a 20m radius of all hatchet lot access driveways. The distance shall be measured from a point where the middle of the access driveway meets the road reserve.

6. Stormwater

(a) The Developer shall provide all necessary stormwater drainage (both internal and external to the development) and such drainage works (except for roofwater systems) shall be designed and constructed in accordance with QUDM such that the overall drainage system caters for a storm event with an ARI of 100 years.

Overland flow paths shall be suitably designed to cater for the water from a storm event with an ARI of 100 years. In the case where the piped system is carrying part of the flow, the overland flow paths shall be designed to cater for that volume which is represented by the difference between the predicted volume from the storm event with an ARI of 100 years and the capacity of the pipe system, noting the requirements of QUDM.

(b) A suitable roofwater system shall be designed in accordance with QUDM, for allotments that do not have adequate fall from within the allotment to the design invert level of the kerb and channel. The design is to be to a minimum Level II in QUDM.

(c) All stormwater flows within and adjacent to the development, other than inter-allotment drainage, shall be confined to dedicated roads, drainage reserves, registered drainage easements or within parkland. The registered drainage easements, if related to piped drainage, shall be centrally located over such underground pipe system and shall be not less than 4.0 m wide, except for drainage easements required for side boundaries which may be 3.0 m wide where approved by the Senior Development Engineer. In addition, the easements shall be of suitable width to contain the predicted overland flow from the storm event with an ARI of 100 years in that location.

(d) No ponding or redirection of stormwater shall occur onto adjoining land unless specifically approved by Council in consultation with the owner of the adjoining land.

(e) Due consideration shall be given in the design and construction of the development in relation to the effect of the developed catchment flows on the downstream discharge receival areas. Suitable stormwater control devices are to be provided to ensure that there is no increase in flow in watercourses. Such control devices are to be designed so as to integrate the landscaping, recreational, infrastructural and drainage roles of watercourses.

(f) All stormwater runoff from the development shall be discharged in a manner and to a point to be approved by the Senior Development Engineer.

(g) Stormwater drainage plans and calculations are to be submitted and approved by the Senior Development Engineer, in conjunction with the submission of an Operational Works application.

(h) Appropriate works shall be carried out to ensure that stormwater drainage from the new kerb and channel discharges suitably into the existing drainage system.

(i) There shall be minimal disturbance to vegetation in the gully areas, unless prior written approval is obtained from Council. Stormwater drainage outlets shall be the subject of detailed design in the preparation of plans for each stage of the development.

(j) The Developer shall provide a roofwater connection point to all lots which have a concrete footpath along the lot frontage and which drain to the street. The connection shall be located at the lowest corner of the lot on an alignment of 1.2 metres from the side boundary and shall discharge to the kerb and channel via a 100mm by 75mm galvanised RHS. The RHS should extend 0.5 metres into the property and have a suitable adaptor to allow connection to a roofwater pipe. All other lots, which drain to the street and do not have a concrete footpath along the lot frontage, do not require kerb adaptors.

(k) The Developer shall provide an extended stormwater detention and/or retention device (or equivalent) on the subject land, which shall be designed and constructed in accordance with QUDM. Where applicable, the detention/retention devices (or equivalent) shall be constructed to ensure that flows, run-off volumes and velocities, at any point downstream in the catchment, are not increased by the development for any combination of frequency and duration from the storm event with an ARI of 2 years up to and including the storm event with an ARI of 100 years. Additional calculations are to be provided demonstrating that the proposed stormwater management system, and all embankments and discharge structures, will be contained within the drainage reserve where applicable (except where connecting to the street drainage), and that the basin shape, volume and surface area will perform according to the attenuation results requirements.

7. Public Utilities

(a) Adequate provision shall be made in all proposed dedicated roads, access strips and easements, to cater for the public utility services that would normally serve the development.

(b) The Developer shall provide appropriate road crossing conduits in accordance with Council's Standard Drawings SR.22 and SR.23. Where concrete footpaths are to be constructed, the conduits shall be extended to the property boundaries.

(c) Street lighting shall be installed by the Developer in accordance with the Australian Standard 1158.3.1 Table 1.1. All street lighting associated with the development shall be certified by a RPEQ. Street lighting shall be installed on the same side as concrete footpaths (where applicable).

(d) The Developer shall provide underground electricity/telecommunications within the development, constructed in the approved allocation as detailed in Council's Standard Drawings SR.22 and SR.23. Electricity/telecommunication drawings shall be co-ordinated with the civil engineering design documents, to ensure that service clashes are avoided. Where allotments front an existing overhead electricity/telecommunication service, these allotments may connect to such service subject to the approval and requirements of the service provider.

(e) The Developer shall provide an Energex approved electrical reticulation layout plan. The electricity layout shall also be shown on the water reticulation layout plans.

(f) The Developer shall provide each allotment with an electricity supply.

(g) Prior to the signing of a plan of survey, the Developer shall provide Council with a copy of an agreement with Energex for the supply of electricity to the development.

(h) Telephone and cable services may be laid in a combined trench with electricity cables, subject to the approval of Energex and the authorised telephone/cable service provider.

(i) The Developer shall make suitable arrangements for the provision of telephone and (where applicable) cable services to all proposed lots within the development. Documentary evidence that discussions have commenced with any authorised telephone/cable service provider, on the provision of telephone/cable services, shall be provided prior to the signing of the plan of survey by Council.

8. Erosion & Silt Management

(a) The Developer shall be responsible for the installation and maintenance of silt management facilities from the time of commencement of construction until the development has been released Off Maintenance by Council. All silt management facilities are to be in accordance with the document "Soil Erosion and Sediment Control" published by the Institution of Engineers Australia, or equivalent.

(b) Silt traps shall be sited upstream from any park or reserve area discharge point preferably on land comprising future allotments, such that no silt impinges on the park or reserve areas. The silt trap areas may be phased out after the development work is complete and adequate grass cover is obtained.

(c) Diversion drains and ponds, as necessary, shall be installed on the site before any other work is undertaken on site to ensure that "dirty water" is contained and/or isolated.

(d) An erosion and sediment control program and maintenance procedures shall be prepared and submitted with the engineering drawings for approval for maintaining the facilities, setting out the frequency of attention, with inspections to be made after each significant rainfall event.

(e) Council reserves the right to enter the site for the purpose of rectifying any silt management facilities which it deems to be inadequate, improperly maintained or not operating in a satisfactory manner.

(f) The Developer shall lodge a $5 000 siltation and erosion performance bond with Council, prior to the commencement of works, which shall only be released by Council at the termination of the maintenance period. Where Council determines that a draw-down of the bond is required, the Developer shall restore the bond to its full amount within 10 days of a notice from Council to that effect. Such bond shall guarantee adequate performance in the circumstances (i) and (ii) below:

(i) In the event that instructions issued to the Consulting Engineer by the Senior Development Engineer for the installation of erosion control measures, are not complied with within 24 hours, Council will call upon the bond to the extent required to carry out the necessary works.

(ii) If the Senior Development Engineer determines that silt damage has occurred on the site, or the downstream drainage system has become silted, the Developer shall be responsible for restoration. Such restoration shall be completed in the time determined by the Senior Development Engineer.

Should the Developer fail to complete the works determined by the Senior Development Engineer within the specified time, Council shall complete the work and recover all costs from the Developer associated with that work.

9. Operational Works – Municipal Works
(ie Works being handed over to Council)

(a) Plans relating to all civil engineering works shall be prepared and submitted for review by Council under the cover of Form 1 - Part A (Common details for all applications) and Form 1 - Part E (Planning Scheme Works). The plans shall show full construction details, layout dimensions, and finished surface levels and shall be submitted together with the appropriate fees for Council approval, prior to the commencement of construction on site.

(b) The Developer shall comply with the requirements of the documents entitled "Planning Scheme Policy 3 General Works" and "Standard Drawings".

(c) All engineering drawings submitted to Council shall be in accordance with Council's Planning Scheme Policy 3 General Works and Standard Drawings, and shall include as a minimum the following:

(i) Engineering drawings shall be marked as confirmation that they have been checked and approved by a RPEQ;

(ii) The drawings shall be submitted as three A3 size sets and one full size set; and

(iii) A "Certificate of Design" shall be submitted by a RPEQ, certifying that the design is in accordance with all relevant engineering standards, Council's requirements and standards, relevant development conditions of approval, and sound engineering practice.

(d) Municipal works shall require a detailed design certified by a RPEQ, the design approved by Council Engineers with appropriate fees payable, a works pre-start meeting on-site and various detailed construction and audit inspections by Council Officers. A twelve month maintenance period is applicable for the works as well as the payment of a maintenance security deposit.

(e) All works shall be supervised by a RPEQ competent in civil works and shall be undertaken by a nominated principal contractor experienced in the construction of municipal works. Council reserves the right to request evidence of the principal contractor's competency. Should it be deemed by the Senior Development Engineer that the contractor does not have the necessary competency or has constructed substandard works for Council in the past, Council reserves the right to reject the nominated contractor.

(f) Municipal works shall be accepted "On Maintenance" prior to commencement of use. A maintenance bond equal to 5% of the construction cost (minimum of $1,000.00) shall be retained by Council for a minimum period of twelve months, or until such time as the works are accepted "Off Maintenance" by Council.

(g) "As Constructed" plans for municipal works shall be submitted to Council and approved prior to the formal acceptance of the works "On Maintenance".

(h) On completion of the works a certificate shall be submitted to Council by a RPEQ certifying that the works have been constructed in accordance with Council's construction standards and in compliance with the approved plans and specification. It is expected that the RPEQ will undertake the necessary inspections to make this certification.

(i) Council reserves the right to require further amendments and/or additions at a later date, should design errors or omissions become apparent in regard to the works relevant to the Operational Works approval.

For Reconfiguring a Lot with External Municipal Works

j) Council requires the provision of a bank guarantee, or a performance bond of not less that 10% (minimum of $5,000.00) of the value of the external municipal works. The bond/guarantee sh be retained by Council until such time the Developer provides a replacement or additional maintenance period bond/guarantee for entire Municipal Works (both external and internal) as security for the performance of the maintenance obligations.

External Municipal Works relates to those works external to the subject site and located in already dedicated public areas, for example existing road or drainage reserve, or private property not subject to Developer ownership.

10. Plan of Survey

(a) Adequate permanent survey marks shall be installed. The Developer shall submit a certificate signed by a licensed surveyor, stating that after the completion of all works associated with the development, permanent survey marks are in their correct position, in accordance with the plan of survey.

(b) The Developer shall grant, free of cost to or compensation payable by council, minimum 4.0m wide easements located centrally over proposed stormwater drains, water mains and sewerage rising mains, where they are located within private property. The documentation associated with these easements may be prepared by the Developer in a form satisfactory to Council's City Solicitor, or the Developer may submit easement plans, only where Council is party to the easements, to Council for the preparation of easement documents at the Developer's expense.

(c) Easements required for discharge of stormwater over adjacent land shall be agreed to in writing by the owner of the subject land prior to construction works commencing.

(d) Easements shall be centrally located over the alignment of stormwater paths and be of a width sufficient to encompass the overland flow from a storm event with an ARI of 100 years.

(e) Easements shall be of sufficient width to contain any fitting, access chamber etc located on the stormwater drains, water mains, and sewerage rising mains.

(f) Land required for detention basins or equivalent is to be dedicated as drainage reserve in favour of Council and not included within parkland dedication unless approved as parkland by Council.

11. Contributions

(a) In accordance with the current Council Policies in relation to headworks contributions, the Developer shall pay, prior to the signing of the Plan of Survey, the following monies to Council:

Stage 1 (1 Lot)

(i)	Water headworks	= $0.00 WT-TM1
(ii)	Sewerage headworks	= $0.00 SW-RC2
(iii)	Road contribution	= $0.00 RD-WAQ

Stage 2 (23 Lots)

(i)	Water headworks	= $58,410.00 WT-TM1
(ii)	Sewerage headworks	= $51,972.00 SW-RC2
(iii)	Road contribution	= $100,605.00 RD-WAQ

Calculations of headworks and contributions are based on the infrastructure contribution rates applicable at the date the development application was lodged with Council. The contributions above shall be applicable for a period of twelve months from the date of the development approval, and thereafter shall be based on the infrastructure contribution rates applicable at the date when payment is made.

12. General

(a) All disturbed verge areas and allotments shall be graded, grassed and left in a mowable condition. The grass cover shall be obtained as early as possible during the development and an acceptable grass cover shall be achieved before the development can be accepted "Off Maintenance".

(b) The Developer shall provide a list of at least three names (and name meanings) to Council for each new road to be opened. The list of names should be submitted as early as practical to allow Council to approve the names in time for sign manufacture and erection prior to the opening of the new roads. A theme may be used for any larger subdivision should this be considered appropriate.

(c) Street name signs shall be manufactured to Council specifications and shall be erected in accordance with Council's Standard Drawing SR.26 at each intersection.

(d) With reference to any works, on land under other private ownership, written permission for the works shall be obtained and forwarded to Council. Similarly, written clearances shall be obtained after the works are completed, unless otherwise accepted by the Senior Development Engineer.

(e) All works required for this development shall take due regard of any and all existing services and, if considered necessary by the relevant authority or the Senior Development Engineer, such works shall be altered at the cost of the Developer.

(f) Any allotment filling for a greater depth than 800 mm to provide for building platforms shall be conducted in accordance with Australian Standard 3798. Test results as required by Australian Standard 3798, and a certificate of quality and uniformity of fill shall be provided by a RPEQ. The level of responsibility shall be Level 1.

(g) A certificate from a RPEQ shall be issued to Council certifying that any retaining wall greater than 800 mm in height is structurally sound and capable of withstanding any likely surcharge loads. Retaining walls greater than 1.0 m in height are to be provided with railings or other barriers to provide pedestrian safety.

(h) Retaining walls shall be designed so that there are no imposed loads placed upon Council's underground services. This may include extending the footing to a level 300 mm below the invert of the pipe.

(i) Filling of gully areas if permitted shall be carried out strictly in accordance with Australian Standard 3798. Test results as required by Australian Standard 3798 and a certificate of quality and uniformity of fill, shall be provided by the Supervising RPEQ for all filled areas.

(j) For batters resulting from cutting and filling of the site and producing slopes greater than 1:6, Council requires a RPEQ to certify that they are stable and properly drained.

(k) Approval of the Senior Development Engineer is required for any fill intended to be placed over Council's underground services.

(l) If, after the preparation of detailed design plans for the various roads, it is found necessary to provide any additional dedicated road area, or modify the proposed dedicated roads to enable the full requirements of Council's standards, Queensland Streets, AMCORD and Austroads documents to be incorporated in any way (but particularly in the production of the required speed environment or because of longitudinal and cross sectional constraints) then the estate layout plan shall be altered accordingly.

(m) Components that will become Council assets at the end of maintenance are subject to the following service life requirements:

  (i) Roadworks – 20 years.

  (ii) Drainage elements – 50 years.

  (iii) Structures – 50 years.

  (iv) All others – 50 years.

(n) The Developer shall provide details of the intended method of installation and compaction of all public utilities (including stormwater) with the Operational Works applications,

demonstrating that the proposed technique considers and avoids premature failure of the service conduit. In the case of stormwater, this information should be incorporated on the long section schedule.

(o) All structures undertaken for the development eg footpaths/cycleways, retaining walls, drainage components and the like, shall be designed in order that foundations effects, differential movements etc are accounted for and do not impeded the component operation or serviceability requirements during their expected lifetime eg avoidance of trip hazards, blockages, structural failures, traffic hazards etc.

(p) The Developer shall be responsible for ensuring that all approvals have been obtained from the relevant infrastructure stakeholders. All approvals shall be submitted in conjunction with the Operational Works.

(q) Earthworks on any lot shall not exceed a total maximum height of 2.0 metres. Retaining walls shall not exceed a total maximum height of 1.2metres with 1 : 4 batters from the top and toe of the wall unless it can be demonstrated to the Council's Senior Development's Engineer's reasonable satisfaction that a greater height is acceptable.

13. Compliance with conditions

All conditions shall be completed prior to signing of the Plan of Survey unless otherwise specified in these conditions.

B. Further Advice

Portable Long Service Leave

a) From 1 January 2000, the Building and Construction Industry (Portable Long Service Leave) Levy must be paid prior to the issue of a development permit where one is required for the 'Building and Construction Industry'. This applies to Building Works, Operational Works and Plumbing and Drainage Works applications, as defined under the *Integrated Planning Act 1997*, where the works are $80 000 or more and matching the definition of 'Building and Construction Industry' under the *Building and Construction Industry (Portable Long Service Leave) Act 1991*.

Council will not be able to issue a Decision Notice without receipt of details that the Levy has been paid. Should you require clarification in regard to the amendments to the *Building and Construction Industry (Portable Long Service Leave) Act 1991*, you should contact QLeave on 1800 803 481 (free call) or (07) 3212 6855.

b) The subject site was partially inundated in the 1974 flood. Council, and its servants and agents, accept no liability or responsibility for any loss or damage to person or property of whatever nature or however caused as the direct or indirect consequence of the granting of the approval herein contained. Such approval has been granted at the request of the Developer and in reliance of information submitted by the Developer in support thereof.

c) That the applicant be advised that from an engineering perspective, further Development Permits, as required by the *Integrated Planning Act 1997*, shall be obtained in respect of any Operational Works in relation to this approval before any such works are commenced.

[redacted]

ASSISTANT DEVELOPMENT ENGINEER

ENDORSED BY:

[redacted]

SENIOR DEVELOPMENT ENGINEER

Annexure NP-5

1704/05 Nathan Rule

21 March 2006

MEMORANDUM

TO: ACTING DEVELOPMENT TEAM CO-ORDINATOR - EAST

FROM: DEVELOPMENT PLANNER - NATHAN RULE

RE: DEVELOPMENT APPLICATION - CODE ASSESSMENT
***INTEGRATED PLANNING ACT 1997* - SECTION 3.2.1(1)**

Appn No: 1704/05

Applicant: DTS Group

Real Property Description: Lot 1 on RP122040 and Lot 28 on RP802704

Property Location: 35 Eric Street, Goodna

Division: 2

Proposal	Development	Approval Type Requested
Reconfiguring a Lot (2 lots into 35 lots in 2 stages)	Reconfiguring a Lot	Development Permit

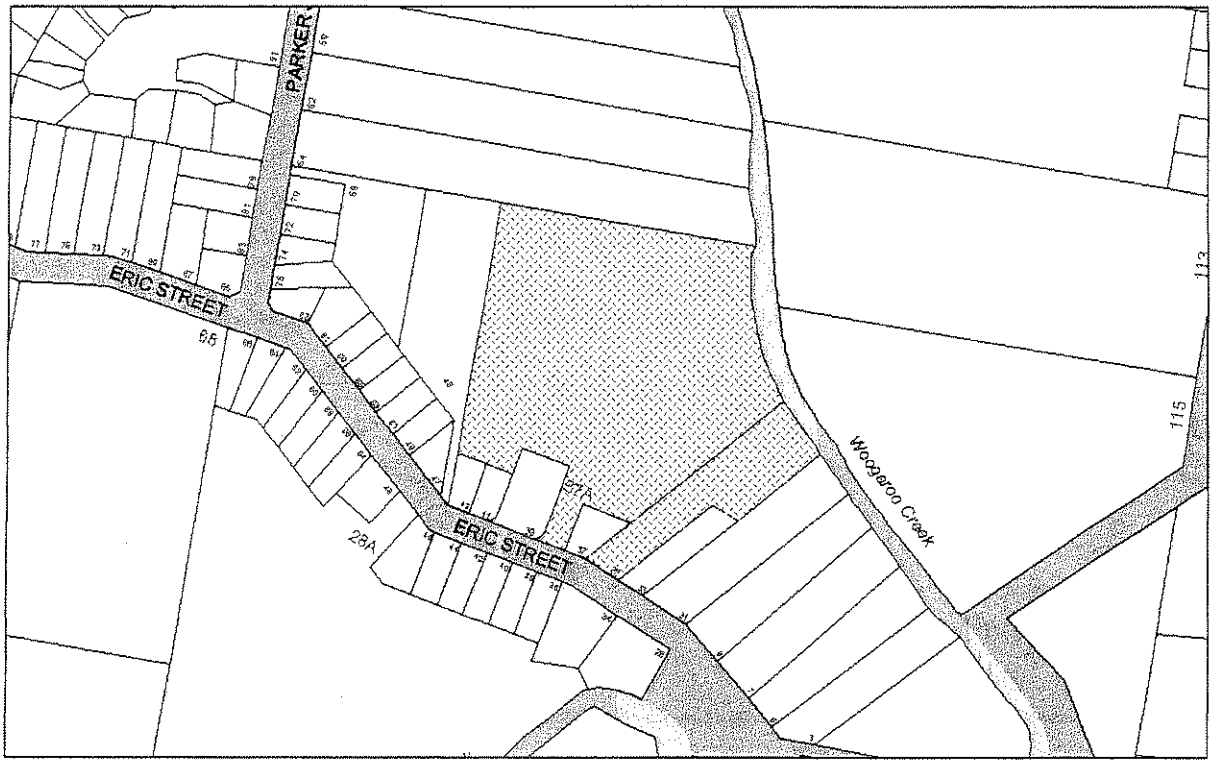
Date Received: 22 March 2005
Start Date for Decision Stage: 17 November 2005
Stat. Date for Determination: 17 January 2006

Site Area: 3.8834 ha

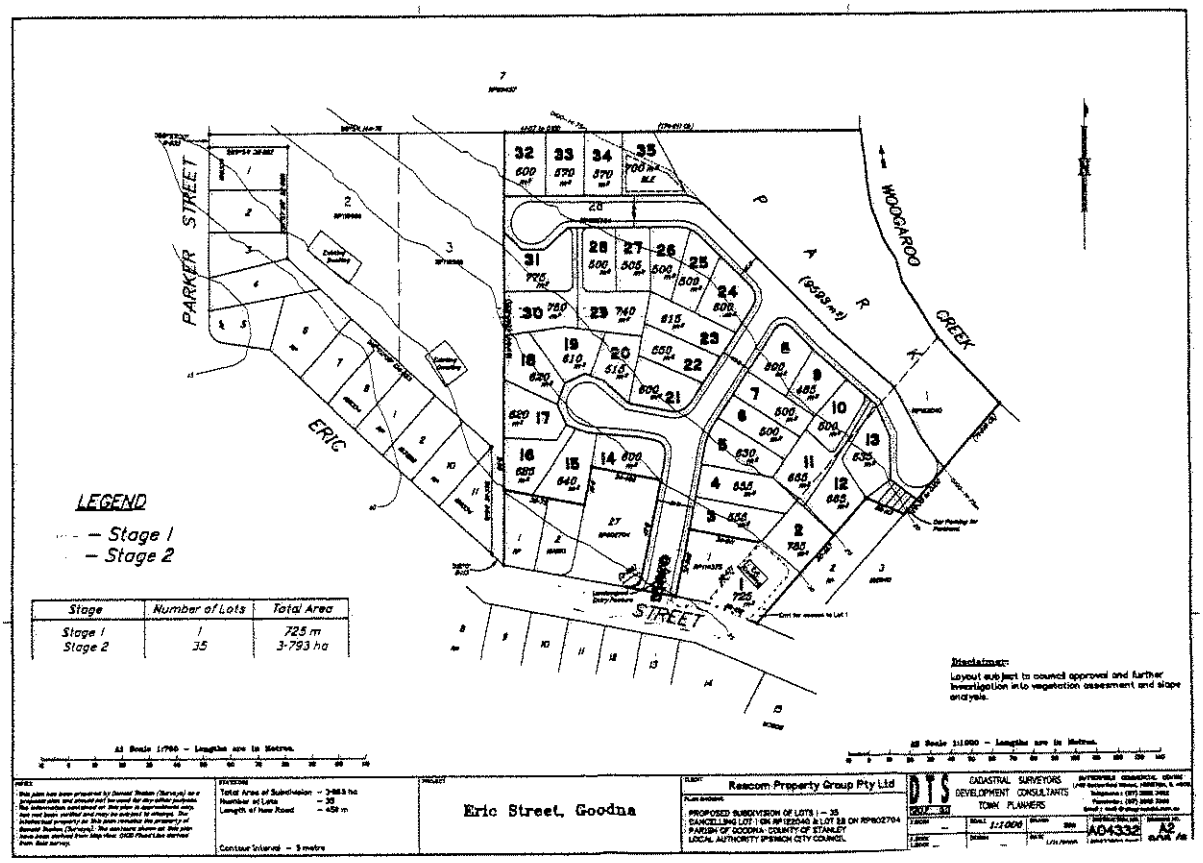
Strategic Plan Designation: Urban Development Area

Zone: Residential Low Density (RL2)

SITE LOCATION



PROPOSAL PLAN



SUMMARY

This application is for a Development Permit for Reconfiguring a Lot (2 lots into 35 lots in 2 stages) on a 3.88 ha site. The proposed lots range in size from 450 m^2 to 775 m^2. Access is proposed from Eric Street via the construction of an internal road network terminating in three cul-de-sacs. Provision has been made to extend the roads to allow for further subdivision of the surrounding lands to the east and west.

A slope analysis was requested regarding the subject property, which revealed that the majority of the proposed lots were in excess of 10%. Consequently, 30 out of the 35 proposed lots were found to be inconsistent with the criteria for a 'traditional lot'. As a result, a condition has been included requiring the number of proposed lots to be reduced from 35 lots to 24 lots to ensure that the proposed lot characteristics (i.e. lot sizes and road frontage widths) comply with the requirements of the Reconfiguring a Lot Code.

The site is located within the Residential Low Density (RL2) Zone under the Ipswich Planning Scheme. The conditioned lot sizes are consistent with the density of 10 to 15 dwellings per hectare recommended by the RL2 Zone. The proposal is generally consistent with the provisions of the Urban Areas Code, the Residential Low Density Zone Code and the Reconfiguring a Lot Code.

Conditions of noteworthy mention proposed to be attached to the approval include:

- Deletion of eleven (11) proposed lots to allow greater lot sizes and road frontage widths;
- Construction of a concrete footpath on one side of all the streets;
- Requirement for housing diversity within the estate (i.e. no two (2) same/similar street elevations); and
- Dedication of land (adjacent to Woogaroo Creek) below the adopted flood level.

Public notification of this application is not required under the *Integrated Planning Act 1997*. Notwithstanding, a number of submissions were received particularly in relation to excessive housing density. Consequently, the amended plan addresses the concerns of submitters and complies with the applicable code requirements.

In summary, it is considered that the proposal to permit the development of a Reconfiguring a Lot (2 lots into 24 lots in 2 stages) is suitable for the subject site and should be approved, subject to the conditions detailed below.

RECOMMENDATION

A. That the Developer be advised that Development Application No. 1704/05 is determined as outlined in the table below and is subject to the conditions specified below.

Proposal	Development	Decision	Approval Type
Reconfiguring a Lot (2 lots into 24 lots in 2 stages)	Reconfiguring a Lot	Approved	Development Permit.
Single Residential (Proposed Lots 1 - 24)	Building Works	Approved	Preliminary Approval.

Further Development Permits Required

Further Development Permits, as required by the *Integrated Planning Act 1997,* shall be obtained in respect of any Operational Works, Building Works and Plumbing Works in relation to this approval before any such works are commenced.

Conditions of Assessment Manager (Ipswich City Council)
Development Permit for Reconfiguring a Lot (2 lots into 24 lots in 2 stages)

1. Basis of Approval

   Subject to these conditions, the facts and circumstances set out in the application and all relevant Council Local Laws and/or Planning Scheme Policies shall be adhered to.

2. Minor Alterations

   Notwithstanding the requirements detailed in this approval, any other minor alterations and/or modifications acceptable to the Development Manager will suffice.

3. Plan of Survey

   (a) The Developer shall submit a plan of survey to conform with Plan Ref. Drawing No. A2 905/6 Instruction No. A04332 (prepared by DTS Group and dated 1 November 2005), subject to the amendments marked in red.

   (b) Adequate permanent survey marks shall be installed. The Developer shall submit a certificate signed by a cadastral surveyor, stating that after the completion of all works associated with the development, permanent survey marks are in their correct position, in accordance with the plan of survey.

   (c) The Developer shall grant, free of cost to or compensation payable by council, minimum 4.0 m wide easements located centrally over proposed stormwater drains, water mains and sewerage rising mains, where they are located within private property. The documentation associated with these easements may be prepared by the Developer in a form satisfactory to Council's City Solicitor, or the Developer may submit easement plans, only where Council is party to the easements, to Council for the preparation of easement documents at the Developer's expense.

   (d) Easements required for discharge of stormwater over adjacent land shall be agreed to in writing by the owner of the subject land prior to construction works commencing.

(e) Easements shall be centrally located over the alignment of stormwater paths and be of a width sufficient to encompass the overland flow from a storm event with an ARI of 100 years.

(f) Easements shall be of sufficient width to contain any fitting, access chamber etc located on the stormwater drains, water mains, and sewerage rising mains.

(g) Land required for detention basins or equivalent is to be dedicated as drainage reserve in favour of Council and not included within parkland dedication unless approved as parkland by Council.

(h) The area of land to be dedicated as drainage reserve shall be dedicated at no cost to Council.

4. Proposed Stages For Reconfiguration

The staging of the reconfiguration shall be generally in accordance with Plan Ref. No. A2 905/6 (prepared by DTS Group and dated 1 November 2005) subject to the amendments marked in red and as follows:

- Lot 1 (Stage 1); and
- Lots 2 – 24 (Stage 2).

5. Rates in Arrears

In accordance with the provisions of the *Integrated Planning Act 1997*, all rates and other expenses as a charge against the land shall not be in arrears at the date of signing of the plan of survey.

6. Hours of Construction

Unless otherwise approved in writing by the Development Manager, hours of construction shall be:

Monday to Saturday 6.30 a.m. to 6.30 p.m.

Work shall not be conducted from or on the premises outside the above hours or on Sundays or public holidays.

7. Road Naming

The Developer may submit to Council a list of proposed street names and the corresponding name meanings for the new road/s to be opened. The proposed names should normally be submitted as part of the Operational Works application. Should a theme be considered appropriate, the theme should be submitted at the same time. Council reserves the right to accept any or none of the proposed names.

8. Locality References

(a) Any place name or estate name used by the Developer (excluding a reference to a building, structure or the like and excluding minor, subsidiary signage within a development) shall make reference to the relevant, approved place name under the *Place Names Act 1994* in the same size and font.

(b) Any reference to the regional location of the site or the development shall not refer to the place or estate as being located in Brisbane or a Brisbane suburb or in the metropolitan area or in the western suburbs (excluding the western suburbs of Ipswich as determined by Council in writing from time to time).

9. Entry Walls or Features

The provision of entry walls or features is prohibited on road reserves or proposed parkland. Entry walls or features shall be fully contained on private property. These entry features or walls shall be designed such that maintenance for Council following the "Off Maintenance" inspection is minimal.

10. Streetscape Contribution

(a) A contribution shall be made towards Council's streetscape program within the Streetscape Contribution Precinct (Goodna). The rate for the 2005/06 financial year is $35.00 per allotment. Such streetscape works may not necessarily occur within the proposed development. However, this will be used on the major streets, entries and feature landscape areas within that Landscape District.

(b) Alternatively, the Developer shall:

(i) Place street trees at a rate of one per allotment to road or park frontage of the estate, in accordance with the Ipswich City Council Street Tree Strategy. Street trees along the park frontage shall be type *Eucalyptus tereticornis* and *Melaleuca quiquenervia.* Street trees along all other roads shall be *Grevillia robusta.* The planting detail shall be shown on the Landscape and Rehabilitation Plan and reflect the Ipswich City Council Standard Drawings.

(ii) Provide a bond to guarantee (b)(i) above. Such bond is required prior to signing of the relevant plan of survey.

(c) In accordance with (b) above, the Developer shall submit a plan of streetscaping and accompanying explanatory letter/report with the Engineering Drawings. Such plan shall be in accordance with Council's Streetscaping of Roads Policy to the satisfaction of the Conservation, Parks and Sport Manager.

11. Engineering Requirements

The following engineering requirements, detailed in Conditions 12 – 20, shall be completed to the satisfaction of the Senior Development Engineer.

Terms

(a) RPEQ - A Registered Professional Engineer of Queensland, suitably qualified and experienced in the particular area of expertise required.

(b) QUDM - The Queensland Urban Drainage Manual, produced by the Queensland Department of Primary Industries.

(c) Queensland Streets - The Design Guidelines for Subdivisional Street Works, prepared for the Institute of Municipal Engineers of Australia (QLD).

(d) MUTCD - The Manual of Uniform Traffic Control Devices, published by DMR.

(e) Ipswich Water - Commercial Business Unit of Ipswich City Council providing water and sewerage services.

(f) DNRM – Department of Natural Resources and Mines.

(g) DMR – Department of Main Roads.

12. Roadworks

(a) The roads shall be constructed with concrete kerb and channel and asphaltic concrete surfacing, together with associated works for the full length of all property frontages.

(b) Roadworks shall be designed and constructed in accordance with Council's Standards, Queensland Streets, Austroads Publications, the relevant and appropriate roadworks design standards and guidelines, and any other documentation deemed appropriate by Council. Such design and construction shall ensure that road carriageway widths are consistent with the road function and position in the road hierarchy and are in accordance with the relevant design speed environment. Threshold treatments shall be highly visible, and shall only be constructed after approval of the proposed surface treatment by the Senior Development Engineer.

(c) The pavement designs shall be in accordance with the Council's Planning Scheme Policy 3 - General Works. All roads shall have two way crossfalls in accordance with Council's adopted standards.

The minimum dedicated road widths, pavement widths and footpath requirements shall be in accordance with Council's requirements as set out below:

Road Type	Dedication Width	Pavement Width	Footpath	Path Width
Access Place	15.0 m	6.5 m	1 Path	1.5 m
Access Street	15.0 m	6.5 m	1 Path	1.5 m
Collector	17.0 m	8.5 m	1 Path	1.5 m
Trunk Collector	20.0 m	9.0 m	2 Cycleway	2.0 m
		or 2 x 5.0 m	or 1 Path + 1 Cycleway	1.5 m 2.0 m

(d) The road pavement widths and geometric layout shall be sufficient to make adequate provision for Council's refuse collection vehicles and public transport movements.

(e) The Developer shall provide a maximum 4.25 m wide verge along the western property boundary of Lot 28 on RP802704 adjacent to Lot 27 on RP802704 (39 Eric Street). The proposed road pavement width for the road to be constructed between Lot 27 on RP802704 and Lot 1 on RP114375 shall be a minimum 6.5 m.

(f) A vehicle turning area shall be provided at the end of all "No through" roads and cul-de-sacs. Circular cul-de-sac turning heads, based on a minimum turning circle of 9.0 m radius, are preferred. "T" and "Y" shaped turning heads are generally not to be used.

(g) Traffic slow down devices shall be provided generally in accordance with Queensland Streets and Council approved alternatives.

(h) "No Through Road" signs shall be erected at the entries to cul-de-sacs and terminating roads.

(i) All traffic signs and delineation shall be installed in accordance with MUTCD.

(j) The Developer shall provide minimum 1.5 m wide concrete footpaths on one side of all the streets and extending past the mid point in cul-de-sacs to the next property boundary.

The construction of footpaths shall be in accordance with Council's Standard Drawing SR.19. The concrete footpaths shall be on the same side as the street lights, and the maximum longitudinal grade shall not exceed 1:8 (where possible).

(k) Kerb ramps are to be constructed in accordance with Council's Standard Drawing SR.18 at all intersections and at additional locations where required to connect the concrete pathways and cycleways. Generally at "T" intersections, 4 kerb ramps are required. Kerb ramps are to generally be set such that impaired pedestrians will move through an intersection on a straight road in a continuous straight line with the kerb ramps "pointing" at the destination ramp.

(l) Vehicular access from the roadways to all allotments shall be capable of being provided.

(m) Provision shall be made for minimum 6.0 m, three chord truncations at intersections. The 6.0 m distance is measured along each frontage from the property corner.

13. Access

(a) The access driveway to all hatchet shaped lots (i.e. proposed Lot 2) shall be constructed from the property boundary for the full length of the access strip with the following design criteria:

(i) the maximum longitudinal grade shall be 1 in 6 and the maximum crossfall shall be 1 in 20, except that the Senior Development Engineer may allow a longitudinal grade of 1 in 4 for a distance not exceeding 60 m in total in special circumstances.

(ii) a drainage system shall be provided so that no part of the driveway shall be inundated in the runoff resulting from a storm event with an ARI of 2 years, and the runoff from the driveway shall be discharged to the satisfaction of the Senior Development Engineer.

(iv) The driveway construction within the access strip to all hatchet lots shall be reinforced concrete not less than 100 mm deep and 3.0 m wide.

(v) The water services for the allotments, together with stormwater pipes and conduits for electricity and telephone (with draw string), shall be installed for the full length of all access strips.

(b) A concrete layback and driveway slab 3.0 m wide, from the layback to the property boundary, shall be constructed for access to all hatchet lots in accordance with Council's Standard Drawing No. SR.12.

(c) The Developer shall relocate the existing driveway for Lot 1 on RP122040 such that a concrete layback and driveway slab 3.0 m wide, from the layback to the property boundary, shall be constructed for access to proposed Lot 1, within the frontage of proposed Lot 1, and in accordance with Council's Standard Drawing SR.12.

(d) Where applicable, the concrete kerb shall be reinstated for any redundant driveway layback.

(e) The footpath shall be re-levelled over those areas where the existing driveways/laybacks are redundant to match existing levels.

14. Sewerage

(a) The Developer shall provide a sewerage reticulation system with appropriate house connection branches, designed so as to command the whole of each of the proposed allotments.

(b) The Developer shall pay the full cost for Council to provide a suitable connection into the existing sewerage reticulation system. All works on live sewers are to be carried out by Council at the Developer's expense, unless arranged otherwise with Ipswich Water.

(c) The Developer shall demonstrate that the proposed pipe sizes and connection points are adequate for the total upstream catchment and the proposed development.

(d) No work on the sewerage reticulation system shall commence prior to the approval of the Operational Works application.

(e) New Council sewer ends are to be extended to or past the boundary of new allotments to enable the future developments to connect to these drains without undue control or hindrance by the property owner in which the end line lies.

15. Water

(a) The Developer shall provide a reticulated water supply system together with valves and fire hydrants, in accordance with the "Guidelines for Planning and Design of Urban Water Supply Systems", which connects into Council's existing reticulation system.

(b) A blue, bi-directional raised reflective pavement marker (RRPM) shall be provided to all hydrants. The marker shall be installed in accordance with the Department of Main Roads Fire Hydrant Indication System Technical Guideline.

(c) The Developer shall demonstrate that the pipe sizes proposed and the available pressure head complies with the requirements of Ipswich Water's "Water Supply Planning Guidelines", and the "Guidelines for Planning and Design of Urban Water Supply Systems" and are adequate to cater for the proposed development. Such demonstration is to cover as a minimum:

(i) available pressure during maximum hour;

(ii) available pressure and flows for fire fighting and other purposes, and any recommendations pertaining thereto; and

(iii) comments regarding the situation at various stages of the development.

Note: Details regarding available pressure heads at various points in the existing water reticulation network for use in the calculations to be produced for such demonstration may be obtained from the Senior Development Engineer on submission of completed application forms and payment of the relevant fees.

(c) All works on live water mains are to be carried out by Council in accordance with Council's policy, and at the Developer's expense.

(d) Where concrete footpaths are to be constructed, the Developer shall provide 100 mm diameter conduits under the footpath and in line with the conduits under the road, for future ease of installing the individual water services. The letter "W" shall be embossed in the concrete to mark the location of the conduit.

(e) Wherever possible, the water main shall be constructed on the opposite side to the concrete footpaths. Where the water main is under a concrete footpath, the Developer shall provide a water connection (including the provision of meters) to each allotment, including the provision of approved pre-cast concrete or cast iron boxes over the stop cock.

(f) Where the water reticulation network is serving in excess of 20 allotments in any one stage, the site shall be served from two directions and shall not be in the form of a single dead end supply. All other mains shall be looped around the cul-de-sac head to join back on to itself.

(g) Sufficient stop valves shall be installed so that in the event of any break in the supply, the maximum number of allotments to be without water is 20.

(h) The Developer shall provide a water connection and meter to all proposed lots.

(i) The fire fighting water supply demand on Council's reticulation system from this development shall not exceed 15 litres/second.

(j) A fire hydrant shall be provided within a 20 m radius of all hatchet lot access driveways. The distance shall be measured from a point where the middle of the access driveway meets the road reserve.

16. Stormwater

(a) The Developer shall provide all necessary stormwater drainage (both internal and external to the development) and such drainage works (except for roofwater systems) shall be designed and constructed in accordance with QUDM such that the overall drainage system caters for a storm event with an ARI of 100 years.

Overland flow paths shall be suitably designed to cater for the water from a storm event with an ARI of 100 years. In the case where the piped system is carrying part of the flow, the overland flow paths shall be designed to cater for that volume which

is represented by the difference between the predicted volume from the storm event with an ARI of 100 years and the capacity of the pipe system, noting the requirements of QUDM.

(b) A suitable roofwater system shall be designed in accordance with QUDM, for allotments that do not have adequate fall from within the allotment to the design invert level of the kerb and channel. The design is to be to a minimum Level II in QUDM.

(c) All stormwater flows within and adjacent to the development, other than inter-allotment drainage, shall be confined to dedicated roads, drainage reserves, registered drainage easements or within parkland. The registered drainage easements, if related to piped drainage, shall be centrally located over such underground pipe system and shall be not less than 4.0 m wide, except for drainage easements required for side boundaries which may be 3.0 m wide where approved by the Senior Development Engineer. In addition, the easements shall be of suitable width to contain the predicted overland flow from the storm event with an ARI of 100 years in that location.

(d) No ponding or redirection of stormwater shall occur onto adjoining land unless specifically approved by Council in consultation with the owner of the adjoining land.

(e) Due consideration shall be given in the design and construction of the development in relation to the effect of the developed catchment flows on the downstream discharge receival areas. Suitable stormwater control devices are to be provided to ensure that there is no increase in flow in watercourses. Such control devices are to be designed so as to integrate the landscaping, recreational, infrastructural and drainage roles of watercourses.

(f) All stormwater runoff from the development shall be discharged in a manner and to a point to be approved by the Senior Development Engineer.

(g) Stormwater drainage plans and calculations are to be submitted and approved by the Senior Development Engineer, in conjunction with the submission of an Operational Works application.

(h) Appropriate works shall be carried out to ensure that stormwater drainage from the new kerb and channel discharges suitably into the existing drainage system.

(i) There shall be minimal disturbance to vegetation in the gully areas, unless prior written approval is obtained from Council. Stormwater drainage outlets shall be the subject of detailed design in the preparation of plans for each stage of the development.

(j) The Developer shall provide a roofwater connection point to all lots which have a concrete footpath along the lot frontage and which drain to the street. The connection shall be located at the lowest corner of the lot on an alignment of 1.2 m from the side boundary and shall discharge to the kerb and channel via a 100 mm by 75 mm galvanised RHS. The RHS should extend 0.5 m into the property and have a suitable adaptor to allow connection to a roofwater pipe. All other lots, which drain to the street and do not have a concrete footpath along the lot frontage, do not require kerb adaptors.

(k) The Developer shall provide an extended stormwater detention and/or retention device (or equivalent) on the subject land, which shall be designed and constructed in accordance with QUDM. Where applicable, the detention/retention devices (or equivalent) shall be constructed to ensure that flows, run-off volumes and velocities, at any point downstream in the catchment, are not increased by the development for any combination of frequency and duration from the storm event with an ARI of 2 years up to and including the storm event with an ARI of 100 years. Additional calculations are to be provided demonstrating that the proposed stormwater management system, and all embankments and discharge structures, will be contained within the drainage reserve where applicable (except where connecting to the street drainage), and that the basin shape, volume and surface area will perform according to the attenuation results requirements.

17. Public Utilities

(a) Adequate provision shall be made in all proposed dedicated roads, access strips and easements, to cater for the public utility services that would normally serve the development.

(b) The Developer shall provide appropriate road crossing conduits in accordance with Council's Standard Drawings SR.22 and SR.23. Where concrete footpaths are to be constructed, the conduits shall be extended to the property boundaries.

(c) Street lighting shall be installed by the Developer in accordance with the Australian Standard 1158.3.1 Table 1.1. All street lighting associated with the development shall be certified by a RPEQ. Street lighting shall be installed on the same side as concrete footpaths (where applicable).

(d) The Developer shall provide underground electricity/telecommunications within the development, constructed in the approved allocation as detailed in Council's Standard Drawings SR.22 and SR.23. Electricity/telecommunication drawings shall be co-ordinated with the civil engineering design documents, to ensure that service clashes are avoided. Where allotments front an existing overhead electricity/telecommunication service, these allotments may connect to such service subject to the approval and requirements of the service provider.

(e) The Developer shall provide an Energex approved electrical reticulation layout plan. The electricity layout shall also be shown on the water reticulation layout plans.

(f) The Developer shall provide each allotment with an electricity supply.

(g) Prior to the signing of a plan of survey, the Developer shall provide Council with a copy of an agreement with Energex for the supply of electricity to the development.

(h) Telephone and cable services may be laid in a combined trench with electricity cables, subject to the approval of Energex and the authorised telephone/cable service provider.

(i) The Developer shall make suitable arrangements for the provision of telephone and (where applicable) cable services to all proposed lots within the development. Documentary evidence that discussions have commenced with any authorised

telephone/cable service provider, on the provision of telephone/cable services, shall be provided prior to the signing of the plan of survey by Council.

18. Erosion & Silt Management

(a) The Developer shall be responsible for the installation and maintenance of silt management facilities from the time of commencement of construction until the development has been released "Off Maintenance" by Council. All silt management facilities are to be in accordance with the document "Soil Erosion and Sediment Control" published by the Institution of Engineers Australia, or equivalent.

(b) Silt traps shall be sited upstream from any park or reserve area discharge point preferably on land comprising future allotments, such that no silt impinges on the park or reserve areas. The silt trap areas may be phased out after the development work is complete and adequate grass cover is obtained.

(c) Diversion drains and ponds, as necessary, shall be installed on the site before any other work is undertaken on site to ensure that "dirty water" is contained and/or isolated.

(d) An erosion and sediment control program and maintenance procedures shall be prepared and submitted with the engineering drawings for approval for maintaining the facilities, setting out the frequency of attention, with inspections to be made after each significant rainfall event.

(e) Council reserves the right to enter the site for the purpose of rectifying any silt management facilities which it deems to be inadequate, improperly maintained or not operating in a satisfactory manner.

(f) The Developer shall lodge a $5,000 siltation and erosion performance bond with Council, prior to the commencement of works, which shall only be released by Council at the termination of the maintenance period. Where Council determines that a draw-down of the bond is required, the Developer shall restore the bond to its full amount within 10 days of a notice from Council to that effect. Such bond shall guarantee adequate performance in the circumstances (i) and (ii) below:

(i) In the event that instructions issued to the Consulting Engineer by the Senior Development Engineer for the installation of erosion control measures, are not complied with within 24 hours, Council will call upon the bond to the extent required to carry out the necessary works.

(ii) If the Senior Development Engineer determines that silt damage has occurred on the site, or the downstream drainage system has become silted, the Developer shall be responsible for restoration. Such restoration shall be completed in the time determined by the Senior Development Engineer.

Should the Developer fail to complete the works determined by the Senior Development Engineer within the specified time, Council shall complete the work and recover all costs from the Developer associated with that work.

19. Operational Works – Municipal Works
(i.e. Works being handed over to Council)

(a) Plans relating to all civil engineering works shall be prepared and submitted for review by Council under the cover of Form 1 - Part A (Common details for all applications) and Form 1 - Part E (Planning Scheme Works). The plans shall show full construction details, layout dimensions, and finished surface levels and shall be submitted together with the appropriate fees for Council approval, prior to the commencement of construction on site.

(b) The Developer shall comply with the requirements of the documents entitled "Planning Scheme Policy 3 - General Works" and "Standard Drawings".

(c) All engineering drawings submitted to Council shall be in accordance with Council's Planning Scheme Policy 3 - General Works and Standard Drawings, and shall include as a minimum the following:

(i) Engineering drawings shall be marked as confirmation that they have been checked and approved by a RPEQ;

(ii) The drawings shall be submitted as three A3 size sets and one full size set; and

(iii) A "Certificate of Design" shall be submitted by a RPEQ, certifying that the design is in accordance with all relevant engineering standards, Council's requirements and standards, relevant development conditions of approval, and sound engineering practice.

(d) Municipal works shall require a detailed design certified by a RPEQ, the design approved by Council Engineers with appropriate fees payable, a works pre-start meeting on-site and various detailed construction and audit inspections by Council Officers. A twelve month maintenance period is applicable for the works as well as the payment of a maintenance security deposit.

(e) All works shall be supervised by a RPEQ competent in civil works and shall be undertaken by a nominated principal contractor experienced in the construction of municipal works. Council reserves the right to request evidence of the principal contractor's competency. Should it be deemed by the Senior Development Engineer that the contractor does not have the necessary competency or has constructed substandard works for Council in the past, Council reserves the right to reject the nominated contractor.

(f) Municipal works shall be accepted "On Maintenance" prior to commencement of use. A maintenance bond equal to 5% of the construction cost (minimum of $1,000.00) shall be retained by Council for a minimum period of twelve months, or until such time as the works are accepted "Off Maintenance" by Council.

(g) "As Constructed" plans for municipal works shall be submitted to Council and approved prior to the formal acceptance of the works "On Maintenance".

(h) On completion of the works a certificate shall be submitted to Council by a RPEQ certifying that the works have been constructed in accordance with Council's construction standards and in compliance with the approved plans and specification. It is expected that the RPEQ will undertake the necessary inspections to make this certification.

(i) Council reserves the right to require further amendments and/or additions at a later date, should design errors or omissions become apparent in regard to the works relevant to the Operational Works approval.

(j) Council requires the provision of a bank guarantee, or a performance bond of not less that 10% (minimum of $5,000) of the value of the external municipal works. The bond/guarantee shall be retained by Council until such time the Developer provides a replacement or additional maintenance period bond/guarantee for entire Municipal Works (both external and internal) as security for the performance of the maintenance obligations.

External Municipal Works relates to those works external to the subject site and located in already dedicated public areas, for example existing road or drainage reserve, or private property not subject to Developer ownership.

20. General

(a) All disturbed verge areas and allotments shall be graded, grassed and left in a mowable condition. The grass cover shall be obtained as early as possible during the development and an acceptable grass cover shall be achieved before the development can be accepted "Off Maintenance".

(b) Street name signs shall be manufactured to Council specifications and shall be erected in accordance with Council's Standard Drawing SR.26 at each intersection.

(c) With reference to any works, on land under other private ownership, written permission for the works shall be obtained and forwarded to Council. Similarly, written clearances shall be obtained after the works are completed, unless otherwise accepted by the Senior Development Engineer.

(d) All works required for this development shall take due regard of any and all existing services and, if considered necessary by the relevant authority or the Senior Development Engineer, such works shall be altered at the cost of the Developer.

(e) Any allotment filling for a greater depth than 800 mm to provide for building platforms shall be conducted in accordance with Australian Standard 3798. Test results as required by Australian Standard 3798, and a certificate of quality and uniformity of fill shall be provided by a RPEQ. The level of responsibility shall be Level 1.

(f) A certificate from a RPEQ shall be issued to Council certifying that any retaining wall greater than 800 mm in height is structurally sound and capable of withstanding any likely surcharge loads. Retaining walls greater than 1.0 m in height are to be provided with railings or other barriers to provide pedestrian safety.

(g) Retaining walls shall be designed so that there are no imposed loads placed upon Council's underground services. This may include extending the footing to a level 300 mm below the invert of the pipe.

(h) Filling of gully areas if permitted shall be carried out strictly in accordance with Australian Standard 3798. Test results as required by Australian Standard 3798 and a certificate of quality and uniformity of fill, shall be provided by the Supervising RPEQ for all filled areas.

(i) For batters resulting from cutting and filling of the site and producing slopes greater than 1:6, Council requires a RPEQ to certify that they are stable and properly drained.

(j) Approval of the Senior Development Engineer is required for any fill intended to be placed over Council's underground services.

(k) If, after the preparation of detailed design plans for the various roads, it is found necessary to provide any additional dedicated road area, or modify the proposed dedicated roads to enable the full requirements of Council's standards, Queensland Streets, AMCORD and Austroads documents to be incorporated in any way (but particularly in the production of the required speed environment or because of longitudinal and cross sectional constraints) then the estate layout plan shall be altered accordingly.

(l) Components that will become Council assets at the end of maintenance are subject to the following service life requirements:

(i) Roadworks – 20 years.
(ii) Drainage elements – 50 years.
(iii) Structures – 50 years.
(iv) All others – 50 years.

(m) The Developer shall provide details of the intended method of installation and compaction of all public utilities (including stormwater) with the Operational Works applications, demonstrating that the proposed technique considers and avoids premature failure of the service conduit. In the case of stormwater, this information should be incorporated on the long section schedule.

(n) All structures undertaken for the development eg footpaths/cycleways, retaining walls, drainage components and the like, shall be designed in order that foundations effects, differential movements etc are accounted for and do not impeded the component operation or serviceability requirements during their expected lifetime eg avoidance of trip hazards, blockages, structural failures, traffic hazards etc.

(o) The Developer shall be responsible for ensuring that all approvals have been obtained from the relevant infrastructure stakeholders. All approvals shall be submitted in conjunction with the Operational Works.

(p) Earthworks on any lot shall not exceed a total maximum height of 2.0 m. Retaining walls shall not exceed a total maximum height of 1.2 m with 1:4 batters from the top and toe of the wall unless it can be demonstrated to the satisfaction of the Senior Development Engineer that a greater height is acceptable.

21. Stormwater Quality (Management Plan)

(a) The Developer shall provide a detailed Stormwater Quality Management Plan (SQMP) to Council for approval by the Development Manager in conjunction with an Operational Works application.

(b) The SQMP shall be prepared by a suitably qualified and experienced professional, be developed in accordance with the *Australian Runoff Quality Design Guidelines* (Australian Institute of Engineers 2003), and demonstrate through appropriate

pollutant export modelling (e.g. MUSIC, AQUALM) that the predicted pollutant levels in stormwater leaving the site meet the objectives identified in Planning Scheme Policy 3 – General Works, Table 2.3.1 - Water Quality Objectives and best management practice load-based objectives.

(c) The SQMP is to include a catchment plan showing the site layout, site contours, flow path directions, catchments and the location of proposed stormwater quality treatment measures.

(d) Modelling parameters used and results generated by the modelling software shall be included in the SQMP. This includes the meteorological data, time step, source nodes (and where applicable any non-standard parameters used), percentage effective impervious area, runoff generation parameters, base and stormflow concentration parameters, an interface layout (diagram demonstrating the source nodes and treatment nodes within the treatment train), output figures and graphs.

(e) The SQMP shall incorporate physical control measures only e.g. gross pollutant traps, grass swales, bio-retention, porous paving, rainwater tanks etc. rather than non-physical measures such as education. At a minimum the treatment train shall incorporate a bio-retention component/s and a gross pollutant trap/s.

(f) Details provided for the bioretention area shall include a diagram showing the high-flow bypass, sediment detention area, scour protection and long-term maintenance access.

(g) The use of road verges as bio-retention/grass swales shall not be accepted as an acceptable treatment measure.

(h) While works are occurring, the Developer shall update the detailed design SQMP as required to reflect current standards, best management practice, plant modifications etc. Any modifications with the potential to result in increased environmental impacts must be submitted to Council for approval.

(i) Stormwater quality treatment shall be provided on site in accordance with the approved SQMP and shall be fully operational prior to Council accepting the works "Off Maintenance".

(j) The Management Plan shall be prepared by a suitably qualified and experienced professional and shall be developed in accordance with the *Australian Runoff Quality Design Guidelines (Australian Institute of Engineers, 2003).*

22. Stormwater Quality (Maintenance Plan)

(a) The Developer shall provide a detailed Stormwater Quality Maintenance Plan for the entire stormwater system to Council for approval by the Development Manager in conjunction with an Operational Works application.

(b) The Maintenance Plan shall outline requirements for both the construction and operational phases specifying the regular maintenance of the stormwater system (e.g. cleaning of GPT filter baskets after storm events) along with the long-term management such as the replacement of the bio-retention filters.

(c) At a minimum, the Maintenance Plan shall include all of the following details:

(i) aims and objectives (the design should ensure that treated stormwater quality will meet the Water Quality Objectives listed in Planning Scheme Policy 3 – General Works, Part 2, Table 2.3.1 – Water Quality Objectives);
(ii) a separate maintenance schedule for each device (inspection and maintenance frequency and data collection);
(iii) a description of how each maintenance action is to be carried out (including equipment needs, maintenance techniques, occupational health and safety, public safety, environmental management considerations, disposal requirements for polluted water and solid waste, access issues);
(iv) management structure;
(v) responsibilities;
(vi) ongoing monitoring;
(vii) record keeping and reporting;
(viii) non-compliance procedures;
(ix) personnel training;
(x) waste management;
(xi) review and update; and
(xii) any relevant contractor contact information.

(d) The Maintenance Plan shall be prepared by a suitably qualified and experienced professional and shall be developed in accordance with the *Australian Runoff Quality Design Guidelines (Australian Institute of Engineers, 2003).*

(e) The Maintenance Plan shall be implemented by the Developer to the satisfaction of the Development Manager.

23. Landscape and Rehabilitation Plan

(a) A Landscape and Rehabilitation Plan (prepared by a corporate member of Australian Institute of Landscape Architects), which conforms to the approved development plan shall be submitted to and approved by the Development Manager in conjunction with the Operational Works application.

(b) The Landscape and Rehabilitation Plan shall be in accordance with the 'Vegetation Assessment and Preliminary Management Report' (prepared by Terra Ark and dated October 2005), Council's Planning Scheme requirements for landscaping and detail all relevant items listed in Section 27 of Planing Scheme Policy 2 – Information Local Government May Request. Specifically, the amended plan shall include, amongst other necessary items, the following features:

(i) soils, mulch and sub-grade treatment;
(ii) tree and shrub planting shown in diagrammatic form in accordance with the Ipswich City Council Standard Drawings;
(iii) existing vegetation proposed to be retained and protection fencing;
(iv) location of services including drainage, sewerage, power, gas and communication (reference to other plans will not be accepted);
(v) contours and spot levels;
(vi) schedule of common name, plant species (only natives to be used), size and attributes;
(vii) details of retaining structures; and
(viii) details of design materials, colours, treatments etc.

(c) The Plan shall specify planting requirements in accordance with the approved Stormwater Quality Management Plan. Planting shall be provided for the floor, shelves and batters of the bio-retention basin. The bio-retention basin shall be planted with natives vegetation (e.g. sedges and tufted grasses) only. Turfing of any bio-retention will not be accepted.

(d) An electric barbeque is not required to be provided in the nominated park.

(e) Rehabilitation extending from the property boundary shall consist of 85% vegetation cover in the park which includes stabilisation, mulching, weeding and revegetation.

(f) All introduced, declared and environmental weeds shall be removed in accordance with the 'Vegetation Assessment and Preliminary Management Report' (prepared by Terra Ark and dated October 2005) and disturbed areas rehabilitated. Weed removal methods shall be outlined on the plan along with appropriate soil and bank stabilisation works.

(g) The Developer shall complete approved landscaping and fencing works in accordance with the approved Landscape Plans to the satisfaction of the Development Manager.

(h) Such landscaping and fencing shall be maintained in perpetuity to Council's satisfaction.

24. Vegetation Clearing

(a) In accordance with the 'Vegetation Assessment and Preliminary Management Report' (prepared by Terra Ark and dated October 2005), all trees to be retained shall be further assessed by a qualified arborist and either treated for retention or recommended for removal.

To this end, a Management Plan prepared by a suitably qualified arborist is to be submitted to and approved by the Development Manager in association with the Operational Works approval. The Plan shall reflect the management measures outlined in the 'Vegetation Assessment and Preliminary Management Report' (prepared by Terra Ark and dated October 2005), particularly sections 7.2 - 7.4.

(b) The Management Plan is to clearly delineate tree retention or removal, protection measures such as fencing and arboricultural care including soil decompaction, soil aeration, fertilising, mulching, watering and hazard reduction pruning where necessary.

(c) The Management Plan shall include the retention of all trees in the parkland as well as those numerically indicated on the 'Tree Protection' Plan Ref. Drawing No. A34332 (prepared by DTS Group and dated 8 November 2005) and referred to in the 'Vegetation Assessment and Preliminary Management Report' (prepared by Terra Ark and dated October 2005). If a qualified arborist determines that any tree presents an unacceptable liability, removal will need to be agreed upon by Council.

(d) The Developer shall construct a temporary star picket and three strand wire fence to Council's satisfaction along the development line separating the park from all other development activities.

(e) Fencing shall be installed prior to Operational Works and shall remain until the development has been put "On Maintenance" or an alternative approved barrier replaces it. Fencing shall be shown on all relevant Operational Works drawings and is to include nominated access points to allow for approved rehabilitation and bio-detention basin works.

(f) No unapproved construction activity is to occur beyond any protection fencing, including vehicle access, material stockpiling, storage or chemicals and/or maintenance fluids, site compound, the tapering or construction of batters, site spoil or rubbish etc.

(g) A qualified arborist shall perform all arboricultural care in accordance with the approved plan prior to any earthworks and supervise any works within 15 metres from protected trees. The arborist shall perform a weekly inspection of protection measures during the earthworks stage making recommendations for any necessary improvements.

25. Fencing

A 1.8 metre high screen fence shall be constructed along the common boundary of the subject site and the following allotments:

(i) Lot 2 on RP112040;
(ii) Lot 1 on RP114375;
(iii) Lot 27 on RP802704;
(iv) Lot 1 on RP151903;
(v) Lot 2 on RP151903; and
(vi) Lot 3 on RP116986.

Details of the fence shall be provided to and approved by the Development Manager as part of the Landscape and Rehabilitation Plan.

26. Contributions

(a) In accordance with the relevant Planning Scheme Policies, the Developer shall pay the following monies to Council, prior to the signing of the plan of survey for the relevant stage:-

Contribution	Sector	Rate	Proposal	Calculation
Local Community Facilities	Goodna - Gailes	Level 1: $44.94/EP Level 2: $62.35/EP Level 3: $36.47/EP Unit Charge = 1.088 Total = Level 1: $48.89/EP Level 2: $67.84/EP Level 3: $39.68/EP	***Stage 1*** Number of Lots (> 450m²): 1.000 @ 3.080 EP **Total = -3.080 EP**	Level 1: $48.89 x -3.080 = $0.00 Level 2: $67.84 x -3.080 = $0.00 Level 3: $39.68 x -3.080 = $0.00 **Total = $0.00**
			Stage 2 Number of Lots (> 450m²): 22.000 @	Level 1: $48.89 x 67.760 = $3,313.11 Level 2: $67.84 x 67.760 = $4,596.62

			3.080 EP **Total = 67.760 EP**	Level 3: $39.68 x 67.760 = $2,688.67 **Total = $10,597.00**
Open Space (Parks)	Goodna - Gailes	Level 1: $110.43/EP Level 2: $572.86/EP Level 3: $593.42/EP Unit Charge = 1.026 Total = Level 1: $113.30/EP Level 2: $587.75/EP Level 3: $608.85/EP	***Stage 1*** Number of Lots (> 450m²): 1.000 @ 3.080 EP **Total = -3.080 EP**	Level 1: $113.30 x -3.080 = $0.00 Level 2: $587.75 x -3.080 = $0.00 Level 3: $608.85 x -3.080 = $0.00 **Total = $0.00**
			Stage 2 Number of Lots (> 450m²): 22.000 @ 3.080 EP **Total = 67.760 EP**	Level 1: $113.30 x 67.760 = $7,677.29 Level 2: $587.75 x 67.760 = $39,826.24 Level 3: $608.85 x 67.760 = $41,255.60 **Total = $88,758.00**
Water Supply	Goodna High Level Water Zone	$707.33/EP Unit Charge = 1.088 Total = $769.58/EP	***Stage 1*** Number of Lots (> 450m²): 1.000 @ 3.300 EP **Total = -3.300 EP**	$769.58 x -3.300 = $0.00 **Total = $0.00**
			Stage 2 Number of Lots (> 450m²): 23.000 @ 3.300 EP **Total = 75.900 EP**	$769.58 x 75.900 = $58,411.12 **Total = $58,411.00**
Sewerage Catchment	Goodna Catchment (excluding Springfield)	$629.36/EP Unit Charge = 1.088 Total = $684.74/EP	***Stage 1*** Number of Lots (> 450m²): 1.000 @ 3.300 EP **Total = -3.300 EP**	$684.74 x -3.300 = $0.00 **Total = $0.00**
			Stage 2 Number of Lots (> 450m²): 23.000 @ 3.300 EP **Total = 75.900 EP**	$684.74 x 75.900 = $51,971.77 **Total = $51,972.00**
Road Contributions	Goodna	$1,437.77/EP Unit Charge = 1.026	***Stage 1*** Number of Lots (> 450m²): 1.000 @ 3.100	$1,475.15 x -3.100 = $0.00 **Total = $0.00**

		Total = $1,475.15/EP	EP **Total = -3.100 EP**	
			Stage 2 Number of Lots (> 450m²): 22.000 @ 3.100 EP **Total = 68.200 EP**	$1,475.15 x 68.200 = $100,605.37 **Total = $100,605.00**
Total for Stage 1				**$0.00**
Total for Stage 2				**$310,343.00**
Total for Development				**$310,343.00**

Calculations of contributions are based on the infrastructure contribution rates applicable at the date the development application was determined by Council. The contributions above shall be applicable for a period of twelve (12) months from the date of the development approval, and thereafter shall be based on the infrastructure contribution rates applicable at the date when payment is made.

27. Earthworks

Earthworks to bench lots to accommodate building construction are not permitted without prior written approval from the Development Manager.

28. Incineration

(a) No incineration of waste, including cleared vegetation, is permitted.

(b) All cleared vegetation must be removed from site or chipped/mulched and spread on site within one (1) week of it being felled.

29. Compliance with Conditions

(a) Unless otherwise stated all conditions shall be prior to signing of the relevant plan of survey or as determined by the Development Manager.

(b) All conditions shall be completed to the satisfaction of the Development Manager.

30. When Approval Takes Effect

This approval has effect in accordance with the provisions of Section 3.5.19 of the *Integrated Planning Act 1997* as follows:

(a) If the Applicant does not appeal the decision to the court - from the time the decision notice is given (or if a negotiated decision notice is given, from the time the negotiated decision notice is given); or

(b) If an appeal is made to the court - subject to the decision of the court, when the appeal is finally decided.

31. When Approval Lapses

(a) The currency period for this approval is 4 years starting the day the approval takes effect. The Developer is required to submit to Council an accurate plan of survey before the end of the currency period, otherwise the approval will lapse.

(b) An extended currency period may be agreed upon, pursuant to Section 3.5.22 of the *Integrated Planning Act 1997*, provided a written notice to Council is made before the end of the currency period. Such written notice is to be on Council's approved form, accompanied by the owner's consent and the prescribed fee in Council's Register of General Charges.

NOTE: Operational Works application(s) required to be submitted must be approved and works completed within the currency period stated above.

Conditions of Assessment Manager (Ipswich City Council)
Preliminary Approval for Building Works (Proposed Lots 1 - 24)

1. Basis of Approval

Subject to these conditions, the facts and circumstances set out in the application and all relevant Council Local Laws and/or Planning Scheme Policies shall be adhered to.

2. Minor Alterations

Notwithstanding the requirements detailed in this approval, any other minor alterations and/or modifications acceptable to the Development Manager will suffice.

3. Housing Diversity

A mix of housing types and styles should be provided within the estate, to the satisfaction of the Development Manager. In any given streetscape, no two (2) houses with the same street elevation are permitted to be established, unless otherwise approved in writing by the Development Manager. Variations in rooflines, verandahs, entries, materials and colours may be incorporated into housing design to achieve the intended diversity. To this end, for any slab on ground construction and/or brick construction dwelling, the Developer and/or landowner shall obtain the consent of the Development Manager for all housing designs, prior to the issue of a Development Permit for Building Works.

NOTE: Where more than one (1) dwelling within the estate is proposed to be constructed by a single entity, the Developer and/or Builder is encouraged to seek consent for all dwellings concurrently.

4. Vegetation Retention

(a) A Building Location Envelope (BLE) Plan shall be prepared for the following lots:-

- Lot 2;
- Lot 6;
- Lot 9;
- Lot 12;
- Lot 13;
- Lot 14;
- Lot 16;
- Lot 17;
- Lot 18;
- Lot 19;
- Lot 20;
- Lot 21;
- Lot 22;
- Lot 23; and
- Lot 24.

The BLE Plan shall nominate an appropriately sized envelope for a Single Residential dwelling on each lot. The BLE Plan shall be to the satisfaction of the Development Manager.

(b) No works, including clearing of vegetation, building and earthworks are permitted outside the approved building envelopes, unless otherwise approved in writing by the Development Manager.

(c) Limited clearing of vegetation to allow for vehicular access, fencing and connection of utilities is permitted, subject to a plan of the proposed works, including the site boundaries and the location of existing vegetation, being submitted to and approved by the Development Manager prior to the commencement of works. Utilities shall be co-located with the driveway, where practical.

5. Compliance with Conditions

All conditions shall be completed to the satisfaction of the Development Manager.

6. When Approval Takes Effect

This approval has effect in accordance with the provisions of Section 3.5.19 of the *Integrated Planning Act 1997* as follows:

(a) If the Applicant does not appeal the decision to the court - from the time the decision notice is given (or if a negotiated decision notice is given, from the time the negotiated decision notice is given); or

(b) If an appeal is made to the court - subject to the decision of the court, when the appeal is finally decided.

7. When Approval Lapses

The currency period for this approval is not limited and starts the day the approval takes effect.

B. That the Developer be further advised of the following:-

1. Hillside Lots

The Reconfiguring a Lot Code requires that Hillside Lots are created on land with slopes in excess of ten (10) percent. Given that the submitted slope analysis (Ref. Job Code RESSGO Sheet No. SK01 Revision A, prepared by ETS Group and dated August 2005) identified that thirty (30) of the proposed thirty-five (35) lots were on land with slope in excess of ten (10) percent, the lot configuration has been amended such that all lots comply with the requirements of the Code.

2. Dwelling Construction

The use of construction techniques other than slab on ground (e.g. post supported structures) should be utilised on all lots greater than ten (10) percent slope, unless a proposed dwelling can be sited on an area of the lot that has less than ten (10) percent slope. Any dwelling on these lots should be constructed as a 'Hillside Home', as defined under the Reconfiguring a Lot Code of the Ipswich Planning Scheme, utilising alternative construction techniques that minimise the need for any surface disturbance and the need for earthworks. The use of extensive cut and fill earthworks is not permitted.

3. Flooding

The subject site was inundated in the 1974 flood. Council, and its servants and agents, accept no liability or responsibility for any loss or damage to person or property of whatever nature or however caused as the direct or indirect consequence of the granting of the approval herein contained. Such approval has been granted at the request of the Developer and in reliance of information submitted by the Developer in support thereof.

4. Portable Long Service Leave

From 1 January 2000, the Building and Construction Industry (Portable Long Service Leave) Levy must be paid prior to the issue of a development permit where one is required for the 'Building and Construction Industry'. This applies to Building Works, Operational Works and Plumbing and Drainage Works applications, as defined under the *Integrated Planning Act 1997*, where the works are $80 000 or more and matching the definition of 'Building and Construction Industry' under the *Building and Construction Industry (Portable Long Service Leave) Act 1991*.

Council will not be able to issue a Decision Notice without receipt of details that the Levy has been paid. Should you require clarification in regard to the amendments to the *Building and Construction Industry (Portable Long Service Leave) Act 1991*, you should contact QLeave on 1800 803 481 (free call) or (07) 3212 6855.

5. Fire Ants (Restricted Area)

In accordance with the *Plant Protection Act 1989* and the Plant Protection Regulation 1990, a quarantine notice has been issued for the State of Queensland to prevent the spread of the Red Imported Fire Ant (ant species Solenopsis invicta) and to eradicate it from the State.

It is the legal obligation of the land owner or any consultant or contractor employed by the land owner to report the presence or suspicion of Fire Ants to the Queensland Department of Primary Industries on 132523 within 24 hours of becoming aware of the presence or suspicion, and to advise in writing within seven days to:

Director General
Department of Primary Industries
GPO Box 46, Brisbane QLD 4001

It should be noted that the movement of Fire Ants is prohibited, unless under the conditions of an Inspectors Approval. More information can be obtained from the Queensland Department of Primary Industries website www.dpi.qld.gov.au.

The land over which you have made a development application is within a suburb known to have Fire Ants and as such is within a "Restricted Area". The presence of Fire Ants on the site may affect the nature, form and extent of works permitted on the site. In view of this it will be necessary for you to contact the Department of Primary Industries to investigate the site and for you to implement any necessary matters required by that Department prior to the commencement of any works.

C. That the corporate Pathway system note the following:

1. This lot is subject to a Preliminary Approval for Building Works.

D. That the following advice be identified on Planning and Development Certificates:

1. Preliminary Approval for Building Works

This lot is subject to a Preliminary Approval for Building Works. For further details in this regard please contact the Development Branch Customer Service Unit on telephone number (07) 3810 6888.

[redacted]
DEVELOPMENT PLANNER

I have this day adopted the recommendation specified in this report.

Such action was taken pursuant to the delegation entitled "Determination of a Development Application, including Negotiated Decisions" granted to me by the Chief Executive Officer dated 16 August 2001 and 22 August 2001.

[redacted]
ACTING DEVELOPMENT TEAM CO-ORDINATOR - EAST

Date:

Annexure NP-6

Ipswich City Council

Assessment Checklist

Code Assessable Development

A. Application Details

Appln No.: **1704/05** Division: **2**

B. Preamble Assessment

1.	Are the real property description and location details provided on the Application Form correct?	☒ Yes ☐ No
2.	Has the 'consent of owner' been correctly obtained?	☒ Yes ☐ No
3.	Has the correct fee been paid?	☒ Yes ☐ No

C. Supporting Information

1. (a) Was any supporting material lodged with the application? ☒ Yes ☐ No

- IDAS Forms A & F;
- Assessment Report (prepared by DTS Group and dated March 2005); and
- Proposal Plan Ref. No. A2 905/2 (prepared by DTS Group and dated 8 March 2005).

(b) Are there any planning issues associated with this material? ☒ Yes ☐ No

- Topography (slopes in excess of 10%)
- Flooding constraints.

2. (a) Is there a need for an Information Request? ☒ Yes ☐ No

➢ Information was requested on the 31 March 2005 regarding lot layout, slope analysis, traffic and stormwater drainage.

A response was received on 17 November 2005 which partially addressed the issues raised.

C. Supporting Information

(b) Are there any outstanding issues associated with the Information Response? ☒ Yes ☐ No ☐ N/A

Comment: The slope analysis provided indicated that 30 out of the 35 proposed lots had a slope gradient in excess of 10.0%. However, the proposed lot layouts did not address the criteria of *Appendix A: Residential Lot Size, Frontage and Special Characteristics* of the Reconfiguring a Lot Code, namely the criteria for 'Hillside Lots'.

D. Referral / Advice Agencies

1. Are there any referral or advice agencies applicable to this development? ☐ Yes ☒ No

2. Are there any issues associated with advice received from a Referral / Advice Agency? ☐ Yes ☐ No ☒ N/A

E. State Planning Policies (SPP's)

1. Are there any SPP's applicable to this development? ☐ Yes ☒ No

2. Does the development comply with any relevant SPP's? ☐ Yes ☐ No ☒ N/A

F. Zone Code

1. What is the relevant zone code(s) for this development?

   (i) Urban Areas Code; and
   (ii) Residential Low Density Zone Code.

2. (a) Does the development require Code assessment under the relevant assessment table for the zone? ☒ Yes ☐ No

   Comment: Reconfiguring a Lot is Code Assessable within the RL2 Zone.

F. Zone Code

3. (a) Are there any overall or specific outcomes for the locality which apply to the development? ☒ Yes ☐ No

(i) Urban Areas Code;

Overall Outcomes

Community Identity

(b) *Definable but inter-related neighbourhoods are created and maintained with a strong sense of community identity.*

Housing

(c) *There is a diversity of housing types.*

(d) *There is an adequate supply of residential land and dwellings that respond to community needs and locational constraints and opportunities.*

Amenity

(i) *There is a high standard of amenity in residential areas and uses and works in these areas are compatible.*

(b) Does the development comply with any relevant overall or specific outcomes for the locality? ☒ Yes ☐ No ☐ N/A

4. Does the development comply with the overall outcomes for the zone? ☒ Yes ☐ No ☐ N/A

(ii) Residential Low Density Zone Code;

Overall Outcomes

(a) *The Residential Low Density Zone caters primarily for low density, sewered, urban residential development and associated uses, to the general exclusion of most other uses including unsewered, acreage housing.*

5. Does the development comply with the "Effects of Development – General" (including the specific outcomes and any applicable probable solutions or acceptable solutions) for the zone? ☒ Yes ☐ No ☐ N/A

- Residential Uses – Density and Character;
- Operation of Road Network and Access;
- Provision of Infrastructure;

F. Zone Code

6. (a) Are there any Sub Area or Precinct provisions within the zone which apply to this development? ☒ Yes ☐ No

Sub Area - RL2

Specific Outcomes

(i) "The established traditional inner suburban residential character is maintained."

(iii) "A mix of housing types and lot sizes are provided in Greenfield and outer infill areas."

(b) Does the development comply with these provisions? ☒ Yes ☐ No ☐ N/A

G. Codes for a Stated Purpose or of a Stated Type (refer Part 12 of the Planning Scheme)

1. Are there any codes under Part 12 of the Planning Scheme applicable to the development? ☒ Yes ☐ No

(i) Reconfiguring a Lot Code;

Lot Layout and Design

The slope analysis provided by the Applicant indicated that 30 out of the 35 proposed lots had a slope gradient of 10.0% or greater. As such, these lots constitute 'hillside lots'. However, the proposed lot layout did not address the criteria of *Appendix A: Residential Lot Size, Frontage and Special Characteristics* of the Code. Consequently, 30 out of the 35 proposed lots do not comply with the provisions of a 'traditional lot', particularly in regard to lot size and frontage widths.

As such, a condition has been included requiring the proposal to be amended from a 35 lot yield to a 24 lot yield, ensuring compliance with the Code.

2. Does the development comply with these codes? ☒ Yes ☐ No ☐ N/A

H. Overlays (refer Part 11 of the Planning Scheme)

1. (a) Is the site affected by a Character Places Overlay? ☐ Yes ☒ No

(b) Is the assessment category changed (refer Table 11.3.2)? ☐ Yes ☒ No ☐ N/A

H. Overlays (refer Part 11 of the Planning Scheme)

	(c) Does the development comply with the Character Places Overlay Code and the Character Code?	☐ Yes ☐ No ☒ N/A
2.	(a) Is the site affected by a Development Constraints Overlay? • OV4 – Difficult Topography; • OV5 – Flooding;	☒ Yes ☐ No
	(b) Is the assessment category changed (refer Table 11.4.3 and 11.4.4)?	☐ Yes ☒ No ☐ N/A
	(c) Does the development comply with the relevant provisions of the Development Constraints Overlay Code?	☒ Yes ☐ No ☐ N/A

I. Other Relevant Matters

1.	(a) Are there any Planning Scheme Policy provisions which specifically apply to this development?	☐ Yes ☒ No
	(b) Does the development comply with these provisions?	☒ Yes ☐ No ☐ N/A
2.	(a) Are there any Implementation Guidelines which specifically apply to this development?	☐ Yes ☒ No
	(b) Does the development comply with these Guidelines?	☐ Yes ☐ No ☒ N/A
3.	Are there any other relevant matters which pertain to this development?	☐ Yes ☒ No ☐ N/A
4.	Infrastructure Contributions – Calculation Sheet attached to this checklist? • Water and Sewerage credits given to 1 lot only (Lot 1) as Lot 58 does not have a connection.	☒ Yes ☐ No ☐ N/A

J. Summary

1. Recommended for:

- [x] Approval - Subject to Conditions
- [ ] Refusal
- [ ] Part Refusal / Part Approval - Subject to conditions

2. Comment: The conditioned (amended) development proposal generally satisfies the Specific Outcomes of the Urban Areas Code, the Residential Low Density Zone Code and the Reconfiguring a Lot Code.

[redacted]
DEVELOPMENT PLANNER

Date:

[redacted]
ACTING DEVELOPMENT TEAM CO-ORDINATOR - EAST

Date:

Annexure NP-7

1704/05 NRR:JAF
Nathan Rule
3810 6957

4 April 2006

INTEGRATED PLANNING ACT 1997

DEVELOPMENT APPLICATION DECISION NOTICE

Application Details

Application No:	1704/05
Real Property Description:	Lot 1 RP122040
Property Location:	35 Eric Street, Goodna
Names and Addresses of all Referral Agencies:	N/A
Decision Date:	3 April 2006
Decision:	Approved subject to the conditions detailed below.
Decision Authority:	Acting Team Co-ordinator - East

DTS Group
1/49 Butterfield Street
HERSTON QLD 4006

Approval Details:

Proposal	Development	Decision	Approval Type
Reconfiguring a Lot (2 lots into 24 lots in 2 stages)	Reconfiguring a lot	Approved	Development Permit.
Single Residential (Proposed Lots 1-24)	Carrying out building work	Approved	Preliminary Approval.

Further Development Permits Required

Further Development Permits, as required by the *Integrated Planning Act 1997,* shall be obtained in respect of any Operational Works, Building Works and Plumbing Works in relation to this approval before any such works are commenced.

Conditions

Assessment Manager (Ipswich City Council)

Conditions applicable to this approval under Integrated Planning Act:

Conditions of Assessment Manager (Ipswich City Council)
Development Permit for Reconfiguring a Lot (2 lots into 24 lots in 2 stages)

1. Basis of Approval

   Subject to these conditions, the facts and circumstances set out in the application and all relevant Council Local Laws and/or Planning Scheme Policies shall be adhered to.

2. Minor Alterations

   Notwithstanding the requirements detailed in this approval, any other minor alterations and/or modifications acceptable to the Development Manager will suffice.

3. Plan of Survey

   (a) The Developer shall submit a plan of survey to conform with Plan Ref. Drawing No. A2 905/6 Instruction No. A04332 (prepared by DTS Group and dated 1 November 2005), subject to the amendments marked in red.

   (b) Adequate permanent survey marks shall be installed. The Developer shall submit a certificate signed by a cadastral surveyor, stating that after the completion of all works associated with the development, permanent survey marks are in their correct position, in accordance with the plan of survey.

   (c) The Developer shall grant, free of cost to or compensation payable by council, minimum 4.0 m wide easements located centrally over proposed stormwater drains, water mains and sewerage rising mains, where they are located within private property. The documentation associated with these easements may be prepared by the Developer in a form satisfactory to Council's City Solicitor, or the Developer may submit easement plans, only where Council is party to the easements, to Council for the preparation of easement documents at the Developer's expense.

(d) Easements required for discharge of stormwater over adjacent land shall be agreed to in writing by the owner of the subject land prior to construction works commencing.

(e) Easements shall be centrally located over the alignment of stormwater paths and be of a width sufficient to encompass the overland flow from a storm event with an ARI of 100 years.

(f) Easements shall be of sufficient width to contain any fitting, access chamber etc located on the stormwater drains, water mains, and sewerage rising mains.

(g) Land required for detention basins or equivalent is to be dedicated as drainage reserve in favour of Council and not included within parkland dedication unless approved as parkland by Council.

(h) The area of land to be dedicated as drainage reserve shall be dedicated at no cost to Council.

4. Proposed Stages For Reconfiguration

The staging of the reconfiguration shall be generally in accordance with Plan Ref. No. A2 905/6 (prepared by DTS Group and dated 1 November 2005) subject to the amendments marked in red and as follows:

- Lot 1 (Stage 1); and
- Lots 2 – 24 (Stage 2).

5. Rates in Arrears

In accordance with the provisions of the *Integrated Planning Act 1997*, all rates and other expenses as a charge against the land shall not be in arrears at the date of signing of the plan of survey.

6. Hours of Construction

Unless otherwise approved in writing by the Development Manager, hours of construction shall be:

Monday to Saturday 6.30 a.m. to 6.30 p.m.

Work shall not be conducted from or on the premises outside the above hours or on Sundays or public holidays.

7. Road Naming

The Developer may submit to Council a list of proposed street names and the corresponding name meanings for the new road/s to be opened. The proposed names should normally be submitted as part of the Operational Works application. Should a theme be considered appropriate, the theme should be submitted at the same time. Council reserves the right to accept any or none of the proposed names.

8. Locality References

(a) Any place name or estate name used by the Developer (excluding a reference to a building, structure or the like and excluding minor, subsidiary signage within a development) shall make reference to the relevant, approved place name under the *Place Names Act 1994* in the same size and font.

(b) Any reference to the regional location of the site or the development shall not refer to the place or estate as being located in Brisbane or a Brisbane suburb or in the metropolitan area or in the western suburbs (excluding the western suburbs of Ipswich as determined by Council in writing from time to time).

9. Entry Walls or Features

The provision of entry walls or features is prohibited on road reserves or proposed parkland. Entry walls or features shall be fully contained on private property. These entry features or walls shall be designed such that maintenance for Council following the "Off Maintenance" inspection is minimal.

10. Streetscape Contribution

(a) A contribution shall be made towards Council's streetscape program within the Streetscape Contribution Precinct (Goodna). The rate for the 2005/06 financial year is $35.00 per allotment. Such streetscape works may not necessarily occur within the proposed development. However, this will be used on the major streets, entries and feature landscape areas within that Landscape District.

(b) Alternatively, the Developer shall:

(i) Place street trees at a rate of one per allotment to road or park frontage of the estate, in accordance with the Ipswich City Council Street Tree Strategy. Street trees along the park frontage shall be type *Eucalyptus tereticornis* and *Melaleuca quiquenervia*. Street trees along all other roads shall be *Grevillia robusta*. The planting detail shall be shown on the Landscape and Rehabilitation Plan and reflect the Ipswich City Council Standard Drawings.

(ii) Provide a bond to guarantee (b)(i) above. Such bond is required prior to signing of the relevant plan of survey.

(c) In accordance with (b) above, the Developer shall submit a plan of streetscaping and accompanying explanatory letter/report with the Engineering Drawings. Such plan shall be in accordance with Council's Streetscaping of Roads Policy to the satisfaction of the Conservation, Parks and Sport Manager.

11. Engineering Requirements

The following engineering requirements, detailed in Conditions 12 – 20, shall be completed to the satisfaction of the Senior Development Engineer.

Terms

(a) RPEQ - A Registered Professional Engineer of Queensland, suitably qualified and experienced in the particular area of expertise required.

(b) QUDM - The Queensland Urban Drainage Manual, produced by the Queensland Department of Primary Industries.

(c) Queensland Streets - The Design Guidelines for Subdivisional Street Works, prepared for the Institute of Municipal Engineers of Australia (QLD).

(d) MUTCD - The Manual of Uniform Traffic Control Devices, published by DMR.

(e) Ipswich Water - Commercial Business Unit of Ipswich City Council providing water and sewerage services.

(f) DNRM – Department of Natural Resources and Mines.

(g) DMR – Department of Main Roads.

12. Roadworks

(a) The roads shall be constructed with concrete kerb and channel and asphaltic concrete surfacing, together with associated works for the full length of all property frontages.

(b) Roadworks shall be designed and constructed in accordance with Council's Standards, Queensland Streets, Austroads Publications, the relevant and appropriate roadworks design standards and guidelines, and any other documentation deemed appropriate by Council. Such design and construction shall ensure that road carriageway widths are consistent with the road function and position in the road hierarchy and are in accordance with the relevant design speed environment. Threshold treatments shall be highly visible, and shall only be constructed after approval of the proposed surface treatment by the Senior Development Engineer.

(c) The pavement designs shall be in accordance with the Council's Planning Scheme Policy 3 - General Works. All roads shall have two way crossfalls in accordance with Council's adopted standards.

The minimum dedicated road widths, pavement widths and footpath requirements shall be in accordance with Council's requirements as set out below:

Road Type	Dedication Width	Pavement Width	Footpath	Path Width
Access Place	15.0 m	6.5 m	1 Path	1.5 m
Access Street	15.0 m	6.5 m	1 Path	1.5 m
Collector	17.0 m	8.5 m	1 Path	1.5 m
Trunk Collector	20.0 m	9.0 m or 2 x 5.0 m	2 Cycleway	2.0 m
			or 1 Path + 1 Cycleway	1.5 m 2.0 m

(d) The road pavement widths and geometric layout shall be sufficient to make adequate provision for Council's refuse collection vehicles and public transport movements.

(e) The Developer shall provide a maximum 4.25 m wide verge along the western property boundary of Lot 28 on RP802704 adjacent to Lot 27 on RP802704 (39 Eric Street). The proposed road pavement width for the road to be constructed between Lot 27 on RP802704 and Lot 1 on RP114375 shall be a minimum 6.5 m.

(f) A vehicle turning area shall be provided at the end of all "No through" roads and cul-de-sacs. Circular cul-de-sac turning heads, based on a minimum turning circle of 9.0 m radius, are preferred. "T" and "Y" shaped turning heads are generally not to be used.

(g) Traffic slow down devices shall be provided generally in accordance with Queensland Streets and Council approved alternatives.

(h) "No Through Road" signs shall be erected at the entries to cul-de-sacs and terminating roads.

(i) All traffic signs and delineation shall be installed in accordance with MUTCD.

(j) The Developer shall provide minimum 1.5 m wide concrete footpaths on one side of all the streets and extending past the mid point in cul-de-sacs to the next property boundary.

The construction of footpaths shall be in accordance with Council's Standard Drawing SR.19. The concrete footpaths shall be on the same side as the street lights, and the maximum longitudinal grade shall not exceed 1:8 (where possible).

(k) Kerb ramps are to be constructed in accordance with Council's Standard Drawing SR.18 at all intersections and at additional locations where required to connect the concrete pathways and cycleways. Generally at "T" intersections, 4 kerb ramps are required. Kerb ramps are to generally be set such that impaired pedestrians will move through an intersection on a straight road in a continuous straight line with the kerb ramps "pointing" at the destination ramp.

(l) Vehicular access from the roadways to all allotments shall be capable of being provided.

(m) Provision shall be made for minimum 6.0 m, three chord truncations at intersections. The 6.0 m distance is measured along each frontage from the property corner.

13. Access

(a) The access driveway to all hatchet shaped lots (i.e. proposed Lot 2) shall be constructed from the property boundary for the full length of the access strip with the following design criteria:

(i) the maximum longitudinal grade shall be 1 in 6 and the maximum crossfall shall be 1 in 20, except that the Senior Development Engineer may allow a longitudinal grade of 1 in 4 for a distance not exceeding 60 m in total in special circumstances.

(ii) a drainage system shall be provided so that no part of the driveway shall be inundated in the runoff resulting from a storm event with an ARI of 2 years, and the runoff from the driveway shall be discharged to the satisfaction of the Senior Development Engineer.

(iv) The driveway construction within the access strip to all hatchet lots shall be reinforced concrete not less than 100 mm deep and 3.0 m wide.

(v) The water services for the allotments, together with stormwater pipes and conduits for electricity and telephone (with draw string), shall be installed for the full length of all access strips.

(b) A concrete layback and driveway slab 3.0 m wide, from the layback to the property boundary, shall be constructed for access to all hatchet lots in accordance with Council's Standard Drawing No. SR.12.

(c) The Developer shall relocate the existing driveway for Lot 1 on RP122040 such that a concrete layback and driveway slab 3.0 m wide, from the layback to the property boundary, shall be constructed for access to proposed Lot 1, within the frontage of proposed Lot 1, and in accordance with Council's Standard Drawing SR.12.

(d) Where applicable, the concrete kerb shall be reinstated for any redundant driveway layback.

(e) The footpath shall be re-levelled over those areas where the existing driveways/laybacks are redundant to match existing levels.

14. Sewerage

(a) The Developer shall provide a sewerage reticulation system with appropriate house connection branches, designed so as to command the whole of each of the proposed allotments.

(b) The Developer shall pay the full cost for Council to provide a suitable connection into the existing sewerage reticulation system. All works on live sewers are to be carried out by Council at the Developer's expense, unless arranged otherwise with Ipswich Water.

(c) The Developer shall demonstrate that the proposed pipe sizes and connection points are adequate for the total upstream catchment and the proposed development.

(d) No work on the sewerage reticulation system shall commence prior to the approval of the Operational Works application.

(e) New Council sewer ends are to be extended to or past the boundary of new allotments to enable the future developments to connect to these drains without undue control or hindrance by the property owner in which the end line lies.

15. Water

(a) The Developer shall provide a reticulated water supply system together with valves and fire hydrants, in accordance with the "Guidelines for Planning and Design of Urban Water Supply Systems", which connects into Council's existing reticulation system.

(b) A blue, bi-directional raised reflective pavement marker (RRPM) shall be provided to all hydrants. The marker shall be installed in accordance with the Department of Main Roads Fire Hydrant Indication System Technical Guideline.

(c) The Developer shall demonstrate that the pipe sizes proposed and the available pressure head complies with the requirements of Ipswich Water's "Water Supply Planning Guidelines", and the "Guidelines for Planning and Design of Urban Water Supply Systems" and are adequate to cater for the proposed development. Such demonstration is to cover as a minimum:

(i) available pressure during maximum hour;

(ii) available pressure and flows for fire fighting and other purposes, and any recommendations pertaining thereto; and

(iii) comments regarding the situation at various stages of the development.

Note: Details regarding available pressure heads at various points in the existing water reticulation network for use in the calculations to be produced for such demonstration may be obtained from the Senior Development Engineer on submission of completed application forms and payment of the relevant fees.

(c) All works on live water mains are to be carried out by Council in accordance with Council's policy, and at the Developer's expense.

(d) Where concrete footpaths are to be constructed, the Developer shall provide 100 mm diameter conduits under the footpath and in line with the conduits under the road, for future ease of installing the individual water services. The letter "W" shall be embossed in the concrete to mark the location of the conduit.

(e) Wherever possible, the water main shall be constructed on the opposite side to the concrete footpaths. Where the water main is under a concrete footpath, the Developer shall provide a water connection (including the provision of meters) to each allotment, including the provision of approved pre-cast concrete or cast iron boxes over the stop cock.

(f) Where the water reticulation network is serving in excess of 20 allotments in any one stage, the site shall be served from two directions and shall not be in the form of a single dead end supply. All other mains shall be looped around the cul-de-sac head to join back on to itself.

(g) Sufficient stop valves shall be installed so that in the event of any break in the supply, the maximum number of allotments to be without water is 20.

(h) The Developer shall provide a water connection and meter to all proposed lots.

(i) The fire fighting water supply demand on Council's reticulation system from this development shall not exceed 15 litres/second.

(j) A fire hydrant shall be provided within a 20 m radius of all hatchet lot access driveways. The distance shall be measured from a point where the middle of the access driveway meets the road reserve.

16. Stormwater

(a) The Developer shall provide all necessary stormwater drainage (both internal and external to the development) and such drainage works (except for roofwater systems) shall be designed and constructed in accordance with QUDM such that the overall drainage system caters for a storm event with an ARI of 100 years.

Overland flow paths shall be suitably designed to cater for the water from a storm event with an ARI of 100 years. In the case where the piped system is carrying part of the flow, the overland flow paths shall be designed to cater for that volume which is represented by the difference between the predicted volume from the storm event with an ARI of 100 years and the capacity of the pipe system, noting the requirements of QUDM.

(b) A suitable roofwater system shall be designed in accordance with QUDM, for allotments that do not have adequate fall from within the allotment to the design invert level of the kerb and channel. The design is to be to a minimum Level II in QUDM.

(c) All stormwater flows within and adjacent to the development, other than inter-allotment drainage, shall be confined to dedicated roads, drainage reserves, registered drainage easements or within parkland. The registered drainage easements, if related to piped drainage, shall be centrally located over such underground pipe system and shall be not less than 4.0 m wide, except for drainage easements required for side boundaries which may be 3.0 m wide where approved by the Senior Development Engineer. In addition, the easements shall be of suitable width to contain the predicted overland flow from the storm event with an ARI of 100 years in that location.

(d) No ponding or redirection of stormwater shall occur onto adjoining land unless specifically approved by Council in consultation with the owner of the adjoining land.

(e) Due consideration shall be given in the design and construction of the development in relation to the effect of the developed catchment flows on the downstream discharge receival areas. Suitable stormwater control devices are to be provided to ensure that there is no increase in flow in watercourses. Such control devices are to be designed so as to integrate the landscaping, recreational, infrastructural and drainage roles of watercourses.

(f) All stormwater runoff from the development shall be discharged in a manner and to a point to be approved by the Senior Development Engineer.

(g) Stormwater drainage plans and calculations are to be submitted and approved by the Senior Development Engineer, in conjunction with the submission of an Operational Works application.

(h) Appropriate works shall be carried out to ensure that stormwater drainage from the new kerb and channel discharges suitably into the existing drainage system.

(i) There shall be minimal disturbance to vegetation in the gully areas, unless prior written approval is obtained from Council. Stormwater drainage outlets shall be the subject of detailed design in the preparation of plans for each stage of the development.

(j) The Developer shall provide a roofwater connection point to all lots which have a concrete footpath along the lot frontage and which drain to the street. The connection shall be located at the lowest corner of the lot on an alignment of 1.2 m from the side boundary and shall discharge to the kerb and channel via a 100 mm by 75 mm galvanised RHS. The RHS should extend 0.5 m into the property and have a suitable adaptor to allow connection to a roofwater pipe. All other lots, which drain to the street and do not have a concrete footpath along the lot frontage, do not require kerb adaptors.

(k) The Developer shall provide an extended stormwater detention and/or retention device (or equivalent) on the subject land, which shall be designed and constructed in accordance with QUDM. Where applicable, the detention/retention devices (or equivalent) shall be constructed to ensure that flows, run-off volumes and velocities, at any point downstream in the catchment, are not increased by the development for any combination of frequency and duration from the storm event with an ARI of 2 years up to and including the storm event with an ARI of 100 years. Additional calculations are to be provided demonstrating that the proposed stormwater management system, and all embankments and discharge structures, will be contained within the drainage reserve where applicable (except where connecting to the street drainage), and that the basin shape, volume and surface area will perform according to the attenuation results requirements.

17. Public Utilities

(a) Adequate provision shall be made in all proposed dedicated roads, access strips and easements, to cater for the public utility services that would normally serve the development.

(b) The Developer shall provide appropriate road crossing conduits in accordance with Council's Standard Drawings SR.22 and SR.23. Where concrete footpaths are to be constructed, the conduits shall be extended to the property boundaries.

(c) Street lighting shall be installed by the Developer in accordance with the Australian Standard 1158.3.1 Table 1.1. All street lighting associated with the development shall be certified by a RPEQ. Street lighting shall be installed on the same side as concrete footpaths (where applicable).

(d) The Developer shall provide underground electricity/telecommunications within the development, constructed in the approved allocation as detailed in Council's Standard Drawings SR.22 and SR.23. Electricity/telecommunication drawings shall be co-ordinated with the civil engineering design documents, to ensure that service clashes are avoided. Where allotments front an existing overhead electricity/telecommunication service, these allotments may connect to such service subject to the approval and requirements of the service provider.

(e) The Developer shall provide an Energex approved electrical reticulation layout plan. The electricity layout shall also be shown on the water reticulation layout plans.

(f) The Developer shall provide each allotment with an electricity supply.

(g) Prior to the signing of a plan of survey, the Developer shall provide Council with a copy of an agreement with Energex for the supply of electricity to the development.

(h) Telephone and cable services may be laid in a combined trench with electricity cables, subject to the approval of Energex and the authorised telephone/cable service provider.

(i) The Developer shall make suitable arrangements for the provision of telephone and (where applicable) cable services to all proposed lots within the development. Documentary evidence that discussions have commenced with any authorised telephone/cable service provider, on the provision of telephone/cable services, shall be provided prior to the signing of the plan of survey by Council.

18. Erosion & Silt Management

(a) The Developer shall be responsible for the installation and maintenance of silt management facilities from the time of commencement of construction until the development has been released "Off Maintenance" by Council. All silt management facilities are to be in accordance with the document "Soil Erosion and Sediment Control" published by the Institution of Engineers Australia, or equivalent.

(b) Silt traps shall be sited upstream from any park or reserve area discharge point preferably on land comprising future allotments, such that no silt impinges on the park or reserve areas. The silt trap areas may be phased out after the development work is complete and adequate grass cover is obtained.

(c) Diversion drains and ponds, as necessary, shall be installed on the site before any other work is undertaken on site to ensure that "dirty water" is contained and/or isolated.

(d) An erosion and sediment control program and maintenance procedures shall be prepared and submitted with the engineering drawings for approval for maintaining the facilities, setting out the frequency of attention, with inspections to be made after each significant rainfall event.

(e) Council reserves the right to enter the site for the purpose of rectifying any silt management facilities which it deems to be inadequate, improperly maintained or not operating in a satisfactory manner.

(f) The Developer shall lodge a $5,000 siltation and erosion performance bond with Council, prior to the commencement of works, which shall only be released by Council at the termination of the maintenance period. Where Council determines that a draw-down of the bond is required, the Developer shall restore the bond to its full amount within 10 days of a notice from Council to that effect. Such bond shall guarantee adequate performance in the circumstances (i) and (ii) below:

(i) In the event that instructions issued to the Consulting Engineer by the Senior Development Engineer for the installation of erosion control measures, are not complied with within 24 hours, Council will call upon the bond to the extent required to carry out the necessary works.

(ii) If the Senior Development Engineer determines that silt damage has occurred on the site, or the downstream drainage system has become silted, the Developer shall be responsible for restoration. Such restoration shall be completed in the time determined by the Senior Development Engineer.

Should the Developer fail to complete the works determined by the Senior Development Engineer within the specified time, Council shall complete the work and recover all costs from the Developer associated with that work.

19. Operational Works – Municipal Works
(i.e. Works being handed over to Council)

(a) Plans relating to all civil engineering works shall be prepared and submitted for review by Council under the cover of Form 1 - Part A (Common details for all applications) and Form 1 - Part E (Planning Scheme Works). The plans shall show full construction details, layout dimensions, and finished surface levels and shall be submitted together with the appropriate fees for Council approval, prior to the commencement of construction on site.

(b) The Developer shall comply with the requirements of the documents entitled "Planning Scheme Policy 3 - General Works" and "Standard Drawings".

(c) All engineering drawings submitted to Council shall be in accordance with Council's Planning Scheme Policy 3 - General Works and Standard Drawings, and shall include as a minimum the following:

(i) Engineering drawings shall be marked as confirmation that they have been checked and approved by a RPEQ;

(ii) The drawings shall be submitted as three A3 size sets and one full size set; and

(iii) A "Certificate of Design" shall be submitted by a RPEQ, certifying that the design is in accordance with all relevant engineering standards, Council's requirements and standards, relevant development conditions of approval, and sound engineering practice.

(d) Municipal works shall require a detailed design certified by a RPEQ, the design approved by Council Engineers with appropriate fees payable, a works pre-start meeting on-site and various detailed construction and audit inspections by Council Officers. A twelve month maintenance period is applicable for the works as well as the payment of a maintenance security deposit.

(e) All works shall be supervised by a RPEQ competent in civil works and shall be undertaken by a nominated principal contractor experienced in the construction of municipal works. Council reserves the right to request evidence of the principal contractor's competency. Should it be deemed by the Senior Development Engineer that the contractor does not have the necessary competency or has constructed substandard works for Council in the past, Council reserves the right to reject the nominated contractor.

(f) Municipal works shall be accepted "On Maintenance" prior to commencement of use. A maintenance bond equal to 5% of the construction cost (minimum of $1,000.00) shall be retained by Council for a minimum period of twelve months, or until such time as the works are accepted "Off Maintenance" by Council.

(g) "As Constructed" plans for municipal works shall be submitted to Council and approved prior to the formal acceptance of the works "On Maintenance".

(h) On completion of the works a certificate shall be submitted to Council by a RPEQ certifying that the works have been constructed in accordance with Council's construction standards and in compliance with the approved plans and specification. It is expected that the RPEQ will undertake the necessary inspections to make this certification.

(i) Council reserves the right to require further amendments and/or additions at a later date, should design errors or omissions become apparent in regard to the works relevant to the Operational Works approval.

(j) Council requires the provision of a bank guarantee, or a performance bond of not less that 10% (minimum of $5,000) of the value of the external municipal works. The bond/guarantee shall be retained by Council until such time the Developer provides a replacement or additional maintenance period bond/guarantee for entire Municipal Works (both external and internal) as security for the performance of the maintenance obligations.

External Municipal Works relates to those works external to the subject site and located in already dedicated public areas, for example existing road or drainage reserve, or private property not subject to Developer ownership.

20. General

(a) All disturbed verge areas and allotments shall be graded, grassed and left in a mowable condition. The grass cover shall be obtained as early as possible during the development and an acceptable grass cover shall be achieved before the development can be accepted "Off Maintenance".

(b) Street name signs shall be manufactured to Council specifications and shall be erected in accordance with Council's Standard Drawing SR.26 at each intersection.

(c) With reference to any works, on land under other private ownership, written permission for the works shall be obtained and forwarded to Council. Similarly, written clearances shall be obtained after the works are completed, unless otherwise accepted by the Senior Development Engineer.

(d) All works required for this development shall take due regard of any and all existing services and, if considered necessary by the relevant authority or the Senior Development Engineer, such works shall be altered at the cost of the Developer.

(e) Any allotment filling for a greater depth than 800 mm to provide for building platforms shall be conducted in accordance with Australian Standard 3798. Test results as required by Australian Standard 3798, and a certificate of quality and uniformity of fill shall be provided by a RPEQ. The level of responsibility shall be Level 1.

(f) A certificate from a RPEQ shall be issued to Council certifying that any retaining wall greater than 800 mm in height is structurally sound and capable of withstanding any likely surcharge loads. Retaining walls greater than 1.0 m in height are to be provided with railings or other barriers to provide pedestrian safety.

(g) Retaining walls shall be designed so that there are no imposed loads placed upon Council's underground services. This may include extending the footing to a level 300 mm below the invert of the pipe.

(h) Filling of gully areas if permitted shall be carried out strictly in accordance with Australian Standard 3798. Test results as required by Australian Standard 3798 and a certificate of quality and uniformity of fill, shall be provided by the Supervising RPEQ for all filled areas.

(i) For batters resulting from cutting and filling of the site and producing slopes greater than 1:6, Council requires a RPEQ to certify that they are stable and properly drained.

(j) Approval of the Senior Development Engineer is required for any fill intended to be placed over Council's underground services.

(k) If, after the preparation of detailed design plans for the various roads, it is found necessary to provide any additional dedicated road area, or modify the proposed dedicated roads to enable the full requirements of Council's standards, Queensland Streets, AMCORD and Austroads documents to be incorporated in any way (but particularly in the production of the required speed environment or because of longitudinal and cross sectional constraints) then the estate layout plan shall be altered accordingly.

(l) Components that will become Council assets at the end of maintenance are subject to the following service life requirements:

(i) Roadworks – 20 years.
(ii) Drainage elements – 50 years.
(iii) Structures – 50 years.
(iv) All others – 50 years.

(m) The Developer shall provide details of the intended method of installation and compaction of all public utilities (including stormwater) with the Operational Works applications, demonstrating that the proposed technique considers and avoids premature failure of the service conduit. In the case of stormwater, this information should be incorporated on the long section schedule.

(n) All structures undertaken for the development eg footpaths/cycleways, retaining walls, drainage components and the like, shall be designed in order that foundations effects, differential movements etc are accounted for and do not impeded the component operation or serviceability requirements during their expected lifetime eg avoidance of trip hazards, blockages, structural failures, traffic hazards etc.

(o) The Developer shall be responsible for ensuring that all approvals have been obtained from the relevant infrastructure stakeholders. All approvals shall be submitted in conjunction with the Operational Works.

(p) Earthworks on any lot shall not exceed a total maximum height of 2.0 m. Retaining walls shall not exceed a total maximum height of 1.2 m with 1:4 batters from the top and toe of the wall unless it can be demonstrated to the satisfaction of the Senior Development Engineer that a greater height is acceptable.

21. Stormwater Quality (Management Plan)

(a) The Developer shall provide a detailed Stormwater Quality Management Plan (SQMP) to Council for approval by the Development Manager in conjunction with an Operational Works application.

(b) The SQMP shall be prepared by a suitably qualified and experienced professional, be developed in accordance with the *Australian Runoff Quality Design Guidelines* (Australian Institute of Engineers 2003), and demonstrate through appropriate pollutant export modelling (e.g. MUSIC, AQUALM) that the predicted pollutant levels in stormwater leaving the site meet the objectives identified in Planning Scheme Policy 3 – General Works, Table 2.3.1 - Water Quality Objectives and best management practice load-based objectives.

(c) The SQMP is to include a catchment plan showing the site layout, site contours, flow path directions, catchments and the location of proposed stormwater quality treatment measures.

(d) Modelling parameters used and results generated by the modelling software shall be included in the SQMP. This includes the meteorological data, time step, source nodes (and where applicable any non-standard parameters used), percentage effective impervious area, runoff generation parameters, base and stormflow concentration parameters, an interface layout (diagram demonstrating the source nodes and treatment nodes within the treatment train), output figures and graphs.

(e) The SQMP shall incorporate physical control measures only e.g. gross pollutant traps, grass swales, bio-retention, porous paving, rainwater tanks etc. rather than non-physical measures such as education. At a minimum the treatment train shall incorporate a bio-retention component/s and a gross pollutant trap/s.

(f) Details provided for the bioretention area shall include a diagram showing the high-flow bypass, sediment detention area, scour protection and long-term maintenance access.

(g) The use of road verges as bio-retention/grass swales shall not be accepted as an acceptable treatment measure.

(h) While works are occurring, the Developer shall update the detailed design SQMP as required to reflect current standards, best management practice, plant modifications etc. Any modifications with the potential to result in increased environmental impacts must be submitted to Council for approval.

(i) Stormwater quality treatment shall be provided on site in accordance with the approved SQMP and shall be fully operational prior to Council accepting the works "Off Maintenance".

(j) The Management Plan shall be prepared by a suitably qualified and experienced professional and shall be developed in accordance with the *Australian Runoff Quality Design Guidelines (Australian Institute of Engineers, 2003).*

22. Stormwater Quality (Maintenance Plan)

(a) The Developer shall provide a detailed Stormwater Quality Maintenance Plan for the entire stormwater system to Council for approval by the Development Manager in conjunction with an Operational Works application.

(b) The Maintenance Plan shall outline requirements for both the construction and operational phases specifying the regular maintenance of the stormwater system (e.g. cleaning of GPT filter baskets after storm events) along with the long-term management such as the replacement of the bio-retention filters.

(c) At a minimum, the Maintenance Plan shall include all of the following details:

(i) aims and objectives (the design should ensure that treated stormwater quality will meet the Water Quality Objectives listed in Planning Scheme Policy 3 – General Works, Part 2, Table 2.3.1 – Water Quality Objectives);
(ii) a separate maintenance schedule for each device (inspection and maintenance frequency and data collection);
(iii) a description of how each maintenance action is to be carried out (including equipment needs, maintenance techniques, occupational health and safety, public safety, environmental management considerations, disposal requirements for polluted water and solid waste, access issues);
(iv) management structure;
(v) responsibilities;
(vi) ongoing monitoring;
(vii) record keeping and reporting;
(viii) non-compliance procedures;
(ix) personnel training;
(x) waste management;
(xi) review and update; and
(xii) any relevant contractor contact information.

(d) The Maintenance Plan shall be prepared by a suitably qualified and experienced professional and shall be developed in accordance with the *Australian Runoff Quality Design Guidelines (Australian Institute of Engineers, 2003)*.

(e) The Maintenance Plan shall be implemented by the Developer to the satisfaction of the Development Manager.

23. Landscape and Rehabilitation Plan

(a) A Landscape and Rehabilitation Plan (prepared by a corporate member of Australian Institute of Landscape Architects), which conforms to the approved development plan shall be submitted to and approved by the Development Manager in conjunction with the Operational Works application.

(b) The Landscape and Rehabilitation Plan shall be in accordance with the 'Vegetation Assessment and Preliminary Management Report' (prepared by Terra Ark and dated October 2005), Council's Planning Scheme requirements for landscaping and detail all relevant items listed in Section 27 of Planing Scheme Policy 2 – Information Local Government May Request. Specifically, the amended plan shall include, amongst other necessary items, the following features:

(i) soils, mulch and sub-grade treatment;
(ii) tree and shrub planting shown in diagrammatic form in accordance with the Ipswich City Council Standard Drawings;

(iii) existing vegetation proposed to be retained and protection fencing;
(iv) location of services including drainage, sewerage, power, gas and communication (reference to other plans will not be accepted);
(v) contours and spot levels;
(vi) schedule of common name, plant species (only natives to be used), size and attributes;
(vii) details of retaining structures; and
(viii) details of design materials, colours, treatments etc.

(c) The Plan shall specify planting requirements in accordance with the approved Stormwater Quality Management Plan. Planting shall be provided for the floor, shelves and batters of the bio-retention basin. The bio-retention basin shall be planted with natives vegetation (e.g. sedges and tufted grasses) only. Turfing of any bio-retention will not be accepted.

(d) An electric barbeque is not required to be provided in the nominated park.

(e) Rehabilitation extending from the property boundary shall consist of 85% vegetation cover in the park which includes stabilisation, mulching, weeding and revegetation.

(f) All introduced, declared and environmental weeds shall be removed in accordance with the 'Vegetation Assessment and Preliminary Management Report' (prepared by Terra Ark and dated October 2005) and disturbed areas rehabilitated. Weed removal methods shall be outlined on the plan along with appropriate soil and bank stabilisation works.

(g) The Developer shall complete approved landscaping and fencing works in accordance with the approved Landscape Plans to the satisfaction of the Development Manager.

(h) Such landscaping and fencing shall be maintained in perpetuity to Council's satisfaction.

24. Vegetation Clearing

(a) In accordance with the 'Vegetation Assessment and Preliminary Management Report' (prepared by Terra Ark and dated October 2005), all trees to be retained shall be further assessed by a qualified arborist and either treated for retention or recommended for removal.

To this end, a Management Plan prepared by a suitably qualified arborist is to be submitted to and approved by the Development Manager in association with the Operational Works approval. The Plan shall reflect the management measures outlined in the 'Vegetation Assessment and Preliminary Management Report' (prepared by Terra Ark and dated October 2005), particularly sections 7.2 - 7.4.

(b) The Management Plan is to clearly delineate tree retention or removal, protection measures such as fencing and arboricultural care including soil decompaction, soil aeration, fertilising, mulching, watering and hazard reduction pruning where necessary.

(c) The Management Plan shall include the retention of all trees in the parkland as well as those numerically indicated on the 'Tree Protection' Plan Ref. Drawing No. A34332 (prepared by DTS Group and dated 8 November 2005) and referred to in the 'Vegetation Assessment and Preliminary Management Report' (prepared by Terra Ark and dated October 2005). If a qualified arborist determines that any tree presents an unacceptable liability, removal will need to be agreed upon by Council.

(d) The Developer shall construct a temporary star picket and three strand wire fence to Council's satisfaction along the development line separating the park from all other development activities.

(e) Fencing shall be installed prior to Operational Works and shall remain until the development has been put "On Maintenance" or an alternative approved barrier replaces it. Fencing shall be shown on all relevant Operational Works drawings and is to include nominated access points to allow for approved rehabilitation and bio-detention basin works.

(f) No unapproved construction activity is to occur beyond any protection fencing, including vehicle access, material stockpiling, storage or chemicals and/or maintenance fluids, site compound, the tapering or construction of batters, site spoil or rubbish etc.

(g) A qualified arborist shall perform all arboricultural care in accordance with the approved plan prior to any earthworks and supervise any works within 15 metres from protected trees. The arborist shall perform a weekly inspection of protection measures during the earthworks stage making recommendations for any necessary improvements.

25. Fencing

A 1.8 metre high screen fence shall be constructed along the common boundary of the subject site and the following allotments:

(i) Lot 2 on RP112040;
(ii) Lot 1 on RP114375;
(iii) Lot 27 on RP802704;
(iv) Lot 1 on RP151903;
(v) Lot 2 on RP151903; and
(vi) Lot 3 on RP116986.

Details of the fence shall be provided to and approved by the Development Manager as part of the Landscape and Rehabilitation Plan.

26. Contributions

(a) In accordance with the relevant Planning Scheme Policies, the Developer shall pay the following monies to Council, prior to the signing of the plan of survey for the relevant stage:-

Contribution	Sector	Rate	Proposal	Calculation
Local Community Facilities	Goodna - Gailes	Level 1: $44.94/EP Level 2: $62.35/EP Level 3: $36.47/EP Unit Charge = 1.088 Total = Level 1: $48.89/EP Level 2: $67.84/EP Level 3: $39.68/EP	***Stage 1*** Number of Lots (> 450m²): 1.000 @ 3.080 EP **Total = -3.080 EP**	Level 1: $48.89 x -3.080 = $0.00 Level 2: $67.84 x -3.080 = $0.00 Level 3: $39.68 x -3.080 = $0.00 **Total = $0.00**
			Stage 2	Level 1: $48.89 x 67.760 = $3,313.11

			Number of Lots (> 450m²): 22.000 @ 3.080 EP **Total = 67.760 EP**	Level 2: $67.84 x 67.760 = $4,596.62 Level 3: $39.68 x 67.760 = $2,688.67 **Total = $10,597.00**
Open Space (Parks)	Goodna - Gailes	Level 1: $110.43/EP Level 2: $572.86/EP Level 3: $593.42/EP Unit Charge = 1.026 Total = Level 1: $113.30/EP Level 2: $587.75/EP Level 3: $608.85/EP	***Stage 1*** Number of Lots (> 450m²): 1.000 @ 3.080 EP **Total = -3.080 EP**	Level 1: $113.30 x -3.080 = $0.00 Level 2: $587.75 x -3.080 = $0.00 Level 3: $608.85 x -3.080 = $0.00 **Total = $0.00**
			Stage 2 Number of Lots (> 450m²): 22.000 @ 3.080 EP **Total = 67.760 EP**	Level 1: $113.30 x 67.760 = $7,677.29 Level 2: $587.75 x 67.760 = $39,826.24 Level 3: $608.85 x 67.760 = $41,255.60 **Total = $88,758.00**
Water Supply	Goodna High Level Water Zone	$707.33/EP Unit Charge = 1.088 Total = $769.58/EP	***Stage 1*** Number of Lots (> 450m²): 1.000 @ 3.300 EP **Total = -3.300 EP**	$769.58 x -3.300 = $0.00 **Total = $0.00**
			Stage 2 Number of Lots (> 450m²): 23.000 @ 3.300 EP **Total = 75.900 EP**	$769.58 x 75.900 = $58,411.12 **Total = $58,411.00**
Sewerage Catchment	Goodna Catchment (excluding Springfield)	$629.36/EP Unit Charge = 1.088 Total = $684.74/EP	***Stage 1*** Number of Lots (> 450m²): 1.000 @ 3.300 EP **Total = -3.300 EP**	$684.74 x -3.300 = $0.00 **Total = $0.00**
			Stage 2 Number of Lots (> 450m²): 23.000 @ 3.300 EP **Total = 75.900 EP**	$684.74 x 75.900 = $51,971.77 **Total = $51,972.00**

Road Contributions	Goodna	$1,437.77/EP Unit Charge = 1.026 Total = $1,475.15/EP	***Stage 1*** Number of Lots (> 450m²): 1.000 @ 3.100 EP **Total = -3.100 EP**	$1,475.15 x -3.100 = $0.00 **Total = $0.00**
			Stage 2 Number of Lots (> 450m²): 22.000 @ 3.100 EP **Total = 68.200 EP**	$1,475.15 x 68.200 = $100,605.37 **Total = $100,605.00**
Total for Stage 1				**$0.00**
Total for Stage 2				**$310,343.00**
Total for Development				**$310,343.00**

Calculations of contributions are based on the infrastructure contribution rates applicable at the date the development application was determined by Council. The contributions above shall be applicable for a period of twelve (12) months from the date of the development approval, and thereafter shall be based on the infrastructure contribution rates applicable at the date when payment is made.

27. Earthworks

Earthworks to bench lots to accommodate building construction are not permitted without prior written approval from the Development Manager.

28. Incineration

(a) No incineration of waste, including cleared vegetation, is permitted.

(b) All cleared vegetation must be removed from site or chipped/mulched and spread on site within one (1) week of it being felled.

29. Compliance with Conditions

(a) Unless otherwise stated all conditions shall be prior to signing of the relevant plan of survey or as determined by the Development Manager.

(b) All conditions shall be completed to the satisfaction of the Development Manager.

30. When Approval Takes Effect

This approval has effect in accordance with the provisions of Section 3.5.19 of the *Integrated Planning Act 1997* as follows:

(a) If the Applicant does not appeal the decision to the court - from the time the decision notice is given (or if a negotiated decision notice is given, from the time the negotiated decision notice is given); or

(b) If an appeal is made to the court - subject to the decision of the court, when the appeal is finally decided.

31. When Approval Lapses

(a) The currency period for this approval is 4 years starting the day the approval takes effect. The Developer is required to submit to Council an accurate plan of survey before the end of the currency period, otherwise the approval will lapse.

(b) An extended currency period may be agreed upon, pursuant to Section 3.5.22 of the *Integrated Planning Act 1997*, provided a written notice to Council is made before the end of the currency period. Such written notice is to be on Council's approved form, accompanied by the owner's consent and the prescribed fee in Council's Register of General Charges.

NOTE: Operational Works application(s) required to be submitted must be approved and works completed within the currency period stated above.

Conditions of Assessment Manager (Ipswich City Council)
Preliminary Approval for Building Works (Proposed Lots 1 - 24)

1. Basis of Approval

Subject to these conditions, the facts and circumstances set out in the application and all relevant Council Local Laws and/or Planning Scheme Policies shall be adhered to.

2. Minor Alterations

Notwithstanding the requirements detailed in this approval, any other minor alterations and/or modifications acceptable to the Development Manager will suffice.

3. Housing Diversity

A mix of housing types and styles should be provided within the estate, to the satisfaction of the Development Manager. In any given streetscape, no two (2) houses with the same street elevation are permitted to be established, unless otherwise approved in writing by the Development Manager. Variations in rooflines, verandahs, entries, materials and colours may be incorporated into housing design to achieve the intended diversity. To this end, for any slab on ground construction and/or brick construction dwelling, the Developer and/or landowner shall obtain the consent of the Development Manager for all housing designs, prior to the issue of a Development Permit for Building Works.

NOTE: Where more than one (1) dwelling within the estate is proposed to be constructed by a single entity, the Developer and/or Builder is encouraged to seek consent for all dwellings concurrently.

4. Vegetation Retention

(a) A Building Location Envelope (BLE) Plan shall be prepared for the following lots:-

- Lot 2;
- Lot 6;
- Lot 9;
- Lot 12;
- Lot 13;
- Lot 14;
- Lot 16;
- Lot 17;
- Lot 18;
- Lot 19;
- Lot 20;
- Lot 21;
- Lot 22;
- Lot 23; and
- Lot 24.

The BLE Plan shall nominate an appropriately sized envelope for a Single Residential dwelling on each lot. The BLE Plan shall be to the satisfaction of the Development Manager.

(b) No works, including clearing of vegetation, building and earthworks are permitted outside the approved building envelopes, unless otherwise approved in writing by the Development Manager.

(c) Limited clearing of vegetation to allow for vehicular access, fencing and connection of utilities is permitted, subject to a plan of the proposed works, including the site boundaries and the location of existing vegetation, being submitted to and approved by the Development Manager prior to the commencement of works. Utilities shall be co-located with the driveway, where practical.

5. Compliance with Conditions

All conditions shall be completed to the satisfaction of the Development Manager.

6. When Approval Takes Effect

This approval has effect in accordance with the provisions of Section 3.5.19 of the *Integrated Planning Act 1997* as follows:

(a) If the Applicant does not appeal the decision to the court - from the time the decision notice is given (or if a negotiated decision notice is given, from the time the negotiated decision notice is given); or

(b) If an appeal is made to the court - subject to the decision of the court, when the appeal is finally decided.

7. When Approval Lapses

The currency period for this approval is not limited and starts the day the approval takes effect.

Advice

The following advices are offered for your information only and should not be viewed as mandatory conditions of this approval.

Assessment Manager (Ipswich City Council)

1. Hillside Lots

The Reconfiguring a Lot Code requires that Hillside Lots are created on land with slopes in excess of ten (10) percent. Given that the submitted slope analysis (Ref. Job Code RESSGO Sheet No. SK01 Revision A, prepared by ETS Group and dated August 2005) identified that thirty (30) of the proposed thirty-five (35) lots were on land with slope in excess of ten (10) percent, the lot configuration has been amended such that all lots comply with the requirements of the Code.

2. Dwelling Construction

The use of construction techniques other than slab on ground (e.g. post supported structures) should be utilised on all lots greater than ten (10) percent slope, unless a proposed dwelling can be sited on an area of the lot that has less than ten (10) percent slope. Any dwelling on these lots should be constructed as a 'Hillside Home', as defined under the Reconfiguring a Lot Code of the Ipswich Planning Scheme, utilising alternative construction techniques that minimise the need for any surface disturbance and the need for earthworks. The use of extensive cut and fill earthworks is not permitted.

3. Flooding

The subject site was inundated in the 1974 flood. Council, and its servants and agents, accept no liability or responsibility for any loss or damage to person or property of whatever nature or however caused as the direct or indirect consequence of the granting of the approval herein contained. Such approval has been granted at the request of the Developer and in reliance of information submitted by the Developer in support thereof.

4. Portable Long Service Leave

From 1 January 2000, the Building and Construction Industry (Portable Long Service Leave) Levy must be paid prior to the issue of a development permit where one is required for the 'Building and Construction Industry'. This applies to Building Works, Operational Works and Plumbing and Drainage Works applications, as defined under the *Integrated Planning Act 1997*, where the works are $80 000 or more and matching the definition of 'Building and Construction Industry' under the *Building and Construction Industry (Portable Long Service Leave) Act 1991*.

Council will not be able to issue a Decision Notice without receipt of details that the Levy has been paid. Should you require clarification in regard to the amendments to the *Building and Construction Industry (Portable Long Service Leave) Act 1991*, you should contact QLeave on 1800 803 481 (free call) or (07) 3212 6855.

5. Fire Ants (Restricted Area)

In accordance with the *Plant Protection Act 1989* and the Plant Protection Regulation 1990, a quarantine notice has been issued for the State of Queensland to prevent the spread of the Red Imported Fire Ant (ant species Solenopsis invicta) and to eradicate it from the State.

It is the legal obligation of the land owner or any consultant or contractor employed by the land owner to report the presence or suspicion of Fire Ants to the Queensland Department of Primary Industries on 132523 within 24 hours of becoming aware of the presence or suspicion, and to advise in writing within seven days to:

Director General
Department of Primary Industries
GPO Box 46, Brisbane QLD 4001

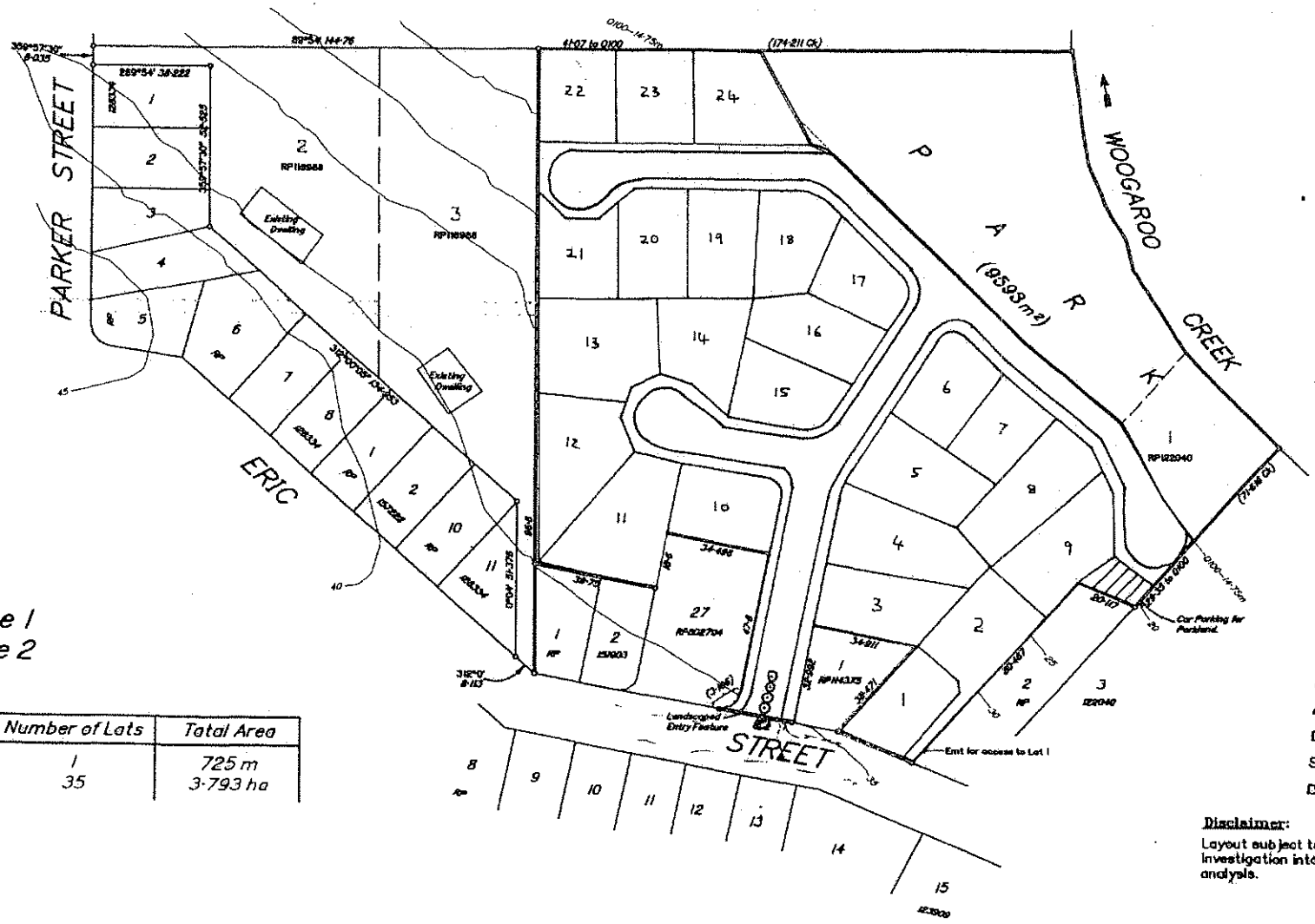
It should be noted that the movement of Fire Ants is prohibited, unless under the conditions of an Inspectors Approval. More information can be obtained from the Queensland Department of Primary Industries website www.dpi.qld.gov.au.

The land over which you have made a development application is within a suburb known to have Fire Ants and as such is within a "Restricted Area". The presence of Fire Ants on the site may affect the nature, form and extent of works permitted on the site. In view of this it will be necessary for you to contact the Department of Primary Industries to investigate the site and for you to implement any necessary matters required by that Department prior to the commencement of any works.

Pursuant to the provisions of the *Integrated Planning Act 1997*, I also enclose herewith a copy of Section 4.1.27 concerning the institution of an appeal.

Yours faithfully

[redacted]
ACTING DEVELOPMENT MANAGER



LEGEND

— Stage 1

— Stage 2

Stage	Number of Lots	Total Area
Stage 1	1	725 m
Stage 2	35	3·793 ha

Pursuant to Section 3.5.15(5) of the Integrated Planning Act, this plan forms part of Council's approval for

Application No: 1704/05

Dated: 23/08/05

Signed: [redacted]

Date: 1/11/05

Disclaimer:

Layout subject to council approval and further investigation into vegetation assessment and slope analysis.

A1 Scale 1:750 — Lengths are in Metres.

10 0 10 20 30 40 50 60 70 80 90 100 110

A2 Scale 1:1000 — Lengths are in Metres.

10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140

NOTES

This plan has been prepared by Donald Thallon (Surveys) as a proposal plan and should not be used for any other purpose. The information contained on this plan is approximate only, has not been verified and may be subject to change. The intellectual property on this plan remains the property of Donald Thallon (Surveys). The contours shown on this plan have been derived from Map View. 0100 Thread Lites derived from field survey.

STATISTICS

Total Area of Subdivision — 3·865 ha
Number of Lots — 35
Length of New Road — 459 m

Contour Interval — 5 metre

PROJECT

Eric Street, Goodna

CLIENT: Rescom Property Group Pty Ltd

PLAN SHOWING

PROPOSED SUBDIVISION OF LOTS 1 — 35
CANCELLING LOT 1 ON RP122040 & LOT 28 ON RP802704
PARISH OF GOODNA — COUNTY OF STANLEY
LOCAL AUTHORITY — IPSWICH CITY COUNCIL

DTS GROUP QLD
CADASTRAL SURVEYORS
DEVELOPMENT CONSULTANTS
TOWN PLANNERS
BUTTONFIELD COMMERCIAL CENTRE
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Telephone: (07) 3852 3422
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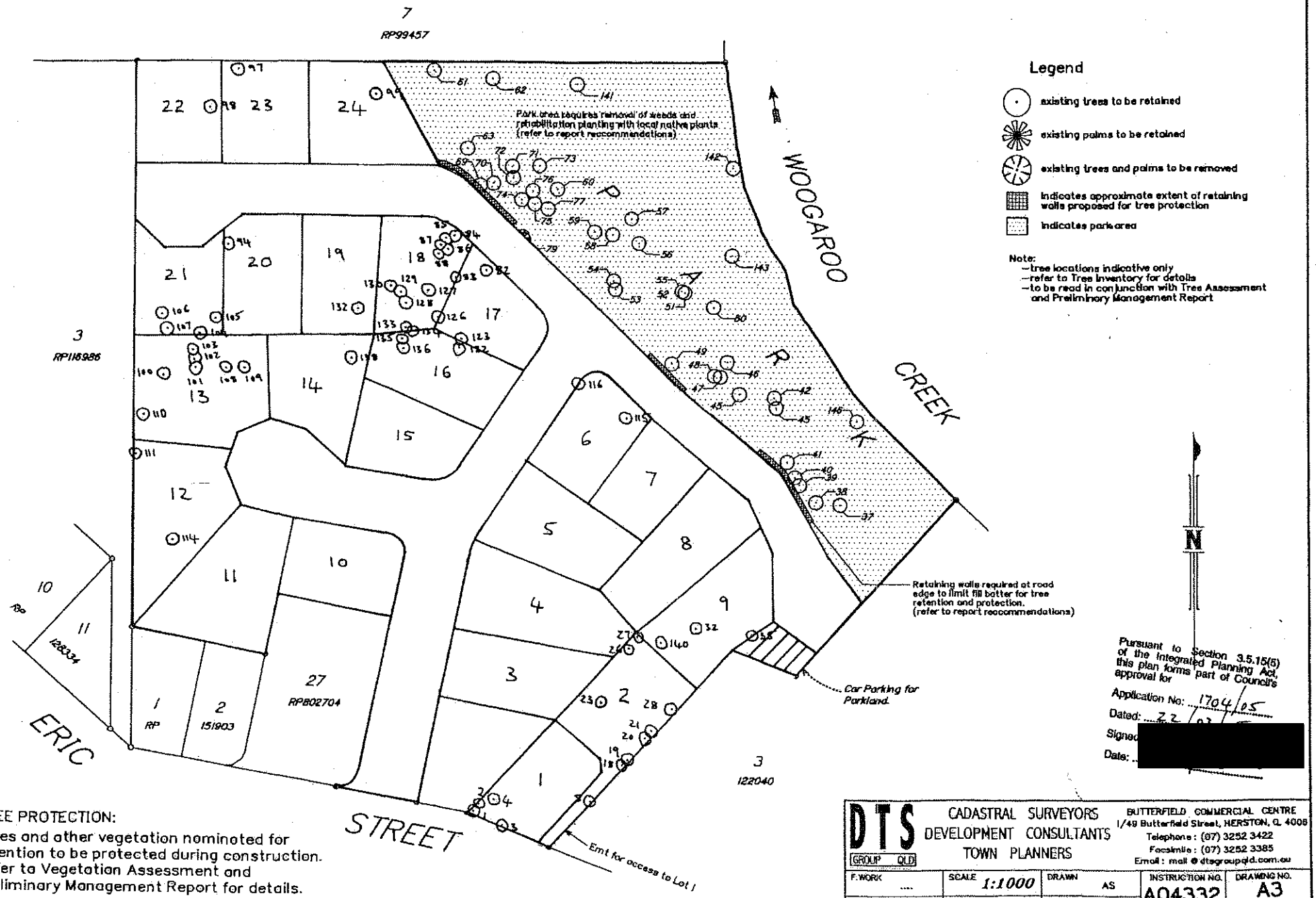
F.WORK	SCALE 1:1000	DRAWN SDN	INSTRUCTION NO. A04332	DRAWING NO. A2 905/6
F.BOOK	DESIGN	DATE 1/11/2005	A04332P3.DWG	
L.BOOK				



TREE PROTECTION:
Trees and other vegetation nominated for retention to be protected during construction. Refer to Vegetation Assessment and Preliminary Management Report for details.

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F.WORK	SCALE 1:1000	DRAWN AS	INSTRUCTION NO. A04332	DRAWING NO. A3 3244
F.BOOK .... L.BOOK	DESIGN	DATE 8/11/2005	A04332P3.Dwg	

Annexure NP-8

PROPOSED SUBDIVISION
AT
ERIC STREET, GOODNA

MASTER PLAN
DETAILED SITE BASED
STORMWATER MANAGEMENT
PLAN

Prepared for
RESCOM PTY LTD.

ISSUE DETAILS

Issue 1	Original Issue to Ipswich City Council with Development Application	August 2006
Issue 2	Revisions to suit Hydraulics report	December 2006

Reviewed by ..... Date .....

Approved for issue by ..... Date .....

TABLE OF CONTENTS

1. INTRODUCTION

The proposed development involves the construction of 32 new residential allotments at Eric Street Goodna. The total area of the new development will be 2.935ha which is bound by Woogaroo Creeks to the north and Eric street to the south with existing residents also bounding the development to the south. This management plan examines at a Detailed Design level, the impacts of the development on stormwater issues and recommends actions to be implemented to minimise those impacts.

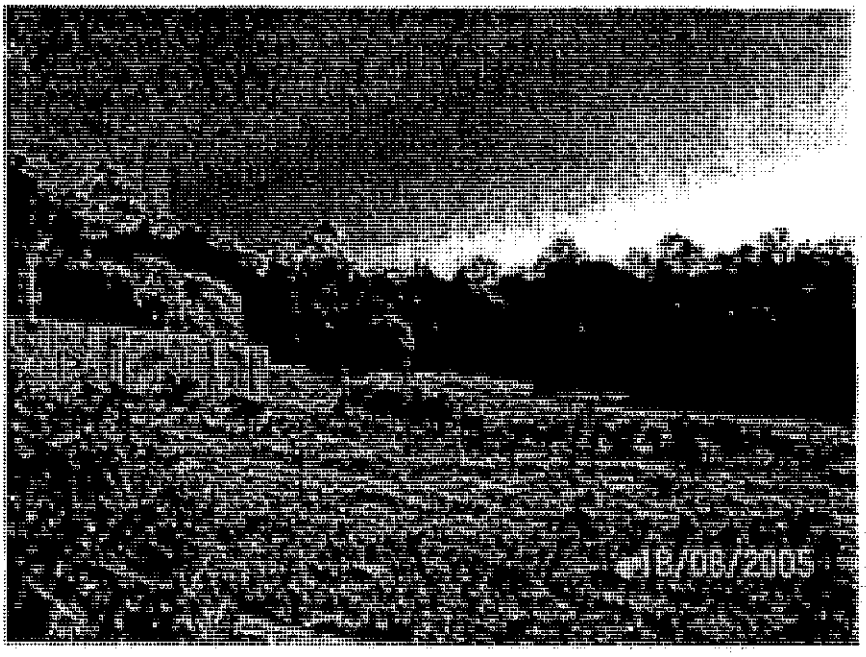


Figure 1 - Site From Eric Street

2. SITE CHARACTERISTICS

There is one stormwater catchment that exists over the development. The catchment discharges to the north through the existing overland flow paths and natural outlet and into Woogaroo Creek. Currently the site is a moderately treed and grassed paddock with small vehicle access tracks through out. After visual inspection of the site it was found that there is some topsoil over shallow rock.

3. DATA

In the preparation of this report information on the site was gathered from the following

- Ipswich City Council (As constructed services, hydrologic and water quality parameters)
- Topographic and Orthographic maps (Contours)
- Dts Group (Detailed Survey)
- Site inspection
- Bureau of Meteorology (Meteorological Data from Amberley Rain Survey Station no. 040910)

4. OPPORTUNITIES AND CONSTRAINTS

Development of the site will increase the amount of stormwater runoff and pollutant level from the site. To manage these increases the opportunity exists to incorporate "treatment trains" within the development. Due to the topography of the site, the catchment discharge points are well defined thus allowing the treatment trains to be placed in the most beneficial locations. Some constraints do exist for the development,

- The site is subject to local Q100 flood levels and Q100 back water flood levels from the Brisbane River.
- The site is subject top a VPO that will effect the possible locations of the treatment trains.

Being a "Green Field" site, the opportunities to incorporate best practice for stormwater discharge and treatment outweigh the constraints.

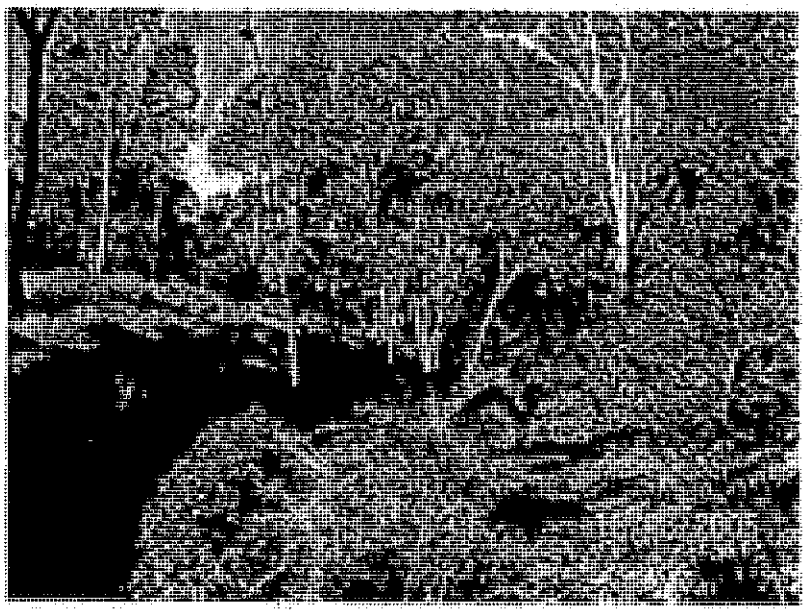


Figure 2 Typical Existing Site Conditions Woogaroo Creek

5. STORMWATER QUALITY

This section of the report details at design level what treatment train needs to be incorporated into the design of the stormwater system to ensure water quality objectives are achieved. A computer model of the development has been analysed to demonstrate that the pollutant levels in the stormwater discharged from the site comply with the pollutant levels identified in Set A of Ipswich City Council's guidelines.

The main pollutants typically generated by the proposed development are listed below.

Construction Phase:

- Litter from construction packaging, paper, food packaging, off cuts, etc.
- Sediment from erosion of exposed soils and stockpiles.
- Hydrocarbons - from fuel and oil spills, leaks from construction equipment.
- Toxic Materials - cement slurry, solvents, cleaning agents, wash waters.
- pH altering substances - cement slurry, wash waters.

Operations Phase:

- Litter - paper.
- Sediment - from erosion of exposed soils and stockpiles on house sites.
- Oxygen demanding substances - organic matter.
- Nutrients - from fertilisers.

a. Treatment Options Investigated

Several different treatment trains for the development were considered for this development, before the final train was decided a few of the alternative option that were considered are as follows:

- The use of permeable pavement such as hydro pave was considered, but with further investigation was deemed unfeasible because of the high maintenance costs.
- The use of a wetland was ruled out because of area restraints and safety problems.
- Grassed swales along the overland flow paths were considered but because of the concrete footpaths within these overland flow paths there is not enough room left to construct a swale.
- The use of ponds and extended detention was considered but because of safety concerns was ruled out.
- The use of underground systems such as the Storm tech underground permeable chambers, were considered but were ruled out due to their high capital cost and concerns as to their efficiency.
- Bio retention and extended detention were considered and because of the site restriction were considered to be the best outcome for the development.

b. Computer Modelling Analysis

Pollutant modelling for the development has been generated using the modelling program 'Model for Urban Stormwater Improvement Conceptualisation' (MUSIC). Two models for the development were generated a

model showing existing conditions and a developed mitigated / unmitigated for the site.

1. Computer Modelling of Existing Site Conditions

The following points have been assumed within the model showing the existing site conditions.

- One forest source node for the site has been used with a 30% impervious area
- A 0% effective impervious area has been assumed, as per BCC's guidelines
- Al other input parameters are as per BCC's guidelines
- No treatment nodes have been used in this model.

Computer Modelling Input Parameters

Catchment Properties	
Catchment Name	**RESSGO~2**
Rainfall Station	40910 AMBERLEY
Et Station	User-defined monthly PET
Start Date	1/01/1980 12:00 AM
End Date	31/12/1990 11:54 PM
Modelling Time Step	6 Minutes

Source Node

Node 1	
Location	**Forest**
Pervious area	70%
Impervious area	30%
Rainfall threshold	1mm/hr
Pervious are properties	
Soil storage capacity	120mm
Initial storage	25%
Field capacity	80mm
Infiltration capacity coefficient - a	2000
Infiltration capacity exponent - b	1
Ground water properties	
Initial depth	50mm
Daily recharge rate	25%
Daily base flow rate	5%
Daily seepage rate	0%
Total suspended solids	
Base flow concentration parameters	
Mean	0.51
Std deviation	0.28
Estimation method	Stochastically generated
Storm flow concentration method	
Mean	1.9
Std deviation	0.2
Estimation method	Stochastically generated
Serial correlation	0
Total Phosphorus	

Base flow concentration parameters	
Mean	-1.79
Std deviation	0.28
Estimation method	Stochastically generated
Storm flow concentration method	
Mean	-1.1
Std deviation	0.22
Estimation method	Stochastically generated
Serial correlation	0
Total Nitrogen	
Base flow concentration parameters	
Mean	-0.59
Std deviation	0.22
Estimation method	Stochastically generated
Storm flow concentration method	
Mean	-0.075
Std deviation	0.24
Estimation method	Stochastically generated
Serial correlation	0

2. Computer Modelling of Developed Site Conditions

The following points have been assumed within the model.

- All sub-catchment areas are as per the areas determined on the catchment plan. The impervious areas for each sub-catchment have been varied to account for the land use within the catchment.
- A seepage loss rate of 0mm/hr has been assumed in modelling as soils test have yet to be undertaken.
- All other parameters used within the modelling were based on BCC standards as noted in the BCC guidelines for pollutant export modelling in Brisbane Version 7 – draft 2
- Defaults for the gross pollutant trap have been used in the modelling.
- At the system discharge point for the catchment, a 40m long 2m wide and 1m deep bio infiltration swale and a 470sqm bio infiltration basin have been modelled. And extended detention depth of 350mm is proposed within the basin area.
- The effective impervious area for the catchment is 60%, which is based on an average lot approx 600sqm with 20m of road frontage. The lot having a house approx 300sqm and driveways / patios etc of approx 100sqm.

4C

Computer Modelling Input Parameters

Catchment Properties	
Catchment Name	RESSGO~1
Rainfall Station	40223 BRISBANE
Et Station	User-defined monthly PET
Start Date	1/01/1990 12:00 AM
End Date	31/12/1990 11:54 PM
Modelling Time Step	6 Minutes

Source Nodes

Node 1	
Location	Urban
Pervious area	40%
Impervious area	60%
Rainfall threshold	1mm/hr
Pervious are properties	
Soil storage capacity	400mm
Initial storage	10%
Field capacity	80mm
Infiltration capacity coefficient - a	50
Infiltration capacity exponent - b	1
Ground water properties	
Initial depth	50mm
Daily recharge rate	25%
Daily base flow rate	5%
Daily seepage rate	0%
Total suspended solids	
Base flow concentration parameters	
Mean	1
Std deviation	0.34
Estimation method	Stochastically generated
Storm flow concentration method	
Mean	2.18
Std deviation	0.39
Estimation method	Stochastically generated
Serial correlation	0
Total Phosphorus	
Base flow concentration parameters	
Mean	-0.97
Std deviation	0.31
Estimation method	Stochastically generated
Storm flow concentration method	
Mean	-0.47
Std deviation	0.31
Estimation method	Stochastically generated
Serial correlation	0

Total Nitrogen	
Base flow concentration parameters	
Mean	0.2
Std deviation	0.2
Estimation method	Stochastically generated
Storm flow concentration method	
Mean	0.26
Std deviation	0.23
Estimation method	Stochastically generated
Serial correlation	0

Treatment Nodes

Node 1	
Location	**Gross pollutant trap**
Inlet properties	
Low flow b-pass	0
High low bypass	100
Transfer functions	
Total suspended solids	
Input	1000
Output	1000
Total Phosphorus	
Input	5
Output	5
Total Nitrogen	
Input	50
Output	50
Gross Pollutants	
Input	15
Output	15

Node 2	
Location	**Bio infiltration**
Inlet properties	
Low flow b-pass	0
High low bypass	100
Storage properties	
Extended detention depth	0.35m
Surface area	520sqm
Seepage loss	0mm/hr
Infiltration properties	
Filter area	520sqm
Filter depth	1m
Filter media particle diameter	0.01mm
Saturated hydraulic conductivity	36mm/hr
Depth beflow underdrain	0%
Outlet properties	
Overflow weir width	2m
Advanced Properties	
Weir coefficient	1.7
Voids ratio	0.3
Number of CSTR cells	3
Total suspended solids	K= 8000 c*= 20
Total phosphorus	K= 6000 c*=0.13
Total nitrogen	K= 500 c*= 1.4

4

c. Modelling Results

In summary the results of the modelling has shown that

- A gross pollutant trap is required to remove gross pollutants and course sediments.
- Bio infiltration with an area of 520sqm at 1m deep with sandy clay filter material is required to remove and filter out fine sediment and the pollutants Nitrogen and Phosphorous.
- Also extended detention of 520sqm at 350mm deep is required to further improve water quality to meet councils load based objectives of 80%TSS, 60%TP, 45%TN and 90% gross pollutants.
- There are no soils tests available as yet. The seepage rate for the soil on site could be higher and may improve water quality above what is modelled.

From a trial using simple treatment methods for the proposed development, an acceptable treatment train was chosen.

Refer to Appendix 'B' for the model outputs such as schematic layouts and graphical outputs of pollutant modelling results for each catchment.

The Treatment Train Effectiveness

	Pre Development loads	Unmitigated loads	Mitigated loads	Reduction
Flow (ML/yr)	22.5	31.3	31.4	-0.1%
Total Suspended Solids (kg/yr)	1610	5400	680	87.4%
Total Phosphorus (kg/yr)	1.71	11.9	2.8	76.5%
Total Nitrogen (kg/yr)	19.1	63.2	32.8	48%
Gross Pollutants (kg/yr)	529	614	0	100%

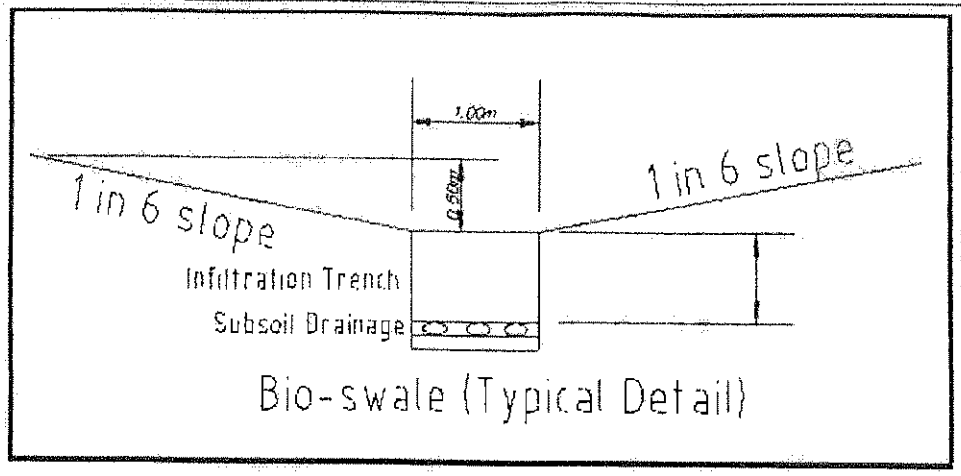


Figure 3 Typical Bio-retention swale

d. Erosion And Sediment Control

Erosion and sediment control will be established and maintained in accordance with Council's current standards of best practice. A detailed erosion and sediment control plan showing how this issue will be managed is attached in Appendix C.

8. STORMWATER MANAGEMENT OPTIONS

In summary the investigations into stormwater runoff within the development indicate that the management options should include.

- The release of stormwater before the flooding of the Brisbane River and Woogaroo Creek occurs
- Water quality improvement devices such as natural channels and bio-swales as noted in section 6 of the report and on the drawings in Appendix C.

9. STORMWATER QUALITY IMPLEMENTATION AND STAGING

Purpose:	
Element	To maintain or enhance pre-development water quality and natural vegetation during the construction and operation of the development. Compliance with this objective is to meet requirements set out in the *Environmental Protection Act* (1994) the *Environmental Protection (Water) Policy* (1997) and Guideline on Identifying and Applying Water Quality Objectives.
Policy	The Principal Contractor is to be made aware of the requirements with respect to water quality within the *Environmental Protection Act* (1994) and the *Environmental Protection (Water) Policy* (1997) at the time of tendering. The Principal Contractor is to implement the measures for *Erosion and Sediment Control* to reduce

	contaminants entering the waterway system. Refer to the *Erosion and Sediment Control* section for full details.
Performance Indicators	Measured levels for water quality indicators shall fall within the value range as set out in the ICC guidelines. In addition the measured levels shall not exceed the baseline levels by more than 10% during the construction period and the measured levels shall not exceed the baseline levels during the maintenance period.
Monitoring	Monitoring frequency shall be in accordance with industry standards. In addition, visual inspections will be performed periodically, but at no less than fortnightly intervals, during the construction and maintenance period and during seasons of traditionally low rainfall (autumn, winter). Visual inspections performed periodically, but at no less than weekly intervals during the construction and maintenance period and during seasons of traditionally high rainfall (spring, summer). Undertake tests after any significant rainfall in any 24-hour period. A significant rainfall event is defined as rainfall of more than 20mm as measured by the Bureau of Meteorology at the nearest rain gauging station.
Reporting	The ETS Group shall receive the results of any testing and analysis conducted by the testing authority. Comparison of results with the baseline measurements shall be undertaken and the comparison results and recommendations reported on a monthly basis along with production of an annual report that will summarise the results for the year and identify any trends.
Corrective Action	Identify the reasons for the deterioration of water quality and determine if it is linked to construction activities. If construction activities are responsible, then isolate the specific cause and determine the best method to prevent the incident from occurring again. The work practice causing the pollution is to cease immediately and clean-up operations to commence immediately and to be completed within 5 working days. If other sources are responsible, then notify the Local Authority of the situation for their action.

Erosion and Sedimentation Management

Purpose:	
Element	To minimise the adverse impact on the quality of the environment by: • Minimising the potential of on-site erosion; and • Controlling the off-site deposition of sediment, In accordance with the requirements of the Environmental Protection Policy (Water) 1997 and the Ipswich City Council's Erosion and Sediment Control Standard.
Policy	These objectives will be achieved by the implementation of an Erosion and Sediment Control Program during the construction phase of the development.
Performance Requirements	The preparation of an Erosion and Sediment Control Program will be the responsibility of the ETS Group as consulting engineers for the development. The program will consist of the following elements: • The characteristics of the site will be investigated including a soils investigation to determine soil characteristics as they apply to soil erosion and sediment control; • The existing of proposed drainage patterns will be determined; • Areas suitable for stockpiling soil and construction materials will be identified; • The need for temporary erosion control devices will be assessed and suitable devices selected; • Medium and long term measures to rehabilitate and stabilise the site will be formulated; • Preparation of erosion and sediment control plans as required by Council's Subdivision Approval. The control plans will be designed in accordance with: o ESC Standard, Ipswich City Council o Design of sediment basins, Brisbane City Council

	○ Soil Erosion and Control, Engineering Guidelines for Queensland Sites, Institute of Engineers The control plans will incorporate the following: • Design details of structures; • A program for implementation and phasing of erosion control activities; and • An on going program detailing maintenance and servicing requirements of control structures. This document will be dynamic and as such will be subject to scrutiny and revision as the development progresses.
Performance Requirements	The following indicators are used to gauge the implementation and effectiveness of the Erosion and Sediment Control Plan (ESCP) process: **Construction Phase** • Installation of temporary erosion and sediment control devices in accordance with contract documentation and a council approved ESCP to this site; • Maintenance of temporary erosion and sediment control devices; • Minimal evidence of erosion after significant rainfall; • Capture of sediment within devices after significant rainfall; and • Measured levels for water quality in the area below the flood line within acceptable levels. • Compliance with Ipswich City Council's ESC standard. **Maintenance Phase** • Installation of temporary and permanent erosion and sediment control devices prior to the establishment of ground cover in accordance with the contract documentation and the approved ESCP; • Maintenance of temporary and permanent erosion and sediment control devices; • Minimal evidence of erosion after significant rainfall; • Capture of sedimentation within devices after significant rainfall; • The presence and maintenance of grass strike and turfed areas; and • Measured levels for water quality in the area below the flood line within acceptable levels. • Compliance with Ipswich City Council's ESC standard. **Post Maintenance** • Maintenance of permanent sedimentation control devices; • Negligible erosion after significant rainfall; • Capture of sediment within devices after significant rainfall; • Maintenance of grass strike and turfed areas; and • Measured levels for water quality in the area below the flood line within acceptable levels.
Monitoring	The monitoring of erosion and sediment control processes will be a periodical visual inspection by ETS Group and/or the Principal Contractor but at no less than weekly intervals during the construction and maintenance periods.
Reporting	The ETS Group will: • During periodic site inspections ensure that all erosion and sediment controls are installed and maintained in accordance with the Contract Documents; Ipswich City Council's Erosion and Sediment Control Standard and the approved ESCP. • Instruct the Principal Contractor to install additional measures to prevent erosion as determined necessary during periodic site inspections; and • Liaise with Ipswich City Council's inspection officer during the construction and maintenance periods. • Liaise with Ipswich City Council's Erosion and Sediment Control Standard Officer.
Corrective Action	The superintendent in consultation with the Principal Contractor is to determine the source and the reason for the erosion and/or sedimentation and: • Implement measures to prevent further erosion occurring; and/or • Locate the source of the sediment entering the system and implement

	measures to prevent further ingress of sediment to the system; and • Where practicable remove the sediment deposited in the system.

Noise and Dust Management

Purpose:	
Element	To minimise the impact of noise and dust nuisance generated by earthworks and construction activities and maintain amenity for adjoining residents. Compliance with this objective is to meet the requirements set out in the Environmental Protection Reg. 1998 Part 2A Environmental Nuisance.
Policy	All works undertaken on site are to comply with the above documents.
Performance Requirements	**Noise** ETS Group's Civil Engineering Works Specification Clause 9 included within the contract with the Principal Contractor nominates the following normal hours of on site work: • *6.30am to 6.30pm Monday to Saturday or business days* • *No work on Sundays or Public Holidays* *Any construction or earthworks activities outside of the hours nominated above will only be permitted with the prior written approval of both the Principal and the relevant Local Authority delegate.* **Dust** ETS Group's Civil Engineering Works Specification Clause 21 included within the Contract with the Principal Contractor specifies: • *Dust generated from the site and from earthworks is to be controlled so as not to adversely affect adjoining properties, and to meet the requirements of the Environmental Protection Act.* • *No visible dust emissions must occur at the boundaries of the site during earthworks and construction activities on the site.* • *If at any time during the earthworks and construction activities, dust emissions exceed the levels specified above, dust-generating activities must cease until sufficient corrective actions have been implemented to reduce dust emissions to acceptable levels or wind conditions are such that acceptable levels are achieved.* • *In order to ensure minimal response times for implementation of corrective actions and continuity of the construction processes, watering equipment shall be available on site at all times during earthworks and construction activities to dampen down disturbed areas.*
Monitoring	The monitoring and control of both noise and dust nuisance is to be a continuous process for the duration of the earthworks and construction activities at all times including non working days.
Reporting	The superintendent is to take note of noise and dust levels: • During regular site inspections throughout the earthworks and construction activities; and • Immediately following receipt of any complaints.
Corrective Action	The superintendent in consultation with the Principal Contractor is to determine the source of the unacceptable noise and dust emissions and; • Devise a method to attenuate offending noise emissions either through maintenance of plant or revised work practices, and • Reduce dust emissions through either: o Suspension of works until weather conditions are favourable; o Damping down of work areas; or o Revision of work practices.

Landscaping

Purpose: Reduce environmental impacts from	
Element	There are two very distinct yet similar landscape objectives on this site • Rehabilitation of the Natural Landscape Environment The objective in these areas is, to create a landscape environment that maintains the natural habitats of the sites flora and fauna. • Enhancement of the Developed Environment The objective in these areas is to create a functional and dynamic landscape environment that enhances the transition between the built and natural areas of the estate. These landscapes should be designed to require minimal maintenance once established.
Policy	The objectives will be achieved by following the guidelines laid down in the Ipswich City Council's Environmental Best Management Practices when rehabilitating an area or designing a new landscape in the streetscape and drainage reserve area. The extent of the rehabilitation and landscape works will be determined during the engineering design phase. Rehabilitation and landscape plans based on consultation with Council Officers will then be developed and submitted for approval prior to any construction commencing.
Performance Requirements	**Enhancement of the Developed Environmental** The current landscape theme for the Estate is a combination of semi formal entry statements using native and exotic plant material. These landscape themes provide a functional and relatively low maintenance landscape environment. The development's landscaping is detailed in plans submitted to and approved by Ipswich City Council. While this will continue it is recommended that the landscape designs follow the guideline below. All landscaping will enhance the built and natural environment of the Estate. • All landscaped areas will be designed to require low levels of maintenance. • All landscaping immediately bounding any natural undisturbed parkland shall provide a transition zone between the built and natural environment. Plants used in these areas will be a 60 - 40 mix of endemic native and native species.
Performance Indicators	Performance indicators will be used to assess the effectiveness of the landscape rehabilitation works. These indicators will be; • A detailed landscape plan will be submitted and approved by ICC prior to any work being carried out in the designated area. • A site inspection is to be carried out by ICC at the completion of the construction phase. This inspection will be to establish an 'on-maintenance' start date. • Maintenance of the site will be as detailed in the landscape construction and maintenance plans submitted to ICC prior to any works commencing. • The Landscape Consultant will monitor the works during construction and maintenance to ensure the rehabilitation and landscape work is carried out as per the approved plan.
Monitoring	During the construction of the rehabilitation and landscape works the site will be inspected a minimum of once per week to ensure all works are being conducted as planned.
Reporting	The Landscape Consultant will; • Provide the Landscape Contractor with any additional information or recommendations to ensure the standard of rehabilitation and landscape works are constructed to or above the approved landscape design.
Corrective Action	The Landscape Consultant in conjunction with the Superintendent will; • Determine the extent of the corrective action required

	• Identify the reason for the corrective action being required • Provide the Principal Contractor with the recommendations required to correct the problem and ensure it will not reoccur.

10. LIFECYCLE COST ASSESSMENT

The developer will fund the initial capital cost of a system to convey and treat stormwater runoff. The lifecycle of the above management options can be stated as relatively long. This is due to the use of structural devices with long design life and natural systems that are self-regulating. Maintenance costs associated with such management options will be high in the early stages of the life cycle but as the developed area stabilises the costs will decrease. Due to the long life of the devices it can be stated that a very low lifecycle cost will be achieved. All maintenance of the proposed devices will become council's responsibility after the 12-month maintenance period, upon acceptance on maintenance.

11. WATER QUALITY MONITORING PROGRAM

A water quality-monitoring program may be required for the site under the conditions imposed by the Development Permit. Below is a conceptual phase monitoring program that will be updated to a detailed design level for inclusion with the Operational Works Application. The site has no base flow of water during dry periods and as such the monitoring program will focus on stormwater discharge quality during construction and the quality of the ecological health during the maintenance period.

Objective / Target	To maintain or enhance pre-development water quality and natural vegetation during the construction and maintenance period. Compliance with this objective is to meet requirements set out in the *Environmental Protection Act (1994)*, the *Environmental Protection (Water) Policy (1997)* and the *Ipswich City Council Engineering Manual.*
Management Strategy	During construction • To reduce the amount of contaminants entering the waterway system by using best practices. Refer to the Sediment and Erosion Control Plan. • Retention of existing vegetation along the waterway corridor (where applicable) with the early establishment of landscaping and rehabilitation work to minimise the potential mobilisation of contaminants. Post construction and during the Maintenance Period • Regular inspection of the works to ensure flora is establishing, contaminants are being removed and that the system's ecological health is of an acceptable quality.
Tasks / Actions	• During construction the Principal Contractor is to ➢ Be made aware of the requirements regarding the water quality issues on the site. ➢ Implement the measures and methodology detailed in the Erosion and Sediment Control Plan to reduce contaminants entering the waterway system

	➢ Perform monitoring of the quality of water based on rainfall events or discharge requirements using hand sampling and visual assessment techniques. • Landscape and rehabilitation works are to be completed as required during the construction phase to ensure protection of sensitive areas. • During the maintenance period perform monitoring of the quality of water based on rainfall events or periodic inspection, using hand sampling and visual assessment techniques.
Performance Indicators	• Capture of sediment and litter in the Sediment and Erosion control devices. • Visual indicators of the efficient removal of nutrients such as nitrogen and phosphorus. Such indicators include growth of flora, fauna within the area, an ecological health assessment, etc.
Frequency / Deadline	Visual inspections shall be performed periodically, but at no less than weekly intervals during the construction period, monthly during the maintenance period and after any significant rainfall in any 24-hour period.
Responsible Party	During the construction phase of the development the Principal Contractor is responsible for maintaining the quality improvement devices and strategies The Superintendents for civil works and landscape works will be responsible for carrying out visual inspections and ordering any corrective action required. The Principal Contractor will notify the Superintendents if any changes occur in the conditions on site so that inspections can be carried out. During the maintenance period of the development the Superintendents will carry out inspections and order any corrective action required.
Reporting and Review	During construction • Site notes will be made of any inspections / tests carried out. A copy of these notes can be supplied to the Council Inspection Officer as requested. • All works will be inspected by Council Inspection Officer's prior to acceptance "On Maintenance" to ensure the Objective / Target is being achieved and that the Performance Indicators are in place. During the Maintenance Period • Site notes will be made of any inspections / tests carried out. A copy of these notes can be supplied to the Council Inspection Officer as requested at time of "Off Maintenance". • All works will be inspected by Council Inspection Officer's prior to acceptance "Off Maintenance" to ensure the Objective / Target has been achieved.
Corrective Action	• Identify the reasons for the deterioration of water quality and determine if it is linked to construction activities. • If construction activities are responsible, then isolate the specific cause and determine the best method to prevent the incident from occurring again. • The work practice causing the pollution is to cease immediately and clean-up operations to commence immediately and to be completed within 5 working days. • If other sources are responsible, then notify the Local Authority of the situation for their action.

Table 1 Water Quality Monitoring

12. MAINTENANCE PLANS AND ASSET HAND-OVER

The majority of the drainage system and water quality treatment devices will become council asset. A maintenance plan will be completed if required by Ipswich City Council and submitted at acceptance of the works 'Off Maintenance' when the asset will become Council's responsibility.

13. STORMWATER QUALITY MAINTENANCE

Key stormwater quality treatment devices requiring maintenance during the operational works phase of the project are trash racks, and bio infiltration filters.

Maintenance of the trash racks consists of:

- Regular inspections to ensure no clean out required.
- Clean out of sediment and gross pollutants.

Maintenance required for Bio retention within swales and within detention basins consists of:

- Regular and storm event inspections to insure:
  - Sufficient vegetation is still established,
  - No erosion has occurred: and
  - Any cleanup required is undertaken.
- Regular mowing/ harvesting to ensure vegetation is maintained at acceptable levels.
- Removal of litter.

MAINTENANCE PLAN DETAILS
GROSS POLLUTANT TRAPS

SCHEDULE OF SITE VISITS													
Purpose of Visit	Frequency	J	F	M	A	M	J	J	A	S	O	N	D
Routine inspection	Half /year	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Annual inspection	1/year				✓								
Routine maintenance	4/year		✓		✓				✓				✓
Routine clean out of sediment	1 year				✓								

The above schedule is a guideline only. Routine clean out sediment and gross pollutants should be scheduled based on the outcome of routine inspection and/or manufacturers guidelines.

INSPECTION	
1.	**Routine Inspection**
1.1	. Routine inspection should be carried out on a regular monthly basis. The purpose of the inspection is to indicate when cleanout of the GPT is required.
1.2	The depth of sediment/gross pollutant in the GPT should be measured according to design specifications.
1.3	Complete an appropriate Maintenance Form. Routine cleanout of sediment/gross pollutants should be scheduled when the depth of sediment/gross pollutants in the GPT exceed design levels.
2.	**Annual Inspection**
2.1	Once a year, the condition of the GPTs should be closely inspected. Any damage or problems

	should be noted on the Maintenance Form for action.

ROUTINE MAINTENANCE

1.	**Purpose**
1.1	Routine maintenance of the GPT involves weed control and the collection of any gross pollutants, if required.
2.	**Weed Management**
2.1	If weeds have been observed during the routine inspection, these weeds should be removed by the GPT. Weeding generally involves manual removal of perennial species.
2.2	The aim is to remove the weed including the roost when the weeds are less than 3 months old; otherwise weeds infestation rapidly occurs and is difficult to control.
2.3	Herbicides should not be used, as they would contaminate the water in the creek.
2.4	The weeds should be disposed offsite at appropriate waste management facility.
2.5	Replant appropriate plant species, where necessary, in areas that have been extensively weeded.
3.0	**Gross Pollutant Management**
3.1	Remove and dispose of gross pollutants that may be visible around the GPT perimeter.

CLEAN OUT OF SEDIMENT

1.	**Set up and Prepare Site for Cleanout**
1.1	Notify adjacent residents of cleanout at least three days prior to date of cleanout.
1.2	Setup equipment onsite including pump.
2.	**Cleanout of Sediment**
21.	The preferred method of cleanout of the GPT is by using equipment as specified by the GPT designer.
2.2	Position the equipment on the side of the GPT to allow easy access into the sediment area and transfer of material into adjacent tipper truck/ disposal bins etc. The truck should be positioned so that water from the truck body drains into the GPT.
2.3	Drain waste in the truck thoroughly before proceeding to the disposal point.

MAINTENANCE PLAN DETAILS
EXTENDED DETENTION BASINS

SCHEDULE OF SITE VISITS

Purpose of Visit	Frequency	J	F	M	A	M	J	J	A	S	O	N	D
Routine inspection	Half /year	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Annual inspection	1/year			✓									
Routine maintenance	2/year	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Clean out of sediment	5 year			✓									

The above schedule is a guideline only Routine clean out and maintenance should be scheduled based

on the outcome of routine inspection

INSPECTION	
1.	Routine Inspection
1.1	Routine inspection should be carried out, as a minimum, on a regular monthly basis The purpose of the inspection is to indicate when maintenance of the extended detention basin is required
1.2	Inspections should consider erosion sediment deposition, condition of vegetation, ponded water.
1.3	Complete appropriate Maintenance Form. Maintenance is required if: · Excessive erosion has occurred · Excessive sediment deposition has occurred · Vegetation is over grown · Water is ponding for excessively long periods of time.
2.	Annual Inspection
2.1	Once a year, the condition of the extended detention basin should be closely inspected. Any damage or problems should be noted on the Maintenance Form for action.

ROUTINE MAINTENANCE	
1.	Purpose
1.1	Routine maintenance of the extended detention basin involves weed control and the collection of any litter, removal of dead or diseased vegetation (eg. Reeds), and mowing of embankments.
2.	Weed Management
2.1	If weeds have been observed during routine inspection, these weeds should be removed from the extended detention basin. Weeding generally involves manual removal of perennial species.
2.2	The aim is to remove the weed including the roots when the weeds are less than 3 months old; otherwise weeds infestation rapidly occurs and is difficult to control.
2.3	Herbicides should not be used as they may contaminate the water in the orchid habitat.
2.4	The weeds should be disposed of appropriately.
2.5	Replant appropriate plant species, where necessary, in areas that have been extensively weeded.

3.0	Litter Management
3.1	Remove and dispose of litter that may be visible around the extended detention system.

4.	Dead or Diseased Vegetation
1.4	Remove or dispose of any dead or diseased vegetation within system
5.	Mowing of Embankments
5.1	Mowing will be required to maintain grass at reasonable levels.

CLEANOUT OF SEDIMENT	
1.	Setup and Prepare Site for Cleanout

1.1	Notify necessary parties at least three days prior to date of cleanout
1.2	Setup equipment onsite.
2.	**Cleanout of Sediment**
2.1	The preferred method of cleanout of the extended detention basin is removing the clogged medium.
2.2	Position the equipment on the side of the system to allow easy access into the extended detention basin and transfer of material into adjacent tipper truck/ disposal bins etc.
2.3	Remove waste in a truck at an appropriate disposal point.

MAINTENANCE PLAN DETAILS
BIO RETENTION SYSTEMS

SCHEDULE OF SITE VISITS

Purpose of Visit	Frequency	J	F	M	A	M	J	J	A	S	O	N	D
Routine inspection	Half /year	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Annual inspection	1/year				✓								
Routine maintenance	2/year				✓						✓		
Routine clean out of sediment	1/2 year				✓								

The above schedule is a guideline only. Routine clean out and maintenance should be scheduled based on the outcome of routine inspection.

INSPECTION

1.	**Routine Inspection**
1.1	Routine inspection should be carried out on a regular monthly basis. The purpose of the inspection is to indicate when maintenance of the Bio retention system is required.
1.2	Inspections should consider erosion, condition of vegetation, ponded water.
1.3	Complete appropriate Maintenance Form. Maintenance is required if failure of the above sediment.
2.	**Annual Inspection**
2.1	Once a year, the condition of the bio retention system should be closely inspected. Any damage or problems should be noted on the Maintenance Form for action.

ROUTINE MAINTENANCE

1.	**Purpose**
1.1	Routine maintenance of the bio retention system involves weed control and the collection of any litter, removal of dead or diseased vegetation, and mulch replacement.

2.	**Weed Management**
2.1	If weeds have been observed during routine inspection, these weeds should be removed from the bio retention system. Weeding generally involves manual removal of perennial species.
2.2	The aim is to remove the weed including the roots when the weeds are less than 3 months old; otherwise weeds infestation rapidly occurs and is difficult to control.
2.3	Herbicides should not be used, as they would contaminate the water in the creek.
2.4	The weed should be disposed offsite at appropriate waste management facility.
2.5	Replant appropriate plant species, where necessary, in areas that have been extensively weeded.
3.	**Litter Management**
3.1	Remove and dispose of litter that may be visible around the bio retention system.

4.	**Dead or Diseased Vegetation**
4.1	Remove or dispose of any dead or diseased vegetation within system
5.	**Mulch Replacement**
5.1	Mulch replacement is recommended when erosion is evident or system looks unattractive.

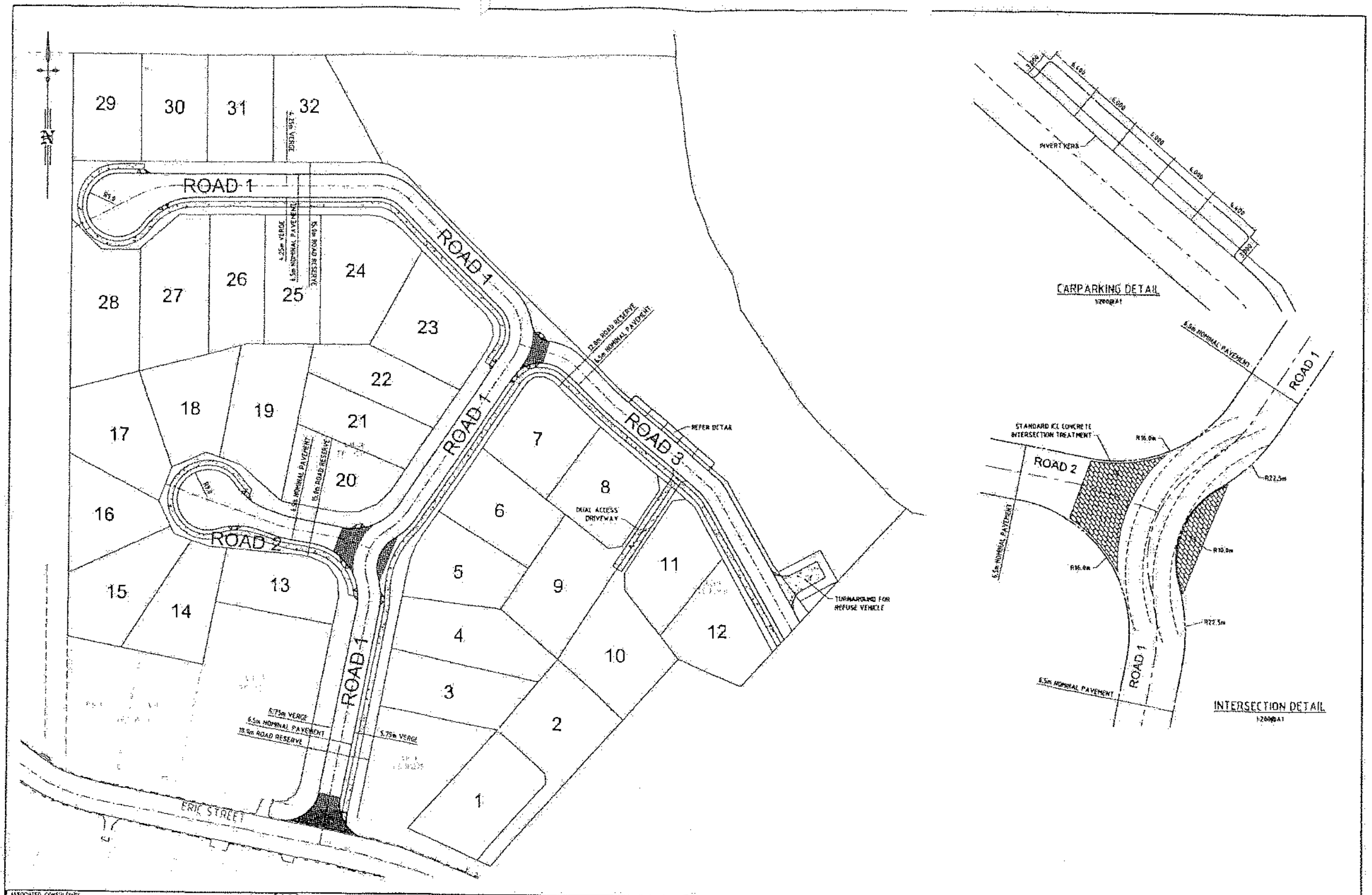
CLEANOUT OF SEDIMENT	
1.	**Setup and Prepare site for Cleanout**
1.1	Notify adjacent residents at least three days prior to date of cleanout.
1.2	Setup equipment onsite
2.	Cleanout of Sediment
2.1	The preferred method of cleanout of the bio retention system is replacing the clogged medium.
2.2	Position the equipment on the side of the system to allow easy access into the bio retention system and transfer of material into adjacent tipper truck. The truck should be positioned so that water from the truck body drains into the bio retention systems.
2.3	Drain waste in the truck thoroughly before proceeding to the disposals point.

14. REFERENCES

1. Ipswich City Council. *Engineering Works Manual*. Ipswich City Council, Ipswich.
2. Department of Primary Industries, et al, 1992. *Queensland Urban Drainage Manual (QUDM)*. Brisbane.
3. CRC for Catchment Hydrology, 2002. *Model for Urban Stormwater Improvement Conceptualisation (MUSIC)*. CRC for Catchment Hydrology, Melbourne.
4. Engineers Australia *Australian runoff Quality* Riverwood New South Wales
5. Bureau of Meteorology, *Meteorological data Amberley IFD 1980 - 1990*, Bureau of Meteorology

APPENDIX A

Site Layout



ASSOCIATED CONSULTANTS: ETS GROUP QLD	PRELIMINARY	CLIENT	RESCOM PROPERTY GROUP
		PROJECT	PROPOSED RESIDENTIAL SUBDIVISION
		LOCATION	ERIC STREET, GOODNA
		SHEET TITLE	FUNCTIONAL ROAD LAYOUT & CARPARK DETAILS

DESIGNED: L.P.K.
DRAWN: L.P.K.
DATE: NOVEMBER 2006
SCALE: 1 : 500 (A1 SIZE)

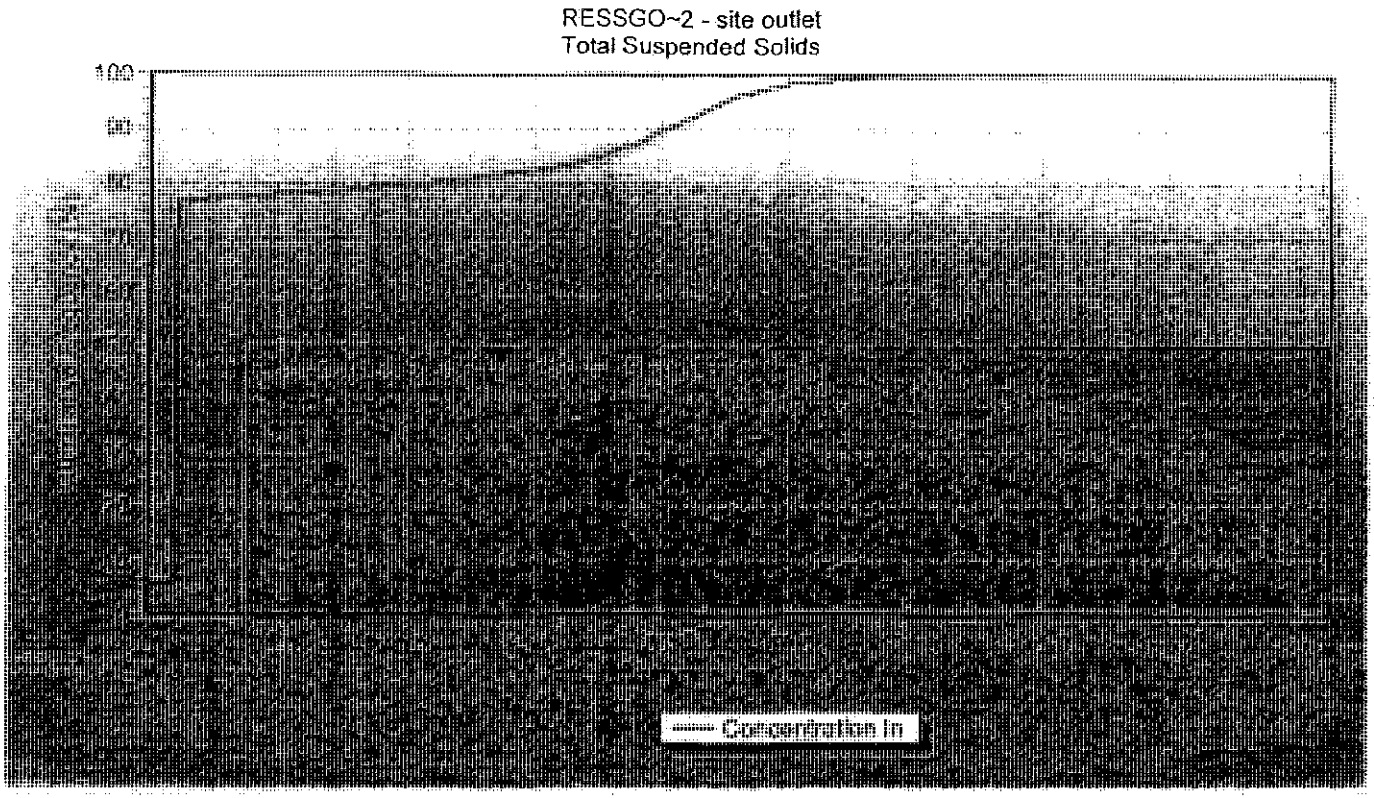
ETS GROUP — ARCHITECTS · ENGINEERS · INTERIOR DESIGNERS
AUSTRALIA · PAPUA NEW GUINEA
SINGAPORE · NEW ZEALAND · INDONESIA · UNITED ARAB EMIRATES

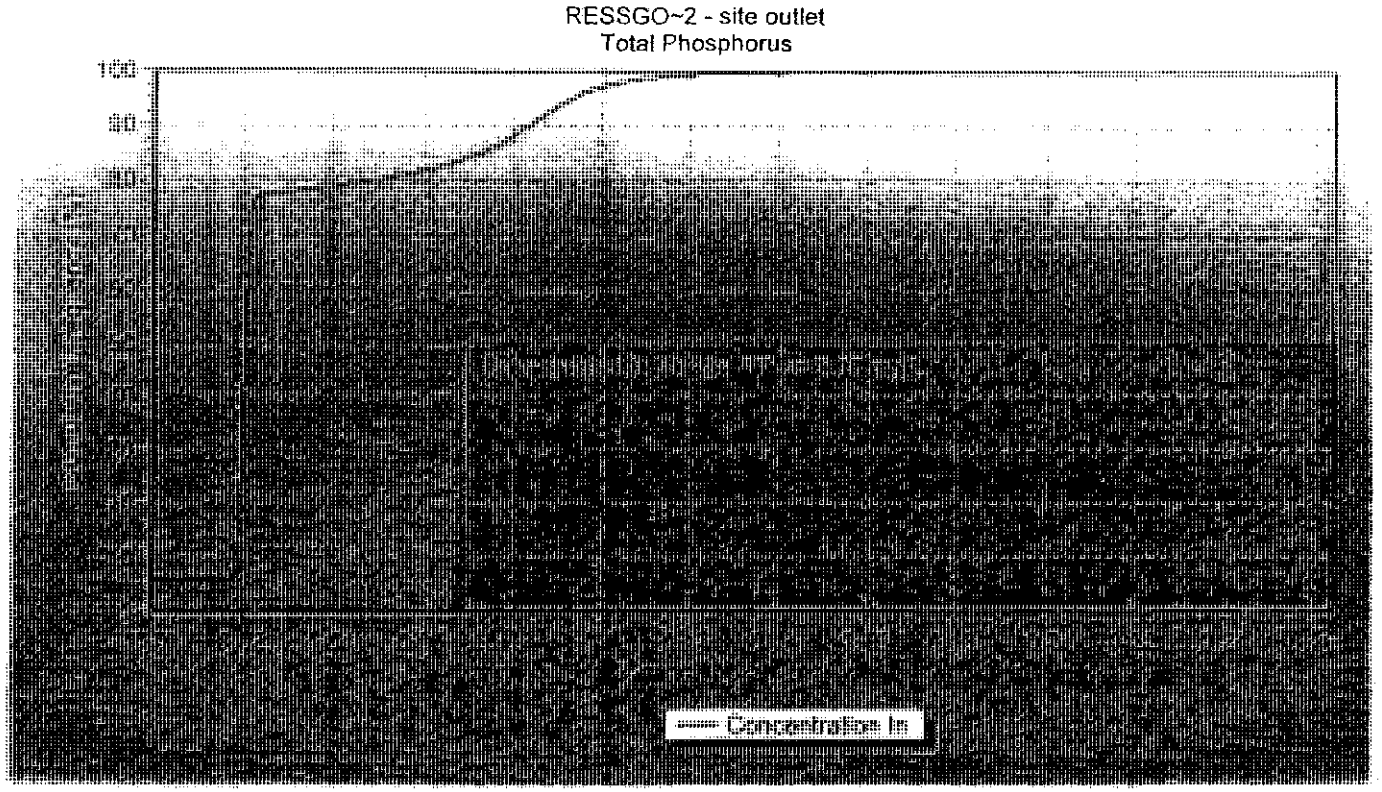
JOB CODE: RESSGO
SHEET NUMBER: FRL
REV: A

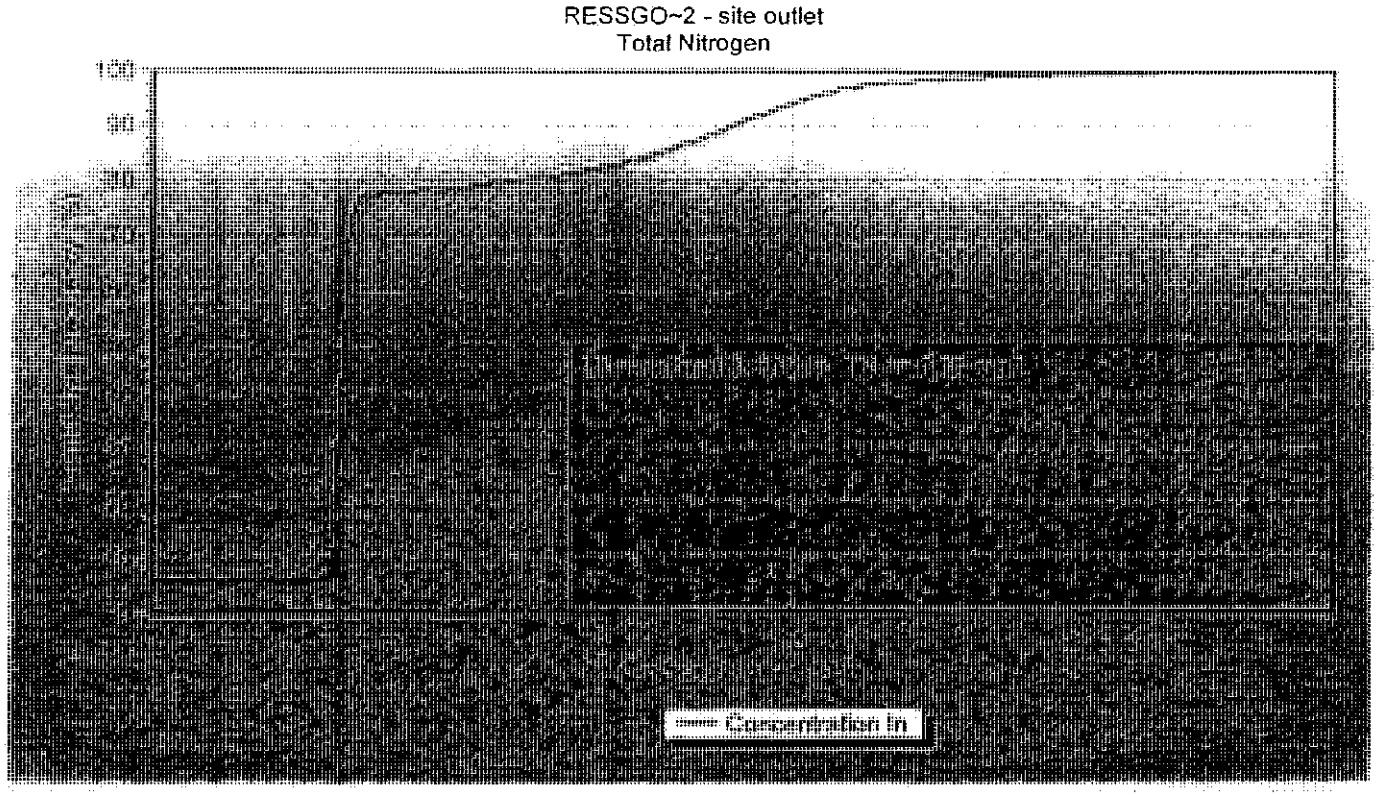
APPENDIX B

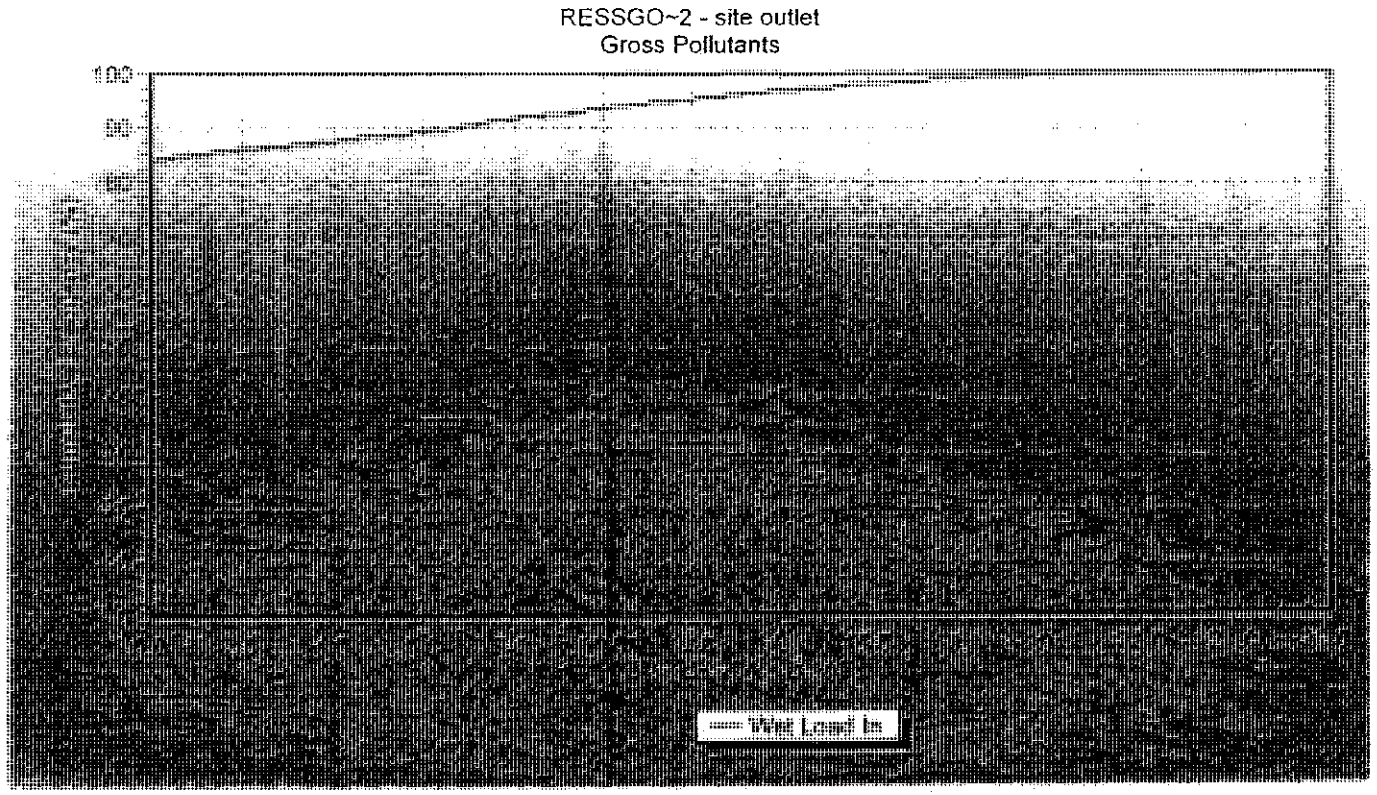
Stormwater Quality Details


Forest
site outlet


RESSGO~2 - site outlet
Total Suspended Solids
Concentration in


RESSGO~2 - site outlet
Total Phosphorus
100
80
60
Concentration


RESSGO~2 - site outlet
Total Nitrogen
Concentration In


RESSGO~2 - site outlet
Gross Pollutants
100
90
80
Wet Load: lb

Source nodes
Location,Forest
ID,1
Node Type,ForestSourceNode
Total Area (ha),4.032
Area Impervious (ha),1.21225263157895
Area Pervious (ha),2.81974736842105
Field Capacity (mm),80
Pervious Area Infiltration Capacity coefficient - a,200
Pervious Area Infiltration Capacity exponent - b,1
Impervious Area Rainfall Threshold (mm/day),1
Pervious Area Soil Storage Capacity (mm),120
Pervious Area Soil Initial Storage (% of Capacity),25
Groundwater Initial Depth (mm),50
Groundwater Daily Recharge Rate (%),25
Groundwater Daily Baseflow Rate (%),5
Groundwater Daily Deep Seepage Rate (%),0
Stormflow Total Suspended Solids Mean (log mg/L),1.9
Stormflow Total Suspended Solids Standard Deviation (log mg/L),0.2
Stormflow Total Suspended Solids Estimation Method,Stochastic
Stormflow Total Suspended Solids Serial Correlation,0
Stormflow Total Phosphorus Mean (log mg/L),-1.1
Stormflow Total Phosphorus Standard Deviation (log mg/L),0.22
Stormflow Total Phosphorus Estimation Method,Stochastic
Stormflow Total Phosphorus Serial Correlation,0
Stormflow Total Nitrogen Mean (log mg/L),-0.075
Stormflow Total Nitrogen Standard Deviation (log mg/L),0.24
Stormflow Total Nitrogen Estimation Method,Stochastic
Stormflow Total Nitrogen Serial Correlation,0
Baseflow Total Suspended Solids Mean (log mg/L),0.51
Baseflow Total Suspended Solids Standard Deviation (log mg/L),0.28
Baseflow Total Suspended Solids Estimation Method,Stochastic
Baseflow Total Suspended Solids Serial Correlation,0
Baseflow Total Phosphorus Mean (log mg/L),-1.79
Baseflow Total Phosphorus Standard Deviation (log mg/L),0.28
Baseflow Total Phosphorus Estimation Method,Stochastic
Baseflow Total Phosphorus Serial Correlation,0
Baseflow Total Nitrogen Mean (log mg/L),-0.59
Baseflow Total Nitrogen Standard Deviation (log mg/L),0.22
Baseflow Total Nitrogen Estimation Method,Stochastic
Baseflow Total Nitrogen Serial Correlation,0
OUT - Mean Annual Flow (ML/yr),22.5
OUT - TSS Mean Annual Load (kg/yr),1.61E3
OUT - TP Mean Annual Load (kg/yr),1.73
OUT - TN Mean Annual Load (kg/yr),19.2
OUT - Gross Pollutant Mean Annual Load (kg/yr),529

No Imported Data Source nodes

No USTM treatment nodes

No Generic treatment nodes

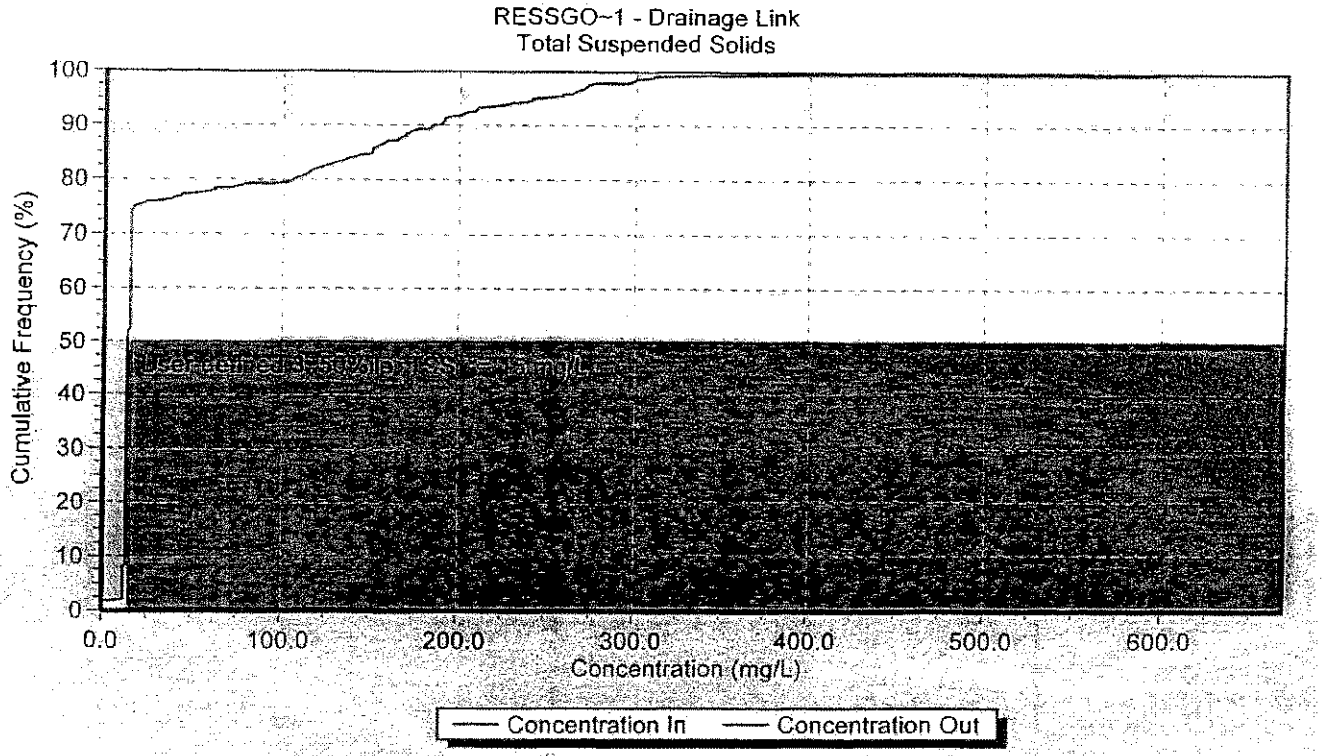
Other nodes
Location,site outlet
ID,2
Node Type,ReceivingNode
IN - Mean Annual Flow (ML/yr),22.5
IN - TSS Mean Annual Load (kg/yr),1.61E3
IN - TP Mean Annual Load (kg/yr),1.73
IN - TN Mean Annual Load (kg/yr),19.2

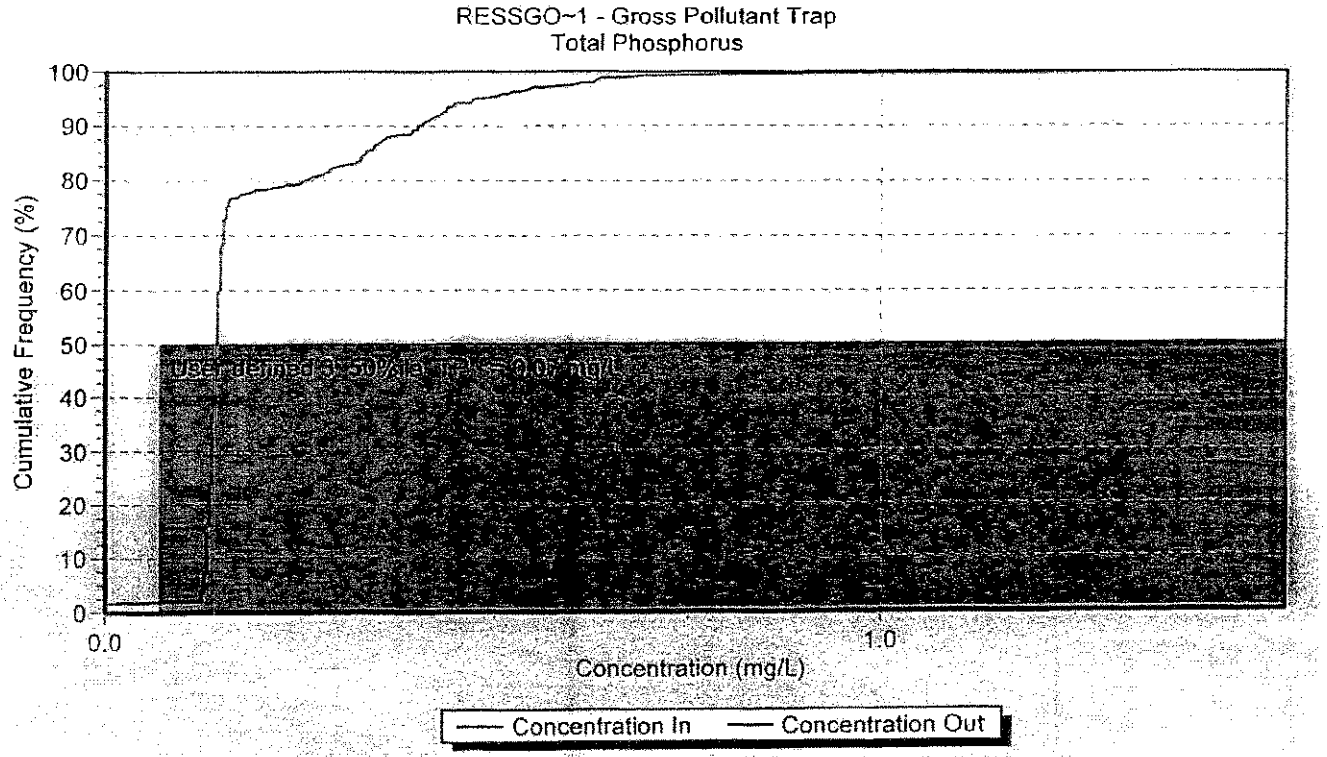
IN - Gross Pollutant Mean Annual Load (kg/yr),529
OUT - Mean Annual Flow (ML/yr),0.00
OUT - TSS Mean Annual Load (kg/yr),0.00
OUT - TP Mean Annual Load (kg/yr),0.00
OUT - TN Mean Annual Load (kg/yr),0.00
OUT - Gross Pollutant Mean Annual Load (kg/yr),0.00

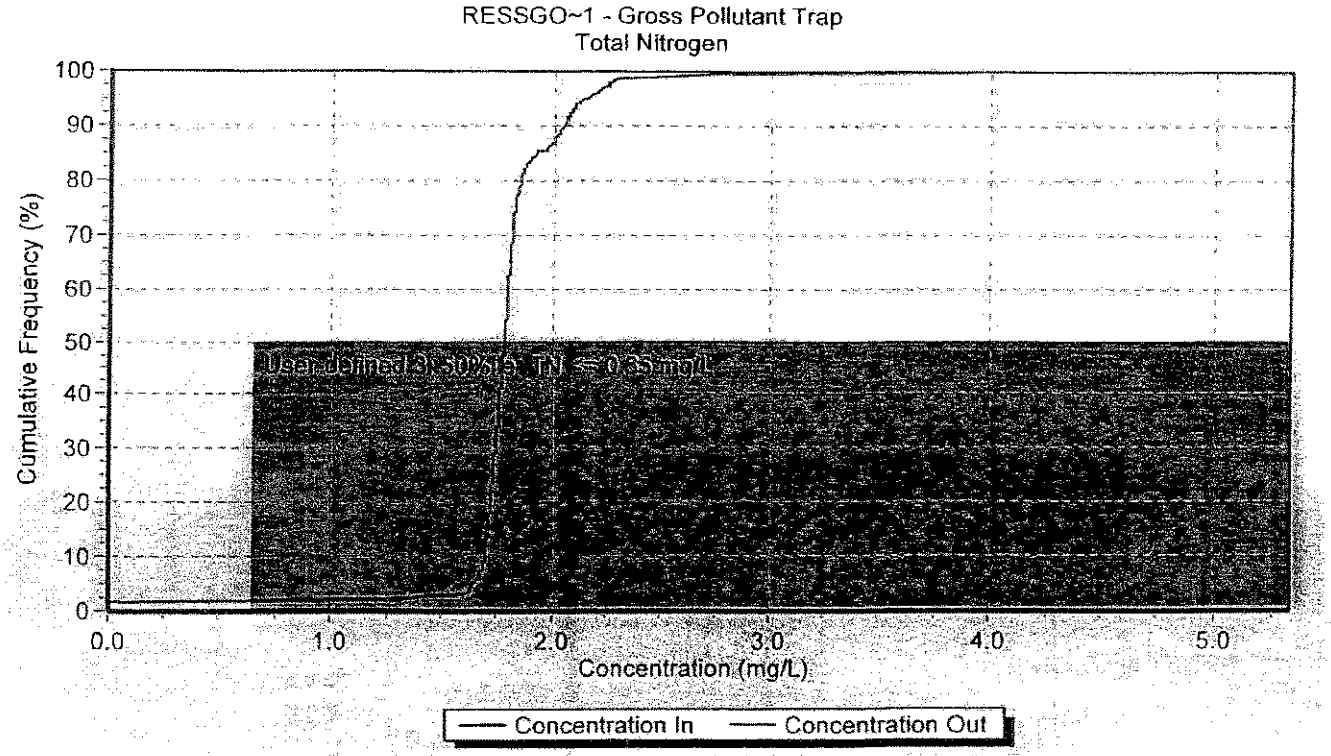
Links
Location,Drainage Link
Source node ID,1
Target node ID,2
Muskingum-Cunge Routing,Not Routed
Muskingum K,
Muskingum theta,
IN - Mean Annual Flow (ML/yr),22.5
IN - TSS Mean Annual Load (kg/yr),1.61E3
IN - TP Mean Annual Load (kg/yr),1.73
IN - TN Mean Annual Load (kg/yr),19.2
IN - Gross Pollutant Mean Annual Load (kg/yr),529
OUT - Mean Annual Flow (ML/yr),22.5
OUT - TSS Mean Annual Load (kg/yr),1.61E3
OUT - TP Mean Annual Load (kg/yr),1.73
OUT - TN Mean Annual Load (kg/yr),19.2
OUT - Gross Pollutant Mean Annual Load (kg/yr),529

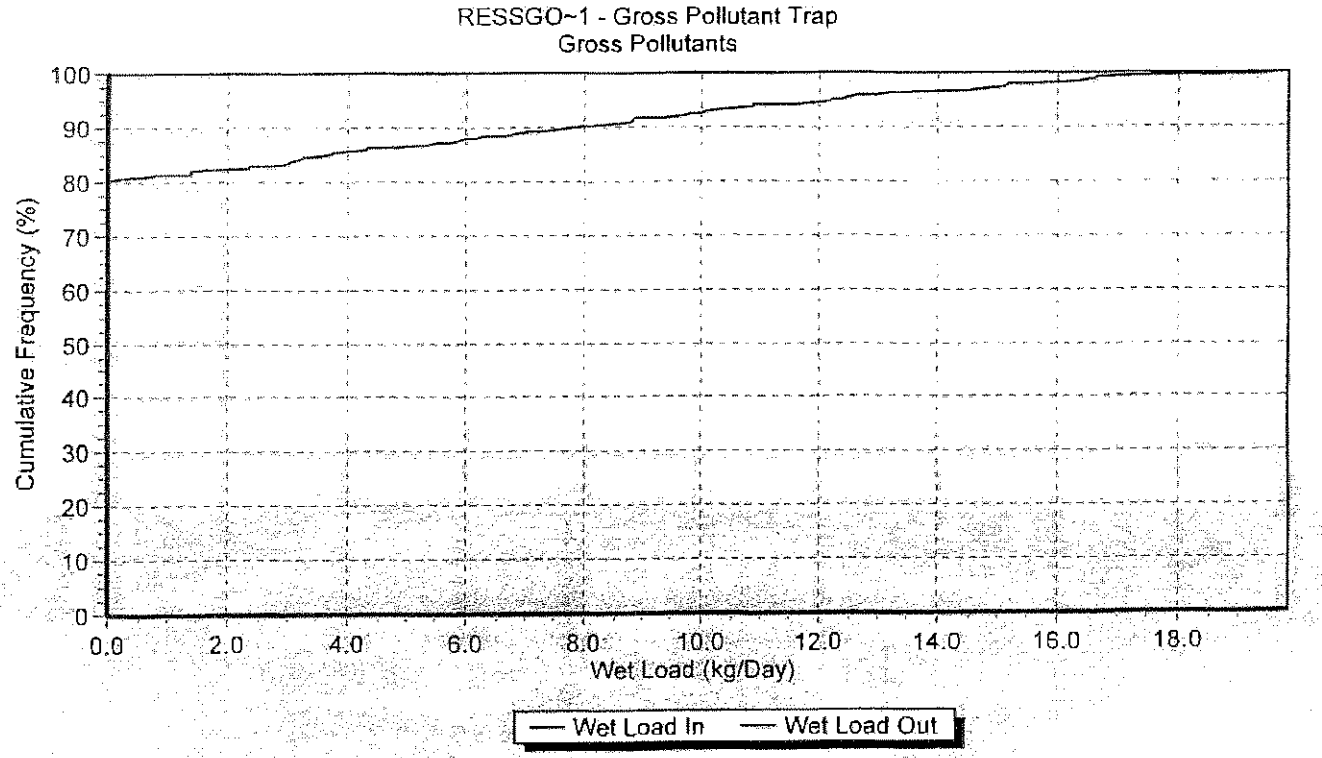
Developed Modelling Results

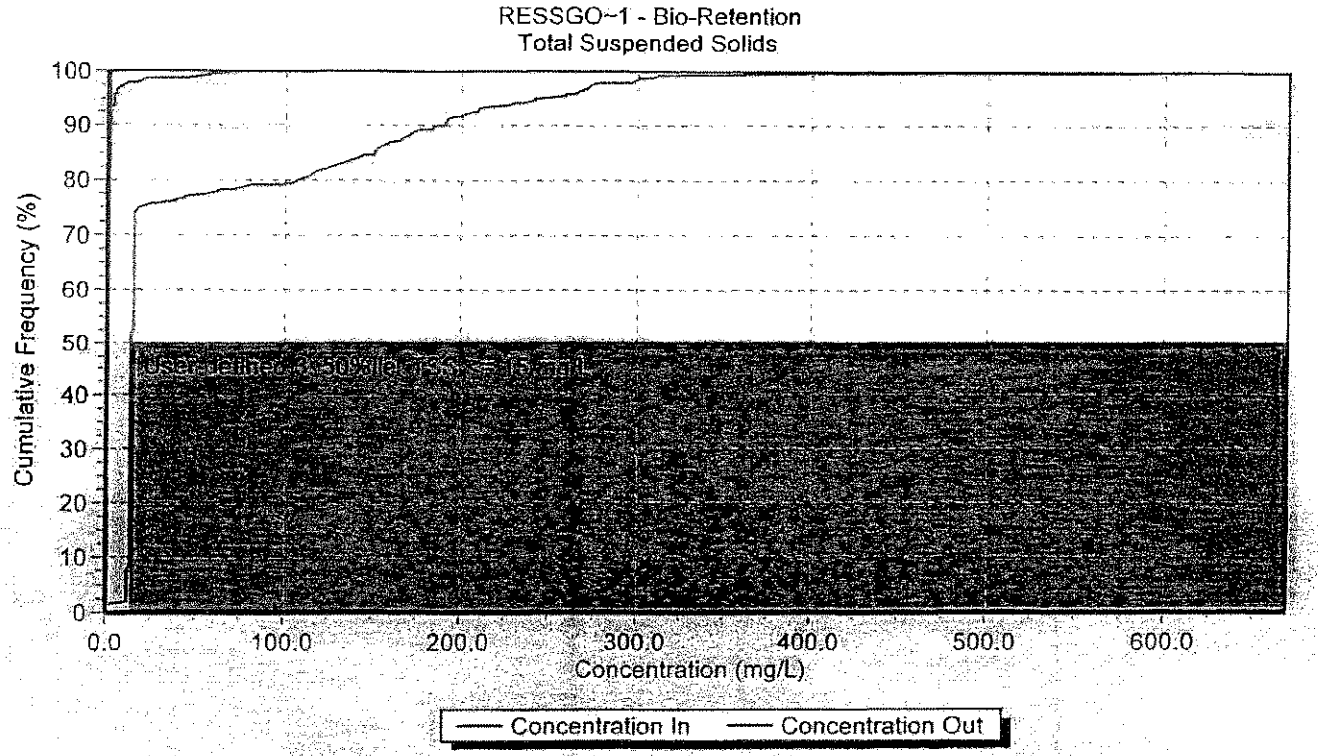

Urban
Gross Pollutant Trap
Bio-Retention
Receiving Node

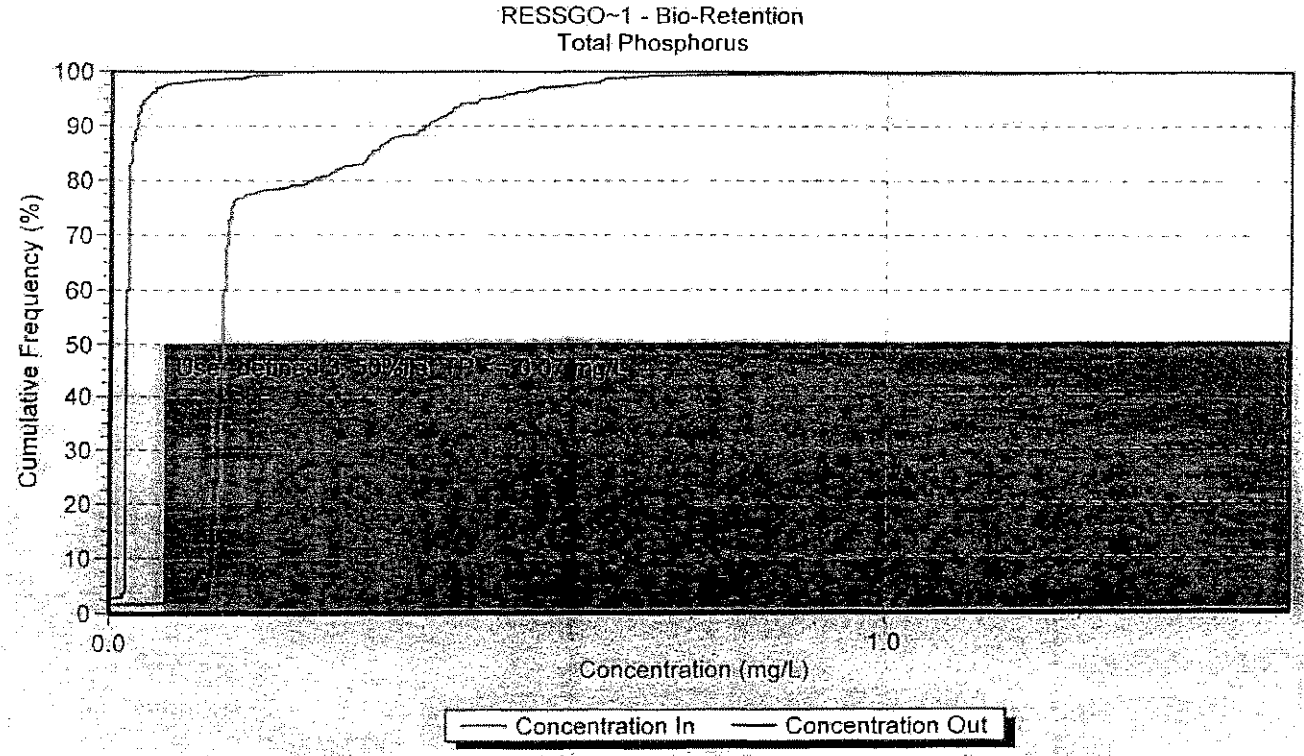

RESSGO~1 - Drainage Link
Total Suspended Solids
Cumulative Frequency (%)
100
90
80
70
60
50
40
30
20
10
0
0.0
100.0
200.0
300.0
400.0
500.0
600.0
Concentration (mg/L)
Concentration In
Concentration Out

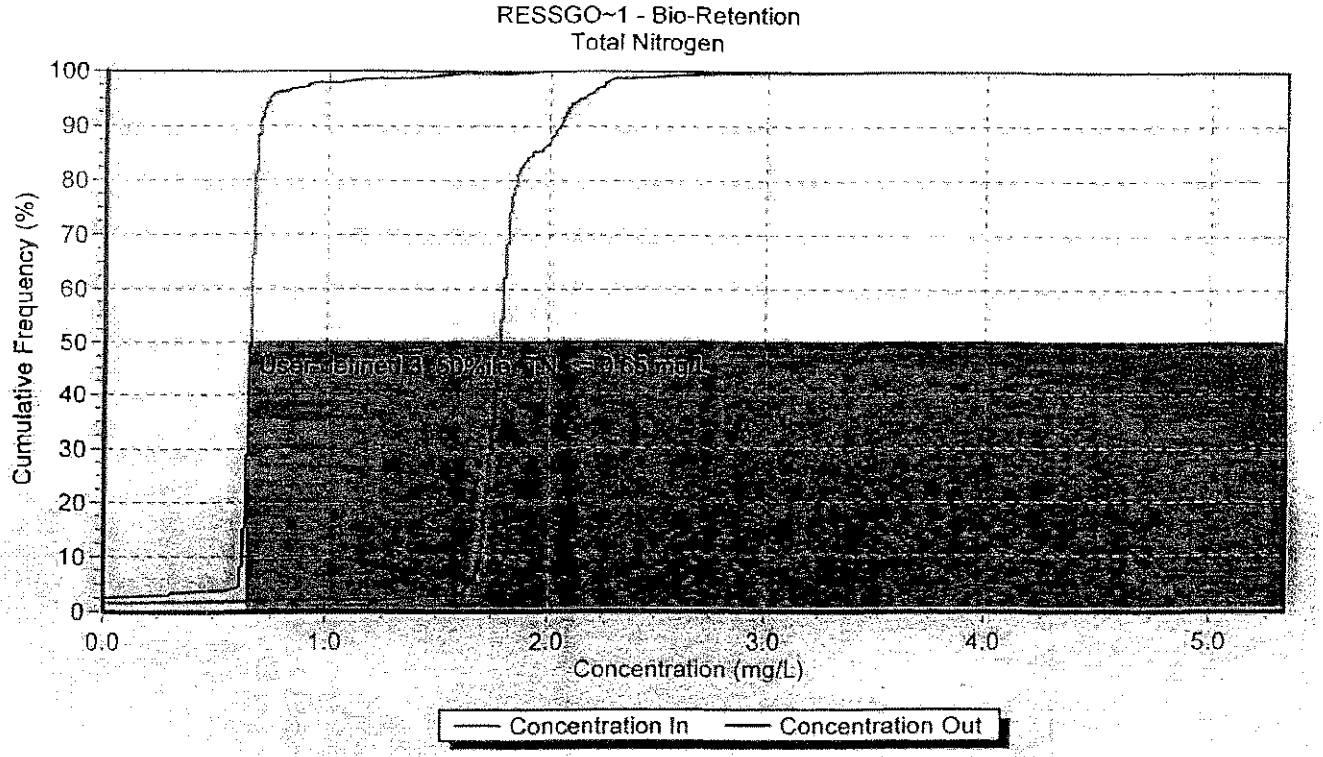

RESSGO~1 - Gross Pollutant Trap
Total Phosphorus
Cumulative Frequency (%)
100
90
80
70
60
50
40
30
20
10
0
0.0
1.0
Concentration (mg/L)
Concentration In
Concentration Out

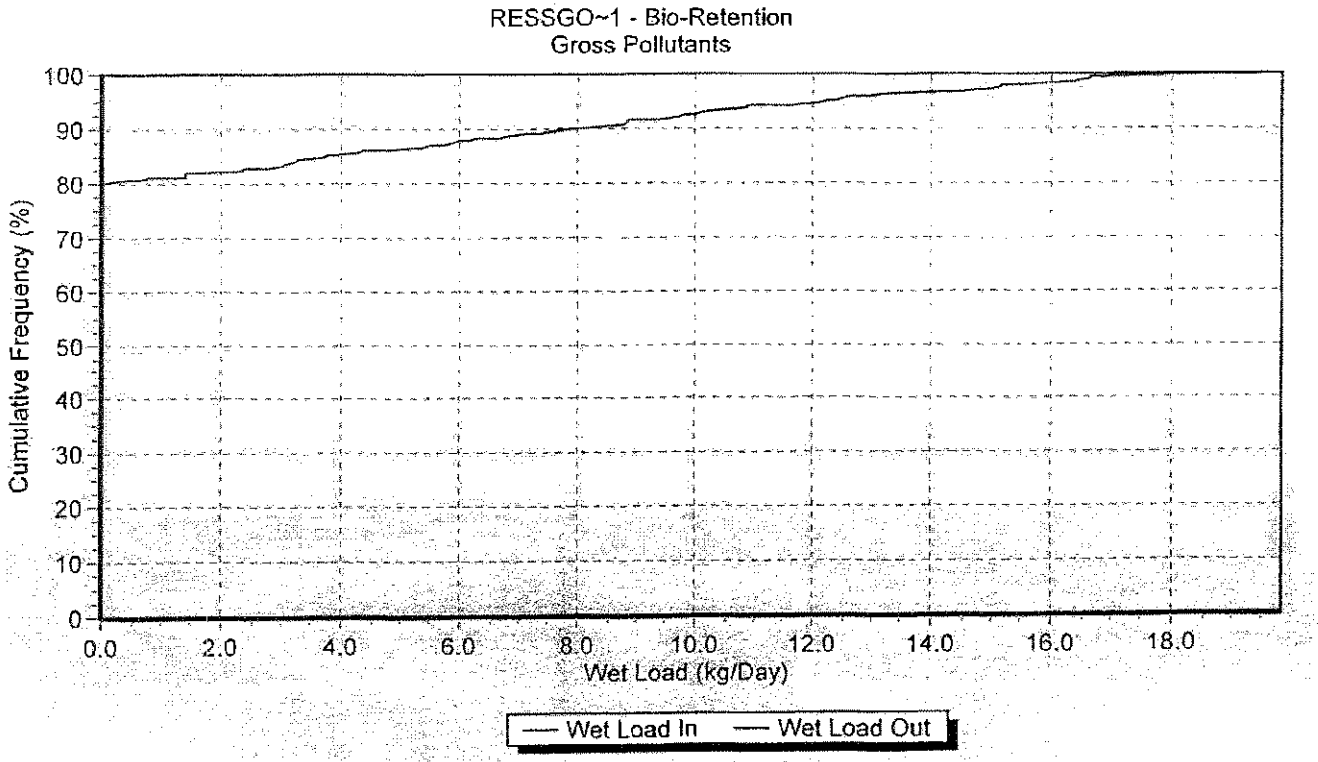

RESSGO~1 - Gross Pollutant Trap
Total Nitrogen
Cumulative Frequency (%)
100
90
80
70
60
50
40
30
20
10
0
0.0
1.0
2.0
3.0
4.0
5.0
Concentration (mg/L)
Concentration In
Concentration Out


RESSGO~1 - Gross Pollutant Trap
Gross Pollutants
Cumulative Frequency (%)
100
90
80
70
60
50
40
30
20
10
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
Wet Load (kg/Day)
Wet Load In
Wet Load Out


RESSGO~1 - Bio-Retention
Total Suspended Solids
Cumulative Frequency (%)
100
90
80
70
60
50
40
30
20
10
0
0.0
100.0
200.0
300.0
400.0
500.0
600.0
Concentration (mg/L)
Concentration In
Concentration Out

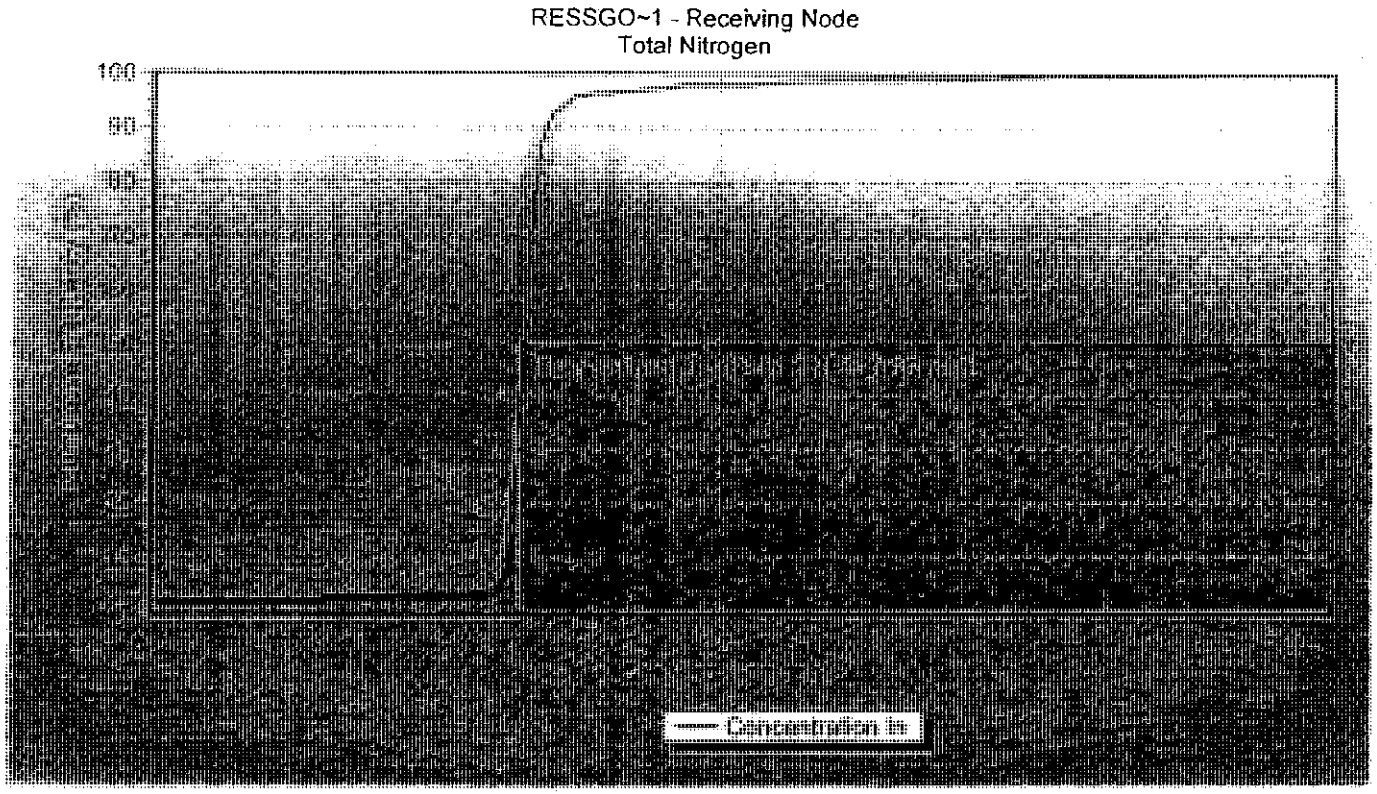

RESSGO~1 - Bio-Retention
Total Phosphorus
Cumulative Frequency (%)
100
90
80
70
60
50
40
30
20
10
0
0.0
1.0
Concentration (mg/L)
Concentration In
Concentration Out


RESSGO~1 - Bio-Retention
Total Nitrogen
Cumulative Frequency (%)
100
90
80
70
60
50
40
30
20
10
0
0.0
1.0
2.0
3.0
4.0
5.0
Concentration (mg/L)
Concentration In
Concentration Out


RESSGO~1 - Bio-Retention
Gross Pollutants
Cumulative Frequency (%)
100
90
80
70
60
50
40
30
20
10
0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
Wet Load (kg/Day)
Wet Load In
Wet Load Out

RESSGO~1 - Receiving Node
Total Suspended Solids

RESSGO~1 - Receiving Node
Total Phosphorus


RESSGO~1 - Receiving Node
Total Nitrogen
100
90
Concentration in

RESSGO~1 - Receiving Node
Gross Pollutants
100
90
Total Load In

```
Source nodes
Location,Urban
ID,1
Node Type,UrbanSourceNode
Total Area (ha),2.935
Area Impervious (ha),1.76653530701754
Area Pervious (ha),1.16846469298246
Field Capacity (mm),80
Pervious Area Infiltration Capacity coefficient - a,50
Pervious Area Infiltration Capacity exponent - b,1
Impervious Area Rainfall Threshold (mm/day),1
Pervious Area Soil Storage Capacity (mm),400
Pervious Area Soil Initial Storage (% of Capacity),10
Groundwater Initial Depth (mm),50
Groundwater Daily Recharge Rate (%),25
Groundwater Daily Baseflow Rate (%),5
Groundwater Daily Deep Seepage Rate (%),0
Stormflow Total Suspended Solids Mean (log mg/L),2.18
Stormflow Total Suspended Solids Standard Deviation (log mg/L),0.39
Stormflow Total Suspended Solids Estimation Method,Stochastic
Stormflow Total Suspended Solids Serial Correlation,0
Stormflow Total Phosphorus Mean (log mg/L),-0.47
Stormflow Total Phosphorus Standard Deviation (log mg/L),0.31
Stormflow Total Phosphorus Estimation Method,Stochastic
Stormflow Total Phosphorus Serial Correlation,0
Stormflow Total Nitrogen Mean (log mg/L),0.26
Stormflow Total Nitrogen Standard Deviation (log mg/L),0.23
Stormflow Total Nitrogen Estimation Method,Stochastic
Stormflow Total Nitrogen Serial Correlation,0
Baseflow Total Suspended Solids Mean (log mg/L),1
Baseflow Total Suspended Solids Standard Deviation (log mg/L),0.34
Baseflow Total Suspended Solids Estimation Method,Stochastic
Baseflow Total Suspended Solids Serial Correlation,0
Baseflow Total Phosphorus Mean (log mg/L),-0.97
Baseflow Total Phosphorus Standard Deviation (log mg/L),0.31
Baseflow Total Phosphorus Estimation Method,Stochastic
Baseflow Total Phosphorus Serial Correlation,0
Baseflow Total Nitrogen Mean (log mg/L),0.2
Baseflow Total Nitrogen Standard Deviation (log mg/L),0.2
Baseflow Total Nitrogen Estimation Method,Stochastic
Baseflow Total Nitrogen Serial Correlation,0
OUT - Mean Annual Flow (ML/yr),0.00
OUT - TSS Mean Annual Load (kg/yr),0.00
OUT - TP Mean Annual Load (kg/yr),0.00
OUT - TN Mean Annual Load (kg/yr),0.00
OUT - Gross Pollutant Mean Annual Load (kg/yr),0.00

No Imported Data Source nodes

USTM treatment nodes
Location,Bio-Retention
ID,3
Node Type,BioRetentionNode
Lo-flow bypass rate (cum/sec),0
Hi-flow bypass rate (cum/sec),100
Inlet pond volume,
Area (sqm),530
Extended detention depth (m),0.35
Permanent pool volume (cum),
Proportion vegetated,
Equivalent pipe diameter (mm),
```

```
Overflow weir width (m),2
Notional Detention Time (hrs),
Orifice discharge coefficient,
Weir coefficient,1.7
Number of CSTR cells,3
Total Suspended Solids k (m/yr),8000
Total Suspended Solids C* (mg/L),20
Total Suspended Solids C** (mg/L),
Total Phosphorus  k (m/yr),6000
Total Phosphorus C* (mg/L),0.13
Total Phosphorus C** (mg/L),
Total Nitrogen k (m/yr),500
Total Nitrogen C* (mg/L),1.4
Total Nitrogen C** (mg/L),
Threshold hydraulic loading for C** (m/yr),
Extraction for Re-use,Off
Annual Re-use Demand - scaled by daily PET (ML),
Constant Daily Re-use Demand (kL),
User-defined Annual Re-use Demand (ML),
Percentage of User-defined Annual Re-use Demand Jan,
Percentage of User-defined Annual Re-use Demand Feb,
Percentage of User-defined Annual Re-use Demand Mar,
Percentage of User-defined Annual Re-use Demand Apr,
Percentage of User-defined Annual Re-use Demand May,
Percentage of User-defined Annual Re-use Demand Jun,
Percentage of User-defined Annual Re-use Demand Jul,
Percentage of User-defined Annual Re-use Demand Aug,
Percentage of User-defined Annual Re-use Demand Sep,
Percentage of User-defined Annual Re-use Demand Oct,
Percentage of User-defined Annual Re-use Demand Nov,
Percentage of User-defined Annual Re-use Demand Dec,
Filter area (sqm),520
Filter depth (m),1
Filter median particle diameter (mm),0.1
Saturated hydraulic conductivity (mm/hr),36
Voids ratio,0.3
Length (m),
Bed slope,
Base Width (m),
Top width (m),
Vegetation height (m),
Proportion of upstream impervious area treated,
Seepage Rate (mm/hr),0
Evap Loss as proportion of PET,
Depth in metres below the drain pipe,0
IN - Mean Annual Flow (ML/yr),0.00
IN - TSS Mean Annual Load (kg/yr),0.00
IN - TP Mean Annual Load (kg/yr),0.00
IN - TN Mean Annual Load (kg/yr),0.00
IN - Gross Pollutant Mean Annual Load (kg/yr),0.00
OUT - Mean Annual Flow (ML/yr),0.00
OUT - TSS Mean Annual Load (kg/yr),0.00
OUT - TP Mean Annual Load (kg/yr),0.00
OUT - TN Mean Annual Load (kg/yr),0.00
OUT - Gross Pollutant Mean Annual Load (kg/yr),0.00

Generic treatment nodes
Location,Gross Pollutant Trap
ID,2
Node Type,GPTNode
Lo-flow bypass rate (cum/sec),0
```

```
Hi-flow bypass rate (cum/sec),100
Flow Transfer Function
Input (cum/sec),0
Output (cum/sec),0
Input (cum/sec),10
Output (cum/sec),10
Input (cum/sec),
Output (cum/sec),
Input (cum/sec),
Output (cum/sec),
Input (cum/sec),
Output (cum/sec),
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Output (cum/sec),
Input (cum/sec),
Output (cum/sec),
Input (cum/sec),
Output (cum/sec),
Gross Pollutant Transfer Function
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Output (kg/ML),0
Input (kg/ML),15
Output (kg/ML),15
Input (kg/ML),
Output (kg/ML),
Input (kg/ML),
Output (kg/ML),
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Input (kg/ML),
Output (kg/ML),
Input (kg/ML),
Output (kg/ML),
Input (kg/ML),
Output (kg/ML),
Total Nitrogen Transfer Function
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Output (mg/L),0
Input (mg/L),50
Output (mg/L),50
Input (mg/L),
Output (mg/L),
Input (mg/L),
Output (mg/L),
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Input (mg/L),
Output (mg/L),
Input (mg/L),
Output (mg/L),
Input (mg/L),
```

```
Output (mg/L),
Input (mg/L),
Output (mg/L),
Total Phosphorus Transfer Function
Input (mg/L),0
Output (mg/L),0
Input (mg/L),5
Output (mg/L),5
Input (mg/L),
Output (mg/L),
Input (mg/L),
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Output (mg/L),
Input (mg/L),
Output (mg/L),
Input (mg/L),
Output (mg/L),
Input (mg/L),
Output (mg/L),
Total Suspended Solids Transfer Function
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Input (mg/L),1000
Output (mg/L),1000
Input (mg/L),
Output (mg/L),
Input (mg/L),
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Output (mg/L),
Input (mg/L),
Output (mg/L),
Input (mg/L),
Output (mg/L),
Input (mg/L),
Output (mg/L),
IN - Mean Annual Flow (ML/yr),0.00
IN - TSS Mean Annual Load (kg/yr),0.00
IN - TP Mean Annual Load (kg/yr),0.00
IN - TN Mean Annual Load (kg/yr),0.00
IN - Gross Pollutant Mean Annual Load (kg/yr),0.00
OUT - Mean Annual Flow (ML/yr),0.00
OUT - TSS Mean Annual Load (kg/yr),0.00
OUT - TP Mean Annual Load (kg/yr),0.00
OUT - TN Mean Annual Load (kg/yr),0.00
OUT - Gross Pollutant Mean Annual Load (kg/yr),0.00

Other nodes
Location,Receiving Node
ID,4
Node Type,ReceivingNode
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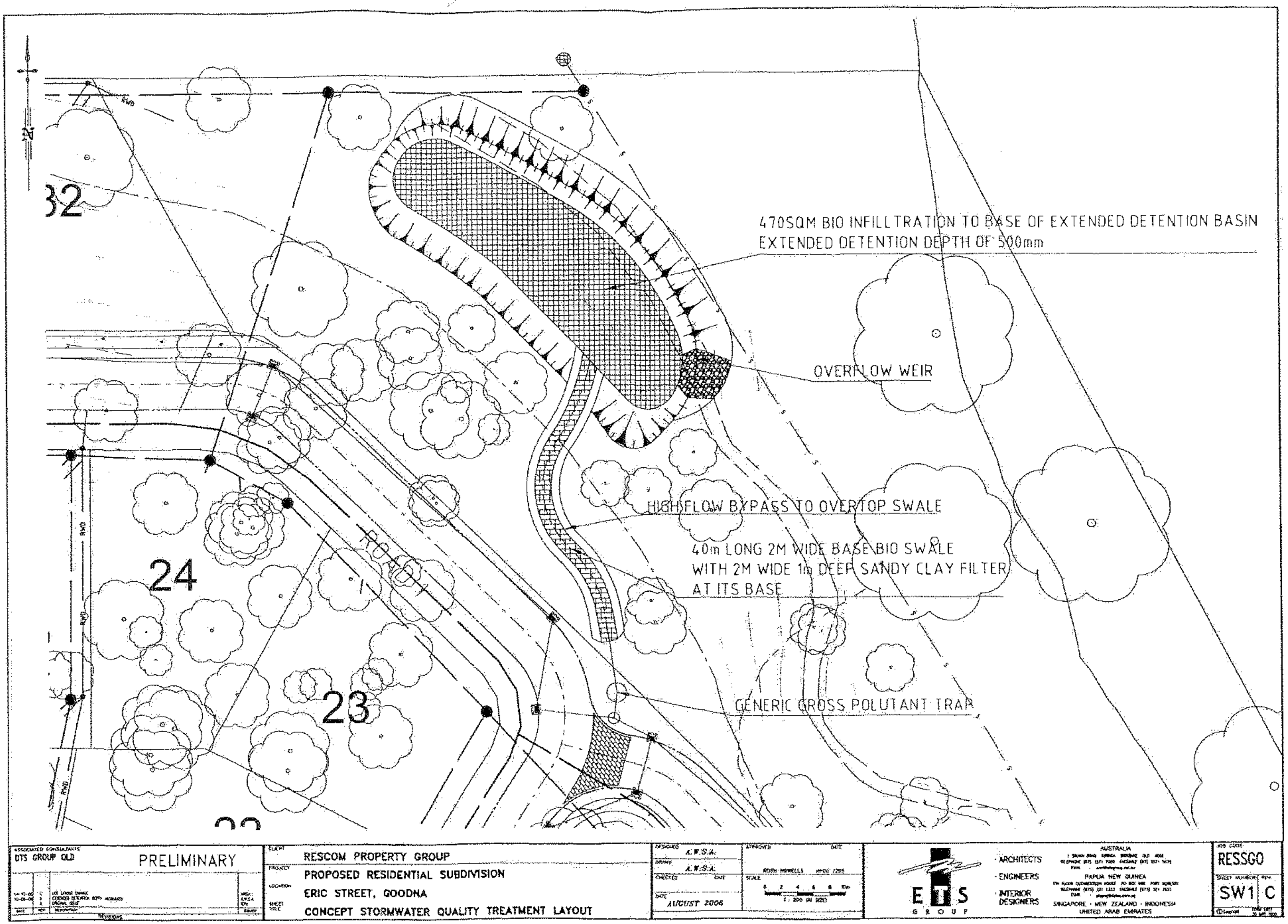
```

IN - TSS Mean Annual Load (kg/yr),0.00
IN - TP Mean Annual Load (kg/yr),0.00
IN - TN Mean Annual Load (kg/yr),0.00
IN - Gross Pollutant Mean Annual Load (kg/yr),0.00
OUT - Mean Annual Flow (ML/yr),0.00
OUT - TSS Mean Annual Load (kg/yr),0.00
OUT - TP Mean Annual Load (kg/yr),0.00
OUT - TN Mean Annual Load (kg/yr),0.00
OUT - Gross Pollutant Mean Annual Load (kg/yr),0.00

Links
Location,Drainage Link,Drainage Link,Drainage Link
Source node ID,1,2,3
Target node ID,2,3,4
Muskingum-Cunge Routing,Not Routed,Not Routed,Not Routed
Muskingum K, , ,
Muskingum theta, , ,
IN - Mean Annual Flow (ML/yr),0.00,0.00,0.00
IN - TSS Mean Annual Load (kg/yr),0.00,0.00,0.00
IN - TP Mean Annual Load (kg/yr),0.00,0.00,0.00
IN - TN Mean Annual Load (kg/yr),0.00,0.00,0.00
IN - Gross Pollutant Mean Annual Load (kg/yr),0.00,0.00,0.00
OUT - Mean Annual Flow (ML/yr),0.00,0.00,0.00
OUT - TSS Mean Annual Load (kg/yr),0.00,0.00,0.00
OUT - TP Mean Annual Load (kg/yr),0.00,0.00,0.00
OUT - TN Mean Annual Load (kg/yr),0.00,0.00,0.00
OUT - Gross Pollutant Mean Annual Load (kg/yr),0.00,0.00,0.00

APPENDIX C

Stormwater Design Drawings



470SQM BIO INFILLTRATION TO BASE OF EXTENDED DETENTION BASIN
EXTENDED DETENTION DEPTH OF 500mm
OVERFLOW WEIR
HIGH FLOW BYPASS TO OVERTOP SWALE
40m LONG 2M WIDE BASE BIO SWALE
WITH 2M WIDE 1m DEEP SANDY CLAY FILTER
AT ITS BASE
GENERIC GROSS POLUTANT TRAP
ROAD
32
24
23
RWD
ASSOCIATED CONSULTANTS
DTS GROUP QLD
PRELIMINARY
CLIENT
RESCOM PROPERTY GROUP
PROJECT
PROPOSED RESIDENTIAL SUBDIVISION
LOCATION
ERIC STREET, GOODNA
SHEET TITLE
CONCEPT STORMWATER QUALITY TREATMENT LAYOUT
DESIGNED A.W.S.A.
DRAWN A.W.S.A.
CHECKED
DATE AUGUST 2006
APPROVED
DATE
SCALE
1 : 200 (A3 SIZE)
ETS GROUP
ARCHITECTS
ENGINEERS
INTERIOR DESIGNERS
AUSTRALIA
PAPUA NEW GUINEA
SINGAPORE · NEW ZEALAND · INDONESIA
UNITED ARAB EMIRATES
JOB CODE
RESSGO
SHEET NUMBER
SW1
REV.
C

APPENDIX D

BCC Water Quality Checklist

BIORETENTION BASIN CALCULATION SUMMARY

Calculation task	Outcome		Check
Catchment Characteristics			
Catchment area	2.9	Ha	
Catchment land use (i.e residential, commercial etc.)			✓
Storm event entering inlet	2	yr ARI	
Conceptual Design			
Bioretention area	520	m^2	
Filter media saturated hydraulic conductivity	35	mm/hr	✓
Extended detention depth	350	mm	
1 Verify size for treatment			
Bioretention area to achieve water quality objectives			
Total suspended solids (Figure 6.2)	100	% of catchment	
Total phosphorus (Figure 6.3)	100	% of catchment	
Total nitrogen (Figure 6.4)	100	% of catchment	
Bioretention area	520	m^2	✓
Extended detention depth	350	m	
2 Determine design flows			
Time of concentration			
Refer to BCC *Subdivision and Development Guidelines* and QUDM	12	minutes	✓
Identify rainfall intensities			
$I_{2\ year\ ARI}$ Refer Report	44	mm/hr	✓
$I_{50\ year\ ARI}$ Refer Report		mm/hr	
Design runoff coefficient			✓
$C_{2\ year\ ARI}$			
$C_{50\ year\ ARI}$			
Peak design flows			✓
2 year ARI		m^3/s	
50 year ARI		m^3/s	
3 Design inflow systems			
Adequate erosion and scour protection?			Yes
* **Check flow widths in upstream gutter**			
2yr ARI flow width	N/A	m	N/A
CHECK ADEQUATE LANES TRAFFICABLE			
* **Kerb opening width**			
Kerb opening length	N/A	m	N/A
4 Specify bioretention media characteristics			
Filter media hydraulic conductivity	36	mm/hr	✓
Filter media depth	1000	mm	
Drainage layer media (sand or fine screenings)			
Drainage layer depth	0	mm	✓
Transition layer (sand) required			
Transition layer depth	0	mm	✓
5 Under-drain design and capacity checks			
Flow capacity of filter media	0.94	m^3/s	✓
Perforations inflow check			✓
Pipe diameter	100	mm	✓
Number of pipes	20		
Capacity of perforations	0.4	m^3/s	✓
CHECK PERFORATION CAPACITY > FILTER MEDIA CAPACITY			
Perforated pipe capacity			
Pipe capacity	2	m^3/s	✓
CHECK PIPE CAPACITY > FILTER MEDIA CAPACITY			

6	**Check requirement for impermeable lining**		
	Soil hydraulic conductivity	UNKNOWN mm/hr	
	Filter media hydraulic conductivity	36 mm/hr	✓
	MORE THAN 10 TIMES HIGHER THAN IN-SITU SOILS?		
7	**Size Overflow pit**		
	System to convey minor floods (2yr ARI)	L x W	N/A
8	**Verification Checks**		
	Velocity for 2 year ARI flow (<0.5m/s)	m/s	N/A
	Velocity for 50 year ARI flow (<2.0m/s)	m/s	
	Treatment performance consistent with Step 1		

* Relevant to streetscape application only

5.4 Landscape Design Notes

5.4.1 Objectives

Landscape design for bioretention basins has four key objectives:

1. Addressing stormwater quality objectives by incorporating appropriate groundcover plant species for sediment removal, erosion protection, stormwater treatment (biologically active root zone) and preventing filter media blockages.
2. Ensuring that the overall landscape design for the bioretention basin integrates with its surrounding environment.
3. Incorporating Crime Prevention through Environmental Design (CPTED) principles and traffic visibility safety standards for roadside systems. This objective also needs to incorporate public safety. Refer to Section 5.4.7.1.
4. Providing other landscape values such as shade, amenity, character, buffers, glare reduction, place making and habitat.

Landscape treatments to bioretention basins will largely depend on their context and size. For example, planter box type systems in urban areas will require a different approach than larger systems located in open space areas. Comprehensive site analysis should inform the landscape design as well as road layouts, civil works and maintenance access requirements. Existing site factors such as roads, driveways, buildings, landforms, soils, plants, microclimates, services and views should be considered. Refer to *Water Sensitive Urban Design in the Sydney Region: 'Practice Note 2 – Site Planning'* (LHCCREMS 2002) for further guidance.

5.4.2 Appropriate Plant Species

Planting for bioretention basin elements may consist of up to three vegetation types:

- groundcovers for stormwater treatment and erosion protection
- shrubbery for screening, glare reduction and character
- trees for shading, character and other landscape values.

It is important to note that if deep rooted plants such as trees are to be planted in bioretention basins, the filter media must have a minimum depth of 800 mm to avoid roots interfering with the perforated under-drain system.

Where the landscape design includes canopy layers, more shade tolerant species should be selected for the groundcover layer. Trees and shrubbery should be managed so that the groundcover layer is not out-competed. If this does occur, replacement planting and possible thinning of the upper vegetation layers may be required. Alternatively, where shade is not required, trees and shrubs that allow for the filtering of sunlight

SC

MRG WATER CONSULTING PTY LTD

DETAILED HYDROLOGIC REPORT

35 & 37A ERIC STREET GOODNA

AUGUST 2006

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Version 2

Job No: 1122

Report Name	Date	Revision No.
Detailed Hydrologic Report for 35 & 37A Eric Street, Goodna	8 August 2006	1122/Rev 1
Detailed Hydrologic Report for 35 & 37A Eric Street, Goodna	11 August 2006	1122/Rev 2
Detailed Hydrologic Report for 35 & 37A Eric Street, Goodna	15 August 2006	1122/Rev 3

Project Engineer: [redacted]
BE Civil, MIE Aust, RPEQ 6722
Director
E
M [redacted]

Technical Officer: [redacted]
Technical Officer
E
M [redacted]

Technical Specialist: [redacted]
Technical Specialist
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M [redacted]

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1.0 INTRODUCTION

MRG Water Consulting Pty Ltd was commissioned by the ETS Group to prepare a detailed hydrologic report for the proposed residential development at 35 & 37A Eric Street, Goodna. Figure 1 shows the location of the development site.

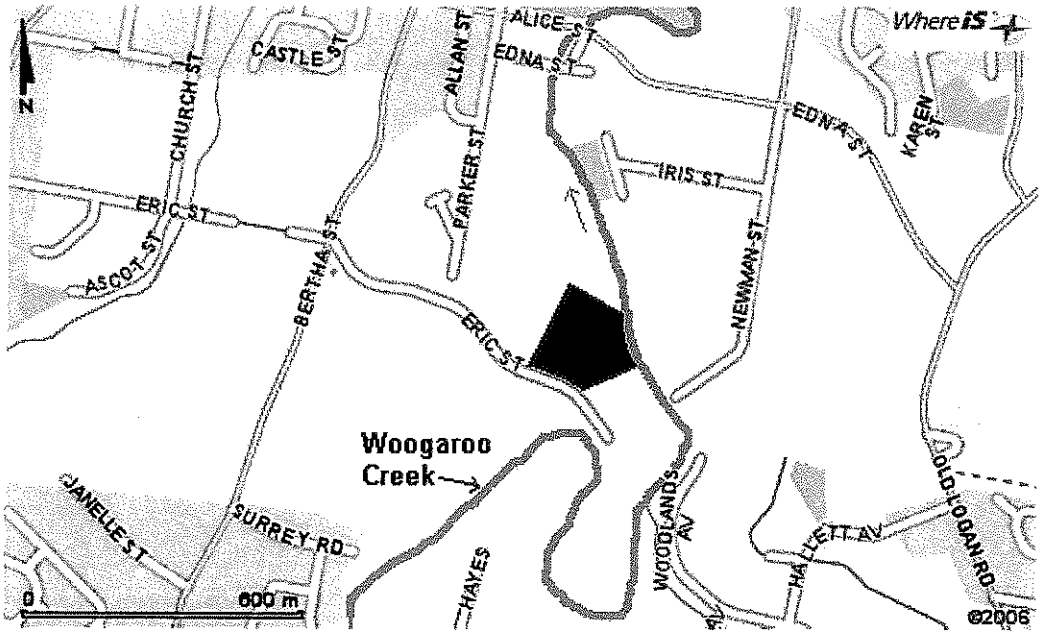
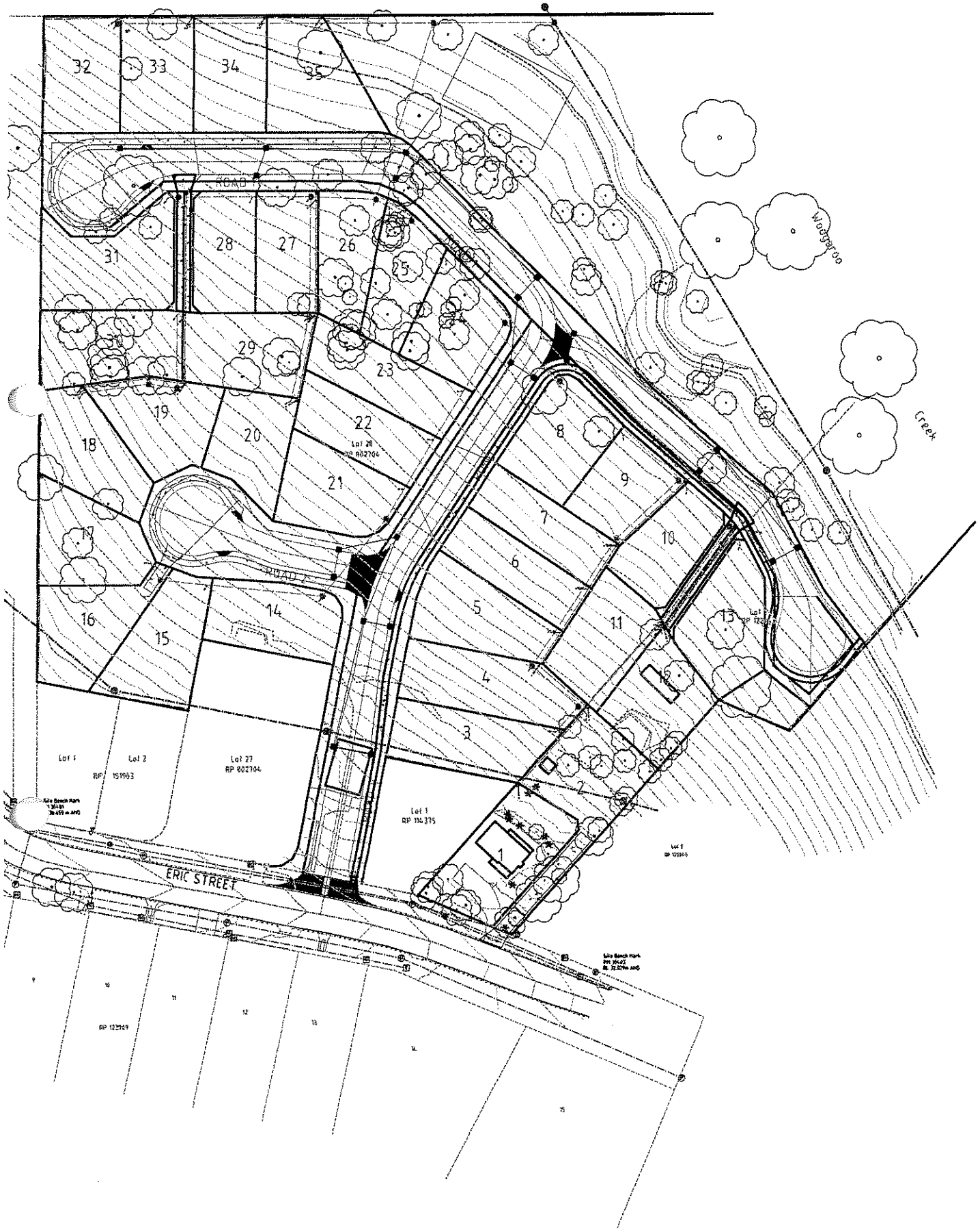


Figure 1 – Locality Plan

The site is located adjacent to Woogaroo Creek and is inundated by flooding from the creek during rare rainfall events. Under a 100 year ARI storm event the site experiences flood levels of 14.7m AHD. Figure 2 shows the layout of the proposed development.

The owner of the site is currently appealing the development approval conditions, (relating to the intensity of development), specified by the Ipswich City Council, (ICC). ICC also requires detention of stormwater discharges from the site and some discussion has occurred between various parties over the need for a detention basin on the site.

The purpose of this report is to provide details of peak stormwater discharges from the developed site and the effect of development on downstream discharges in Woogaroo Creek.


ROAD 1
ROAD 2
ERIC STREET
Woodroom
Creek
Lot 28
RP 802704
Lot 1
RP 151983
Lot 27
RP 802704
Lot 1
RP 114375

2.0 RATIONAL METHOD CALCULATIONS

The peak stormwater discharges from the existing and developed site have been calculated using the Rational Method, at the outlet on Figure 3. The Rational Method calculations have been completed in accordance with the parameters recommended in the Queensland Urban Drainage Manual (QUDM, 1992) for the 100, 50, 20, 10, 5, 2 and 1 year ARI storm events. Table 2.1 shows the calculated peak discharges. Complete details of the Rational Method calculations are found in Table A.1 and A.2 of Appendix A of this report.

Table 2.1 - Rational Method Peak Discharges

ARI (Years)	Peak Discharge (m^3/s)		Increase due to development of the site (m^3/s)
	Existing Site	Developed Site	
1	0.46	0.60	0.14
2	0.63	0.83	0.20
5	0.91	1.19	0.28
10	1.09	1.42	0.33
20	1.32	1.73	0.41
50	1.72	2.23	0.51
100	2.01	2.61	0.60

Table 2.1 shows that development of the site will increase peak discharges leaving the site by up to 0.60 m^3/s.

3.0 WBNM HYDROLOGIC MODEL

3.1 GENERAL

Although the Rational Method provides a calculation of the peak discharges at the site, it provides no information on critical storm duration for the catchment, the shape of the resulting discharge hydrographs or the volume of discharge during each event. To obtain this information, a WBNM hydrologic model was set up for the site.

WBNM is an event based hydrologic model that calculates flood hydrographs from storm rainfall hyetographs. A schematic representation of the WBNM model layout for the site is presented in Figure 3.

A WBNM model was set up for the existing and fully developed site. It was then calibrated to the peak discharges presented in Tables 2.1. The WBNM model was run using the 100 year ARI design storms for the 25, 45, 60 and 90 min rainfall events. It was found that the 60 min design storm was the critical storm duration for the existing site and the 25 min design storm was the critical storm duration for the developed site.

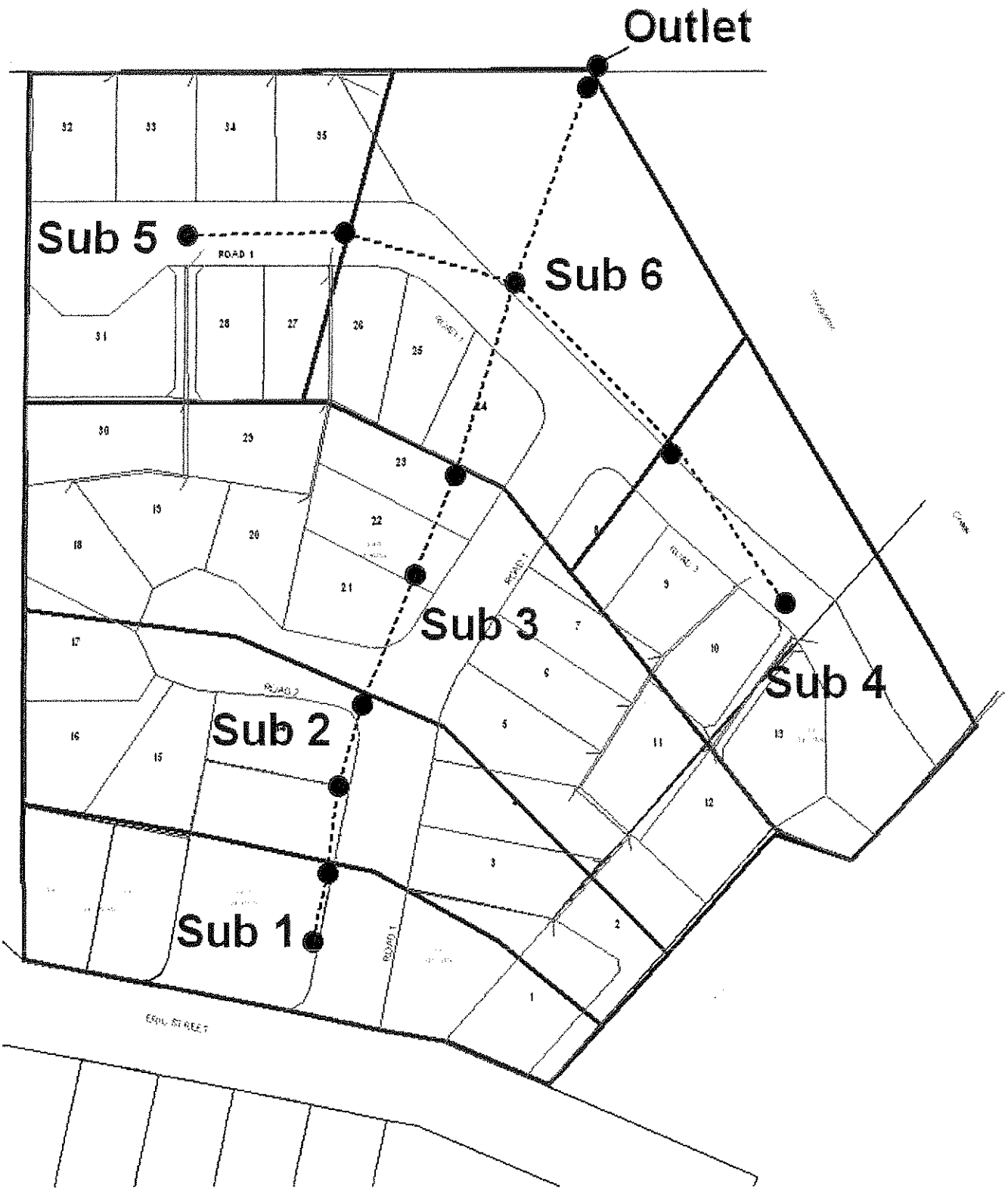


Figure 3 – WBNM Model Layout, Scale 1:1250

Jenkins (1997) recommends that the C lag parameters used in WBNM models be in the range of 1.13 to 1.88. The C lag parameter used in our WBNM model of the existing and developed site was 1.62 and 1.88 respectively. These values fit appropriately within the range specified by Jenkins (1997) and assisted in calibrating the models. The impervious lag factor was set as 0.13 for both the existing and developed site.

A continuing loss of 2.5 mm/hr from pervious areas and an initial loss of 0 mm from pervious and impervious areas were used in the WBNM model. Table 2.2 compares the peak discharges predicted by the WBNM model with the Rational Method for the existing and developed site.

Table 2.2 - Comparison of Rational Method and WBNM Peak Discharges

Site Condition	Peak Discharge (m^3/s)		Difference (m^3/s)
	Rational	WBNM	
Existing	2.01	2.02	0.01 (+0.5%)
Developed	2.61	2.61	0.0 (0.0%)

The WBNM and Rational Method peak discharges differ by less than 1%, therefore the models are considered to be adequately calibrated.

3.2 WBNM RESULTS

Figure 4 and 5 shows the 100 year ARI 25 and 60 minute discharge hydrographs plotted against each other for the existing and developed site. The 25 minute storm is the critical duration for the developed site and the 60 minute storm is the critical duration for the existing site.

Figure 4 - Discharge Hydrographs for the 100 year ARI, 25 min Events

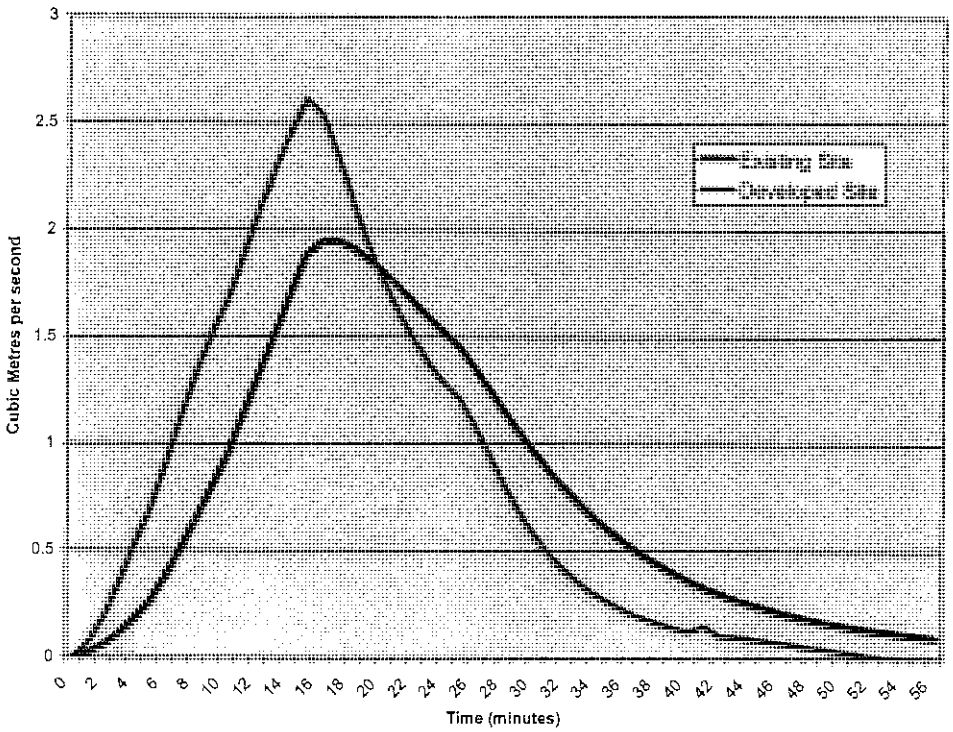


Figure 5 - Discharge Hydrographs for the 100 year ARI, 60 min Events

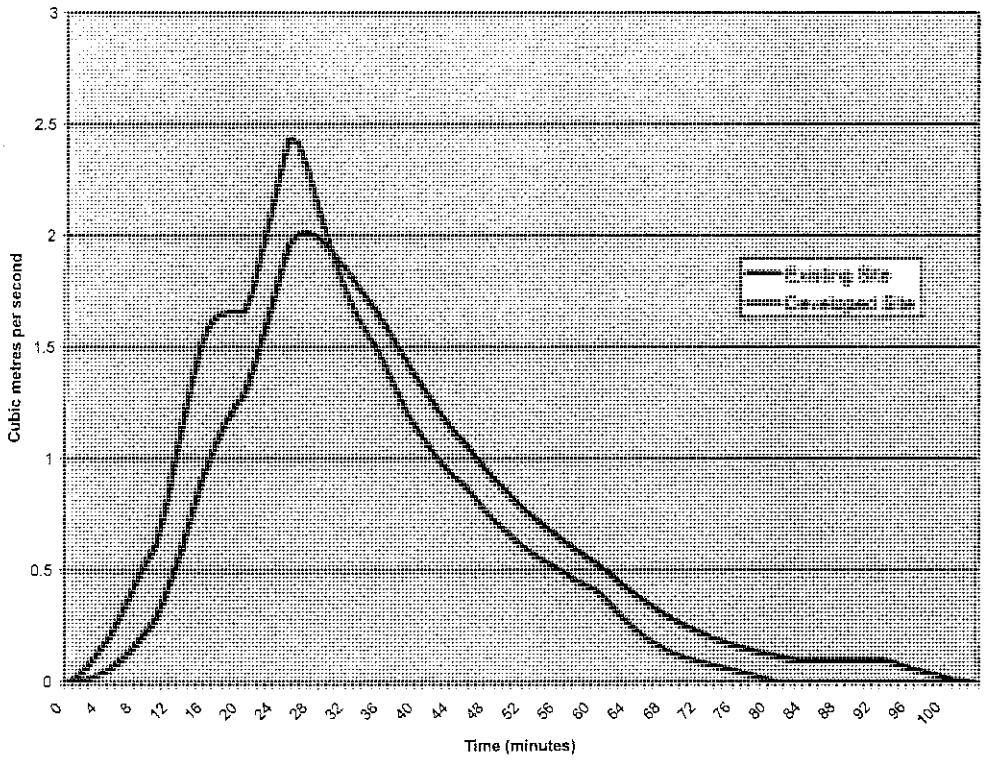


Figure 4 and 5 demonstrate that development of the site will not only increase the peak stormwater discharge leaving the site but shorten the time taken for the peak discharge to reach Woogaroo Creek.

Development of the site will also increase the overall volume of stormwater leaving the development site. The WBNM modelling predicts that the volume of stormwater leaving the developed site will increase from 2691 m^3 to 2713 m^3 for the 100 year ARI 25 minute storm event and from 4136 m^3 to 4184 m^3 for the 100 year ARI 60 minute storm event. The largest increase is for the 60 minute storm and is 48 m^3.

Recent correspondence from ICC indicated that the critical duration storm in Woogaroo Creek was 180 minutes. Therefore the peak discharge in Woogaroo Creek would arrive adjacent to the site after approximately 60-90 minutes.

Although peak discharges are increased at the site boundary due to development of the site, the peak discharges in Woogaroo Creek, (where the lawful point of discharge is located), will either remain unchanged or reduce slightly.

Figure 4 and 5 help to demonstrate this deduction. For both the 25 and 60 minute storm durations the developed site discharge is always less than the existing site discharge after 30 minutes, well before the peak of Woogaroo Creek will arrive.

4.0 DETENTION VERSUS RETENTION OF STORMWATER

4.1 DETENTION EFFECTS

The construction of a detention basin on this development site is not recommended. A detention basin is usually designed to hold the water for a short period, (around 1 hour), before releasing it into the waterway. However, the effect of any basin would be to hold the discharge until the peak of Woogaroo Creek arrived and the combined effect would increase peak discharges and flood levels downstream of the site.

4.2 RETENTION IMPACTS

Although detention is not recommended for the site, retention of stormwater on the development site is highly recommended. Retention of stormwater will reduce the overall volume of stormwater entering Woogaroo Creek and allow captured stormwater to be used for gardening, toilet flushing and hot water use. As stated in Section 3.2 of this report, development of the site will increase the volume of stormwater entering Woogaroo Creek by 48 m^3 during a 100 year ARI storm event.

The site is to be developed with detached housing and each house will have a rainwater tank provided. The rainwater tanks will be able to be used for gardening, toilet flushing and hot water use.

The tanks are particularly pertinent in light of the extreme drought conditions and water restrictions in southeast Queensland.

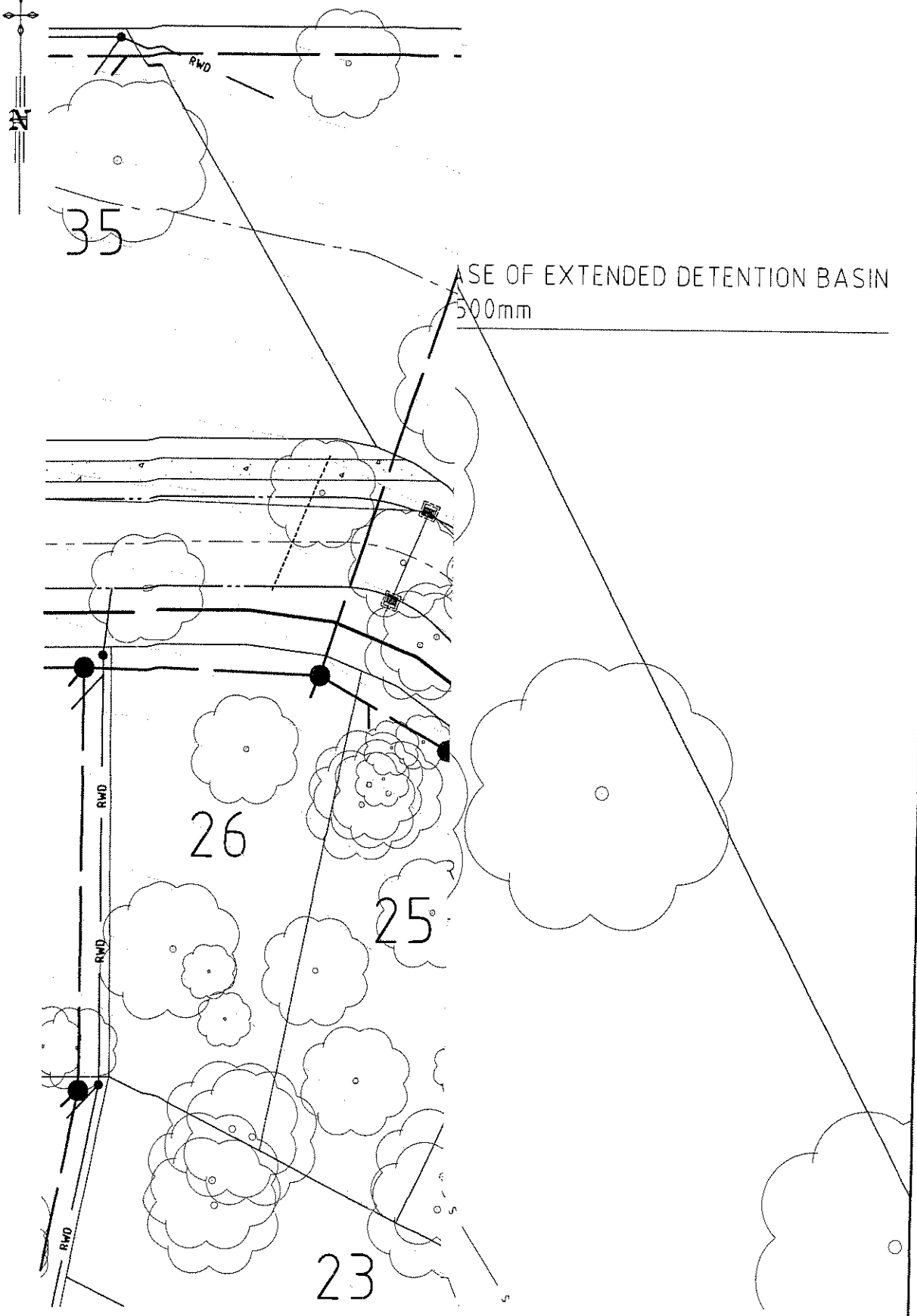
The recommend size tank provided for each house is a 5000 litre tank, although larger tanks will provide a greater benefit. In 2002, Dr Peter Coombes and Dr Simon Wardrop developed a rainwater tank calculator to assess the detention effect on peak discharges for a range of tank sizes in the Brisbane Area. The calculator can be found at http://users.bigpond.net.au/wardrop/bcc/calculator.html.

Using this calculator showed that for 150 m^2 of roof area connected to the tank, with a 5000 litre tank, 200 mm of detention and the tank being used for hot water, gardening and watering, a discharge reduction of 17.7%, 15.9%, 6.7% and 6.2% could be expected for a 1, 2, 5 and 10 year ARI storm events respectively.

In addition to this, the calculator estimates that the tank will reduce the use of mains water supply by 43% each year. The reduction of mains water use reduces to 51% if a 10,000 litre tank was used on each house instead.

Assuming the tanks are half full at the beginning of a storm event, the combined 35 rainwater tanks on each dwelling could store 87.5 m^3, more than the calculated increase due to development of the site.

In addition to the tanks, it is proposed to construct a retention area within the parkland adjacent to Woogaroo Creek. Figure 6, (Drawing SW1/B by ETS Group), shows the proposed retention area.



ASSOCIATED CONSULTANTS
DTS GROUP QLD

PRELIMINARY

DATE	REV	DESCRIPTION	ISSUED
10-08-06	b	EXTENDED DETENTION DEPTH INCREASED	A.W.S.A. KPH
	A	ORIGINAL ISSUE	

REVISIONS

CLIENT

RCHITECTS

PROJECT

NGINEERS

LOCATION

ITERIOR
ESIGNERS

SHEET TITLE

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SINGAPORE • NEW ZEALAND • INDONESIA
UNITED ARAB EMIRATES

JOB CODE:
RESSGO

SHEET NUMBER: SW1 | REV: B

FORM E027
30 MAR 2000

The basin will capture stormwater and release it over a 24 hour period. The retention area will hold up to 235 m^3 of stormwater runoff. Thus the site is expected to reduce the total volume of stormwater entering Woogaroo Creek during a storm event by between 250 m^3 and 410 m^3, depending on the initial volume in the rainwater tanks.

5.0 CONCLUSION

The report demonstrates that development of the site will not increase peak stormwater discharges in Woogaroo Creek.

Construction of a detention basin on the site could potentially increase water levels within Woogaroo Creek, due to coincident peak timing.

The development does propose rainwater tanks and a retention area which will retain water for at least 24 hours. The combined effect of these measures will ensure that the total volume of stormwater entering Woogaroo Creek during a storm event will reduce by a minimum of 200 m^3.

[redacted]
BE Civil, MIE Aust, RPEQ 6722
Director
E
M [redacted]

6.0 BIBLIOGRAPHY

Jenkins (1997) Estimating The WBNM Lag Parameter for Ungauged Catchments in Queensland, Dr. G. A. Jenkins, (Dec 1997).

LIST OF APPENDICES

APPENDIX A

Rational Method Calculations

RATIONAL METHOD CALCULATIONS

Project: Eric St, Goodna (Site Only)

Location of Discharge: Downstream Site Boundary (Woogaroo Creek)
Catchment Condition: Existing Site
Other Comments:

Time of Concentration	14.0 minutes				
	Developed			Total	
Sub-Catchment Areas	3.920			3.92	ha
C10 Runoff Coefficients	0.71				

ARI (years)	Rainfall Intensity (mm/hr)	Depth (mm)	Fy	Runoff Coefficients Developed	0	0	Discharges (cumecs) Developed	0	0	TOTAL
1	75	18	0.80	0.57	0.00	0.00	0.464	0.000	0.000	**0.46**
2	96	22	0.85	0.60	0.00	0.00	0.631	0.000	0.000	**0.63**
5	124	29	0.95	0.67	0.00	0.00	0.911	0.000	0.000	**0.91**
10	141	33	1.00	0.71	0.00	0.00	1.090	0.000	0.000	**1.09**
20	163	38	1.05	0.75	0.00	0.00	1.323	0.000	0.000	**1.32**
50	194	45	1.15	0.82	0.00	0.00	1.725	0.000	0.000	**1.72**
100	217	51	1.20	0.85	0.00	0.00	2.013	0.000	0.000	**2.01**

Upper Catchment Slope	12.0%
Overland Flow Time	14 min
Travel Length	0 metres
Fall	0 metres
Travel Time	0 min
Delta for Time of Concentration	0.0 / 14.0

Equiv Travel Velocity 0.0 m/s

ARI	% of Q100
1	23%
2	31%
5	45%
10	54%
20	66%
50	86%
100	100%

Table A1

RATIONAL METHOD CALCULATIONS

Project: Eric St, Goodna (Site Only)

Location of Discharge: Downstream Site Boundary (Woogaroo Creek)
Catchment Condition: Fully Developed Site
Other Comments:

Time of Concentration	9.0 minutes				
	Developed			Total	
Sub-Catchment Areas	3.920			3.92	ha
C10 Runoff Coefficients	0.77				

ARI (years)	Rainfall Intensity (mm/hr)	Depth (mm)	Fy	Runoff Coefficients Developed	0	0	Discharges (cumecs) Developed	0	0	TOTAL
1	90	14	0.80	0.62	0.00	0.00	0.604	0.000	0.000	**0.60**
2	117	18	0.85	0.65	0.00	0.00	0.834	0.000	0.000	**0.83**
5	149	22	0.95	0.73	0.00	0.00	1.187	0.000	0.000	**1.19**
10	169	25	1.00	0.77	0.00	0.00	1.417	0.000	0.000	**1.42**
20	196	29	1.05	0.81	0.00	0.00	1.726	0.000	0.000	**1.73**
50	231	35	1.15	0.89	0.00	0.00	2.227	0.000	0.000	**2.23**
100	259	39	1.20	0.92	0.00	0.00	2.606	0.000	0.000	**2.61**

Upper Catchment Slope	12.0%
Standard Inlet time	8 min
Travel Length	100 metres
Fall	10 metres
Travel Time	1 min
Delta for Time of Concentration	1.0
	9.0

Equiv Travel Velocity
1.7 m/s

ARI	% of Q100
1	23%
2	32%
5	46%
10	54%
20	66%
50	85%
100	100%

Table A.2

APPENDIX B

WBNM Model Files

#####START_QA_SUMMARY_FILE#####################################
#########

C:\MRG Water\MRG Jobs\1122 Eric Street, Goodna\WBNM\37A Eric St developed
Program run at 11:50 on 10 8 2006 (ddmmyy)

MRG Water Consulting Pty Ltd
Water Engineering
6/18 Torbey Street
Sunnybank Hills
Qld
Australia
4109
[redacted]
wbnm.ifd

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

#####START_PREAMBLE_BLOCK##########|##########|##########|###
########|
Project Location - Eric Street, Goodna
This model contains the fully developed site with no detention basins.
Storms Q1-Q100

#####END_PREAMBLE_BLOCK###########|##########|##########|###
########|

#####START_STATUS_BLOCK###########|##########|##########|###
########|
C:\MRG Water\MRG Jobs\1122 Eric Street, Goodna\WBNM\37A Eric St developed
last edited 10/ 8/2006
by [redacted] of MRG Water Consulting Pty Ltd
2003_V102 Unchecked_Edited_Model

```
#####END_STATUS_BLOCK##############|###########|###########|##
#########|


#####START_DISPLAY_BLOCK###########|###########|###########|###
########|
    300.0     600.0     1200.0     100.0
none
      0.0       0.0       0.0       0.0       0.0       0.0
#####END_DISPLAY_BLOCK############|###########|###########|###
########|


#####START_TOPOLOGY_BLOCK##########|###########|###########|###
########|
       6
SUB1          466.0     179.0     470.0     195.0 SUB2
SUB2          472.0     215.0     478.0     234.0 SUB3
SUB3          490.0     264.0     499.0     287.0 SUB6
SUB4          577.0     257.0     550.0     292.0 SUB6
SUB5          435.0     342.0     473.0     343.0 SUB6
SUB6          513.0     332.0     530.0     377.0 SINK
#####END_TOPOLOGY_BLOCK###########|###########|###########|##
#########|


#####START_SURFACES_BLOCK##########|###########|###########|###
########|
     0.77
    -99.90
SUB1          0.44      50.0      1.88      0.13
SUB2          0.60      50.0      1.88      0.13
SUB3          0.98      50.0      1.88      0.13
SUB4          0.57      50.0      1.88      0.13
SUB5          0.58      50.0      1.88      0.13
SUB6          0.75      50.0      1.88      0.13
#####END_SURFACES_BLOCK###########|###########|###########|###
########|


#####START_FLOWPATHS_BLOCK#########|###########|###########|###
########|
       3
SUB2
#####ROUTING
     0.33
SUB3
#####ROUTING
     0.33
SUB6
#####ROUTING
     0.33
#####END_FLOWPATHS_BLOCK##########|###########|###########|###
########|
```

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


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


#####START_STORM_BLOCK############|##########|##########|##
#########|
       34

#####START_STORM#2
100 YEAR 25MIN
     1.00
     1.00
#####START_DESIGN_RAIN
      100        25      -1.00
IFD_COEFFS_IN_THIS_FILE
       1
IPSWICH            3UNKNOWN         970.00     500.00      50.00      45.97       7.17
1.98      92.33      14.58       4.23       4.39      17.13       0.17    1200.00         25
0.60 ICC IFD
#####END_DESIGN_RAIN
#####START_CALC_RAINGAUGE_WEIGHTS
#####END_CALC_RAINGAUGE_WEIGHTS
#####START_LOSS_RATES
SUB1            0.00       2.50       0.00
SUB2            0.00       2.50       0.00
SUB3            0.00       2.50       0.00
SUB4            0.00       2.50       0.00
SUB5            0.00       2.50       0.00
SUB6            0.00       2.50       0.00
#####END_LOSS_RATES
#####START_RECORDED_HYDROGRAPHS
       0
#####END_RECORDED_HYDROGRAPHS
#####START_IMPORTED_HYDROGRAPHS
       0
#####END_IMPORTED_HYDROGRAPHS
#####END_STORM#2

#####START_RESULTS_STORM_2

#####START_HYDROGRAPHS_SUB6
  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  151.13   148.63   0.145    0.018    0.011    0.038    0.068    0.068    0.000
   2.0  151.13   148.63   0.288    0.095    0.026    0.067    0.188    0.188    0.000
   3.0  151.13   148.63   0.426    0.218    0.042    0.089    0.348    0.348    0.000
   4.0  151.13   148.63   0.559    0.362    0.056    0.106    0.524    0.524    0.000
```

5.0	151.13	148.63	0.683	0.507	0.070	0.118	0.695	0.695	0.000
6.0	218.30	215.80	0.877	0.668	0.092	0.145	0.905	0.905	0.000
7.0	218.30	215.80	1.052	0.850	0.112	0.165	1.127	1.127	0.000
8.0	218.30	215.80	1.207	1.027	0.130	0.180	1.337	1.337	0.000
9.0	218.30	215.80	1.339	1.187	0.145	0.191	1.524	1.524	0.000
10.0	218.30	215.80	1.450	1.325	0.158	0.200	1.684	1.684	0.000
11.0	293.87	291.37	1.642	1.474	0.183	0.226	1.883	1.883	0.000
12.0	293.87	291.37	1.812	1.648	0.204	0.245	2.097	2.097	0.000
13.0	293.87	291.37	1.959	1.814	0.222	0.260	2.296	2.296	0.000
14.0	293.87	291.37	2.083	1.960	0.236	0.271	2.467	2.467	0.000
15.0	293.87	291.37	2.184	2.083	0.248	0.280	2.611	2.611	0.000
16.0	92.36	89.86	1.986	2.084	0.220	0.235	2.540	2.540	0.000
17.0	92.36	89.86	1.791	1.945	0.198	0.202	2.345	2.345	0.000
18.0	92.36	89.86	1.613	1.774	0.180	0.176	2.130	2.130	0.000
19.0	92.36	89.86	1.460	1.609	0.165	0.157	1.931	1.931	0.000
20.0	92.36	89.86	1.332	1.463	0.153	0.142	1.758	1.758	0.000
21.0	83.96	81.46	1.217	1.336	0.142	0.129	1.607	1.607	0.000
22.0	83.96	81.46	1.124	1.226	0.133	0.119	1.478	1.478	0.000
23.0	83.96	81.46	1.048	1.134	0.125	0.111	1.371	1.371	0.000
24.0	83.96	81.46	0.987	1.059	0.119	0.105	1.283	1.283	0.000
25.0	83.96	81.46	0.938	0.997	0.114	0.101	1.212	1.212	0.000
26.0	0.00	0.00	0.793	0.913	0.096	0.077	1.086	1.086	0.000
27.0	0.00	0.00	0.666	0.798	0.082	0.058	0.939	0.939	0.000
28.0	0.00	0.00	0.556	0.684	0.070	0.044	0.798	0.798	0.000
29.0	0.00	0.00	0.464	0.580	0.061	0.033	0.674	0.674	0.000
30.0	0.00	0.00	0.388	0.491	0.053	0.025	0.569	0.569	0.000
31.0	0.00	0.00	0.325	0.415	0.046	0.019	0.480	0.480	0.000
32.0	0.00	0.00	0.273	0.351	0.040	0.015	0.406	0.406	0.000
33.0	0.00	0.00	0.231	0.298	0.035	0.011	0.344	0.344	0.000
34.0	0.00	0.00	0.196	0.254	0.031	0.008	0.294	0.294	0.000
35.0	0.00	0.00	0.168	0.218	0.027	0.006	0.251	0.251	0.000
36.0	0.00	0.00	0.144	0.187	0.024	0.005	0.217	0.217	0.000
37.0	0.00	0.00	0.125	0.162	0.022	0.004	0.187	0.187	0.000
38.0	0.00	0.00	0.109	0.141	0.019	0.003	0.163	0.163	0.000
39.0	0.00	0.00	0.095	0.123	0.017	0.002	0.142	0.142	0.000
40.0	0.00	0.00	0.083	0.108	0.016	0.002	0.125	0.125	0.000

#####END_HYDROGRAPHS_SUB6

#####START_CATCHMENT_SUMMARY##
##########
Catchment area (hectares) = 3.92
Impervious percent (%) = 50.00
Rainfall depth (mm) = 69.97
Excess rainfall (mm) = 69.45
Calc. runoff depth (mm) = 69.22 - from bottom subarea
Recd. runoff depth (mm) = 0.00 - from bottom subarea
Calc. peak discharge (m3/s) = 2.611 - from bottom subarea
Recd. peak discharge (m3/s) = 0.000 - from bottom subarea
#####END_CATCHMENT_SUMMARY##
##########

#####START_SUBAREA_SUMMARY##
###############
SUBAREA CENTRE OF AREA OUTLET DOWNSTREAM
Easting Northing Easting Northing

SUB1	466.00	179.00	470.00	195.00	SUB2
SUB2	472.00	215.00	478.00	234.00	SUB3
SUB3	490.00	264.00	499.00	287.00	SUB6
SUB4	577.00	257.00	550.00	292.00	SUB6
SUB5	435.00	342.00	473.00	343.00	SUB6
SUB6	513.00	332.00	530.00	377.00	SINK

SUBAREA	AREA (ha)	CONTRIBUTING AREA(ha)	IMP (%)	CODES(1=exists) Stream Struct	Outlet Struct	Local	QLINEAR (m3/s)
SUB1	0.44	0.44	50.0	0	0	0	-99.90
SUB2	0.60	1.04	50.0	1	0	0	-99.90
SUB3	0.98	2.02	50.0	1	0	0	-99.90
SUB4	0.57	0.57	50.0	0	0	0	-99.90
SUB5	0.58	0.58	50.0	0	0	0	-99.90
SUB6	0.75	3.92	50.0	1	0	0	-99.90

#####END_SUBAREA_SUMMARY###
###############

#####START_DEPTH_SUMMARY###
##########

SUBAREA	RAINFALL (mm)	----PERVIOUS---- EXCESS (mm)	RUNOFF (mm)	---IMPERVIOUS--- EXCESS (mm)	RUNOFF (mm)
SUB1	69.97	68.93	68.49	69.97	69.90
SUB2	69.97	68.93	68.56	69.97	69.91
SUB3	69.97	68.93	68.63	69.97	69.93
SUB4	69.97	68.93	68.54	69.97	69.92
SUB5	69.97	68.93	68.56	69.97	69.91
SUB6	69.97	68.93	68.59	69.97	69.92

#####END_DEPTH_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)							
SUB1	0.000	0.000	0.151	0.154	0.000	0.000	0.304	0.000
SUB2	0.304	0.000	0.206	0.210	0.000	0.000	0.720	0.000
SUB3	0.720	0.000	0.336	0.343	0.000	0.000	1.398	0.000
SUB4	0.000	0.000	0.195	0.199	0.000	0.000	0.395	0.000
SUB5	0.000	0.000	0.199	0.203	0.000	0.000	0.402	0.000
SUB6	2.194	0.000	0.257	0.262	0.000	0.000	2.713	0.000

#####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)

SUB1	0	0.000	0.000	0.155	0.168	0.000	0.323	0.323
SUB2	0	0.323	0.306	0.204	0.226	0.000	0.736	0.736
SUB3	0	0.736	0.693	0.313	0.361	0.000	1.357	1.357
SUB4	0	0.000	0.000	0.195	0.215	0.000	0.410	0.410
SUB5	0	0.000	0.000	0.198	0.219	0.000	0.417	0.417
SUB6	0	2.184	2.084	0.248	0.280	0.000	2.611	2.611

#####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)

SUB1	0	0.0	0.0	15.0	15.0	0.0	15.0	15.0
SUB2	0	15.0	15.0	15.0	15.0	0.0	15.0	15.0
SUB3	0	15.0	16.0	15.0	15.0	0.0	15.0	15.0
SUB4	0	0.0	0.0	15.0	15.0	0.0	15.0	15.0
SUB5	0	0.0	0.0	15.0	15.0	0.0	15.0	15.0
SUB6	0	15.0	16.0	15.0	15.0	0.0	15.0	15.0

#####END_TIME_SUMMARY##
###########

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

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 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_2


#####START_STORM#4
100 YEAR 60MIN
     1.00
     1.00
#####START_DESIGN_RAIN
      100       60     -1.00
IFD_COEFFS_IN_THIS_FILE
       1
IPSWICH           3UNKNOWN        970.00     500.00     50.00     45.97      7.17
1.98     92.33     14.58      4.23      4.39     17.13      0.17    1200.00       25
0.60 ICC IFD
#####END_DESIGN_RAIN
#####START_CALC_RAINGAUGE_WEIGHTS
#####END_CALC_RAINGAUGE_WEIGHTS
#####START_LOSS_RATES
SUB1            0.00      2.50      0.00
SUB2            0.00      2.50      0.00
SUB3            0.00      2.50      0.00
SUB4            0.00      2.50      0.00
SUB5            0.00      2.50      0.00
SUB6            0.00      2.50      0.00
#####END_LOSS_RATES
#####START_RECORDED_HYDROGRAPHS
       0
#####END_RECORDED_HYDROGRAPHS
#####START_IMPORTED_HYDROGRAPHS
       0
#####END_IMPORTED_HYDROGRAPHS
#####END_STORM#4

#####START_RESULTS_STORM_4

#####START_HYDROGRAPHS_SUB6
  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   55.82    53.32   0.050    0.005    0.003    0.014    0.022    0.022    0.000
   2.0   55.82    53.32   0.096    0.025    0.007    0.025    0.057    0.057    0.000
   3.0   55.82    53.32   0.140    0.060    0.012    0.033    0.104    0.104    0.000
   4.0   55.82    53.32   0.182    0.102    0.016    0.039    0.157    0.157    0.000
   5.0   55.82    53.32   0.221    0.147    0.020    0.044    0.211    0.211    0.000
   6.0   94.76    92.26   0.301    0.202    0.028    0.057    0.287    0.287    0.000

   7.0   94.76    92.26   0.375    0.270    0.037    0.067    0.374    0.374    0.000
   8.0   94.76    92.26   0.441    0.343    0.044    0.075    0.462    0.462    0.000
   9.0   94.76    92.26   0.501    0.413    0.051    0.081    0.545    0.545    0.000
  10.0   94.76    92.26   0.554    0.478    0.057    0.085    0.619    0.619    0.000
  11.0  209.00   206.50   0.739    0.575    0.079    0.117    0.771    0.771    0.000
  12.0  209.00   206.50   0.910    0.724    0.099    0.141    0.965    0.965    0.000
```

13.0	209.00	206.50	1.065	0.888	0.117	0.160	1.164	1.164	0.000
14.0	209.00	206.50	1.202	1.045	0.132	0.174	1.351	1.351	0.000
15.0	209.00	206.50	1.320	1.186	0.146	0.185	1.516	1.516	0.000
16.0	150.58	148.08	1.341	1.282	0.147	0.178	1.606	1.606	0.000
17.0	150.58	148.08	1.350	1.324	0.148	0.173	1.645	1.645	0.000
18.0	150.58	148.08	1.350	1.341	0.149	0.169	1.659	1.659	0.000
19.0	150.58	148.08	1.345	1.345	0.150	0.166	1.661	1.661	0.000
20.0	150.58	148.08	1.340	1.343	0.151	0.164	1.658	1.658	0.000
21.0	281.69	279.19	1.509	1.398	0.174	0.195	1.767	1.767	0.000
22.0	281.69	279.19	1.669	1.528	0.194	0.219	1.941	1.941	0.000
23.0	281.69	279.19	1.814	1.675	0.211	0.237	2.123	2.123	0.000
24.0	281.69	279.19	1.940	1.816	0.225	0.251	2.292	2.292	0.000
25.0	281.69	279.19	2.047	1.941	0.237	0.261	2.439	2.439	0.000
26.0	129.81	127.31	1.924	1.972	0.218	0.231	2.421	2.421	0.000
27.0	129.81	127.31	1.799	1.894	0.203	0.207	2.304	2.304	0.000
28.0	129.81	127.31	1.681	1.786	0.191	0.190	2.167	2.167	0.000
29.0	129.81	127.31	1.578	1.677	0.181	0.177	2.035	2.035	0.000
30.0	129.81	127.31	1.491	1.579	0.173	0.167	1.918	1.918	0.000
31.0	116.83	114.33	1.403	1.489	0.164	0.156	1.809	1.809	0.000
32.0	116.83	114.33	1.330	1.406	0.156	0.148	1.710	1.710	0.000
33.0	116.83	114.33	1.269	1.335	0.150	0.141	1.626	1.626	0.000
34.0	116.83	114.33	1.221	1.275	0.145	0.137	1.557	1.557	0.000
35.0	116.83	114.33	1.181	1.226	0.141	0.133	1.500	1.500	0.000
36.0	77.89	75.39	1.099	1.169	0.131	0.120	1.421	1.421	0.000
37.0	77.89	75.39	1.027	1.100	0.123	0.111	1.333	1.333	0.000
38.0	77.89	75.39	0.965	1.033	0.116	0.104	1.252	1.252	0.000
39.0	77.89	75.39	0.913	0.973	0.110	0.098	1.181	1.181	0.000
40.0	77.89	75.39	0.870	0.921	0.105	0.094	1.120	1.120	0.000
41.0	67.50	65.00	0.821	0.874	0.100	0.088	1.061	1.061	0.000
42.0	67.50	65.00	0.780	0.828	0.095	0.084	1.007	1.007	0.000
43.0	67.50	65.00	0.746	0.788	0.091	0.081	0.960	0.960	0.000
44.0	67.50	65.00	0.718	0.754	0.087	0.078	0.919	0.919	0.000
45.0	67.50	65.00	0.694	0.725	0.085	0.076	0.886	0.886	0.000
46.0	45.43	42.93	0.648	0.692	0.079	0.069	0.840	0.840	0.000
47.0	45.43	42.93	0.607	0.653	0.074	0.064	0.791	0.791	0.000
48.0	45.43	42.93	0.572	0.615	0.070	0.060	0.745	0.745	0.000
49.0	45.43	42.93	0.542	0.581	0.066	0.057	0.704	0.704	0.000
50.0	45.43	42.93	0.517	0.551	0.063	0.055	0.669	0.669	0.000
51.0	38.94	36.44	0.488	0.523	0.060	0.051	0.634	0.634	0.000
52.0	38.94	36.44	0.463	0.496	0.057	0.049	0.601	0.601	0.000
53.0	38.94	36.44	0.442	0.471	0.054	0.047	0.572	0.572	0.000
54.0	38.94	36.44	0.425	0.450	0.052	0.045	0.548	0.548	0.000
55.0	38.94	36.44	0.410	0.432	0.050	0.044	0.526	0.526	0.000
56.0	29.86	27.36	0.387	0.413	0.048	0.041	0.502	0.502	0.000
57.0	29.86	27.36	0.367	0.393	0.045	0.039	0.477	0.477	0.000
58.0	29.86	27.36	0.350	0.374	0.043	0.037	0.454	0.454	0.000
59.0	29.86	27.36	0.335	0.357	0.041	0.035	0.434	0.434	0.000
60.0	29.86	27.36	0.323	0.342	0.040	0.034	0.416	0.416	0.000
61.0	0.00	0.00	0.279	0.320	0.035	0.026	0.381	0.381	0.000
62.0	0.00	0.00	0.240	0.288	0.031	0.020	0.338	0.338	0.000
63.0	0.00	0.00	0.206	0.254	0.027	0.015	0.296	0.296	0.000
64.0	0.00	0.00	0.176	0.222	0.024	0.011	0.257	0.257	0.000
65.0	0.00	0.00	0.151	0.193	0.021	0.009	0.223	0.223	0.000
66.0	0.00	0.00	0.130	0.168	0.019	0.007	0.194	0.194	0.000
67.0	0.00	0.00	0.113	0.146	0.017	0.005	0.168	0.168	0.000
68.0	0.00	0.00	0.098	0.127	0.015	0.004	0.146	0.146	0.000
69.0	0.00	0.00	0.085	0.111	0.014	0.003	0.128	0.128	0.000

70.0 0.00 0.00 0.075 0.097 0.013 0.002 0.112 0.112 0.000
#####END_HYDROGRAPHS_SUB6

#####START_CATCHMENT_SUMMARY##
##########
Catchment area (hectares) = 3.92
Impervious percent (%) = 50.00
Rainfall depth (mm) = 108.18
Excess rainfall (mm) = 106.93
Calc. runoff depth (mm) = 106.74 - from bottom subarea
Recd. runoff depth (mm) = 0.00 - from bottom subarea
Calc. peak discharge (m3/s) = 2.439 - from bottom subarea
Recd. peak discharge (m3/s) = 0.000 - from bottom subarea
#####END_CATCHMENT_SUMMARY##
##########

#####START_SUBAREA_SUMMARY##
###############

SUBAREA	CENTRE OF AREA		OUTLET		DOWNSTREAM
	Easting	Northing	Easting	Northing	
SUB1	466.00	179.00	470.00	195.00	SUB2
SUB2	472.00	215.00	478.00	234.00	SUB3
SUB3	490.00	264.00	499.00	287.00	SUB6
SUB4	577.00	257.00	550.00	292.00	SUB6
SUB5	435.00	342.00	473.00	343.00	SUB6
SUB6	513.00	332.00	530.00	377.00	SINK

SUBAREA	AREA	CONTRIBUTING	IMP	CODES(1=exists)		QLINEAR
	(ha)	AREA(ha)	(%)	Stream Struct	Outlet Struct	Local (m3/s)
SUB1	0.44	0.44	50.0	0	0	0 -99.90
SUB2	0.60	1.04	50.0	1	0	0 -99.90
SUB3	0.98	2.02	50.0	1	0	0 -99.90
SUB4	0.57	0.57	50.0	0	0	0 -99.90
SUB5	0.58	0.58	50.0	0	0	0 -99.90
SUB6	0.75	3.92	50.0	1	0	0 -99.90

#####END_SUBAREA_SUMMARY##
###############

#####START_DEPTH_SUMMARY##
##########
SUBAREA	RAINFALL	----PERVIOUS----		---IMPERVIOUS---	
		EXCESS	RUNOFF	EXCESS	RUNOFF
	(mm)	(mm)	(mm)	(mm)	(mm)
SUB1	108.18	105.68	105.31	108.18	108.12
SUB2	108.18	105.68	105.34	108.18	108.13
SUB3	108.18	105.68	105.44	108.18	108.14
SUB4	108.18	105.68	105.35	108.18	108.12
SUB5	108.18	105.68	105.34	108.18	108.13
SUB6	108.18	105.68	105.38	108.18	108.13

#####END_DEPTH_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)

SUB1							
0.000	0.000	0.232	0.238	0.000	0.000	0.470	0.000
SUB2							
0.470	0.000	0.316	0.324	0.000	0.000	1.110	0.000
SUB3							
1.110	0.000	0.517	0.530	0.000	0.000	2.156	0.000
SUB4							
0.000	0.000	0.300	0.308	0.000	0.000	0.608	0.000
SUB5							
0.000	0.000	0.305	0.314	0.000	0.000	0.619	0.000
SUB6							
3.384	0.000	0.395	0.405	0.000	0.000	4.184	0.000

#####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)

SUB1	0	0.000	0.000	0.146	0.157	0.000	0.303	0.303
SUB2	0	0.303	0.284	0.194	0.211	0.000	0.687	0.687
SUB3	0	0.687	0.650	0.301	0.337	0.000	1.269	1.269
SUB4	0	0.000	0.000	0.185	0.201	0.000	0.386	0.386
SUB5	0	0.000	0.000	0.188	0.204	0.000	0.392	0.392
SUB6	0	2.047	1.972	0.237	0.261	0.000	2.439	2.439

#####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)

SUB1	0	0.0	0.0	25.0	25.0	0.0	25.0	25.0
SUB2	0	25.0	26.0	25.0	25.0	0.0	25.0	25.0
SUB3	0	25.0	26.0	25.0	25.0	0.0	25.0	25.0
SUB4	0	0.0	0.0	25.0	25.0	0.0	25.0	25.0
SUB5	0	0.0	0.0	25.0	25.0	0.0	25.0	25.0
SUB6	0	25.0	26.0	25.0	25.0	0.0	25.0	25.0

#####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_4

#####START_MULTIPLE_STORM_SUMMARY##########################
#########
STORM ---BURST----- ---EVENT----- RAINFALL EXCESS PEAK
ARI DURATION ARI DURATION RAINFALL DISCHARGE
(year) (minutes) (year)(minutes) (mm) (mm) (m3/s)

1	100	20	0	0	62.04	61.62	2.43
2	100	25	0	0	69.97	69.45	2.61
3	100	45	0	0	94.23	93.29	2.22
4	100	60	0	0	108.18	106.93	2.44
5	100	90	0	0	121.04	119.17	1.80
6	100	180	0	0	144.75	141.00	1.29
7	50	25	0	0	62.16	58.68	2.24
8	50	45	0	0	83.48	79.65	1.91
9	50	60	0	0	95.70	91.58	2.12
10	50	90	0	0	107.05	102.30	1.58
11	20	20	0	0	46.42	34.67	1.44
12	20	25	0	0	52.23	40.40	1.64
13	20	45	0	0	69.85	57.66	1.36
14	20	60	0	0	79.90	67.47	1.68
15	20	90	0	0	89.34	76.39	1.39
16	10	20	0	0	39.94	29.19	1.19
17	10	25	0	0	44.88	34.07	1.36
18	10	30	0	0	49.19	38.27	1.27
19	10	60	0	0	68.29	56.88	1.39

20	10	90	0	0	76.33	64.40	1.17
21	10	120	0	0	82.27	69.76	1.02
22	5	25	0	0	39.38	29.07	1.13
23	5	45	0	0	52.26	41.59	0.92
24	5	60	0	0	59.54	48.64	1.16
25	5	90	0	0	66.52	55.10	0.99
26	2	25	0	0	30.43	22.11	0.84
27	2	45	0	0	40.06	31.41	0.67
28	2	60	0	0	45.45	36.58	0.84
29	2	90	0	0	50.74	41.32	0.73
30	1	25	0	0	23.73	16.44	0.60
31	1	45	0	0	31.32	23.69	0.48
32	1	60	0	0	35.58	27.72	0.61
33	1	90	0	0	39.70	31.33	0.54
34	1	120	0	0	42.74	33.87	0.46

#####END_MULTIPLE_STORM_SUMMARY##
##########

#####END_QA_SUMMARY_FILE###
##########

Annexure NP-10

Conclave Joint Statement - Engineering

Rescom Property vs Ipswich City Council

Planning and Environment Court Appeal No. BD 1344 of 2006

This letter relates to conclave of engineering experts held in October 2006, between:

- Mr Gary Ellis (Ipswich City Council) for the Respondent;
- [redacted] (ETS Group) for the Appellant;
- [redacted] MRG Water Consulting) for the Appellant.

[redacted] (Adam Pekol Consulting) was present at the first meeting conducted 12 October 2006. It was noted that traffic issues were not going to be discussed in that particular meeting. A subsequent letter prepared by [redacted] was receipted as further supporting information.

Site Information

The subject development site is described as 35 Eric Street Goodna, more particularly Lot 1 on RP122040 and Lot 28 on RP8072704. The site has an area of 8.8664 hectares.

It is understood that the site is located within the *Residential Low-Density* RL2 zone under Ipswich City Council's *Ipswich Planning Scheme*. It is also understood that the site is contained within the *Urban Footprint* under the South East Queensland Regional Plan 2005-2006.

Current Development Proposal

The current development proposal is as shown in DTS Layout Plan A2905/8. This layout plan proposes a total 33 Lots with Park/Open Space. The total area of residential subdivision is 3.865 hectares and includes 459m road. Lot sizes range between 485m^2 and 830m^2 with an approximate average lot size of 637m^2.

Basis of Review Determinations

The following responses are declared in the context that the review and analysis pertains to development proposal as detailed in DTS Layout Plan A2905/8 and to supporting information as follows: ETS Earthworks drawing SK2 Revision A; Detailed Hydrological Report prepared by MRG Consulting Pty Ltd (dated August 2006) and Traffic Engineering Comments prepared by Adam Pekol Consulting and dated 13 October 2006. Additionally the responses provided are in the context of engineering matters and identified respondent's grounds in terms of engineering processes and requirements only.

[redacted] [redacted] [redacted]

INITIALS

The expert conclave discussions were reduced to points of agreement and disagreement (Areas of Concern) in terms of compliance with particular respondent's grounds.

Agreement

The experts were able to agree on the following points:

A1. With respect to Respondent's Ground 10.1

Proposed Lots 1 and 33 are considered to be traditional lots since they have natural slopes less than or equal to 10% and therefore excluded from this specific outcome.

A2. With respect to Respondent's Ground 10.2

The current proposed configuration layout necessitates the requirement for supplementary earthworks in order to provide traditional style lots (10% or less slope, specifically proposed lots 2 to 14, lots 19 to 26 and lots 30 to 33) rather than provision of hillside lots that accord with the requirements of Reconfiguring a Lot Code Appendix A (4). Should the number of hillside lots be increased, conversely the number of traditional lots be decreased, the earthworks would correspondingly be reduced and the requirement for retaining walls mostly removed. Lots 15 to 18 and Lots 20, 24, 25, 28 and 29 satisfy the required land area for hillside lots.

A3. With respect to Respondent's Ground 10.15.1

The maximum opportunity for on-site infiltration while maintaining appropriate lot density (i.e. generally in accordance with Reconfiguring a Lot Code Appendix A (4)) would coincide with the provision of an increased percentage of hillside lots. This would correspond to a reduced aspect ratio (impervious versus pervious area) for larger hillside allotments as roof areas and other impervious areas are comparatively less than the pervious surrounds, thereby providing increased opportunity for infiltration and water quality.

The dedicated open space area would to some degree offset the reduced pervious area associated with the development as proposed. Additionally the provision of roofwater tanks would assist in capturing runoff that would fall on impervious area, which could be utilised for infiltration on garden beds etc.

A4. With respect to Respondent's Ground 10.15.2

The current proposed revised retaining walls (assumed gravity system) configuration would in some instances cause minor concentration of stormwater overland flows to occur for internal property boundaries but these occasional design issues could be overcome with the provision of suitable inter-allotment drainage system. Similar minor stormwater overland flow concentrations would result from the installation of property boundary fences and therefore considered not be a continuing issue in terms of this appeal.

[redacted] [redacted] [redacted]

INITIALS

Notably it is considered that the interference along external property boundaries is negligible and would not require any specific drainage system unless drainage to the design invert level of the roadway kerb and channel or equivalent is not possible therefore a similar allotment drainage system would be necessary.

A5. With respect to Respondent's Ground 13.2

The proposed internal road network is considered to generally minimise earthworks, excepting Road 3 where further cut is required to provide the road sag (with appropriate vertical curve) at Road 1 intersection to facilitate minor and major stormwater drainage in accordance with QUDM.

The proposed internal road layout is functional in terms of termination points (cul-de-sacs), capacity, mobility and permits future connectivity to, and environment capacity for, adjoining development. Further Road 1 reserve width of 18 m, extending between Road 2 and Eric Street, permits the opportunity for pavement construction to a width of 8.5m (between inverts) necessary for collector status, thereby enhancing the road network capacity and further accommodating future adjoining development.

In terms of speed environment, the internal road and lot layout generally provides the necessary intersection spacings and opportunity for speed restrictive design through appropriate street length, bends or curves. However, the street deflection at Road 1 and Road 2 intersection is considered inadequate to obtain an effective street length, but this could be overcome with the provision of an appropriate style speed control device constructed at or near the applicable intersection.

The proposed car parking bay would be operationally more effective located along the proposed park frontage. Also this relocation would provide, dependent upon park vegetation constraints, the opportunity to minimise the earthworks and retaining walls in the vicinity of proposed Lot 13 and the boundary of exiting Lots 2 and 3 on RP122040.

A6. With respect to Respondent's Ground 22.1 and 22.3

Peak discharge for the subject site would increase at the site boundary for all design storm events ranging from events with an ARI of 1 year to 100 years.

Roof water tanks will provide a range of detention volumes depending on a number of usage demand factors for the retained stormwater. Further rainwater tanks offer benefits in terms of stormwater quality as the suspended sediments and particulates originating from the dwelling roof are likely to settle to the bottom of the tank to create a sludge, thereby reducing the pollutant loading for site stormwater runoff.

To ensure that for site discharge pre-development stormwater conditions were maintained, a detention basin or equivalent would be required.

In terms of stormwater runoff quality it was agreed that the a retention system that maintains predevelopment discharge, volumes and velocities for storm event with an

[redacted] [redacted] [redacted]

INITIALS

ARI of 1 year is required in order to preserve the geomorphic conditions of the Woogaroo Creek.

Any proposed detention basin (designed for Q2 to Q100) should be located above the Q100 flood level in order to minimise earthworks below the Q100 and ensure maximum tree retention and bank stability.

A7. With respect to Respondent's Ground 22.3

The fill propose for lots 32 and 33 is to accommodate the desired flood immunity for Q100. The extent of fill ranges between 300 to 1000 mm but the average fill depth does not generally exceed more than 350 mm in this area.

A8. With respect to Respondent's Ground 22.4

It is agreed that any proposed detention basin would have a relatively significant footprint for the site area and where located within the proposed park would detrimentally affect the capability to preserve existing vegetation and minimise earthworks below the Q20 and Q100 flood levels.

Areas of Concern – Gary Ellis

C1. With respect to Respondent's Ground 10.1

Mr Gary Ellis considers that earthworks (refer ETS Dwg SK2) reduce the natural slopes to less than 10% on some of the affected lots for no real engineering benefit other than to create traditional style lots.

Proposed Lot 23 has the potential for the future landowner to construct a retaining wall along the common property boundary of Lots 24 and 25, thereby impacting on the retained vegetation and in ground infrastructure servicing the allotment. The corresponding relative high aspect ratio (depth to width) would require substantial earthworks and retaining wall (approximately 1.5-2.0 m height) in order to provide a slab on ground construction. Similarly proposed Lots 6 and 7 would create substantive earthworks along common property boundaries when dwellings are constructed.

With respect to proposed hatchet style Lots 11 and 12 it is commented that albeit the access strip is 5m wide it serves two allotments and is generally undesirable.

C2. With respect to Respondent's Ground 10.2.1

The current proposed earthworks do not create level building platforms, but rather create a mixture of lots that facilitate the adoption of traditional lots (greater than 7% slope category) and hillside lots. However, because of the proposed lot area sizes there is the real risk that in order to construct slab on ground individual landowners will construct retaining walls to establish the chosen dwelling and provide usable land and thereby undo the general approach to minimise earthworks, restrict retaining walls and maximise tree retention. Should the lots be created for hillside housing

[redacted] [redacted] [redacted]

INITIALS

there would be the opportunity to restrict slab on ground construction and thereby restrict post-development earthworks and retaining walls, this would also eliminate the need for any substantive earthworks. Therefore it is recommended that increased proportion of hillside lots be created to avoid the propensity for further substantive earthworks by individual landowners.

C3. With respect to Respondent's Ground 10.15.3

In order to provide sewerage and stormwater infrastructure it is most likely that the infrastructure would be located either behind or in front of the gravity retaining wall. Further it is possible that the provided pipe infrastructure would transverse under a retaining wall. The complexity of such arrangements is that should the asset owner undertake to replace or repair the subject infrastructure consideration must be given to the integrity and replacement (where required) of the adjacent retaining wall, thereby burdening the activity unnecessarily in terms of risk and cost.

C4. With respect to Respondent's Ground 13.2

With respect to the external road network, it is considered that the Eric Street and the Bertha Street intersection would not satisfy current road design standards and safety requirements. Specifically that the Bertha Street safety would require upgrade in form of channelisation improvements. Additionally, Eric Street would most likely require warning and delineation improvements to improve the safety where design speed requirements do not satisfy current specifications.

C5. With respect to Respondent's Ground 22.1 and 22.2

Insufficient information has been provided to permit a determination whether the proposed fill and alteration earthworks will detrimentally affect the flood storage capacity of flood conveyance for the cross section of the adjoining watercourse.

C6. With respect to Respondent's Ground 22.3

It is very important to maintain pre-development stormwater conditions as downstream of the development site has existing flooding problems that effect 40 to 50 homes for Q100 flood event of the Woogaroo Creek catchment. The underlying principle that the site peak discharge will not worsen the downstream peak discharges in Woogaroo Creek since the site discharge will diminish to less than peak well before arrival of the peak Woogaroo Creek discharge is a simplism based on average temporal rainfall pattern that ignores the real potential for multi-peak events and irregular rainfall patterns containing rainfall bursts, i.e. real storm event creating worse case scenario. Albeit the increased site discharge is relatively negligible in terms of the Woogaroo Creek discharge, the potential exists for the increased site discharge to coincide with the Woogaroo Creek discharge thereby increasing the peak discharge and flood event, ever so slightly, during a irregular rainfall pattern. Importantly should this approach to not detain successive development increased discharges become a precedence and accepted methodology within this catchment then there exists the real possibility for significant higher peak discharges relative to

[redacted] [redacted] [redacted]

INITIALS

pre-development and therefore peak flood levels. This would then have significant and serious consequences for existing downstream properties.

With respect to roof water tanks there exists a potential for system failure, i.e. insufficient available air space, during a particular design or real storm event. The probability of failure for this application is presently unknown unless continuous simulation modelling of the temporal rainfall pattern is examined and analysed. Unless this modelling is undertaken it is not encouraged to include the retention storage benefit of the roofwater tanks in any hydrology assessment. Additionally this principle is further supported in the realisation that there is a potential for individual landowners to interfere with the roofwater tank configuration and limited control available to the local government. This would however produce a conservative approach to the estimation of stormwater retention.

[redacted] feels that this approach would be overly conservative and the benefit of roofwater tanks should not be disregarded for storm events with an ARI of 10 years or less. Gary Ellis agrees that the effectiveness of roofwater tanks is limited to the frequent smaller storm events.

C7. <u>With respect to Respondent's Ground 22.4</u>

Insufficient information has been provided to establish whether there is proposed fill and or works within 30m of a defined watercourse or within 10m of the top of the bank of a defined watercourse. Further it has not been established that the proposed works comply with Figure 11.4.12 of the Scheme.

[redacted] [redacted] [redacted]

INITIALS

SIGNED

[redacted] (26 October 2006)

Gary Ellis

[redacted] (26 October 2006)

[redacted] (26 October 2006)

[redacted]

[redacted]

INITIALS

[redacted]

Annexure NP-11

MRG WATER CONSULTING PTY LTD

EXPERT WITNESS REPORT

RESCOM PROPERTY GROUP PTY LTD
VRS
IPSWICH CITY COUNCIL

P&E APPEAL No. BD1344/2006

DECEMBER 2006

MRG WATER CONSULTING PTY LTD
ACN 109 187 402 ABN 14 109 187 402
6/18 Torbey Street, Sunnybank Hills QLD 4109
Telephone:
Email [redacted]

Job No: 1122

Report Name	Date	Revision No.
Expert Witness Report – Rescom Property Group Pty Ltd vrs Ipswich City Council, P&E No. BD1344/2006	20 December 2006	1122/Rev 1

Project Engineer: [redacted]
BE Civil, MIE Aust, RPEQ 6722
Director
E
M [redacted]

Technical Officer: [redacted]
Technical Officer
E
M [redacted]

MRG WATER CONSULTING PTY LTD
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Telephone:
Email [redacted]

1.0 INTRODUCTION

MRG Water Consulting Pty Ltd was commissioned to prepare an expert witness report regarding hydraulic matters for the court appeal by Rescom Property Group Pty Ltd against the Ipswich City Council, regarding the proposed residential development at 35 & 37A Eric Street, Goodna. Figure 1 shows the location of the development site. The site is located adjacent to Woogaroo Creek and a portion of it is inundated by flooding from the creek and from the Brisbane River during rare rainfall events.

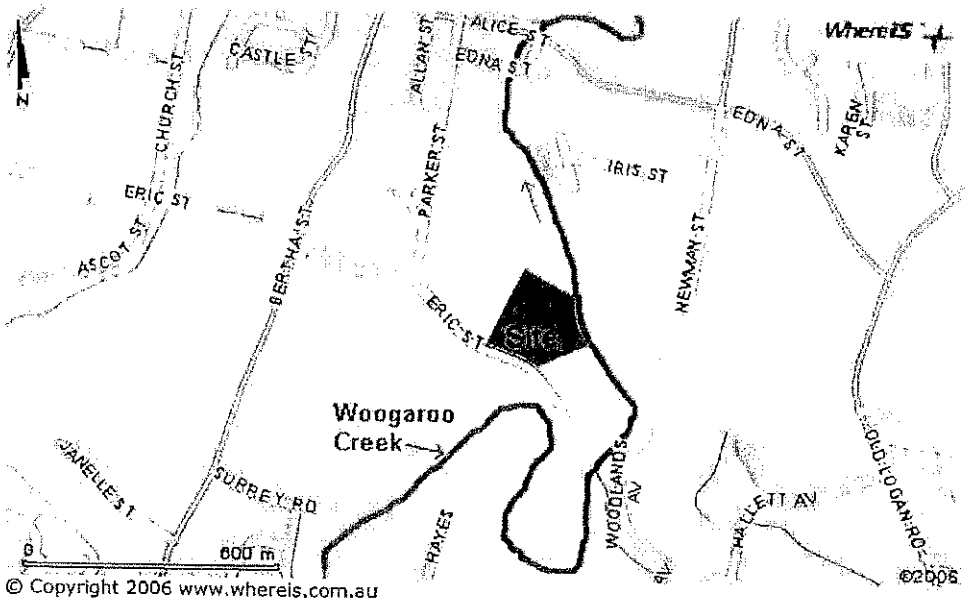

Figure 1 – Locality Plan

The owner of the site is currently appealing the development approval conditions, (relating to the intensity of development), specified by the Ipswich City Council, (ICC). Drawing A2/905/8 by the DTS Group Qld Pty Ltd shows the layout of the development proposed by the Rescom Property Group Pty Ltd.

A number of without prejudice conclaves between hydraulic experts, Gary Ellis (for Respondent) and Mark Gibson (for Appellant), occurred in October and November 2006. Following these conclaves, it was agreed that the following points needed further investigation.

1. Further information was required to confirm that the proposed earthworks will not detrimentally affect the flood storage capacity or conveyance of Woogaroo Creek.

2. Some form or type of detention/retention is needed as part of the proposed development to ensure that downstream flood affected properties do not experience a worsening. The detention should also not delay stormwater discharges too long as the peak may coincide with that of Woogaroo Creek and increase flooding downstream. It

was agreed that a combination of retention/detention basins and roof water tanks be used as part of the solution.

The purpose of this report is to undertake the hydraulic modelling of Woogaroo Creek to determine the impacts of the development on downstream and upstream properties and devise a detention system for the development which will ensure a no worsening to downstream properties.

This report supersedes all previous reports regarding stormwater issues for the proposed development.

2.0 RATIONAL METHOD CALCULATIONS

The peak stormwater discharges from the existing and developed site and upstream catchment have been calculated using the Rational Method, at Point 1 on Figure 3. The Rational Method calculations have been completed in accordance with the parameters recommended in the Queensland Urban Drainage Manual (QUDM, 1992) for the 100, 50, 20, 10, 5 and 2 year ARI storm events. Table 2.1 shows the calculated peak discharges. Complete details of the Rational Method calculations are found in Table A.1 and A.2 of Appendix A of this report.

Table 2.1 - Rational Method Peak Discharges

ARI (Years)	Peak Discharge (m^3/s)		Increase due to development of the site (m^3/s)
	Existing Site	Developed Site	
2	0.84	1.06	0.22 (26.0%)
5	1.21	1.51	0.30 (24.5%)
10	1.45	1.80	0.35 (24.1%)
20	1.76	2.19	0.43 (24.6%)
50	2.30	2.84	0.54 (23.6%)
100	2.68	3.32	0.64 (23.9%)

Table 2.1 shows that development of the site will increase peak discharges at Point 1 by up to 0.64 m^3/s, or 24.6%.

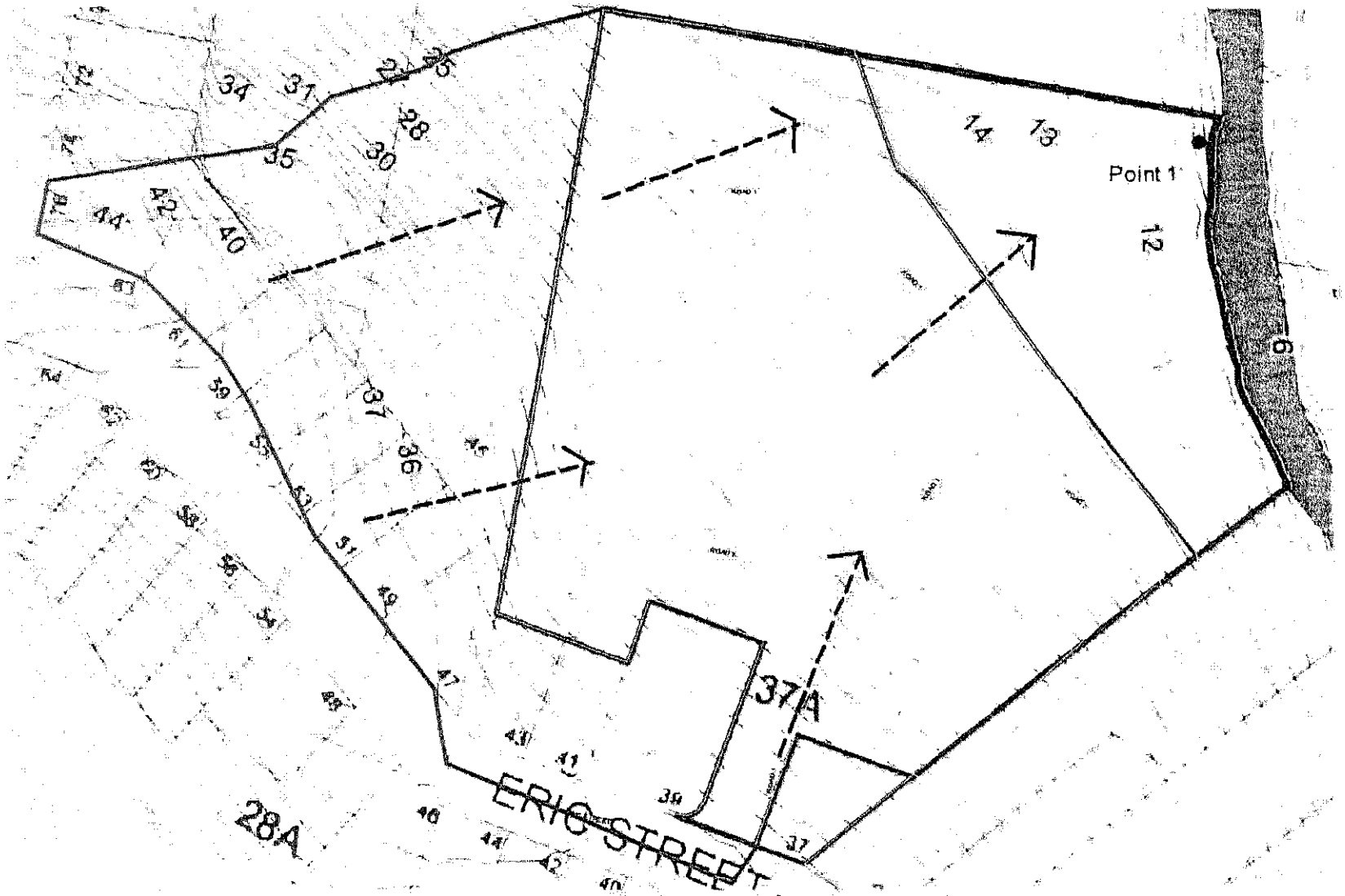

Figure 3 – Rational Method Layout – Scale 1:1500 @ A4

3.0 RAFTS HYDROLOGIC MODEL

3.1 GENERAL

To determine the 2, 5, 10, 20, 50 and 100 year discharge hydrographs entering Woogaroo Creek, a RAFTS hydrologic model was set up for the site and the upstream catchment area.

RAFTS is a non-linear routing hydrologic model that calculates flood hydrographs from storm rainfall hyetographs. It can be used for the analysis and management of both urban and rural watersheds and the design of flood storages and river analysis works. RAFTS can also assist with the design of smaller urban drainage systems, on-site detention systems and large detention basins. A schematic representation of the RAFTS model layout for the site and upstream catchment is presented on Figure 4.

3.2 MODEL SETUP

Two RAFTS models were set up; the first for the existing site, and the second for the fully developed site. The RAFTS models were run with the 2, 5, 10, 20, 50 and 100 year ARI design storms for the 25, 30, 45, 60, 90, 180 and 360 minute rainfall events. Tables 3.1 and 3.2 show that for nearly every storm event, 60 minutes is the critical storm duration.

Existing Site - The B_x lag parameter used in the RAFTS model for the existing site was 1.63. The RAFTS model was set up with sub-catchments B, D, F and G being fully pervious and sub-catchments A, C and E, being 50% pervious and 50% impervious. Continuing losses of 2.5 and 0 mm/hr were used for the pervious and impervious areas respectively. An initial loss of 1 mm was used for the impervious areas. The initial loss for the pervious area was adjusted to calibrate the model discharges for each storm event to the peak discharges obtained from the Rational Method in Table 2.1. These initial pervious loss values are presented in Table 3.1.

Developed Site - The B_x lag parameter used in the RAFTS model for the developed site was 1.34. The RAFTS model was set up with sub-catchment G being fully pervious and sub-catchments A, B, C, D, E and F being 50% pervious and 50% impervious. Continuing losses of 2.5 and 0 mm/hr were used for the pervious and impervious areas respectively. An initial loss of 1 mm was used for the impervious areas. The initial loss for the pervious area was adjusted to calibrate the model discharges for each storm event to the peak discharges obtained from the Rational Method in Table 2.1. These loss values are presented in Table 3.2.

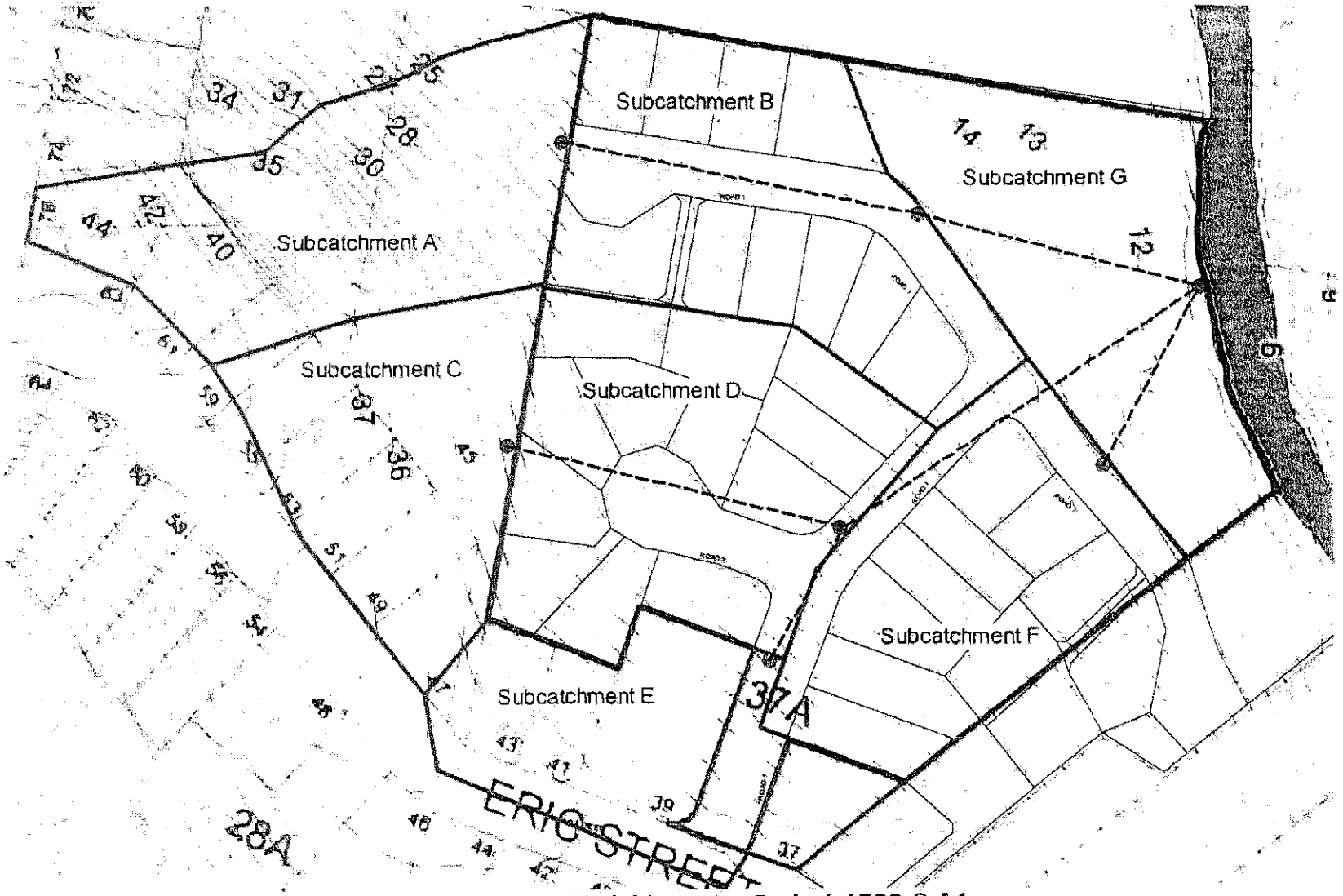

Figure 4 – RAFTS Model Layout – Scale 1:1500 @ A4

Table 3.1 - RAFTS Model Parameters - Existing Site Conditions

ARI	Existing Site Conditions					
	B_x	Critical Storm Duration (min)	Initial Pervious Loss (mm)	Continuing Pervious Loss (mm)	Initial Impervious Loss (mm)	Continuing Impervious Loss (mm)
2	1.63	60	5	2.5	1	0
5	1.63	60	7	2.5	1	0
10	1.63	60	6	2.5	1	0
20	1.63	60	8	2.5	1	0
50	1.63	60	1	2.5	1	0
100	1.63	60	0	2.5	1	0

Table 3.2 - RAFTS Model Parameters - Developed Site Conditions

ARI	Developed Site Conditions					
	B_x	Critical Storm Duration (min)	Initial Pervious Loss (mm)	Continuing Pervious Loss (mm)	Initial Impervious Loss (mm)	Continuing Impervious Loss (mm)
2	1.34	25	12	2.5	1	0
5	1.34	60	12	2.5	1	0
10	1.34	60	13	2.5	1	0
20	1.34	25	16	2.5	1	0
50	1.34	60	8	2.5	1	0
100	1.34	60	0	2.5	1	0

Tables 3.3 and 3.4 present the RAFTS model peak discharges in comparison to the Rational Method peak discharges. The maximum difference between the two models was found to be less than 0.8 m^3/s. Therefore the models were considered adequately calibrated.

Table 3.3 - RAFTS and Rational Method Peak Discharges at Point 1 - Existing Site

ARI (years)	Peak Discharge (m^3/s)		Difference (%)
	Rational Method - Existing	RAFTS - Existing	
2	0.84	0.8348	-0.62
5	1.21	1.203	-0.79
10	1.45	1.458	0.45
20	1.76	1.755	-0.39
50	2.30	2.292	-0.20
100	2.68	2.68	-0.02

Figure 5 - Comparison of 100 year ARI Discharge Hydrographs for Existing and Developed Site - (Unmitigated)

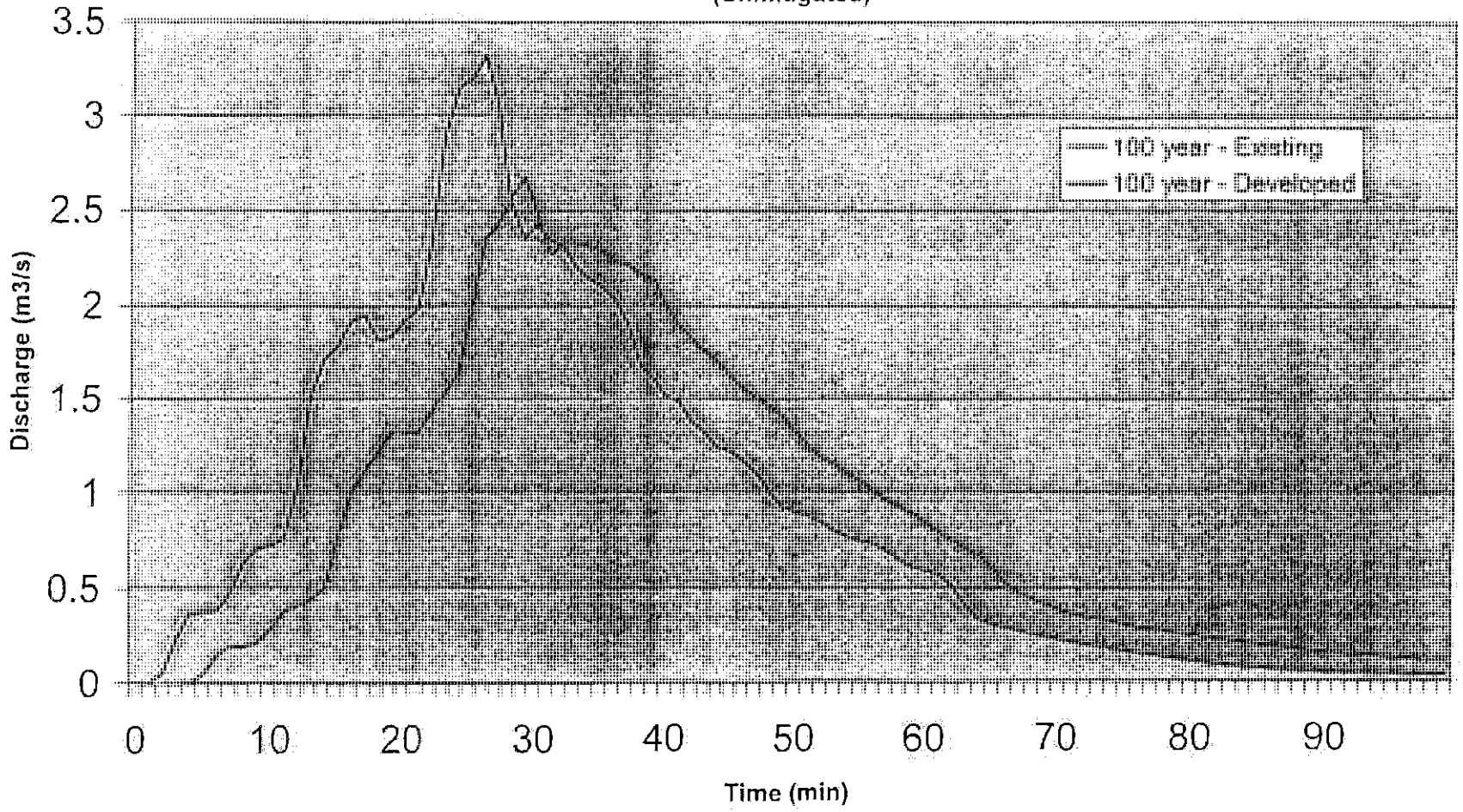

Table 3.4 - RAFTS and Rational Method Peak Discharges at Point 1 - Developed Site

ARI (years)	Peak Discharge (m^3/s)		Difference (%)
	Rational Method - Developed	RAFTS - Developed	
2	1.06	1.058	-0.03
5	1.51	1.512	0.12
10	1.80	1.808	0.39
20	2.19	2.187	-0.34
50	2.84	2.825	-0.46
100	3.32	3.321	-0.02

Figure 5 shows the 100 year ARI discharge hydrographs entering Woogaroo Creek from the existing and developed (unmitigated) site. Figure 5 demonstrates that development of the site will not only increase the peak stormwater discharge leaving the site but shorten the time taken for the peak discharge to reach Woogaroo Creek.

4.0 PROPOSED DETENTION/RETENTION BASIN AND TANKS

4.1 GENERAL

As discussed previously, some form or type of detention/retention is needed as part of the proposed development to ensure that downstream flood affected properties do not experience a worsening. The detention should also not delay stormwater discharges too long as the peak may coincide with that of Woogaroo Creek and increase flooding downstream.

It is proposed to assess the impact of using 5000 litre rainwater tanks on each new allotment, with a portion of each dedicated for detention of stormwater. In addition, a detention/retention basin will be constructed to reduce the volume of stormwater and peak discharge entering Woogaroo Creek.

4.2 RAINWATER TANKS CHARACTERISTICS

It is proposed that each allotment have a 5000 litre rainwater tank which captures a least 75% of the roof water off each new house. Within the tank, 3500 litres will be used for retention of stormwater and the top 1500 litres will be used for stormwater detention. A 2.5 cm outlet pipe will be located at the interface between the retention and detention spaces. The rainwater tanks should be connected to the new dwellings to allow the collected water to be used for gardening, toilet flushing and hot water use.

4.3 BASIN CHARACTERISTICS

In addition to the tanks, it is proposed to construct a retention/detention area within the parkland adjacent to Woogaroo Creek. Table 4.1 shows a summary of the proposed basin's characteristics and Table 4.2 shows the storage/depth relationship of the proposed basin.

Table 4.1 Retention/Detention Basin Characteristics

Item	Details
Outlets	• 0.45 m x 0.45 m box culvert with invert 0.3 m above floor of basin. • Spillway - 2 m wide @ 1.0 m above invert of basin.
Dimensions, Side Slopes and Other	• Basin to retain 162 m^3 of stormwater below pipe invert to infiltrate for water quality purposes. • Side slopes 1 in 4 to 1 in 6. • Located in area above the 100 year ARI local flood line, (12.55 m AHD). • Grassed swale leading from pipe outlet of development to basin to have maximum capacity of 2.5 m^3/s. Flows greater than this should spill out of swale and bypass the basin.

Table 4.2 Depth/Storage Relationship

Depth (m)	Storage (m^3)
0	0.0
0.5	270
1.0	540
1.5	810

It should be noted that the invert of the box culvert will be located 0.3 m above the base of the basin. This will allow water quality treatments such as bio-retention filters and infiltration areas to be constructed in the base of the basin. The Stormwater Quality Management Plan by the ETS Group provides further information on these details.

4.4 MITIGATION EFFECT OF PROPOSED BASIN ONLY

The RAFTS model with the proposed basin was run for the 2, 5, 10, 20, 50 and 100 year ARI design storms to assess the basin performance. Table 4.3 compares the results of the modelling for existing and developed conditions, (with basin only).

Table 4.3 - Comparison of Existing Site and Developed Site with Basin Only

ARI (years)	Peak Discharge (m^3/s)		Difference due to site development (m^3/s)
	Existing Site	Developed Site with Basin	
2	0.84	0.88	0.04 (4.6%)
5	1.21	1.26	0.05 (4.2%)
10	1.45	1.37	-0.08 (-5.7%)
20	1.76	1.58	-0.18 (-10.2%)
50	2.30	1.98	-0.32 (-13.9%)
100	2.68	2.60	-0.08 (-2.8%)

The results show that the detention/retention basin reduces peak discharges from existing conditions by up to 13.9% for the 10 yr to 100 yr ARI events. The basin does not fully mitigate the effect of the development for the 2 and 5 year ARI events.

The depth of water in the basin during the 100 year ARI storm event is 1.25 m. Detailed RAFTS model results are found in Appendix B of this report.

4.5 MITIGATION EFFECT OF RAINWATER TANKS AND BASIN

The RAFTS model with the proposed basin and rainwater tanks was run for the 2 and 5 year ARI design storms to assess the impact of the tanks on peak stormwater discharges. Table 4.4 compares the results of the modelling for existing and developed conditions, (with basin and tanks).

Table 4.4 - Comparison of Existing and Developed Site with Detention Basin and Rainwater Tanks

ARI (years)	Peak Discharge (m^3/s)		Difference due to site development (m^3/s)
	Existing Site	Developed Site with Basin	
2	0.84	0.74	-0.10 (-12.1%)
5	1.21	1.16	-0.05 (-4.5%)

The results show that the combination of rainwater tanks and the basin reduces peak discharges from existing conditions by up to 12.1% for the 2 and 5 yr ARI events. Therefore the combined effect of the basin and rainwater tanks will mitigate the effect of development of the site on peak stormwater discharges entering Woogaroo Creek.

5.0 IMPACT ON WOOGAROO CREEK FLOOD LEVELS

Investigation of the site has shown that two Woogaroo Creek flood levels need to be considered as part of the development process. The site is affected by a 100 year ARI water level in the Brisbane River. During this river flood event, water from the river travels up Woogaroo Creek and inundates a portion of the property. This backwater from the river is essentially ponding and velocities in Woogaroo Creek would be close to zero.

The site is also affected by a 100 year ARI flood event in Woogaroo Creek. During this event the water level on the site is 12.55 m AHD and 12.94 m AHD at the downstream and upstream property boundaries respectively.

Currently all roadworks and house allotments are located above the 100 year ARI level in the Brisbane River of 14.75 m AHD. However, it is possible to construct the basin between the 100 year ARI Woogaroo Creek level and the 100 year ARI Brisbane River level. This is because works in this area will not decrease the conveyance or flood storage of Woogaroo Creek and will not increase flood levels in the Brisbane River.

Figure 6 shows the area available for the construction of the basin and suggests a possible location. The construction of a basin in this area would be preferable as there are few trees and only scattered vegetation in this area.

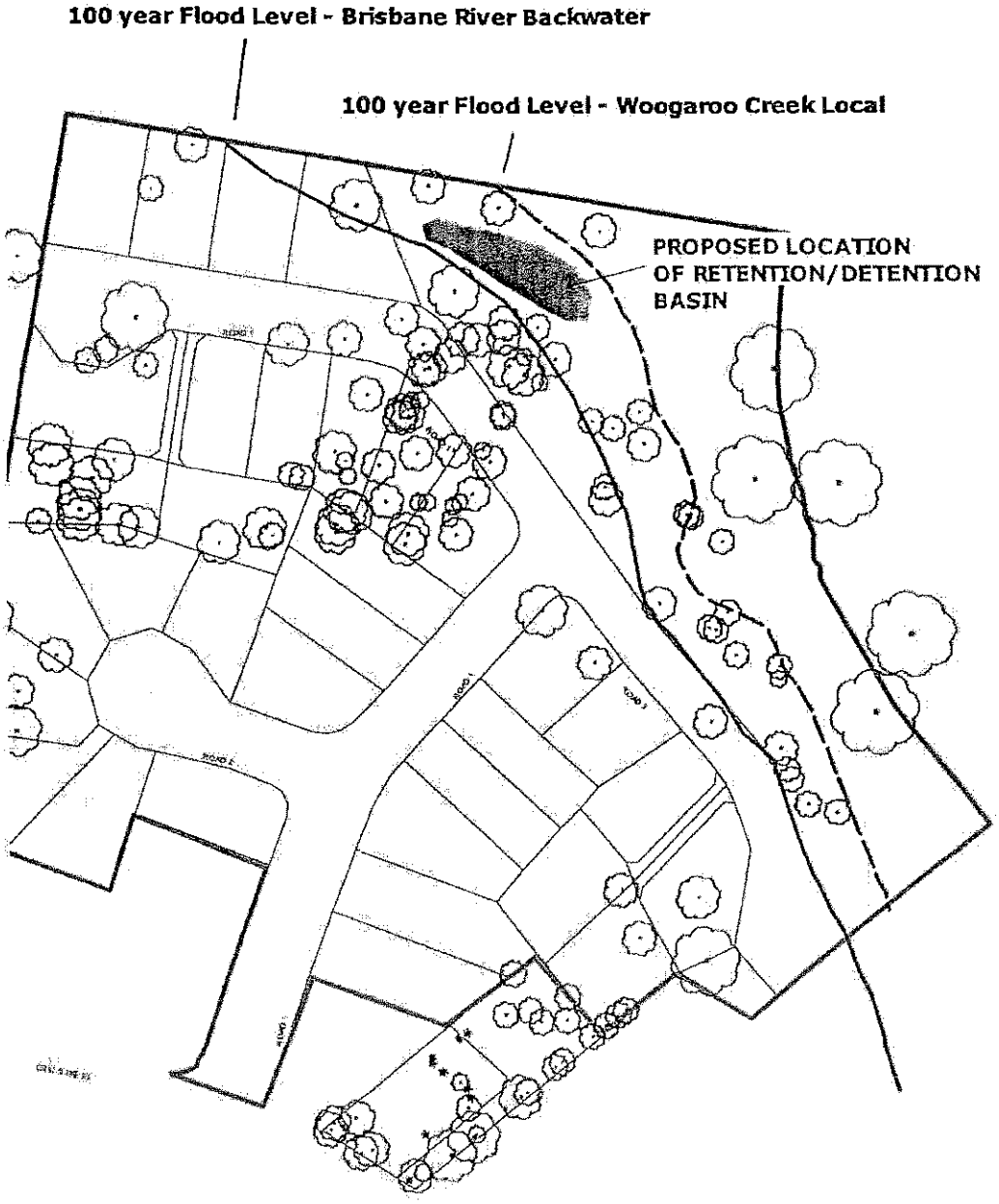

Figure 6 – Proposed Basin Location – Scale 1:1500 @ A4

6.0 CONCLUSION

The report demonstrates that by constructing a detention basin and fitting rainwater tanks as part of the development of the site, the development:

a. Will not increase peak stormwater discharges in Woogaroo Creek;
b. Will not reduce the conveyance capacity of Woogaroo Creek for up to a 100 year ARI event;
c. Will not reduce the flood storage of Woogaroo Creek on the site for up to a 100 year ARI event; and
d. Will not cause a worsening to upstream or downstream properties.

The development includes measures to retain stormwater on the site through tanks and a retention basin which will assist in maintaining the existing bed and bank stability in Woogaroo Creek.

[redacted]

Mark Gibson
BE Civil, MIE Aust, RPEQ 6722
Director
E
M [redacted]

LIST OF APPENDICES

APPENDIX A

Rational Method Calculations

RATIONAL METHOD CALCULATIONS

Project: Eric St, Goodna (Site Only)

Location of Discharge: Downstream Site Boundary (Woogaroo Creek)
Catchment Condition: Existing Site and fully Developed Upstream Catchment
Other Comments:

Time of Concentration	14.0	minutes			
	Developed	Undeveloped		Total	
Sub-Catchment Areas	2.007	3.243		5.25	ha
C10 Runoff Coefficients	0.78	0.66			

ARI (years)	Rainfall Intensity (mm/hr)	Depth (mm)	Fy	Runoff Coefficients Developed	Undeveloped	0	Discharges (cumecs) Developed	Undeveloped	0	TOTAL
1	75	18	0.80	0.62	0.53	0.00	0.261	0.357	0.000	**0.62**
2	96	22	0.85	0.66	0.56	0.00	0.355	0.485	0.000	**0.84**
5	124	29	0.95	0.74	0.63	0.00	0.512	0.700	0.000	**1.21**
10	141	33	1.00	0.78	0.66	0.00	0.613	0.838	0.000	**1.45**
20	163	38	1.05	0.82	0.69	0.00	0.744	1.018	0.000	**1.76**
50	194	45	1.15	0.90	0.76	0.00	0.970	1.326	0.000	**2.30**
100	217	51	1.20	0.94	0.79	0.00	1.132	1.548	0.000	**2.68**

Upper Catchment Slope	15.0%
Standard Inlet Time	8 min
Travel Length	237 metres
Fall	20 metres
Travel Time	2 min
Delta for Time of Concentration	3.0 14.0

Equiv Travel Velocity 0.7 m/s

ARI	% of Q100
1	23%
2	31%
5	45%
10	54%
20	66%
50	86%
100	100%

Table A1

RATIONAL METHOD CALCULATIONS

Project: Eric St, Goodna (Site Only)

Location of Discharge: Downstream Site Boundary (Woogaroo Creek)
Catchment Condition: Fully Developed Site
Other Comments:

Time of Concentration	10.0	minutes			
	Developed	Undeveloped		Total	
Sub-Catchment Areas	4.475	0.775		5.25	ha
C10 Runoff Coefficients	0.78	0.66			

ARI (years)	Rainfall Intensity (mm/hr)	Depth (mm)	Fy	Runoff Coefficients Developed	Undeveloped	0	Discharges (cumecs) Developed	Undeveloped	0	TOTAL
1	87	15	0.80	0.62	0.53	0.00	0.675	0.099	0.000	**0.77**
2	112	19	0.85	0.66	0.56	0.00	0.923	0.135	0.000	**1.06**
5	143	24	0.95	0.74	0.63	0.00	1.317	0.193	0.000	**1.51**
10	162	27	1.00	0.78	0.66	0.00	1.571	0.230	0.000	**1.80**
20	188	31	1.05	0.82	0.69	0.00	1.914	0.280	0.000	**2.19**
50	222	37	1.15	0.90	0.76	0.00	2.475	0.363	0.000	**2.84**
100	249	42	1.20	0.94	0.79	0.00	2.897	0.425	0.000	**3.32**

Upper Catchment Slope	15.0%
Standard Inlet time	8 min
Travel Length	237 metres
Fall	20 metres
Travel Time	2 min
Delta for	1.0
Time of Concentration	10.0

Equiv Travel Velocity
2.0 m/s

ARI	% of Q100
1	23%
2	32%
5	45%
10	54%
20	66%
50	85%
100	100%

Table A.2

APPENDIX B

RAFTS Model Result Files

```
 Run started at:  8th  December  2006   9:31:55


#############################################################################
#####
                          RUNTIME          RESULTS
#############################################################################
#####


Max. no. of links allowed =  2000

Max. no. of routng increments allowed = 25000

Max. no. of rating curve points = 25000

Max. no. of storm temporal points = 25000

Max. no. of channel subreaches =    25

Max link stack level =    25

Input Version number =          650

 LINK A                 1.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.1888
 ESTIMATED PEAK FLOW          (CUMECS) =      0.19
 ESTIMATED TIME TO PEAK          (MINS) =     15.00

 LINK B                 1.001

 ESTIMATED VOLUME (CU METRES*10**3) =          0.3898
 ESTIMATED PEAK FLOW          (CUMECS) =      0.38
 ESTIMATED TIME TO PEAK          (MINS) =     15.00

 LINK C                 2.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.1434
 ESTIMATED PEAK FLOW          (CUMECS) =      0.14
 ESTIMATED TIME TO PEAK          (MINS) =     15.00

 LINK E                 3.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.1396
 ESTIMATED PEAK FLOW          (CUMECS) =      0.14
 ESTIMATED TIME TO PEAK          (MINS) =     15.00

 LINK D                 2.001
```

```
 Run started at:  8th  December  2006   9:26:40


##############################################################################
#####
                          RUNTIME          RESULTS
##############################################################################
#####


Max. no. of links allowed =  2000

Max. no. of routng increments allowed = 25000

Max. no. of rating curve points = 25000

Max. no. of storm temporal points = 25000

Max. no. of channel subreaches =    25

Max link stack level =    25

Input Version number =          650


 LINK A                1.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.7559
 ESTIMATED PEAK FLOW          (CUMECS) =      0.46
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK B                1.001

 ESTIMATED VOLUME (CU METRES*10**3) =           1.551
 ESTIMATED PEAK FLOW          (CUMECS) =      0.78
 ESTIMATED TIME TO PEAK          (MINS) =     26.00

 LINK C                2.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.5686
 ESTIMATED PEAK FLOW          (CUMECS) =      0.35
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK E                3.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.5584
 ESTIMATED PEAK FLOW          (CUMECS) =      0.33
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK D                2.001
```

```
ESTIMATED VOLUME (CU METRES*10**3) =          1.955
ESTIMATED PEAK FLOW          (CUMECS) =      0.96
ESTIMATED TIME TO PEAK          (MINS) =     26.00

LINK F                  4.000

ESTIMATED VOLUME (CU METRES*10**3) =         0.6646
ESTIMATED PEAK FLOW          (CUMECS) =      0.29
ESTIMATED TIME TO PEAK          (MINS) =     31.00

LINK G                  1.002

ESTIMATED VOLUME (CU METRES*10**3) =          4.886
ESTIMATED PEAK FLOW          (CUMECS) =      2.29
ESTIMATED TIME TO PEAK          (MINS) =     29.00
```

```
##############################################################################
#####
50year 60min developed

Results for period from  2:15.0 29/11/2006
                    to  8:15.0 29/11/2006
##############################################################################
#####
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                                ROUTING INCREMENT (MINS) =       1.00
                                STORM DURATION (MINS)    =       60.
                                RETURN PERIOD (YRS)      =       50.
                                BX                       =    1.6300
                                TOTAL OF FIRST SUB-AREAS  (ha) =       4.25
                                TOTAL OF SECOND SUB-AREAS (ha) =       1.00
                                TOTAL OF ALL SUB-AREAS (ha)    =       5.25
```

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Catch. Area #2 (ha)	Slope #1 (%)	Slope #2 (%)	% Impervious #1 (%)	% Impervious #2 (%)	Perm #1	Perm #2	B #1	B #2	Link No.
A	0.4030	0.4030	15.00	15.00	0.000	100.0	.080	.025	.0169	.0008	1.000
B	0.8550	0.000	13.00	0.000	0.000	0.000	.080	0.00	.0268	0.000	1.001
C	0.3030	0.3030	13.00	13.00	0.000	100.0	.080	.025	.0156	.0007	2.000
E	0.2980	0.2980	9.000	9.000	0.000	100.0	.080	.025	.0186	.0009	3.000
D	0.8940	0.000	10.00	0.000	0.000	0.000	.080	0.00	.0312	0.000	2.001
F	0.7190	0.000	12.00	0.000	0.000	0.000	.080	0.00	.0255	0.000	4.000
G	0.7750	0.000	11.00	0.000	0.000	0.000	.080	0.00	.0277	0.000	1.002

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Init. Loss #2 (mm)	Cont. Loss #1 (mm/h)	Cont. Loss #2 (mm/h)	Excess Rain #1 (mm)	Excess Rain #2 (mm)	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
A	96.000	1.000	1.000	2.500	0.000	92.542	95.000	0.4614	25.00	1.000
B	96.000	1.000	0.000	2.500	0.000	92.542	0.000	0.7801	26.00	3.000

C	96.000	1.000	1.000	2.500	0.000	92.542	95.000	0.3518	25.00	1.000
E	96.000	1.000	1.000	2.500	0.000	92.542	95.000	0.3275	25.00	1.000
D	96.000	1.000	0.000	2.500	0.000	92.542	0.000	0.9599	26.00	3.000
F	96.000	1.000	0.000	2.500	0.000	92.542	0.000	0.2861	31.00	3.000
G	96.000	1.000	0.000	2.500	0.000	92.542	0.000	2.292	29.00	0.000

Run completed at: 8th December 2006 9:26:40

mik open 0

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 Run started at:  8th  December  2006   9:27:40


#########################################################################################
#####
                          RUNTIME          RESULTS
#########################################################################################
#####


Max. no. of links allowed =  2000


Max. no. of routng increments allowed = 25000


Max. no. of rating curve points = 25000


Max. no. of storm temporal points = 25000


Max. no. of channel subreaches =    25


Max link stack level =    25


Input Version number =          650


 LINK A                 1.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.6015
 ESTIMATED PEAK FLOW          (CUMECS) =      0.39
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK B                 1.001

 ESTIMATED VOLUME (CU METRES*10**3) =          1.199
 ESTIMATED PEAK FLOW          (CUMECS) =      0.61
 ESTIMATED TIME TO PEAK          (MINS) =     26.00

 LINK C                 2.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.4512
 ESTIMATED PEAK FLOW          (CUMECS) =      0.30
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK E                 3.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.4438
 ESTIMATED PEAK FLOW          (CUMECS) =      0.26
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK D                 2.001
```

```
ESTIMATED VOLUME (CU METRES*10**3) =          1.521
ESTIMATED PEAK FLOW          (CUMECS) =      0.74
ESTIMATED TIME TO PEAK          (MINS) =     26.00

LINK F                  4.000

ESTIMATED VOLUME (CU METRES*10**3) =         0.5044
ESTIMATED PEAK FLOW          (CUMECS) =      0.23
ESTIMATED TIME TO PEAK          (MINS) =     35.00

LINK G                  1.002

ESTIMATED VOLUME (CU METRES*10**3) =          3.769
ESTIMATED PEAK FLOW          (CUMECS) =      1.75
ESTIMATED TIME TO PEAK          (MINS) =     29.00
```

```
##############################################################################
#####
20year 60min developed

Results for period from  2:15.0 29/11/2006
                    to  8:15.0 29/11/2006
##############################################################################
#####
```

```
ROUTING INCREMENT (MINS) =       1.00
STORM DURATION (MINS)    =       60.
RETURN PERIOD (YRS)      =       20.
BX                       =     1.6300
TOTAL OF FIRST SUB-AREAS  (ha) =       4.25
TOTAL OF SECOND SUB-AREAS (ha) =       1.00
TOTAL OF ALL SUB-AREAS (ha)    =       5.25
```

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Catch. Area #2	Slope #1 (%)	Slope #2	% Impervious #1 (%)	% Impervious #2	Perm #1	Perm #2	B #1	B #2	Link No.
A	0.4030	0.4030	15.00	15.00	0.000	100.0	.080	.025	.0169	.0008	1.000
B	0.8550	0.000	13.00	0.000	0.000	0.000	.080	0.00	.0268	0.000	1.001
C	0.3030	0.3030	13.00	13.00	0.000	100.0	.080	.025	.0156	.0007	2.000
E	0.2980	0.2980	9.000	9.000	0.000	100.0	.080	.025	.0186	.0009	3.000
D	0.8940	0.000	10.00	0.000	0.000	0.000	.080	0.00	.0312	0.000	2.001
F	0.7190	0.000	12.00	0.000	0.000	0.000	.080	0.00	.0255	0.000	4.000
G	0.7750	0.000	11.00	0.000	0.000	0.000	.080	0.00	.0277	0.000	1.002

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Init. Loss #2 (mm)	Cont. Loss #1 (mm/h)	Cont. Loss #2 (mm/h)	Excess Rain #1 (mm)	Excess Rain #2 (mm)	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
A	80.000	8.000	1.000	2.500	0.000	69.875	79.000	0.3916	25.00	1.000
B	80.000	8.000	0.000	2.500	0.000	69.875	0.000	0.6108	26.00	3.000

C	80.000	8.000	1.000	2.500	0.000	69.875	79.000	0.2972	25.00	1.000
E	80.000	8.000	1.000	2.500	0.000	69.875	79.000	0.2564	25.00	1.000
D	80.000	8.000	0.000	2.500	0.000	69.875	0.000	0.7442	26.00	3.000
F	80.000	8.000	0.000	2.500	0.000	69.875	0.000	0.2286	35.00	3.000
G	80.000	8.000	0.000	2.500	0.000	69.875	0.000	1.755	29.00	0.000

Run completed at: 8th December 2006 9:27:40

mik open 0

```
 Run started at:  8th  December  2006   9:28:19


##############################################################################################
#####
                          RUNTIME          RESULTS
##############################################################################################
#####


Max. no. of links allowed =  2000


Max. no. of routng increments allowed = 25000


Max. no. of rating curve points = 25000


Max. no. of storm temporal points = 25000


Max. no. of channel subreaches =    25


Max link stack level =    25


Input Version number =          650


 LINK A                 1.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.5125
 ESTIMATED PEAK FLOW          (CUMECS) =      0.33
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK B                 1.001

 ESTIMATED VOLUME (CU METRES*10**3) =           1.025
 ESTIMATED PEAK FLOW          (CUMECS) =      0.51
 ESTIMATED TIME TO PEAK          (MINS) =     26.00

 LINK C                 2.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.3844
 ESTIMATED PEAK FLOW          (CUMECS) =      0.24
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK E                 3.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.3772
 ESTIMATED PEAK FLOW          (CUMECS) =      0.21
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK D                 2.001
```

```
ESTIMATED VOLUME (CU METRES*10**3) =          1.297
ESTIMATED PEAK FLOW          (CUMECS) =      0.61
ESTIMATED TIME TO PEAK          (MINS) =     26.00

LINK F                 4.000

ESTIMATED VOLUME (CU METRES*10**3) =         0.4315
ESTIMATED PEAK FLOW          (CUMECS) =      0.19
ESTIMATED TIME TO PEAK          (MINS) =     35.00

LINK G                 1.002

ESTIMATED VOLUME (CU METRES*10**3) =          3.219
ESTIMATED PEAK FLOW          (CUMECS) =      1.46
ESTIMATED TIME TO PEAK          (MINS) =     29.00



################################################################################
#####
10year 60min developed

Results for period from  2:15.0 29/11/2006
                    to  8:15.0 29/11/2006
################################################################################
#####

                                ROUTING INCREMENT (MINS) =       1.00
                                STORM DURATION (MINS)    =       60.
                                RETURN PERIOD (YRS)      =       10.
                                BX                       =    1.6300
                                TOTAL OF FIRST SUB-AREAS  (ha) =       4.25
                                TOTAL OF SECOND SUB-AREAS (ha) =       1.00
                                TOTAL OF ALL SUB-AREAS (ha)    =       5.25
```

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Catch. Area #2 (ha)	Slope #1 (%)	Slope #2 (%)	% Impervious #1 (%)	% Impervious #2 (%)	Perm #1	Perm #2	B #1	B #2	Link No.
A	0.4030	0.4030	15.00	15.00	0.000	100.0	.080	.025	.0169	.0008	1.000
B	0.8550	0.000	13.00	0.000	0.000	0.000	.080	0.00	.0268	0.000	1.001
C	0.3030	0.3030	13.00	13.00	0.000	100.0	.080	.025	.0156	.0007	2.000
E	0.2980	0.2980	9.000	9.000	0.000	100.0	.080	.025	.0186	.0009	3.000
D	0.8940	0.000	10.00	0.000	0.000	0.000	.080	0.00	.0312	0.000	2.001
F	0.7190	0.000	12.00	0.000	0.000	0.000	.080	0.00	.0255	0.000	4.000
G	0.7750	0.000	11.00	0.000	0.000	0.000	.080	0.00	.0277	0.000	1.002

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Init. Loss #2 (mm)	Cont. Loss #1 (mm/h)	Cont. Loss #2 (mm/h)	Excess Rain #1 (mm)	Excess Rain #2 (mm)	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
A	68.000	6.000	1.000	2.500	0.000	59.833	67.000	0.3310	25.00	1.000
B	68.000	6.000	0.000	2.500	0.000	59.833	0.000	0.5146	26.00	3.000

C	68.000	6.000	1.000	2.500	0.000	59.833	67.000	0.2388	25.00	1.000
E	68.000	6.000	1.000	2.500	0.000	59.833	67.000	0.2123	25.00	1.000
D	68.000	6.000	0.000	2.500	0.000	59.833	0.000	0.6099	26.00	3.000
F	68.000	6.000	0.000	2.500	0.000	59.833	0.000	0.1912	35.00	3.000
G	68.000	6.000	0.000	2.500	0.000	59.833	0.000	1.458	29.00	0.000

Run completed at: 8th December 2006 9:28:20

mik open 0

```
 Run started at:  8th  December  2006   9:28:54


################################################################################
#####
                          RUNTIME          RESULTS
################################################################################
#####


Max. no. of links allowed =  2000

Max. no. of routng increments allowed = 25000

Max. no. of rating curve points = 25000

Max. no. of storm temporal points = 25000

Max. no. of channel subreaches =    25

Max link stack level =    25

Input Version number =          650


 LINK A                 1.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.4430
 ESTIMATED PEAK FLOW          (CUMECS) =      0.27
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK B                 1.001

 ESTIMATED VOLUME (CU METRES*10**3) =          0.8779
 ESTIMATED PEAK FLOW          (CUMECS) =      0.42
 ESTIMATED TIME TO PEAK          (MINS) =     26.00

 LINK C                 2.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.3337
 ESTIMATED PEAK FLOW          (CUMECS) =      0.20
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK E                 3.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.3280
 ESTIMATED PEAK FLOW          (CUMECS) =      0.18
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK D                 2.001
```

```
ESTIMATED VOLUME (CU METRES*10**3) =          1.120
ESTIMATED PEAK FLOW          (CUMECS) =      0.52
ESTIMATED TIME TO PEAK          (MINS) =     26.00

LINK F                 4.000

ESTIMATED VOLUME (CU METRES*10**3) =         0.3673
ESTIMATED PEAK FLOW          (CUMECS) =      0.16
ESTIMATED TIME TO PEAK          (MINS) =     35.00

LINK G                 1.002

ESTIMATED VOLUME (CU METRES*10**3) =          2.761
ESTIMATED PEAK FLOW          (CUMECS) =      1.20
ESTIMATED TIME TO PEAK          (MINS) =     29.00



################################################################################
#####
5year 60min developed

Results for period from  2:15.0 29/11/2006
                    to  8:15.0 29/11/2006
################################################################################
#####
```

```
ROUTING INCREMENT (MINS) =       1.00
STORM DURATION (MINS)    =       60.
RETURN PERIOD (YRS)      =       5.
BX                       =    1.6300
TOTAL OF FIRST SUB-AREAS  (ha) =       4.25
TOTAL OF SECOND SUB-AREAS (ha) =       1.00
TOTAL OF ALL SUB-AREAS (ha)    =       5.25
```

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Catch. Area #2 (ha)	Slope #1 (%)	Slope #2 (%)	% Impervious #1 (%)	% Impervious #2 (%)	Perm #1	Perm #2	B #1	B #2	Link No.
A	0.4030	0.4030	15.00	15.00	0.000	100.0	.080	.025	.0169	.0008	1.000
B	0.8550	0.000	13.00	0.000	0.000	0.000	.080	0.00	.0268	0.000	1.001
C	0.3030	0.3030	13.00	13.00	0.000	100.0	.080	.025	.0156	.0007	2.000
E	0.2980	0.2980	9.000	9.000	0.000	100.0	.080	.025	.0186	.0009	3.000
D	0.8940	0.000	10.00	0.000	0.000	0.000	.080	0.00	.0312	0.000	2.001
F	0.7190	0.000	12.00	0.000	0.000	0.000	.080	0.00	.0255	0.000	4.000
G	0.7750	0.000	11.00	0.000	0.000	0.000	.080	0.00	.0277	0.000	1.002

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Init. Loss #2 (mm)	Cont. Loss #1 (mm/h)	Cont. Loss #2 (mm/h)	Excess Rain #1 (mm)	Excess Rain #2 (mm)	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
A	60.000	7.000	1.000	2.500	0.000	50.917	59.000	0.2714	25.00	1.000
B	60.000	7.000	0.000	2.500	0.000	50.917	0.000	0.4178	26.00	3.000

C	60.000	7.000	1.000	2.500	0.000	50.917	59.000	0.2002	25.00	1.000
E	60.000	7.000	1.000	2.500	0.000	50.917	59.000	0.1832	25.00	1.000
D	60.000	7.000	0.000	2.500	0.000	50.917	0.000	0.5164	26.00	3.000
F	60.000	7.000	0.000	2.500	0.000	50.917	0.000	0.1592	35.00	3.000
G	60.000	7.000	0.000	2.500	0.000	50.917	0.000	1.203	29.00	0.000

Run completed at: 8th December 2006 9:28:55

mik open 0

```
 Run started at:  8th  December  2006   9:29:32


#################################################################################
#####
                          RUNTIME          RESULTS
#################################################################################
#####


Max. no. of links allowed =  2000


Max. no. of routng increments allowed = 25000


Max. no. of rating curve points = 25000


Max. no. of storm temporal points = 25000


Max. no. of channel subreaches =    25


Max link stack level =    25


Input Version number =          650


 LINK A                 1.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.3349
 ESTIMATED PEAK FLOW          (CUMECS) =      0.20
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK B                 1.001

 ESTIMATED VOLUME (CU METRES*10**3) =          0.6653
 ESTIMATED PEAK FLOW          (CUMECS) =      0.30
 ESTIMATED TIME TO PEAK          (MINS) =     26.00

 LINK C                 2.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.2517
 ESTIMATED PEAK FLOW          (CUMECS) =      0.14
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK E                 3.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.2469
 ESTIMATED PEAK FLOW          (CUMECS) =      0.13
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK D                 2.001
```

```
ESTIMATED VOLUME (CU METRES*10**3) =          0.8401
ESTIMATED PEAK FLOW          (CUMECS) =      0.36
ESTIMATED TIME TO PEAK          (MINS) =     26.00

LINK F                  4.000

ESTIMATED VOLUME (CU METRES*10**3) =          0.2748
ESTIMATED PEAK FLOW          (CUMECS) =      0.11
ESTIMATED TIME TO PEAK          (MINS) =     35.00

LINK G                  1.002

ESTIMATED VOLUME (CU METRES*10**3) =           2.077
ESTIMATED PEAK FLOW          (CUMECS) =      0.83
ESTIMATED TIME TO PEAK          (MINS) =     29.00



################################################################################
#####
2year 60min developed

Results for period from  2:15.0 29/11/2006
                    to  8:15.0 29/11/2006
################################################################################
#####
```

ROUTING INCREMENT (MINS)	=	1.00
STORM DURATION (MINS)	=	60.
RETURN PERIOD (YRS)	=	2.
BX	=	1.6300
TOTAL OF FIRST SUB-AREAS (ha)	=	4.25
TOTAL OF SECOND SUB-AREAS (ha)	=	1.00
TOTAL OF ALL SUB-AREAS (ha)	=	5.25

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Catch. Area #2 (ha)	Slope #1 (%)	Slope #2 (%)	% Impervious #1 (%)	% Impervious #2 (%)	Perm #1	Perm #2	B #1	B #2	Link No.
A	0.4030	0.4030	15.00	15.00	0.000	100.0	.080	.025	.0169	.0008	1.000
B	0.8550	0.000	13.00	0.000	0.000	0.000	.080	0.00	.0268	0.000	1.001
C	0.3030	0.3030	13.00	13.00	0.000	100.0	.080	.025	.0156	.0007	2.000
E	0.2980	0.2980	9.000	9.000	0.000	100.0	.080	.025	.0186	.0009	3.000
D	0.8940	0.000	10.00	0.000	0.000	0.000	.080	0.00	.0312	0.000	2.001
F	0.7190	0.000	12.00	0.000	0.000	0.000	.080	0.00	.0255	0.000	4.000
G	0.7750	0.000	11.00	0.000	0.000	0.000	.080	0.00	.0277	0.000	1.002

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Init. Loss #2 (mm)	Cont. Loss #1 (mm/h)	Cont. Loss #2 (mm/h)	Excess Rain #1 (mm)	Excess Rain #2 (mm)	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
A	45.500	5.000	1.000	2.500	0.000	38.417	44.500	0.1964	25.00	1.000
B	45.500	5.000	0.000	2.500	0.000	38.417	0.000	0.3042	26.00	3.000

C	45.500	5.000	1.000	2.500	0.000	38.417	44.500	0.1447	25.00	1.000
E	45.500	5.000	1.000	2.500	0.000	38.417	44.500	0.1335	25.00	1.000
D	45.500	5.000	0.000	2.500	0.000	38.417	0.000	0.3560	26.00	3.000
F	45.500	5.000	0.000	2.500	0.000	38.417	0.000	0.1115	35.00	3.000
G	45.500	5.000	0.000	2.500	0.000	38.417	0.000	0.8348	29.00	0.000

Run completed at: 8th December 2006 9:29:32

mik open 0

```
 Run started at:  8th  December  2006   9:45:45


##########################################################################################
#####
                          RUNTIME          RESULTS
##########################################################################################
#####


Max. no. of links allowed =  2000

Max. no. of routng increments allowed = 25000

Max. no. of rating curve points = 25000

Max. no. of storm temporal points = 25000

Max. no. of channel subreaches =    25

Max link stack level =    25

Input Version number =          650

 LINK A                1.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.4226
 ESTIMATED PEAK FLOW          (CUMECS) =      0.27
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK B                1.001

 ESTIMATED VOLUME (CU METRES*10**3) =          0.8367
 ESTIMATED PEAK FLOW          (CUMECS) =      0.48
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK C                2.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.3186
 ESTIMATED PEAK FLOW          (CUMECS) =      0.20
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK E                3.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.3128
 ESTIMATED PEAK FLOW          (CUMECS) =      0.18
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK D                2.001
```

```
ESTIMATED VOLUME (CU METRES*10**3) =          1.065
ESTIMATED PEAK FLOW          (CUMECS) =      0.57
ESTIMATED TIME TO PEAK          (MINS) =     25.00

LINK Basin              1.002

ESTIMATED VOLUME (CU METRES*10**3) =          1.902
ESTIMATED PEAK FLOW          (CUMECS) =      1.05
ESTIMATED TIME TO PEAK          (MINS) =     26.00

LINK F                  4.000

ESTIMATED VOLUME (CU METRES*10**3) =         0.3496
ESTIMATED PEAK FLOW          (CUMECS) =      0.19
ESTIMATED TIME TO PEAK          (MINS) =     25.00

LINK G                  1.003

ESTIMATED VOLUME (CU METRES*10**3) =          2.607
ESTIMATED PEAK FLOW          (CUMECS) =      1.16
ESTIMATED TIME TO PEAK          (MINS) =     27.00
```

```
################################################################################
#####
5yr 60min developed

Results for period from  1:15.0 29/11/2006
                    to  7:15.0 29/11/2006
################################################################################
#####
```

```
                                ROUTING INCREMENT (MINS) =       1.00
                                STORM DURATION (MINS)    =       60.
                                RETURN PERIOD (YRS)      =       5.
                                BX                       =    1.3400
                                TOTAL OF FIRST SUB-AREAS  (ha) =       3.01
                                TOTAL OF SECOND SUB-AREAS (ha) =       2.24
                                TOTAL OF ALL SUB-AREAS (ha)    =       5.25
```

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link	Catch. Area		Slope		% Impervious		Perm		B		Link
Label	#1	#2	#1	#2	#1	#2	#1	#2	#1	#2	No.
	(ha)		(%)		(%)						
A	0.4030	0.4030	15.00	15.00	0.000	100.0	.080	.025	.0139	.0006	1.000
B	0.4280	0.4280	13.00	13.00	0.000	100.0	.080	.025	.0154	.0007	1.001
C	0.3030	0.3030	13.00	13.00	0.000	100.0	.080	.025	.0128	.0006	2.000
E	0.2980	0.2980	9.000	9.000	0.000	100.0	.080	.025	.0153	.0007	3.000
D	0.4470	0.4470	10.00	10.00	0.000	100.0	.080	.025	.0179	.0008	2.001
Basin	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0027	0.000	1.002
F	0.3600	0.3600	12.00	12.00	0.000	100.0	.080	.025	.0146	.0007	4.000
G	0.7750	0.000	11.00	0.000	0.000	0.000	.080	0.00	.0227	0.000	1.003

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	#2	Cont. Loss #1 (mm/h)	#2	Excess Rain #1 (mm)	#2	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
A	60.000	12.00	1.000	2.500	0.000	46.000	59.000	0.2720	25.00	1.000
B	60.000	12.00	1.000	2.500	0.000	46.000	59.000	0.4779	25.00	1.000
C	60.000	12.00	1.000	2.500	0.000	46.000	59.000	0.2010	25.00	1.000
E	60.000	12.00	1.000	2.500	0.000	46.000	59.000	0.1841	25.00	1.000
D	60.000	12.00	1.000	2.500	0.000	46.000	59.000	0.5748	25.00	1.000
Basin	60.000	12.00	0.000	2.500	0.000	46.000	0.000	1.053	26.00	0.000
F	60.000	12.00	1.000	2.500	0.000	46.000	59.000	0.1884	25.00	1.000
G	60.000	12.00	0.000	2.500	0.000	46.000	0.000	1.156	27.00	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak Inflow (m^3/s)	Time to Peak	Peak Outflow (m^3/s)	Total Inflow (m^3)	Basin Vol. Avail	Basin Vol. Used	Basin Stage Used
Basin	26.00	1.052	28.00	.8821	1901.7	0.0000	228.05	13.422

SUMMARY OF BASIN OUTLET RESULTS

Link Label	No. of	S/D Factor (m)	Dia (m)	Width (m)	Pipe Length (m)	Pipe Slope (%)
Basin	2.0		.4500	0.4500	7.000	7.000

Run completed at: 8th December 2006 9:45:45

mik open 0

```
 Run started at:  8th  December  2006   9:44:56


##########################################################################################
#####
                          RUNTIME          RESULTS
##########################################################################################
#####


Max. no. of links allowed =  2000


Max. no. of routng increments allowed = 25000


Max. no. of rating curve points = 25000


Max. no. of storm temporal points = 25000


Max. no. of channel subreaches =    25


Max link stack level =    25


Input Version number =          650


 LINK A                 1.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.3068
 ESTIMATED PEAK FLOW          (CUMECS) =      0.19
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK B                 1.001

 ESTIMATED VOLUME (CU METRES*10**3) =          0.5973
 ESTIMATED PEAK FLOW          (CUMECS) =      0.32
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK C                 2.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.2310
 ESTIMATED PEAK FLOW          (CUMECS) =      0.14
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK E                 3.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.2272
 ESTIMATED PEAK FLOW          (CUMECS) =      0.13
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK D                 2.001
```

```
ESTIMATED VOLUME (CU METRES*10**3) =          0.7628
ESTIMATED PEAK FLOW          (CUMECS) =      0.40
ESTIMATED TIME TO PEAK          (MINS) =     25.00

LINK Basin              1.002

ESTIMATED VOLUME (CU METRES*10**3) =          1.360
ESTIMATED PEAK FLOW          (CUMECS) =      0.72
ESTIMATED TIME TO PEAK          (MINS) =     26.00

LINK F                  4.000

ESTIMATED VOLUME (CU METRES*10**3) =          0.2457
ESTIMATED PEAK FLOW          (CUMECS) =      0.12
ESTIMATED TIME TO PEAK          (MINS) =     25.00

LINK G                  1.003

ESTIMATED VOLUME (CU METRES*10**3) =          1.848
ESTIMATED PEAK FLOW          (CUMECS) =      0.73
ESTIMATED TIME TO PEAK          (MINS) =     27.00
```

```
##############################################################################
#####
2yr 60min developed

Results for period from  1:15.0 29/11/2006
                    to  7:15.0 29/11/2006
##############################################################################
#####
```

```
ROUTING INCREMENT (MINS) =       1.00
STORM DURATION (MINS)    =       60.
RETURN PERIOD (YRS)      =       2.
BX                       =    1.3400
TOTAL OF FIRST SUB-AREAS  (ha) =       3.01
TOTAL OF SECOND SUB-AREAS (ha) =       2.24
TOTAL OF ALL SUB-AREAS (ha)    =       5.25
```

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Catch. Area #2 (ha)	Slope #1 (%)	Slope #2 (%)	% Impervious #1 (%)	% Impervious #2 (%)	Perm #1	Perm #2	B #1	B #2	Link No.
A	0.4030	0.4030	15.00	15.00	0.000	100.0	.080	.025	.0139	.0006	1.000
B	0.4280	0.4280	13.00	13.00	0.000	100.0	.080	.025	.0154	.0007	1.001
C	0.3030	0.3030	13.00	13.00	0.000	100.0	.080	.025	.0128	.0006	2.000
E	0.2980	0.2980	9.000	9.000	0.000	100.0	.080	.025	.0153	.0007	3.000
D	0.4470	0.4470	10.00	10.00	0.000	100.0	.080	.025	.0179	.0008	2.001
Basin	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0027	0.000	1.002
F	0.3600	0.3600	12.00	12.00	0.000	100.0	.080	.025	.0146	.0007	4.000
G	0.7750	0.000	11.00	0.000	0.000	0.000	.080	0.00	.0227	0.000	1.003

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	#2	Cont. Loss #1 (mm/h)	#2	Excess Rain #1 (mm)	#2	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
A	45.500	12.00	1.000	2.500	0.000	31.583	44.500	0.1851	25.00	1.000
B	45.500	12.00	1.000	2.500	0.000	31.583	44.500	0.3150	25.00	1.000
C	45.500	12.00	1.000	2.500	0.000	31.583	44.500	0.1369	25.00	1.000
E	45.500	12.00	1.000	2.500	0.000	31.583	44.500	0.1287	25.00	1.000
D	45.500	12.00	1.000	2.500	0.000	31.583	44.500	0.4027	25.00	1.000
Basin	45.500	12.00	0.000	2.500	0.000	31.583	0.000	0.7177	26.00	0.000
F	45.500	12.00	1.000	2.500	0.000	31.583	44.500	0.1230	25.00	1.000
G	45.500	12.00	0.000	2.500	0.000	31.583	0.000	0.7325	27.00	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak Inflow (m^3/s)	Time to Peak	Peak Outflow (m^3/s)	Total Inflow (m^3)	Basin Vol. Avail	Basin Vol. Used	Basin Stage Used
Basin	26.00	.7177	28.00	.5811	1360.0	0.0000	168.11	13.311

SUMMARY OF BASIN OUTLET RESULTS

Link Label	No. of	S/D Factor (m)	Dia (m)	Width (m)	Pipe Length (m)	Pipe Slope (%)
Basin	2.0		.4500	0.4500	7.000	7.000

Run completed at: 8th December 2006 9:44:57

mik open 0

Run started at: 8th December 2006 9:43:28

```
################################################################################
#####
                        RUNTIME           RESULTS
################################################################################
#####
```

Max. no. of links allowed = 2000

Max. no. of routng increments allowed = 25000

Max. no. of rating curve points = 25000

Max. no. of storm temporal points = 25000

Max. no. of channel subreaches = 25

Max link stack level = 25

Input Version number = 650

```
LINK A                    1.000

ESTIMATED VOLUME (CU METRES*10**3) =        0.8571
ESTIMATED PEAK FLOW          (CUMECS) =     0.54
ESTIMATED TIME TO PEAK         (MINS) =     25.00

LINK B                    1.001

ESTIMATED VOLUME (CU METRES*10**3) =         1.767
ESTIMATED PEAK FLOW          (CUMECS) =     1.10
ESTIMATED TIME TO PEAK         (MINS) =     25.00

LINK C                    2.000

ESTIMATED VOLUME (CU METRES*10**3) =        0.6436
ESTIMATED PEAK FLOW          (CUMECS) =     0.41
ESTIMATED TIME TO PEAK         (MINS) =     25.00

LINK E                    3.000

ESTIMATED VOLUME (CU METRES*10**3) =        0.6338
ESTIMATED PEAK FLOW          (CUMECS) =     0.39
ESTIMATED TIME TO PEAK         (MINS) =     25.00

LINK D                    2.001
```

```
ESTIMATED VOLUME (CU METRES*10**3) =          2.228
ESTIMATED PEAK FLOW          (CUMECS) =      1.35
ESTIMATED TIME TO PEAK          (MINS) =     25.00

LINK Basin              1.002

ESTIMATED VOLUME (CU METRES*10**3) =          3.995
ESTIMATED PEAK FLOW          (CUMECS) =      2.45
ESTIMATED TIME TO PEAK          (MINS) =     26.00

LINK F                  4.000

ESTIMATED VOLUME (CU METRES*10**3) =          0.7655
ESTIMATED PEAK FLOW          (CUMECS) =      0.48
ESTIMATED TIME TO PEAK          (MINS) =     25.00

LINK G                  1.003

ESTIMATED VOLUME (CU METRES*10**3) =          5.578
ESTIMATED PEAK FLOW          (CUMECS) =      2.60
ESTIMATED TIME TO PEAK          (MINS) =     27.00
```

```
##############################################################################################
#####
100yr 60min developed

Results for period from  1:15.0 29/11/2006
                    to  7:15.0 29/11/2006
##############################################################################################
#####
```

```
                                ROUTING INCREMENT (MINS) =       1.00
                                STORM DURATION (MINS)    =       60.
                                RETURN PERIOD (YRS)      =       100.
                                BX                       =    1.3400
                                TOTAL OF FIRST SUB-AREAS  (ha) =       3.01
                                TOTAL OF SECOND SUB-AREAS (ha) =       2.24
                                TOTAL OF ALL SUB-AREAS (ha)    =       5.25
```

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Catch. Area #2 (ha)	Slope #1 (%)	Slope #2 (%)	% Impervious #1 (%)	% Impervious #2 (%)	Perm #1	Perm #2	B #1	B #2	Link No.
A	0.4030	0.4030	15.00	15.00	0.000	100.0	.080	.025	.0139	.0006	1.000
B	0.4280	0.4280	13.00	13.00	0.000	100.0	.080	.025	.0154	.0007	1.001
C	0.3030	0.3030	13.00	13.00	0.000	100.0	.080	.025	.0128	.0006	2.000
E	0.2980	0.2980	9.000	9.000	0.000	100.0	.080	.025	.0153	.0007	3.000
D	0.4470	0.4470	10.00	10.00	0.000	100.0	.080	.025	.0179	.0008	2.001
Basin	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0027	0.000	1.002
F	0.3600	0.3600	12.00	12.00	0.000	100.0	.080	.025	.0146	.0007	4.000
G	0.7750	0.000	11.00	0.000	0.000	0.000	.080	0.00	.0227	0.000	1.003

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	#2	Cont. Loss #1 (mm/h)	#2	Excess Rain #1 (mm)	#2	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
A	108.00	0.000	1.000	2.500	0.000	105.50	107.00	0.5425	25.00	1.000
B	108.00	0.000	1.000	2.500	0.000	105.50	107.00	1.097	25.00	1.000
C	108.00	0.000	1.000	2.500	0.000	105.50	107.00	0.4103	25.00	1.000
E	108.00	0.000	1.000	2.500	0.000	105.50	107.00	0.3934	25.00	1.000
D	108.00	0.000	1.000	2.500	0.000	105.50	107.00	1.355	25.00	1.000
Basin	108.00	0.000	0.000	2.500	0.000	105.50	0.000	2.452	26.00	0.000
F	108.00	0.000	1.000	2.500	0.000	105.50	107.00	0.4792	25.00	1.000
G	108.00	0.000	0.000	2.500	0.000	105.50	0.000	2.604	27.00	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak Inflow (m^3/s)	Time to Peak	Peak Outflow (m^3/s)	Total Inflow (m^3)	Basin Vol. Avail	Basin Vol. Used	Basin Stage Used
Basin	26.00	2.451	28.00	1.893	3995.0	0.0000	675.09	14.250

SUMMARY OF BASIN OUTLET RESULTS

Link Label	No. of	S/D Factor (m)	Dia (m)	Width (m)	Pipe Length (m)	Pipe Slope (%)
Basin	2.0		.4500	0.4500	7.000	7.000

Run completed at: 8th December 2006 9:43:28

mik open 0

```
 Run started at:  8th  December  2006   9:42:54


#########################################################################################
#####
                          RUNTIME          RESULTS
#########################################################################################
#####


Max. no. of links allowed =  2000


Max. no. of routng increments allowed = 25000


Max. no. of rating curve points = 25000


Max. no. of storm temporal points = 25000


Max. no. of channel subreaches =    25


Max link stack level =    25


Input Version number =          650


 LINK A                 1.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.7286
 ESTIMATED PEAK FLOW          (CUMECS) =      0.47
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK B                 1.001

 ESTIMATED VOLUME (CU METRES*10**3) =          1.502
 ESTIMATED PEAK FLOW          (CUMECS) =      0.95
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK C                 2.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.5486
 ESTIMATED PEAK FLOW          (CUMECS) =      0.36
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK E                 3.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.5380
 ESTIMATED PEAK FLOW          (CUMECS) =      0.34
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK D                 2.001
```

```
ESTIMATED VOLUME (CU METRES*10**3) =          1.896
ESTIMATED PEAK FLOW          (CUMECS) =      1.17
ESTIMATED TIME TO PEAK          (MINS) =     25.00

LINK Basin              1.002

ESTIMATED VOLUME (CU METRES*10**3) =          3.399
ESTIMATED PEAK FLOW          (CUMECS) =      2.12
ESTIMATED TIME TO PEAK          (MINS) =     26.00

LINK F                  4.000

ESTIMATED VOLUME (CU METRES*10**3) =          0.6519
ESTIMATED PEAK FLOW          (CUMECS) =      0.42
ESTIMATED TIME TO PEAK          (MINS) =     25.00

LINK G                  1.003

ESTIMATED VOLUME (CU METRES*10**3) =          4.712
ESTIMATED PEAK FLOW          (CUMECS) =      1.98
ESTIMATED TIME TO PEAK          (MINS) =     32.00
```

```
##############################################################################
#####
50yr 60min developed

Results for period from  1:15.0 29/11/2006
                    to  7:15.0 29/11/2006
##############################################################################
#####
```

```
ROUTING INCREMENT (MINS) =       1.00
STORM DURATION (MINS)    =       60.
RETURN PERIOD (YRS)      =       50.
BX                       =    1.3400
TOTAL OF FIRST SUB-AREAS  (ha) =       3.01
TOTAL OF SECOND SUB-AREAS (ha) =       2.24
TOTAL OF ALL SUB-AREAS (ha)    =       5.25
```

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link	Catch. Area		Slope		% Impervious		Perm		B		Link
Label	#1	#2	#1	#2	#1	#2	#1	#2	#1	#2	No.
	(ha)		(%)		(%)						
A	0.4030	0.4030	15.00	15.00	0.000	100.0	.080	.025	.0139	.0006	1.000
B	0.4280	0.4280	13.00	13.00	0.000	100.0	.080	.025	.0154	.0007	1.001
C	0.3030	0.3030	13.00	13.00	0.000	100.0	.080	.025	.0128	.0006	2.000
E	0.2980	0.2980	9.000	9.000	0.000	100.0	.080	.025	.0153	.0007	3.000
D	0.4470	0.4470	10.00	10.00	0.000	100.0	.080	.025	.0179	.0008	2.001
Basin	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0027	0.000	1.002
F	0.3600	0.3600	12.00	12.00	0.000	100.0	.080	.025	.0146	.0007	4.000
G	0.7750	0.000	11.00	0.000	0.000	0.000	.080	0.00	.0227	0.000	1.003

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Init. Loss #2 (mm)	Cont. Loss #1 (mm/h)	Cont. Loss #2 (mm/h)	Excess Rain #1 (mm)	Excess Rain #2 (mm)	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
A	96.000	8.000	1.000	2.500	0.000	85.792	95.000	0.4730	25.00	1.000
B	96.000	8.000	1.000	2.500	0.000	85.792	95.000	0.9483	25.00	1.000
C	96.000	8.000	1.000	2.500	0.000	85.792	95.000	0.3615	25.00	1.000
E	96.000	8.000	1.000	2.500	0.000	85.792	95.000	0.3370	25.00	1.000
D	96.000	8.000	1.000	2.500	0.000	85.792	95.000	1.169	25.00	1.000
Basin	96.000	8.000	0.000	2.500	0.000	85.792	0.000	2.118	26.00	0.000
F	96.000	8.000	1.000	2.500	0.000	85.792	95.000	0.4172	25.00	1.000
G	96.000	8.000	0.000	2.500	0.000	85.792	0.000	1.981	32.00	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak Inflow (m^3/s)	Time to Peak	Peak Outflow (m^3/s)	Total Inflow (m^3)	Basin Vol. Avail	Basin Vol. Used	Basin Stage Used
Basin	26.00	2.117	33.00	1.397	3398.6	0.0000	569.99	14.056

SUMMARY OF BASIN OUTLET RESULTS

Link Label	No. of	S/D Factor (m)	Dia (m)	Width (m)	Pipe Length (m)	Pipe Slope (%)
Basin	2.0		.4500	0.4500	7.000	7.000

Run completed at: 8th December 2006 9:42:54

mik open 0

```
 Run started at:  8th  December  2006   9:42:09


#########################################################################################
#####
                          RUNTIME          RESULTS
#########################################################################################
#####


Max. no. of links allowed =  2000


Max. no. of routng increments allowed = 25000


Max. no. of rating curve points = 25000


Max. no. of storm temporal points = 25000


Max. no. of channel subreaches =    25


Max link stack level =    25


Input Version number =          650


 LINK A                1.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.5681
 ESTIMATED PEAK FLOW          (CUMECS) =      0.39
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK B                1.001

 ESTIMATED VOLUME (CU METRES*10**3) =           1.173
 ESTIMATED PEAK FLOW          (CUMECS) =      0.77
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK C                2.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.4279
 ESTIMATED PEAK FLOW          (CUMECS) =      0.30
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK E                3.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.4202
 ESTIMATED PEAK FLOW          (CUMECS) =      0.25
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK D                2.001
```

```
ESTIMATED VOLUME (CU METRES*10**3) =          1.480
ESTIMATED PEAK FLOW          (CUMECS) =      0.90
ESTIMATED TIME TO PEAK          (MINS) =     25.00

LINK Basin              1.002

ESTIMATED VOLUME (CU METRES*10**3) =          2.652
ESTIMATED PEAK FLOW          (CUMECS) =      1.67
ESTIMATED TIME TO PEAK          (MINS) =     26.00

LINK F                  4.000

ESTIMATED VOLUME (CU METRES*10**3) =          0.5087
ESTIMATED PEAK FLOW          (CUMECS) =      0.34
ESTIMATED TIME TO PEAK          (MINS) =     25.00

LINK G                  1.003

ESTIMATED VOLUME (CU METRES*10**3) =          3.642
ESTIMATED PEAK FLOW          (CUMECS) =      1.58
ESTIMATED TIME TO PEAK          (MINS) =     31.00
```

```
################################################################################
#####
20yr 60min developed

Results for period from  1:15.0 29/11/2006
                     to  7:15.0 29/11/2006
################################################################################
#####
```

```
ROUTING INCREMENT (MINS) =       1.00
STORM DURATION (MINS)    =       60.
RETURN PERIOD (YRS)      =       20.
BX                       =     1.3400
TOTAL OF FIRST SUB-AREAS  (ha) =       3.01
TOTAL OF SECOND SUB-AREAS (ha) =       2.24
TOTAL OF ALL SUB-AREAS (ha)    =       5.25
```

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Catch. Area #2 (ha)	Slope #1 (%)	Slope #2 (%)	% Impervious #1	% Impervious #2	Perm #1	Perm #2	B #1	B #2	Link No.
A	0.4030	0.4030	15.00	15.00	0.000	100.0	.080	.025	.0139	.0006	1.000
B	0.4280	0.4280	13.00	13.00	0.000	100.0	.080	.025	.0154	.0007	1.001
C	0.3030	0.3030	13.00	13.00	0.000	100.0	.080	.025	.0128	.0006	2.000
E	0.2980	0.2980	9.000	9.000	0.000	100.0	.080	.025	.0153	.0007	3.000
D	0.4470	0.4470	10.00	10.00	0.000	100.0	.080	.025	.0179	.0008	2.001
Basin	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0027	0.000	1.002
F	0.3600	0.3600	12.00	12.00	0.000	100.0	.080	.025	.0146	.0007	4.000
G	0.7750	0.000	11.00	0.000	0.000	0.000	.080	0.00	.0227	0.000	1.003

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Init. Loss #2 (mm)	Cont. Loss #1 (mm/h)	Cont. Loss #2 (mm/h)	Excess Rain #1 (mm)	Excess Rain #2 (mm)	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
A	80.000	16.00	1.000	2.500	0.000	62.000	79.000	0.3854	25.00	1.000
B	80.000	16.00	1.000	2.500	0.000	62.000	79.000	0.7663	25.00	1.000
C	80.000	16.00	1.000	2.500	0.000	62.000	79.000	0.2964	25.00	1.000
E	80.000	16.00	1.000	2.500	0.000	62.000	79.000	0.2532	25.00	1.000
D	80.000	16.00	1.000	2.500	0.000	62.000	79.000	0.8993	25.00	1.000
Basin	80.000	16.00	0.000	2.500	0.000	62.000	0.000	1.666	26.00	0.000
F	80.000	16.00	1.000	2.500	0.000	62.000	79.000	0.3376	25.00	1.000
G	80.000	16.00	0.000	2.500	0.000	62.000	0.000	1.581	31.00	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak Inflow (m^3/s)	Time to Peak	Peak Outflow (m^3/s)	Total Inflow (m^3)	Basin Vol. Avail	Basin Vol. Used	Basin Stage Used
Basin	26.00	1.665	33.00	1.123	2652.3	0.0000	386.15	13.715

SUMMARY OF BASIN OUTLET RESULTS

Link Label	No. of	S/D Factor (m)	Dia (m)	Width (m)	Pipe Length (m)	Pipe Slope (%)
Basin	2.0		.4500	0.4500	7.000	7.000

Run completed at: 8th December 2006 9:42:09

mik open 0

```
 Run started at:  8th  December  2006   9:41:18


##############################################################################
#####
                          RUNTIME          RESULTS
##############################################################################
#####


Max. no. of links allowed =  2000


Max. no. of routng increments allowed = 25000


Max. no. of rating curve points = 25000


Max. no. of storm temporal points = 25000


Max. no. of channel subreaches =    25


Max link stack level =    25


Input Version number =          650


 LINK A                 1.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.4839
 ESTIMATED PEAK FLOW          (CUMECS) =      0.33
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK B                 1.001

 ESTIMATED VOLUME (CU METRES*10**3) =          0.9983
 ESTIMATED PEAK FLOW          (CUMECS) =      0.64
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK C                 2.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.3638
 ESTIMATED PEAK FLOW          (CUMECS) =      0.24
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK E                 3.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.3581
 ESTIMATED PEAK FLOW          (CUMECS) =      0.21
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK D                 2.001
```

```
ESTIMATED VOLUME (CU METRES*10**3) =          1.259
ESTIMATED PEAK FLOW          (CUMECS) =      0.74
ESTIMATED TIME TO PEAK          (MINS) =     25.00

LINK Basin              1.002

ESTIMATED VOLUME (CU METRES*10**3) =          2.258
ESTIMATED PEAK FLOW          (CUMECS) =      1.38
ESTIMATED TIME TO PEAK          (MINS) =     26.00

LINK F                  4.000

ESTIMATED VOLUME (CU METRES*10**3) =         0.4322
ESTIMATED PEAK FLOW          (CUMECS) =      0.27
ESTIMATED TIME TO PEAK          (MINS) =     25.00

LINK G                  1.003

ESTIMATED VOLUME (CU METRES*10**3) =          3.098
ESTIMATED PEAK FLOW          (CUMECS) =      1.37
ESTIMATED TIME TO PEAK          (MINS) =     31.00
```

```
##############################################################################
#####
10yr 60min developed

Results for period from  1:15.0 29/11/2006
                    to  7:15.0 29/11/2006
##############################################################################
#####
```

```
ROUTING INCREMENT (MINS) =       1.00
STORM DURATION (MINS)    =       60.
RETURN PERIOD (YRS)      =       10.
BX                       =    1.3400
TOTAL OF FIRST SUB-AREAS  (ha) =       3.01
TOTAL OF SECOND SUB-AREAS (ha) =       2.24
TOTAL OF ALL SUB-AREAS (ha)    =       5.25
```

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Catch. Area #2 (ha)	Slope #1 (%)	Slope #2 (%)	% Impervious #1 (%)	% Impervious #2 (%)	Perm #1	Perm #2	B #1	B #2	Link No.
A	0.4030	0.4030	15.00	15.00	0.000	100.0	.080	.025	.0139	.0006	1.000
B	0.4280	0.4280	13.00	13.00	0.000	100.0	.080	.025	.0154	.0007	1.001
C	0.3030	0.3030	13.00	13.00	0.000	100.0	.080	.025	.0128	.0006	2.000
E	0.2980	0.2980	9.000	9.000	0.000	100.0	.080	.025	.0153	.0007	3.000
D	0.4470	0.4470	10.00	10.00	0.000	100.0	.080	.025	.0179	.0008	2.001
Basin	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0027	0.000	1.002
F	0.3600	0.3600	12.00	12.00	0.000	100.0	.080	.025	.0146	.0007	4.000
G	0.7750	0.000	11.00	0.000	0.000	0.000	.080	0.00	.0227	0.000	1.003

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Init. Loss #2 (mm)	Cont. Loss #1 (mm/h)	Cont. Loss #2 (mm/h)	Excess Rain #1 (mm)	Excess Rain #2 (mm)	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
A	68.000	13.00	1.000	2.500	0.000	53.000	67.000	0.3264	25.00	1.000
B	68.000	13.00	1.000	2.500	0.000	53.000	67.000	0.6442	25.00	1.000
C	68.000	13.00	1.000	2.500	0.000	53.000	67.000	0.2361	25.00	1.000
E	68.000	13.00	1.000	2.500	0.000	53.000	67.000	0.2127	25.00	1.000
D	68.000	13.00	1.000	2.500	0.000	53.000	67.000	0.7397	25.00	1.000
Basin	68.000	13.00	0.000	2.500	0.000	53.000	0.000	1.384	26.00	0.000
F	68.000	13.00	1.000	2.500	0.000	53.000	67.000	0.2733	25.00	1.000
G	68.000	13.00	0.000	2.500	0.000	53.000	0.000	1.368	31.00	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak Inflow (m^3/s)	Time to Peak	Peak Outflow (m^3/s)	Total Inflow (m^3)	Basin Vol. Avail	Basin Vol. Used	Basin Stage Used
Basin	26.00	1.383	28.00	.9963	2257.6	0.0000	299.29	13.554

SUMMARY OF BASIN OUTLET RESULTS

Link Label	No. of	S/D Factor	Dia (m)	Width (m)	Pipe Length (m)	Pipe Slope (%)
Basin	2.0		.4500	0.4500	7.000	7.000

Run completed at: 8th December 2006 9:41:18

mik open 0

```
 Run started at:  8th  December  2006   9:40:37


##########################################################################################
#####
                          RUNTIME          RESULTS
##########################################################################################
#####


Max. no. of links allowed =  2000

Max. no. of routng increments allowed = 25000

Max. no. of rating curve points = 25000

Max. no. of storm temporal points = 25000

Max. no. of channel subreaches =    25

Max link stack level =    25

Input Version number =          650


 LINK A                 1.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.2632
 ESTIMATED PEAK FLOW          (CUMECS) =      0.27
 ESTIMATED TIME TO PEAK          (MINS) =     15.00

 LINK B                 1.001

 ESTIMATED VOLUME (CU METRES*10**3) =          0.5430
 ESTIMATED PEAK FLOW          (CUMECS) =      0.53
 ESTIMATED TIME TO PEAK          (MINS) =     15.00

 LINK C                 2.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.1987
 ESTIMATED PEAK FLOW          (CUMECS) =      0.20
 ESTIMATED TIME TO PEAK          (MINS) =     15.00

 LINK E                 3.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.1944
 ESTIMATED PEAK FLOW          (CUMECS) =      0.19
 ESTIMATED TIME TO PEAK          (MINS) =     15.00

 LINK D                 2.001
```

```
ESTIMATED VOLUME (CU METRES*10**3) =          0.6858
ESTIMATED PEAK FLOW          (CUMECS) =      0.65
ESTIMATED TIME TO PEAK          (MINS) =     15.00

LINK Basin              1.002

ESTIMATED VOLUME (CU METRES*10**3) =          1.229
ESTIMATED PEAK FLOW          (CUMECS) =      1.17
ESTIMATED TIME TO PEAK          (MINS) =     16.00

LINK F                  4.000

ESTIMATED VOLUME (CU METRES*10**3) =          0.2360
ESTIMATED PEAK FLOW          (CUMECS) =      0.23
ESTIMATED TIME TO PEAK          (MINS) =     15.00

LINK G                  1.003

ESTIMATED VOLUME (CU METRES*10**3) =          1.665
ESTIMATED PEAK FLOW          (CUMECS) =      1.26
ESTIMATED TIME TO PEAK          (MINS) =     16.00
```

```
##############################################################################
#####
5yr 25min developed

Results for period from  1:15.0 29/11/2006
                    to  3:45.0 29/11/2006
##############################################################################
#####
```

```
ROUTING INCREMENT (MINS) =       1.00
STORM DURATION (MINS)    =       25.
RETURN PERIOD (YRS)      =       5.
BX                       =    1.3400
TOTAL OF FIRST SUB-AREAS  (ha) =       3.01
TOTAL OF SECOND SUB-AREAS (ha) =       2.24
TOTAL OF ALL SUB-AREAS (ha)    =       5.25
```

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Catch. Area #2 (ha)	Slope #1 (%)	Slope #2 (%)	% Impervious #1 (%)	% Impervious #2 (%)	Pern #1	Pern #2	B #1	B #2	Link No.
A	0.4030	0.4030	15.00	15.00	0.000	100.0	.080	.025	.0139	.0006	1.000
B	0.4280	0.4280	13.00	13.00	0.000	100.0	.080	.025	.0154	.0007	1.001
C	0.3030	0.3030	13.00	13.00	0.000	100.0	.080	.025	.0128	.0006	2.000
E	0.2980	0.2980	9.000	9.000	0.000	100.0	.080	.025	.0153	.0007	3.000
D	0.4470	0.4470	10.00	10.00	0.000	100.0	.080	.025	.0179	.0008	2.001
Basin	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0027	0.000	1.002
F	0.3600	0.3600	12.00	12.00	0.000	100.0	.080	.025	.0146	.0007	4.000
G	0.7750	0.000	11.00	0.000	0.000	0.000	.080	0.00	.0227	0.000	1.003

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Init. Loss #2 (mm)	Cont. Loss #1 (mm/h)	Cont. Loss #2 (mm/h)	Excess Rain #1 (mm)	Excess Rain #2 (mm)	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
A	95.000	12.00	1.000	2.500	0.000	26.833	38.583	0.2661	15.00	1.000
B	95.000	12.00	1.000	2.500	0.000	26.833	38.583	0.5264	15.00	1.000
C	95.000	12.00	1.000	2.500	0.000	26.833	38.583	0.1980	15.00	1.000
E	95.000	12.00	1.000	2.500	0.000	26.833	38.583	0.1852	15.00	1.000
D	95.000	12.00	1.000	2.500	0.000	26.833	38.583	0.6481	15.00	1.000
Basin	95.000	12.00	0.000	2.500	0.000	26.833	0.000	1.175	16.00	0.000
F	95.000	12.00	1.000	2.500	0.000	26.833	38.583	0.2312	15.00	1.000
G	95.000	12.00	0.000	2.500	0.000	26.833	0.000	1.261	16.00	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak Inflow (m^3/s)	Time to Peak	Peak Outflow (m^3/s)	Total Inflow (m^3)	Basin Vol. Avail	Basin Vol. Used	Basin Stage Used
Basin	16.00	1.174	18.00	.9527	1229.0	0.0000	248.12	13.459

SUMMARY OF BASIN OUTLET RESULTS

Link Label	No. of	S/D Factor (m)	Dia (m)	Width (m)	Pipe Length (m)	Pipe Slope (%)
Basin	2.0		.4500	0.4500	7.000	7.000

Run completed at: 8th December 2006 9:40:37

mik open 0

```
 Run started at:  8th  December  2006   9:39:49


#########################################################################################
#####
                          RUNTIME          RESULTS
#########################################################################################
#####


Max. no. of links allowed =  2000


Max. no. of routng increments allowed = 25000


Max. no. of rating curve points = 25000


Max. no. of storm temporal points = 25000


Max. no. of channel subreaches =    25


Max link stack level =    25


Input Version number =          650


 LINK A                1.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.1888
 ESTIMATED PEAK FLOW          (CUMECS) =      0.19
 ESTIMATED TIME TO PEAK          (MINS) =     15.00

 LINK B                1.001

 ESTIMATED VOLUME (CU METRES*10**3) =          0.3898
 ESTIMATED PEAK FLOW          (CUMECS) =      0.38
 ESTIMATED TIME TO PEAK          (MINS) =     15.00

 LINK C                2.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.1434
 ESTIMATED PEAK FLOW          (CUMECS) =      0.14
 ESTIMATED TIME TO PEAK          (MINS) =     15.00

 LINK E                3.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.1396
 ESTIMATED PEAK FLOW          (CUMECS) =      0.14
 ESTIMATED TIME TO PEAK          (MINS) =     15.00

 LINK D                2.001
```

```
ESTIMATED VOLUME (CU METRES*10**3) =          0.4938
ESTIMATED PEAK FLOW          (CUMECS) =      0.47
ESTIMATED TIME TO PEAK          (MINS) =     15.00

LINK Basin              1.002

ESTIMATED VOLUME (CU METRES*10**3) =          0.8836
ESTIMATED PEAK FLOW          (CUMECS) =      0.85
ESTIMATED TIME TO PEAK          (MINS) =     16.00

LINK F                  4.000

ESTIMATED VOLUME (CU METRES*10**3) =          0.1702
ESTIMATED PEAK FLOW          (CUMECS) =      0.17
ESTIMATED TIME TO PEAK          (MINS) =     15.00

LINK G                  1.003

ESTIMATED VOLUME (CU METRES*10**3) =           1.186
ESTIMATED PEAK FLOW          (CUMECS) =      0.88
ESTIMATED TIME TO PEAK          (MINS) =     16.00
```

```
##############################################################################
#####
2yr 25min developed

Results for period from  1:15.0 29/11/2006
                    to  3:45.0 29/11/2006
##############################################################################
#####
```

```
ROUTING INCREMENT (MINS) =       1.00
STORM DURATION (MINS)    =       25.
RETURN PERIOD (YRS)      =       2.
BX                       =    1.3400
TOTAL OF FIRST SUB-AREAS  (ha) =       3.01
TOTAL OF SECOND SUB-AREAS (ha) =       2.24
TOTAL OF ALL SUB-AREAS (ha)    =       5.25
```

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Catch. Area #2 (ha)	Slope #1 (%)	Slope #2 (%)	% Impervious #1	% Impervious #2 (%)	Perm #1	Perm #2	B #1	B #2	Link No.
A	0.4030	0.4030	15.00	15.00	0.000	100.0	.080	.025	.0139	.0006	1.000
B	0.4280	0.4280	13.00	13.00	0.000	100.0	.080	.025	.0154	.0007	1.001
C	0.3030	0.3030	13.00	13.00	0.000	100.0	.080	.025	.0128	.0006	2.000
E	0.2980	0.2980	9.000	9.000	0.000	100.0	.080	.025	.0153	.0007	3.000
D	0.4470	0.4470	10.00	10.00	0.000	100.0	.080	.025	.0179	.0008	2.001
Basin	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0027	0.000	1.002
F	0.3600	0.3600	12.00	12.00	0.000	100.0	.080	.025	.0146	.0007	4.000
G	0.7750	0.000	11.00	0.000	0.000	0.000	.080	0.00	.0227	0.000	1.003

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	#2	Cont. Loss #1 (mm/h)	#2	Excess Rain #1 (mm)	#2	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
A	73.000	12.00	1.000	2.500	0.000	17.750	29.417	0.1875	15.00	1.000
B	73.000	12.00	1.000	2.500	0.000	17.750	29.417	0.3788	15.00	1.000
C	73.000	12.00	1.000	2.500	0.000	17.750	29.417	0.1445	15.00	1.000
E	73.000	12.00	1.000	2.500	0.000	17.750	29.417	0.1368	15.00	1.000
D	73.000	12.00	1.000	2.500	0.000	17.750	29.417	0.4694	15.00	1.000
Basin	73.000	12.00	0.000	2.500	0.000	17.750	0.000	0.8482	16.00	0.000
F	73.000	12.00	1.000	2.500	0.000	17.750	29.417	0.1667	15.00	1.000
G	73.000	12.00	0.000	2.500	0.000	17.750	0.000	0.8783	16.00	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak Inflow (m^3/s)	Time to Peak	Peak Outflow (m^3/s)	Total Inflow (m^3)	Basin Vol. Avail	Basin Vol. Used	Basin Stage Used
Basin	16.00	.8482	17.00	.6994	883.61	0.0000	192.22	13.356

SUMMARY OF BASIN OUTLET RESULTS

Link Label	No. of	S/D Factor (m)	Dia (m)	Width (m)	Pipe Length (m)	Pipe Slope (%)
Basin	2.0		.4500	0.4500	7.000	7.000

Run completed at: 8th December 2006 9:39:50

mik open 0

```
 Run started at:  8th  December  2006   9:36:28


#########################################################################################
#####
                          RUNTIME          RESULTS
#########################################################################################
#####


Max. no. of links allowed =  2000


Max. no. of routng increments allowed = 25000


Max. no. of rating curve points = 25000


Max. no. of storm temporal points = 25000


Max. no. of channel subreaches =    25


Max link stack level =    25


Input Version number =          650


 LINK A                1.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.8571
 ESTIMATED PEAK FLOW          (CUMECS) =      0.54
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK B                1.001

 ESTIMATED VOLUME (CU METRES*10**3) =          1.767
 ESTIMATED PEAK FLOW          (CUMECS) =      1.10
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK C                2.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.6436
 ESTIMATED PEAK FLOW          (CUMECS) =      0.41
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK E                3.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.6338
 ESTIMATED PEAK FLOW          (CUMECS) =      0.39
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK D                2.001
```

```
 ESTIMATED VOLUME (CU METRES*10**3) =          2.228
 ESTIMATED PEAK FLOW          (CUMECS) =      1.35
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK F                 4.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.7655
 ESTIMATED PEAK FLOW          (CUMECS) =      0.48
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK G                 1.002

 ESTIMATED VOLUME (CU METRES*10**3) =          5.579
 ESTIMATED PEAK FLOW          (CUMECS) =      3.32
 ESTIMATED TIME TO PEAK          (MINS) =     26.00
```

```
##############################################################################
#####
100yr 60min developed

Results for period from  1:15.0 29/11/2006
                    to  7:15.0 29/11/2006
##############################################################################
#####
```

```
                                ROUTING INCREMENT (MINS) =       1.00
                                STORM DURATION (MINS)    =       60.
                                RETURN PERIOD (YRS)      =       100.
                                BX                       =     1.3400
                                TOTAL OF FIRST SUB-AREAS  (ha) =       3.01
                                TOTAL OF SECOND SUB-AREAS (ha) =       2.24
                                TOTAL OF ALL SUB-AREAS (ha)    =       5.25
```

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Catch. Area #2 (ha)	Slope #1 (%)	Slope #2 (%)	% Impervious #1 (%)	% Impervious #2 (%)	Perm #1	Perm #2	B #1	B #2	Link No.
A	0.4030	0.4030	15.00	15.00	0.000	100.0	.080	.025	.0139	.0006	1.000
B	0.4280	0.4280	13.00	13.00	0.000	100.0	.080	.025	.0154	.0007	1.001
C	0.3030	0.3030	13.00	13.00	0.000	100.0	.080	.025	.0128	.0006	2.000
E	0.2980	0.2980	9.000	9.000	0.000	100.0	.080	.025	.0153	.0007	3.000
D	0.4470	0.4470	10.00	10.00	0.000	100.0	.080	.025	.0179	.0008	2.001
F	0.3600	0.3600	12.00	12.00	0.000	100.0	.080	.025	.0146	.0007	4.000
G	0.7750	0.000	11.00	0.000	0.000	0.000	.080	0.00	.0227	0.000	1.002

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Init. Loss #2 (mm)	Cont. Loss #1 (mm/h)	Cont. Loss #2 (mm/h)	Excess Rain #1 (mm)	Excess Rain #2 (mm)	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
A	108.00	0.000	1.000	2.500	0.000	105.50	107.00	0.5425	25.00	1.000
B	108.00	0.000	1.000	2.500	0.000	105.50	107.00	1.097	25.00	1.000

C	108.00	0.000	1.000	2.500	0.000	105.50	107.00	0.4103	25.00	1.000
E	108.00	0.000	1.000	2.500	0.000	105.50	107.00	0.3934	25.00	1.000
D	108.00	0.000	1.000	2.500	0.000	105.50	107.00	1.355	25.00	1.000
F	108.00	0.000	1.000	2.500	0.000	105.50	107.00	0.4792	25.00	1.000
G	108.00	0.000	0.000	2.500	0.000	105.50	0.000	3.320	26.00	0.000

Run completed at: 8th December 2006 9:36:29

mik open 0

```
 Run started at:  8th  December  2006   9:35:57


##########################################################################################
#####
                          RUNTIME          RESULTS
##########################################################################################
#####


Max. no. of links allowed =  2000


Max. no. of routng increments allowed = 25000


Max. no. of rating curve points = 25000


Max. no. of storm temporal points = 25000


Max. no. of channel subreaches =    25


Max link stack level =    25


Input Version number =          650


 LINK A                 1.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.7286
 ESTIMATED PEAK FLOW         (CUMECS) =      0.47
 ESTIMATED TIME TO PEAK         (MINS) =     25.00

 LINK B                 1.001

 ESTIMATED VOLUME (CU METRES*10**3) =           1.502
 ESTIMATED PEAK FLOW         (CUMECS) =      0.95
 ESTIMATED TIME TO PEAK         (MINS) =     25.00

 LINK C                 2.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.5486
 ESTIMATED PEAK FLOW         (CUMECS) =      0.36
 ESTIMATED TIME TO PEAK         (MINS) =     25.00

 LINK E                 3.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.5380
 ESTIMATED PEAK FLOW         (CUMECS) =      0.34
 ESTIMATED TIME TO PEAK         (MINS) =     25.00

 LINK D                 2.001
```

```
ESTIMATED VOLUME (CU METRES*10**3) =          1.896
ESTIMATED PEAK FLOW          (CUMECS) =      1.17
ESTIMATED TIME TO PEAK          (MINS) =     25.00

LINK F                 4.000

ESTIMATED VOLUME (CU METRES*10**3) =         0.6519
ESTIMATED PEAK FLOW          (CUMECS) =      0.42
ESTIMATED TIME TO PEAK          (MINS) =     25.00

LINK G                 1.002

ESTIMATED VOLUME (CU METRES*10**3) =          4.713
ESTIMATED PEAK FLOW          (CUMECS) =      2.83
ESTIMATED TIME TO PEAK          (MINS) =     26.00



################################################################################
#####
50yr 60min developed

Results for period from  1:15.0 29/11/2006
                    to  7:15.0 29/11/2006
################################################################################
#####
```

ROUTING INCREMENT (MINS) =	1.00
STORM DURATION (MINS) =	60.
RETURN PERIOD (YRS) =	50.
BX =	1.3400
TOTAL OF FIRST SUB-AREAS (ha) =	3.01
TOTAL OF SECOND SUB-AREAS (ha) =	2.24
TOTAL OF ALL SUB-AREAS (ha) =	5.25

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Catch. Area #2 (ha)	Slope #1 (%)	Slope #2 (%)	% Impervious #1 (%)	% Impervious #2 (%)	Perm #1	Perm #2	B #1	B #2	Link No.
A	0.4030	0.4030	15.00	15.00	0.000	100.0	.080	.025	.0139	.0006	1.000
B	0.4280	0.4280	13.00	13.00	0.000	100.0	.080	.025	.0154	.0007	1.001
C	0.3030	0.3030	13.00	13.00	0.000	100.0	.080	.025	.0128	.0006	2.000
E	0.2980	0.2980	9.000	9.000	0.000	100.0	.080	.025	.0153	.0007	3.000
D	0.4470	0.4470	10.00	10.00	0.000	100.0	.080	.025	.0179	.0008	2.001
F	0.3600	0.3600	12.00	12.00	0.000	100.0	.080	.025	.0146	.0007	4.000
G	0.7750	0.000	11.00	0.000	0.000	0.000	.080	0.00	.0227	0.000	1.002

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Init. Loss #2 (mm)	Cont. Loss #1 (mm/h)	Cont. Loss #2 (mm/h)	Excess Rain #1 (mm)	Excess Rain #2 (mm)	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
A	96.000	8.000	1.000	2.500	0.000	85.792	95.000	0.4730	25.00	1.000
B	96.000	8.000	1.000	2.500	0.000	85.792	95.000	0.9483	25.00	1.000

C	96.000	8.000	1.000	2.500	0.000	85.792	95.000	0.3615	25.00	1.000
E	96.000	8.000	1.000	2.500	0.000	85.792	95.000	0.3370	25.00	1.000
D	96.000	8.000	1.000	2.500	0.000	85.792	95.000	1.169	25.00	1.000
F	96.000	8.000	1.000	2.500	0.000	85.792	95.000	0.4172	25.00	1.000
G	96.000	8.000	0.000	2.500	0.000	85.792	0.000	2.825	26.00	0.000

Run completed at: 8th December 2006 9:35:57

mik open 0

```
 Run started at:  8th  December  2006   9:35:14


#########################################################################################
#####
                          RUNTIME          RESULTS
#########################################################################################
#####


Max. no. of links allowed =  2000


Max. no. of routng increments allowed = 25000


Max. no. of rating curve points = 25000


Max. no. of storm temporal points = 25000


Max. no. of channel subreaches =    25


Max link stack level =    25


Input Version number =          650


 LINK A                 1.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.3483
 ESTIMATED PEAK FLOW          (CUMECS) =      0.38
 ESTIMATED TIME TO PEAK          (MINS) =     15.00

 LINK B                 1.001

 ESTIMATED VOLUME (CU METRES*10**3) =          0.7180
 ESTIMATED PEAK FLOW          (CUMECS) =      0.73
 ESTIMATED TIME TO PEAK          (MINS) =     15.00

 LINK C                 2.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.2609
 ESTIMATED PEAK FLOW          (CUMECS) =      0.27
 ESTIMATED TIME TO PEAK          (MINS) =     15.00

 LINK E                 3.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.2576
 ESTIMATED PEAK FLOW          (CUMECS) =      0.25
 ESTIMATED TIME TO PEAK          (MINS) =     15.00

 LINK D                 2.001
```

```
ESTIMATED VOLUME (CU METRES*10**3) =          0.9027
ESTIMATED PEAK FLOW          (CUMECS) =      0.86
ESTIMATED TIME TO PEAK          (MINS) =     15.00

LINK F                 4.000

ESTIMATED VOLUME (CU METRES*10**3) =          0.3091
ESTIMATED PEAK FLOW          (CUMECS) =      0.31
ESTIMATED TIME TO PEAK          (MINS) =     15.00

LINK G                 1.002

ESTIMATED VOLUME (CU METRES*10**3) =           2.202
ESTIMATED PEAK FLOW          (CUMECS) =      2.05
ESTIMATED TIME TO PEAK          (MINS) =     16.00



################################################################################
#####
20yr 25min developed

Results for period from  1:15.0 29/11/2006
                     to  3:45.0 29/11/2006
################################################################################
#####
```

ROUTING INCREMENT (MINS) = 1.00
STORM DURATION (MINS) = 25.
RETURN PERIOD (YRS) = 20.
BX = 1.3400
TOTAL OF FIRST SUB-AREAS (ha) = 3.01
TOTAL OF SECOND SUB-AREAS (ha) = 2.24
TOTAL OF ALL SUB-AREAS (ha) = 5.25

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Catch. Area #2 (ha)	Slope #1 (%)	Slope #2 (%)	% Impervious #1	% Impervious #2	Perm #1	Perm #2	B #1	B #2	Link No.
A	0.4030	0.4030	15.00	15.00	0.000	100.0	.080	.025	.0139	.0006	1.000
B	0.4280	0.4280	13.00	13.00	0.000	100.0	.080	.025	.0154	.0007	1.001
C	0.3030	0.3030	13.00	13.00	0.000	100.0	.080	.025	.0128	.0006	2.000
E	0.2980	0.2980	9.000	9.000	0.000	100.0	.080	.025	.0153	.0007	3.000
D	0.4470	0.4470	10.00	10.00	0.000	100.0	.080	.025	.0179	.0008	2.001
F	0.3600	0.3600	12.00	12.00	0.000	100.0	.080	.025	.0146	.0007	4.000
G	0.7750	0.000	11.00	0.000	0.000	0.000	.080	0.00	.0227	0.000	1.002

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Init. Loss #2 (mm)	Cont. Loss #1 (mm/h)	Cont. Loss #2 (mm/h)	Excess Rain #1 (mm)	Excess Rain #2 (mm)	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
A	125.00	16.00	1.000	2.500	0.000	35.333	51.083	0.3847	15.00	1.000
B	125.00	16.00	1.000	2.500	0.000	35.333	51.083	0.7284	15.00	1.000

C	125.00	16.00	1.000	2.500	0.000	35.333	51.083	0.2699	15.00	1.000
E	125.00	16.00	1.000	2.500	0.000	35.333	51.083	0.2511	15.00	1.000
D	125.00	16.00	1.000	2.500	0.000	35.333	51.083	0.8648	15.00	1.000
F	125.00	16.00	1.000	2.500	0.000	35.333	51.083	0.3132	15.00	1.000
G	125.00	16.00	0.000	2.500	0.000	35.333	0.000	2.046	16.00	0.000

Run completed at: 8th December 2006 9:35:14

mik open 0

```
 Run started at:  8th  December  2006   9:34:33


#####################################################################################
#####
                          RUNTIME          RESULTS
#####################################################################################
#####


Max. no. of links allowed =  2000


Max. no. of routng increments allowed = 25000


Max. no. of rating curve points = 25000


Max. no. of storm temporal points = 25000


Max. no. of channel subreaches =    25


Max link stack level =    25


Input Version number =          650


 LINK A                1.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.4839
 ESTIMATED PEAK FLOW          (CUMECS) =      0.33
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK B                1.001

 ESTIMATED VOLUME (CU METRES*10**3) =          0.9983
 ESTIMATED PEAK FLOW          (CUMECS) =      0.64
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK C                2.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.3638
 ESTIMATED PEAK FLOW          (CUMECS) =      0.24
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK E                3.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.3581
 ESTIMATED PEAK FLOW          (CUMECS) =      0.21
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK D                2.001
```

```
 ESTIMATED VOLUME (CU METRES*10**3) =          1.259
 ESTIMATED PEAK FLOW          (CUMECS) =      0.74
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK F                 4.000

 ESTIMATED VOLUME (CU METRES*10**3) =         0.4322
 ESTIMATED PEAK FLOW          (CUMECS) =      0.27
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK G                 1.002

 ESTIMATED VOLUME (CU METRES*10**3) =          3.099
 ESTIMATED PEAK FLOW          (CUMECS) =      1.81
 ESTIMATED TIME TO PEAK          (MINS) =     26.00



##########################################################################################
#####
10yr 60min developed

Results for period from  1:15.0 29/11/2006
                    to  7:15.0 29/11/2006
##########################################################################################
#####


                                ROUTING INCREMENT (MINS) =       1.00
                                STORM DURATION (MINS)    =       60.
                                RETURN PERIOD (YRS)      =       10.
                                BX                       =    1.3400
                                TOTAL OF FIRST SUB-AREAS  (ha) =       3.01
                                TOTAL OF SECOND SUB-AREAS (ha) =       2.24
                                TOTAL OF ALL SUB-AREAS (ha)    =       5.25
```

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Catch. Area #2 (ha)	Slope #1 (%)	Slope #2 (%)	% Impervious #1 (%)	% Impervious #2 (%)	Perm #1	Perm #2	B #1	B #2	Link No.
A	0.4030	0.4030	15.00	15.00	0.000	100.0	.080	.025	.0139	.0006	1.000
B	0.4280	0.4280	13.00	13.00	0.000	100.0	.080	.025	.0154	.0007	1.001
C	0.3030	0.3030	13.00	13.00	0.000	100.0	.080	.025	.0128	.0006	2.000
E	0.2980	0.2980	9.000	9.000	0.000	100.0	.080	.025	.0153	.0007	3.000
D	0.4470	0.4470	10.00	10.00	0.000	100.0	.080	.025	.0179	.0008	2.001
F	0.3600	0.3600	12.00	12.00	0.000	100.0	.080	.025	.0146	.0007	4.000
G	0.7750	0.000	11.00	0.000	0.000	0.000	.080	0.00	.0227	0.000	1.002

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Init. Loss #2 (mm)	Cont. Loss #1 (mm/h)	Cont. Loss #2 (mm/h)	Excess Rain #1 (mm)	Excess Rain #2 (mm)	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
A	68.000	13.00	1.000	2.500	0.000	53.000	67.000	0.3264	25.00	1.000
B	68.000	13.00	1.000	2.500	0.000	53.000	67.000	0.6442	25.00	1.000

C	68.000	13.00	1.000	2.500	0.000	53.000	67.000	0.2361	25.00	1.000
E	68.000	13.00	1.000	2.500	0.000	53.000	67.000	0.2127	25.00	1.000
D	68.000	13.00	1.000	2.500	0.000	53.000	67.000	0.7397	25.00	1.000
F	68.000	13.00	1.000	2.500	0.000	53.000	67.000	0.2733	25.00	1.000
G	68.000	13.00	0.000	2.500	0.000	53.000	0.000	1.808	26.00	0.000

Run completed at: 8th December 2006 9:34:34

mik open 0

```
 Run started at:  8th  December  2006   9:33:44


##########################################################################################
#####
                          RUNTIME          RESULTS
##########################################################################################
#####


Max. no. of links allowed =  2000


Max. no. of routng increments allowed = 25000


Max. no. of rating curve points = 25000


Max. no. of storm temporal points = 25000


Max. no. of channel subreaches =    25


Max link stack level =    25


Input Version number =          650


 LINK A                1.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.4226
 ESTIMATED PEAK FLOW          (CUMECS) =      0.27
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK B                1.001

 ESTIMATED VOLUME (CU METRES*10**3) =          0.8711
 ESTIMATED PEAK FLOW          (CUMECS) =      0.53
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK C                2.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.3186
 ESTIMATED PEAK FLOW          (CUMECS) =      0.20
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK E                3.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.3128
 ESTIMATED PEAK FLOW          (CUMECS) =      0.18
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK D                2.001
```

```
ESTIMATED VOLUME (CU METRES*10**3) =          1.101
ESTIMATED PEAK FLOW          (CUMECS) =      0.63
ESTIMATED TIME TO PEAK          (MINS) =     25.00

LINK F                 4.000

ESTIMATED VOLUME (CU METRES*10**3) =         0.3783
ESTIMATED PEAK FLOW          (CUMECS) =      0.23
ESTIMATED TIME TO PEAK          (MINS) =     25.00

LINK G                 1.002

ESTIMATED VOLUME (CU METRES*10**3) =          2.708
ESTIMATED PEAK FLOW          (CUMECS) =      1.51
ESTIMATED TIME TO PEAK          (MINS) =     26.00



################################################################################
#####
5yr 60min developed

Results for period from  1:15.0 29/11/2006
                    to  7:15.0 29/11/2006
################################################################################
#####
```

ROUTING INCREMENT (MINS) = 1.00
STORM DURATION (MINS) = 60.
RETURN PERIOD (YRS) = 5.
BX = 1.3400
TOTAL OF FIRST SUB-AREAS (ha) = 3.01
TOTAL OF SECOND SUB-AREAS (ha) = 2.24
TOTAL OF ALL SUB-AREAS (ha) = 5.25

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Catch. Area #2 (ha)	Slope #1 (%)	Slope #2 (%)	% Impervious #1 (%)	% Impervious #2 (%)	Perm #1	Perm #2	B #1	B #2	Link No.
A	0.4030	0.4030	15.00	15.00	0.000	100.0	.080	.025	.0139	.0006	1.000
B	0.4280	0.4280	13.00	13.00	0.000	100.0	.080	.025	.0154	.0007	1.001
C	0.3030	0.3030	13.00	13.00	0.000	100.0	.080	.025	.0128	.0006	2.000
E	0.2980	0.2980	9.000	9.000	0.000	100.0	.080	.025	.0153	.0007	3.000
D	0.4470	0.4470	10.00	10.00	0.000	100.0	.080	.025	.0179	.0008	2.001
F	0.3600	0.3600	12.00	12.00	0.000	100.0	.080	.025	.0146	.0007	4.000
G	0.7750	0.000	11.00	0.000	0.000	0.000	.080	0.00	.0227	0.000	1.002

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Init. Loss #2 (mm)	Cont. Loss #1 (mm/h)	Cont. Loss #2 (mm/h)	Excess Rain #1 (mm)	Excess Rain #2 (mm)	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
A	60.000	12.00	1.000	2.500	0.000	46.000	59.000	0.2720	25.00	1.000
B	60.000	12.00	1.000	2.500	0.000	46.000	59.000	0.5273	25.00	1.000

```
C          60.000 12.00 1.000  2.500 0.000  46.000 59.000  0.2010  25.00 1.000
E          60.000 12.00 1.000  2.500 0.000  46.000 59.000  0.1841  25.00 1.000
D          60.000 12.00 1.000  2.500 0.000  46.000 59.000  0.6265  25.00 1.000
F          60.000 12.00 1.000  2.500 0.000  46.000 59.000  0.2303  25.00 1.000
G          60.000 12.00 0.000  2.500 0.000  46.000  0.000   1.512  26.00 0.000

 Run completed at:  8th  December  2006   9:33:44


 mik open          0
```

```
 Run started at:  8th  December  2006   9:30:27


##########################################################################################
#####
                          RUNTIME          RESULTS
##########################################################################################
#####


Max. no. of links allowed =  2000


Max. no. of routng increments allowed = 25000


Max. no. of rating curve points = 25000


Max. no. of storm temporal points = 25000


Max. no. of channel subreaches =    25


Max link stack level =    25


Input Version number =          650


 LINK A                 1.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.8564
 ESTIMATED PEAK FLOW          (CUMECS) =      0.52
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK B                 1.001

 ESTIMATED VOLUME (CU METRES*10**3) =           1.762
 ESTIMATED PEAK FLOW          (CUMECS) =      0.91
 ESTIMATED TIME TO PEAK          (MINS) =     26.00

 LINK C                 2.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.6443
 ESTIMATED PEAK FLOW          (CUMECS) =      0.40
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK E                 3.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.6343
 ESTIMATED PEAK FLOW          (CUMECS) =      0.38
 ESTIMATED TIME TO PEAK          (MINS) =     25.00

 LINK D                 2.001
```

```
ESTIMATED VOLUME (CU METRES*10**3) =          2.223
ESTIMATED PEAK FLOW          (CUMECS) =      1.11
ESTIMATED TIME TO PEAK          (MINS) =     26.00

LINK F                 4.000

ESTIMATED VOLUME (CU METRES*10**3) =          0.7600
ESTIMATED PEAK FLOW          (CUMECS) =      0.33
ESTIMATED TIME TO PEAK          (MINS) =     30.00

LINK G                 1.002

ESTIMATED VOLUME (CU METRES*10**3) =          5.565
ESTIMATED PEAK FLOW          (CUMECS) =      2.68
ESTIMATED TIME TO PEAK          (MINS) =     29.00
```

```
##############################################################################################
#####
100year 60min developed

Results for period from  2:15.0 29/11/2006
                    to  8:15.0 29/11/2006
##############################################################################################
#####
```

```
                                ROUTING INCREMENT (MINS) =       1.00
                                STORM DURATION (MINS)    =       60.
                                RETURN PERIOD (YRS)      =       100.
                                BX                       =    1.6300
                                TOTAL OF FIRST SUB-AREAS  (ha) =       4.25
                                TOTAL OF SECOND SUB-AREAS (ha) =       1.00
                                TOTAL OF ALL SUB-AREAS (ha)    =       5.25
```

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Catch. Area #2 (ha)	Slope #1 (%)	Slope #2 (%)	% Impervious #1	% Impervious #2	Perm #1	Perm #2	B #1	B #2	Link No.
A	0.4030	0.4030	15.00	15.00	0.000	100.0	.080	.025	.0169	.0008	1.000
B	0.8550	0.000	13.00	0.000	0.000	0.000	.080	0.00	.0268	0.000	1.001
C	0.3030	0.3030	13.00	13.00	0.000	100.0	.080	.025	.0156	.0007	2.000
E	0.2980	0.2980	9.000	9.000	0.000	100.0	.080	.025	.0186	.0009	3.000
D	0.8940	0.000	10.00	0.000	0.000	0.000	.080	0.00	.0312	0.000	2.001
F	0.7190	0.000	12.00	0.000	0.000	0.000	.080	0.00	.0255	0.000	4.000
G	0.7750	0.000	11.00	0.000	0.000	0.000	.080	0.00	.0277	0.000	1.002

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Init. Loss #2 (mm)	Cont. Loss #1 (mm/h)	Cont. Loss #2 (mm/h)	Excess Rain #1 (mm)	Excess Rain #2 (mm)	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
A	108.00	0.000	1.000	2.500	0.000	105.50	107.00	0.5230	25.00	1.000
B	108.00	0.000	0.000	2.500	0.000	105.50	0.000	0.9080	26.00	3.000

C	108.00	0.000	1.000	2.500	0.000	105.50	107.00	0.3980	25.00	1.000
E	108.00	0.000	1.000	2.500	0.000	105.50	107.00	0.3750	25.00	1.000
D	108.00	0.000	0.000	2.500	0.000	105.50	0.000	1.114	26.00	3.000
F	108.00	0.000	0.000	2.500	0.000	105.50	0.000	0.3314	30.00	3.000
G	108.00	0.000	0.000	2.500	0.000	105.50	0.000	2.680	29.00	0.000

Run completed at: 8th December 2006 9:30:27

mik open 0

```
 ESTIMATED VOLUME (CU METRES*10**3) =          0.4938
 ESTIMATED PEAK FLOW          (CUMECS) =      0.47
 ESTIMATED TIME TO PEAK          (MINS) =     15.00

 LINK F                 4.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.1702
 ESTIMATED PEAK FLOW          (CUMECS) =      0.17
 ESTIMATED TIME TO PEAK          (MINS) =     15.00

 LINK G                 1.002

 ESTIMATED VOLUME (CU METRES*10**3) =          1.190
 ESTIMATED PEAK FLOW          (CUMECS) =      1.06
 ESTIMATED TIME TO PEAK          (MINS) =     16.00



##############################################################################################
#####
2yr 25min developed

Results for period from  1:15.0 29/11/2006
                    to  3:45.0 29/11/2006
##############################################################################################
#####
```

ROUTING INCREMENT (MINS)	=	1.00
STORM DURATION (MINS)	=	25.
RETURN PERIOD (YRS)	=	2.
BX	=	1.3400
TOTAL OF FIRST SUB-AREAS (ha)	=	3.01
TOTAL OF SECOND SUB-AREAS (ha)	=	2.24
TOTAL OF ALL SUB-AREAS (ha)	=	5.25

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Catch. Area #2 (ha)	Slope #1 (%)	Slope #2 (%)	% Impervious #1 (%)	% Impervious #2 (%)	Perm #1	Perm #2	B #1	B #2	Link No.
A	0.4030	0.4030	15.00	15.00	0.000	100.0	.080	.025	.0139	.0006	1.000
B	0.4280	0.4280	13.00	13.00	0.000	100.0	.080	.025	.0154	.0007	1.001
C	0.3030	0.3030	13.00	13.00	0.000	100.0	.080	.025	.0128	.0006	2.000
E	0.2980	0.2980	9.000	9.000	0.000	100.0	.080	.025	.0153	.0007	3.000
D	0.4470	0.4470	10.00	10.00	0.000	100.0	.080	.025	.0179	.0008	2.001
F	0.3600	0.3600	12.00	12.00	0.000	100.0	.080	.025	.0146	.0007	4.000
G	0.7750	0.000	11.00	0.000	0.000	0.000	.080	0.00	.0227	0.000	1.002

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Init. Loss #2 (mm)	Cont. Loss #1 (mm/h)	Cont. Loss #2 (mm/h)	Excess Rain #1 (mm)	Excess Rain #2 (mm)	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
A	73.000	12.00	1.000	2.500	0.000	17.750	29.417	0.1875	15.00	1.000
B	73.000	12.00	1.000	2.500	0.000	17.750	29.417	0.3788	15.00	1.000

C	73.000	12.00	1.000	2.500	0.000	17.750	29.417	0.1445	15.00	1.000
E	73.000	12.00	1.000	2.500	0.000	17.750	29.417	0.1368	15.00	1.000
D	73.000	12.00	1.000	2.500	0.000	17.750	29.417	0.4694	15.00	1.000
F	73.000	12.00	1.000	2.500	0.000	17.750	29.417	0.1667	15.00	1.000
G	73.000	12.00	0.000	2.500	0.000	17.750	0.000	1.058	16.00	0.000

Run completed at: 8th December 2006 9:31:55

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Annexure NP-12

JUDGMENT

In the Planning and Environment Court
Held at: Brisbane

Appeal No. BD 1344 of 2006

Between: **Rescom Property Group Pty Ltd ACN 107 186 292**

Appellant

And: **Ipswich City Council**

Respondent

Before: His Honour Judge Alan Wilson SC

Date of Hearing: 21 March 2007
Date of Judgment: 21 March 2007

THIS MATTER HAVING on the 21st day of March 2007 come on for hearing by way of appeal against the decision of the Respondent to impose certain conditions on the approval of an application lodged by the Appellant with the Respondent for a development permit for a Reconfiguration of a Lot (2 lots into 32 lots in two stages) and a preliminary approval for Carrying out Building Work on land at 35 Eric Street, Goodna, more particularly described as Lot 1 on RP 122040 and Lot 28 on RP 802704 County of Stanley, Parish of Goodna.

AND UPON THE COURT BEING SATISFIED THAT the changes to the development application are minor changes for the purposes of section 4.1.52(2)(b) of the *Integrated Planning Act 1997*

AND UPON HEARING the solicitors for the Appellant and the solicitors for the Respondent

IT IS ADJUDGED BY CONSENT THAT:

1. The appeal be allowed; and

2. The application be approved subject to the conditions in the development approval package attached hereto and marked "A".

Judgment
Filed on behalf of the Appellant
Form PEC 8

Robert Milne Legal
Level 9
333 Adelaide Street
Brisbane Qld 4000
Ph 3229 8226
Fax 3229 8236

Filed on:	
Filed by:	Robert Milne Legal
Service Address:	Level 9 333 Adelaide Street Brisbane QLD 4000
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Registrar

"A"

Approval Details:

Proposal	Development	Decision	Approval Type
Reconfiguring a Lot (2 lots into 32 lots in 2 stages)	Reconfiguring a lot	Approved	Development Permit.
Single Residential (Proposed Lots 1-32)	Carrying out building work	Approved	Preliminary Approval.

Further Development Permits Required

Further Development Permits, as required by the *Integrated Planning Act 1997*, shall be obtained in respect of any Operational Works, Building Works and Plumbing Works in relation to this approval before any such works are commenced.

Conditions

Assessment Manager (Ipswich City Council)

Conditions applicable to this approval under Integrated Planning Act:

Conditions of Assessment Manager (Ipswich City Council)
Development Permit for Reconfiguring a Lot (2 lots into 32 lots in 2 stages)

1. Basis of Approval

   Subject to these conditions, the facts and circumstances set out in the application and all relevant Council Local Laws and/or Planning Scheme Policies shall be adhered to.

2. Minor Alterations

   Notwithstanding the requirements detailed in this approval, any other minor alterations and/or modifications acceptable to the Development Manager will suffice.

3. Plan of Survey

   (a) The Developer shall submit a plan of survey to conform with Plan Ref. Drawing No. A2 905/9 Instruction No. A04332 (prepared by DTS Group and dated 4 December 2006).

   (b) Adequate permanent survey marks shall be installed. The Developer shall submit a certificate signed by a cadastral surveyor, stating that after the completion of all works associated with the development, permanent survey marks are in their correct position, in accordance with the plan of survey.

   (c) The Developer shall grant, free of cost to or compensation payable by council, minimum 4.0 m wide easements located centrally over proposed stormwater drains, water mains and sewerage rising mains, where they are located within private property. The documentation associated with these easements may be prepared by the Developer in a form satisfactory to Council's City Solicitor, or the Developer may submit easement plans, only where Council is party to the easements, to Council for the preparation of easement documents at the Developer's expense.

(d) Easements for the purpose of overland water flow are to be provided on lots 31 and 32. These easements shall be granted over the land extending from the Q100 line as shown on Plan Ref. Drawing No. A2 905/9 Instruction No. A04332 (prepared by DTS Group and dated 4 December 2006) to the eastern and northern boundaries of each lot. Retaining walls shall not be built on these easements. Open style fencing that does not prevent overland flow shall be provided on the eastern and northern boundaries of lots 31 and 32 which are subject to the overland flow easements.

(e) Easements required for discharge of stormwater over adjacent land shall be agreed to in writing by the owner of the subject land prior to construction works commencing.

(f) Easements shall be centrally located over the alignment of stormwater paths and be of a width sufficient to encompass the overland flow from a storm event with an ARI of 100 years.

(g) Easements shall be of sufficient width to contain any fitting, access chamber etc located on the stormwater drains, water mains, and sewerage rising mains.

(h) Land required for detention basins or equivalent is to be dedicated as drainage reserve in favour of Council and not included within parkland dedication unless approved as parkland by Council.

(i) The area of land to be dedicated as drainage reserve shall be dedicated at no cost to Council.

4. Proposed Stages For Reconfiguration

The staging of the reconfiguration shall be generally in accordance with Plan Ref. Drawing No. A2 905/9 Instruction No. A04332 (prepared by DTS Group and dated 4 December 2006) and as follows:

- Lot 1 (Stage 1); and
- Lots 2 –32 (Stage 2).

5. Rates in Arrears

In accordance with the provisions of the *Integrated Planning Act 1997*, all rates and other expenses as a charge against the land shall not be in arrears at the date of signing of the plan of survey.

6. Construction Prior to Plan Sealing

Prior to the sealing of the survey plan, the developer shall construct houses to lock up stage on lots 22 to 25 inclusive as shown on Plan Ref. Drawing No. A2 905/9 Instruction No. A04332 (prepared by DTS Group and dated 4 December 2006). These houses shall be constructed and landscaped generally in accordance with 'Landscape Concept Plan Lots 22-25' Plan Ref. Drawing No. CP03 Issue A (prepared by JW Concepts and dated 5 December 2006).

7. Hours of Construction

Unless otherwise approved in writing by the Development Manager, hours of construction shall be:

Monday to Saturday 6.30 a.m. to 6.30 p.m.

Work shall not be conducted from or on the premises outside the above hours or on Sundays or public holidays.

8. Road Naming

The Developer may submit to Council a list of proposed street names and the corresponding name meanings for the new road/s to be opened. The proposed names should normally be submitted as part of the Operational Works application. Should a theme be considered appropriate, the theme should be submitted at the same instance. Council reserves the right to accept any or none of the proposed names.

9. Locality References

(a) Any place name or estate name used by the Developer (excluding a reference to a building, structure or the like and excluding minor, subsidiary signage within a development) shall make reference to the relevant, approved place name under the *Place Names Act 1994* in the same size and font.

(b) Any reference to the regional location of the site or the development shall not refer to the place or estate as being located in Brisbane or a Brisbane suburb or in the metropolitan area or in the western suburbs (excluding the western suburbs of Ipswich as determined by Council in writing from time to time).

10. Entry Walls or Features

The provision of entry walls or features is prohibited on road reserves or proposed parkland. Entry walls or features shall be fully contained on private property. These entry features or walls shall be designed such that maintenance for Council following the "Off Maintenance" inspection is minimal.

11. Streetscape Contribution

(a) A contribution shall be made towards Council's streetscape program within the Streetscape Contribution Precinct (Goodna). The rate for the 2005/06 financial year is $35.00 per allotment. Such streetscape works may not necessarily occur within the proposed development. However, this will be used on the major streets, entries and feature landscape areas within that Landscape District.

(b) Alternatively, the Developer shall:

(i) Place street trees at a rate of one per allotment to road or park frontage of the estate, in accordance with the Ipswich City Council Street Tree Strategy. Street trees along the park

frontage shall be type *Eucalyptus tereticornis* and *Melaleuca quiquenervia*. Street trees along all other roads shall be *Grevillia robusta*. The planting detail shall be shown on the Landscape and Rehabilitation Plan and reflect the Ipswich City Council Standard Drawings.

(ii) Provide a bond to guarantee (b)(i) above. Such bond is required prior to signing of the relevant plan of survey.

(c) In accordance with (b) above, the Developer shall submit a plan of streetscaping and accompanying explanatory letter/report with the Engineering Drawings. Such plan shall be in accordance with Council's Streetscaping of Roads Policy to the satisfaction of the Conservation, Parks and Sport Manager.

12. Engineering Requirements

The following engineering requirements, detailed in Conditions 12 - 20, shall be completed to the satisfaction of the Senior Development Engineer.

Terms

(a) RPEQ - A Registered Professional Engineer of Queensland, suitably qualified and experienced in the particular area of expertise required.

(b) QUDM - The Queensland Urban Drainage Manual, produced by the Queensland Department of Primary Industries.

(c) Queensland Streets - The Design Guidelines for Subdivisional Street Works, prepared for the Institute of Municipal Engineers of Australia (QLD).

(d) MUTCD - The Manual of Uniform Traffic Control Devices, published by DMR.

(e) Ipswich Water - Commercial Business Unit of Ipswich City Council providing water and sewerage services.

(f) DNRM – Department of Natural Resources and Mines.

(g) DMR – Department of Main Roads.

13. Roadworks

(a) All internal roads shall be constructed with concrete kerb and channel and asphaltic concrete surfacing, together with associated works for the full length of all property frontages. Further, concrete kerb and channel shall be provided along the northern side of Eric Street starting at the western property boundary of Lot 1 RP151903 and extending through to the eastern property of Lot 1 RP114375. Gravel pavement infill with asphaltic concrete overlay or full depth asphaltic concrete pavement shall be provided between the new kerb and channel and the existing pavement. The extent to which the widening intrudes into the existing pavement shall be determined on site by the Senior Development Engineer. The asphaltic concrete overlay shall extend over the existing pavement where longitudinal and cross sectional profiles warrant. The work shall include the appropriate transitions back to the existing bituminous pavement and associated works.

(b) Roadworks shall be designed and constructed in accordance with Council's Standards, Queensland Streets, Austroads Publications, the relevant and appropriate roadworks design standards and guidelines, and any other documentation deemed appropriate by Council. Such design and construction shall ensure that road carriageway widths are consistent with the road function and position in the road hierarchy and are in accordance with the relevant design speed environment. Threshold treatments shall be highly visible, and shall only be constructed after approval of the proposed surface treatment by the Senior Development Engineer.

(c) The pavement designs shall be in accordance with the Council's Planning Scheme Policy 3 - General Works. All roads shall have two way crossfalls in accordance with Council's adopted standards.

The minimum dedicated road widths, pavement widths and footpath requirements shall be in accordance with Council's requirements as set out below:

Road Type	Dedication Width	Pavement Width	Footpath	Path Width
Access Place	15.0 m	6.5 m	1 Path	1.5 m
Access Street	15.0 m	6.5 m	1 Path	1.5 m
Collector	17.0 m	8.5 m	1 Path	1.5 m
Trunk Collector	20.0 m	9.0 m or 2 x 5.0 m	2 Cycleway	2.0 m
			or 1 Path + 1 Cycleway	1.5 m 2.0 m

(d) The road pavement widths and geometric layout shall be sufficient to make adequate provision for Council's refuse collection vehicles and public transport movements.

(e) The Developer shall provide a maximum 4.25 m wide verge along the western property boundary of Lot 28 on RP802704 adjacent to Lot 27 on RP802704 (39 Eric Street). The proposed road pavement width for the road to be constructed between Lot 27 on RP802704 and Lot 1 on RP114375 shall be a minimum 6.5 m.

(f) A vehicle turning area shall be provided at the end of all "No through" roads and cul-de-sacs. Circular cul-de-sac turning heads, based on a minimum turning circle of 9.0 m radius, are preferred. "T" and "Y" shaped turning heads are generally not to be used.

(g) Traffic slow down devices shall be provided generally in accordance with Queensland Streets and Council approved alternatives.

(h) "No Through Road" signs shall be erected at the entries to cul-de-sacs and terminating roads.

(i) All traffic signs and delineation shall be installed in accordance with MUTCD.

(j) The Developer shall provide minimum 1.5 m wide concrete footpaths on one side of all the streets and extending past the mid point in cul-de-sacs to the next property boundary.

The construction of footpaths shall be in accordance with Council's Standard Drawing SR.19. The concrete footpaths shall be on the same side as the street lights, and the maximum longitudinal grade shall not exceed 1:8 (where possible).

(k) Kerb ramps are to be constructed in accordance with Council's Standard Drawing SR.18 at all intersections and at additional locations where required to connect the concrete pathways and cycleways. Generally at "T" intersections, 4 kerb ramps are required. Kerb ramps are to generally be set such that impaired pedestrians will move through an intersection on a straight road in a continuous straight line with the kerb ramps "pointing" at the destination ramp.

(l) Vehicular access from the roadways to all allotments shall be capable of being provided.

(m) Provision shall be made for minimum 6.0 m, three chord truncations at intersections. The 6.0 m distance is measured along each frontage from the property corner.

(n) The Developer shall provide intersection channelisation improvements (eg. linemarking, delineation posts and signage) for the Eric Street and Bertha Street intersection. Additionally the Developer shall provide delineation linemarking, guideposts, street signage etc for Eric Street extending from this intersection to the development entrance road. The Developer shall submit a linemarking and signage plan for these works in conjunction with any application for internal works operational works

14. Access

(a) The access driveway to all hatchet shaped lots (i.e. proposed Lot 2) shall be constructed from the property boundary for the full length of the access strip with the following design criteria:

(i) the maximum longitudinal grade shall be 1 in 6 and the maximum crossfall shall be 1 in 20, except that the Senior Development Engineer may allow a longitudinal grade of 1 in 4 for a distance not exceeding 60 m in total in special circumstances.

(ii) a drainage system shall be provided so that no part of the driveway shall be inundated in the runoff resulting from a storm event with an ARI of 2 years, and the runoff from the driveway shall be discharged to the satisfaction of the Senior Development Engineer.

(iv) The driveway construction within the access strip to all hatchet lots shall be reinforced concrete not less than 100 mm deep and 3.0 m wide.

(v) The water services for the allotments, together with stormwater pipes and conduits for electricity and telephone (with draw string), shall be installed for the full length of all access strips.

(b) A concrete layback and driveway slab 3.0 m wide, from the layback to the property boundary, shall be constructed for access to all hatchet lots in accordance with Council's Standard Drawing No. SR.12.

(c) The Developer shall relocate the existing driveway for Lot 1 on RP122040 such that a concrete layback and driveway slab 3.0 m wide, from the layback to the property boundary, shall be constructed for access to proposed Lot 1, within the frontage of proposed Lot 1, and in accordance with Council's Standard Drawing SR.12.

(d) Where applicable, the concrete kerb shall be reinstated for any redundant driveway layback.

(e) The footpath shall be re-levelled over those areas where the existing driveways/laybacks are redundant to match existing levels.

15. Sewerage

(a) The Developer shall provide a sewerage reticulation system with appropriate house connection branches, designed so as to command the whole of each of the proposed allotments.

(b) The Developer shall pay the full cost for Council to provide a suitable connection into the existing sewerage reticulation system. All works on live sewers are to be carried out by Council at the Developer's expense, unless arranged otherwise with Ipswich Water.

(c) The Developer shall demonstrate that the proposed pipe sizes and connection points are adequate for the total upstream catchment and the proposed development.

(d) No work on the sewerage reticulation system shall commence prior to the approval of the Operational Works application.

(e) New Council sewer ends are to be extended to or past the boundary of new allotments to enable the future developments to connect to these drains without undue control or hindrance by the property owner in which the end line lies.

16. Water

(a) The Developer shall provide a reticulated water supply system together with valves and fire hydrants, in accordance with the "Guidelines for Planning and Design of Urban Water Supply Systems", which connects into Council's existing reticulation system.

(b) A blue, bi-directional raised reflective pavement marker (RRPM) shall be provided to all hydrants. The marker shall be installed in accordance with the Department of Main Roads Fire Hydrant Indication System Technical Guideline.

(c) The Developer shall demonstrate that the pipe sizes proposed and the available pressure head complies with the requirements of Ipswich Water's "Water Supply Planning Guidelines", and the "Guidelines for Planning and Design of Urban Water Supply Systems" and are adequate to cater for the proposed development. Such demonstration is to cover as a minimum:

(i) available pressure during maximum hour;

(ii) available pressure and flows for fire fighting and other purposes, and any recommendations pertaining thereto; and

(iii) comments regarding the situation at various stages of the development.

Note: Details regarding available pressure heads at various points in the existing water reticulation network for use in the calculations to be produced for such demonstration may be obtained from the Senior Development Engineer on submission of completed application forms and payment of the relevant fees.

(c) All works on live water mains are to be carried out by Council in accordance with Council's policy, and at the Developer's expense.

(d) Where concrete footpaths are to be constructed, the Developer shall provide 100 mm diameter conduits under the footpath and in line with the conduits under the road, for future ease of installing the individual water services. The letter "W" shall be embossed in the concrete to mark the location of the conduit.

(e) Wherever possible, the water main shall be constructed on the opposite side to the concrete footpaths. Where the water main is under a concrete footpath, the Developer shall provide a water connection (including the provision of meters) to each allotment, including the provision of approved pre-cast concrete or cast iron boxes over the stop cock.

(f) Where the water reticulation network is serving in excess of 20 allotments in any one stage, the site shall be served from two directions and shall not be in the form of a single dead end supply. All other mains shall be looped around the cul-de-sac head to join back on to itself.

(g) Sufficient stop valves shall be installed so that in the event of any break in the supply, the maximum number of allotments to be without water is 20.

(h) The Developer shall provide a water connection and meter to all proposed lots.

(i) Council's water supply system has been designed to achieve the target levels of service as outlined in Ipswich Water's Water Supply Planning Guidelines. It is the responsibility of the Developer to provide any fire fighting requirements over and above Council's target levels of service, at their expense, internally and without adverse impact to Council's water supply system.

(j) A fire hydrant shall be provided within a 20 m radius of all hatchet lot access driveways. The distance shall be measured from a point where the middle of the access driveway meets the road reserve.

17. Stormwater

(a) From a stormwater perspective the subject site shall generally be developed in accordance with the Site Based Stormwater Management Plan (SMP) prepared by MRG Consulting and dated December 2006. Additionally the Developer shall submit to Council in conjunction with operational works application RPEQ certification from the SMP author certifying that the proposed civil works comply with the recommendations and requirements of the approved SMP.

(b) The Developer shall provide all necessary stormwater drainage (both internal and external to the development) and such drainage works (except for roofwater systems) shall be designed and constructed in accordance with QUDM such that the overall drainage system caters for a storm event with an ARI of 100 years.

Overland flow paths shall be suitably designed to cater for the water from a storm event with an ARI of 100 years. In the case where the piped system is carrying part of the flow, the overland flow paths shall be designed to cater for that volume which is represented by the difference between the predicted volume from the storm event with an ARI of 100 years and the capacity of the pipe system, noting the requirements of QUDM.

(c) A suitable roofwater system shall be designed in accordance with QUDM, for allotments that do not have adequate fall from within the allotment to the design invert level of the kerb and channel. The design is to be to a minimum Level III in QUDM.

(d) All stormwater flows within and adjacent to the development, other than inter-allotment drainage, shall be confined to dedicated roads, drainage reserves, registered drainage easements or within parkland. The registered drainage easements, if related to piped drainage, shall be centrally located over such underground pipe system and shall be not less than 4.0 m wide, except for drainage easements required for side boundaries which may be 3.0 m wide where approved by the Senior Development Engineer. In addition, the easements shall be of suitable width to contain the predicted overland flow from the storm event with an ARI of 100 years in that location.

(e) No ponding, concentration or redirection of stormwater shall occur onto adjoining land unless specifically approved by Council in consultation with the owner of the adjoining land.

(f) Due consideration shall be given in the design and construction of the development in relation to the effect of the developed catchment flows on the downstream discharge receival areas. Suitable stormwater control devices are to be provided to ensure that there is no increase in flow in watercourses. Such control devices are to be designed so as to integrate the landscaping, recreational, infrastructural and drainage roles of watercourses.

(g) All stormwater runoff from the development shall be discharged in a manner and to a point to be approved by the Senior Development Engineer.

(h) Stormwater drainage plans and calculations are to be submitted and approved by the Senior Development Engineer, in conjunction with the submission of an Operational Works application.

(i) Appropriate works shall be carried out to ensure that stormwater drainage from the new kerb and channel discharges suitably into the existing drainage system.

(j) There shall be minimal disturbance to vegetation in the gully areas, unless prior written approval is obtained from Council. Stormwater drainage outlets shall be the subject of detailed design in the preparation of plans for each stage of the development.

(k) The Developer shall provide a roofwater connection point to all lots which have a concrete footpath along the lot frontage and which drain to the street. The connection shall be located at the lowest corner of the lot on an alignment of 1.2 m from the side boundary and shall discharge to the kerb and channel via a 100 mm by 75 mm galvanised RHS. The RHS should extend 0.5 m into the property and have a suitable adaptor to allow connection to a roofwater pipe. All other lots, which drain to the street and do not have a concrete footpath along the lot frontage, do not require kerb adaptors.

(l) The Developer shall provide an extended stormwater detention and/or retention device (or equivalent) on the subject land, which shall be designed and constructed in accordance with QUDM. Where applicable, the detention/retention devices (or equivalent) shall be constructed to ensure that flows, run-off volumes and velocities, at any point downstream in the catchment, are not increased by the development for any combination of frequency and duration from the storm event with an ARI of 2 years up to and including the storm event with an ARI of 100 years. Additional calculations are to be provided demonstrating that the

proposed stormwater management system, and all embankments and discharge structures, will be contained within the drainage reserve where applicable (except where connecting to the street drainage), and that the basin shape, volume and surface area will perform according to the attenuation results requirements.

18. Public Utilities

(a) Adequate provision shall be made in all proposed dedicated roads, access strips and easements, to cater for the public utility services that would normally serve the development.

(b) The Developer shall provide appropriate road crossing conduits in accordance with Council's Standard Drawings SR.22 and SR.23. Where concrete footpaths are to be constructed, the conduits shall be extended to the property boundaries.

(c) Street lighting shall be installed by the Developer in accordance with the Australian Standard 1158.3.1 Table 1.1. All street lighting associated with the development shall be certified by a RPEQ. Street lighting shall be installed on the same side as concrete footpaths (where applicable).

(d) The Developer shall provide underground electricity/telecommunications within the development, constructed in the approved allocation as detailed in Council's Standard Drawings SR.22 and SR.23. Electricity/telecommunication drawings shall be co-ordinated with the civil engineering design documents, to ensure that service clashes are avoided. Where allotments front an existing overhead electricity/telecommunication service, these allotments may connect to such service subject to the approval and requirements of the service provider.

(e) The Developer shall provide an Energex approved electrical reticulation layout plan. The electricity layout shall also be shown on the water reticulation layout plans.

(f) The Developer shall provide each allotment with an electricity supply.

(g) Prior to the signing of a plan of survey, the Developer shall provide Council with a copy of an agreement with Energex for the supply of electricity to the development.

(h) Telephone and cable services may be laid in a combined trench with electricity cables, subject to the approval of Energex and the authorised telephone/cable service provider.

(i) The Developer shall make suitable arrangements for the provision of telephone and (where applicable) cable services to all proposed lots within the development. Documentary evidence that discussions have commenced with any authorised telephone/cable service provider, on the provision of telephone/cable services, shall be provided prior to the signing of the plan of survey by Council.

19. Erosion & Silt Management

(a) The Developer shall be responsible for the installation and maintenance of silt management facilities from the time of commencement of construction until the development has been released "Off Maintenance" by Council. All silt management facilities are to be in accordance with the document "Soil Erosion and Sediment Control" published by the Institution of Engineers Australia, or equivalent.

(b) Silt traps shall be sited upstream from any park or reserve area discharge point preferably on land comprising future allotments, such that no silt impinges on the park or reserve areas. The silt trap areas may be phased out after the development work is complete and adequate grass cover is obtained.

(c) Diversion drains and ponds, as necessary, shall be installed on the site before any other work is undertaken on site to ensure that "dirty water" is contained and/or isolated.

(d) An erosion and sediment control program and maintenance procedures shall be prepared and submitted with the engineering drawings for approval for maintaining the facilities, setting out the frequency of attention, with inspections to be made after each significant rainfall event.

(e) Council reserves the right to enter the site for the purpose of rectifying any silt management facilities which it deems to be inadequate, improperly maintained or not operating in a satisfactory manner.

(f) The Developer shall lodge a $5,000 siltation and erosion performance bond with Council, prior to the commencement of works, which shall only be released by Council at the termination of the maintenance period. Where Council determines that a draw-down of the bond is required, the Developer shall restore the bond to its full amount within 10 days of a notice from Council to that effect. Such bond shall guarantee adequate performance in the circumstances (i) and (ii) below:

(i) In the event that instructions issued to the Consulting Engineer by the Senior Development Engineer for the installation of erosion control measures, are not complied with within 24 hours, Council will call upon the bond to the extent required to carry out the necessary works.

(ii) If the Senior Development Engineer determines that silt damage has occurred on the site, or the downstream drainage system has become silted, the Developer shall be responsible for restoration. Such restoration shall be completed in the time determined by the Senior Development Engineer.

Should the Developer fail to complete the works determined by the Senior Development Engineer within the specified time, Council shall complete the work and recover all costs from the Developer associated with that work.

20. Operational Works – Municipal Works
(i.e. Works being handed over to Council)

(a) Plans relating to all civil engineering works shall be prepared and submitted for review by Council under the cover of Form 1 - Part A (Common details for all applications) and Form 1 - Part E (Planning Scheme Works). The plans shall show full construction details, layout dimensions, and finished surface levels and shall be submitted together with the appropriate fees for Council approval, prior to the commencement of construction on site.

(b) The Developer shall comply with the requirements of the documents entitled "Planning Scheme Policy 3 - General Works" and "Standard Drawings".

(c) All engineering drawings submitted to Council shall be in accordance with Council's Planning Scheme Policy 3 - General Works and Standard Drawings, and shall include as a minimum the following:

(i) Engineering drawings shall be marked as confirmation that they have been checked and approved by a RPEQ;

(ii) The drawings shall be submitted as three A3 size sets and one full size set; and

(iii) A "Certificate of Design" shall be submitted by a RPEQ, certifying that the design is in accordance with all relevant engineering standards, Council's requirements and standards, relevant development conditions of approval, and sound engineering practice.

(d) Municipal works shall require a detailed design certified by a RPEQ, the design approved by Council Engineers with appropriate fees payable, a works pre-start meeting on-site and various detailed construction and audit inspections by Council Officers. A twelve month maintenance period is applicable for the works as well as the payment of a maintenance security deposit.

(e) All works shall be supervised by a RPEQ competent in civil works and shall be undertaken by a nominated principal contractor experienced in the construction of municipal works. Council reserves the right to request evidence of the principal contractor's competency. Should it be deemed by the Senior Development Engineer that the contractor does not have the necessary competency or has constructed substandard works for Council in the past, Council reserves the right to reject the nominated contractor.

(f) Municipal works shall be accepted "On Maintenance" prior to commencement of use. A maintenance bond equal to 5% of the construction cost (minimum of $1,000.00) shall be retained by Council for a minimum period of twelve months, or until such time as the works are accepted "Off Maintenance" by Council.

(g) "As Constructed" plans for municipal works shall be submitted to Council and approved prior to the formal acceptance of the works "On Maintenance".

(h) On completion of the works a certificate shall be submitted to Council by a RPEQ certifying that the works have been constructed in accordance with Council's construction standards and in compliance with the approved plans and specification. It is expected that the RPEQ will undertake the necessary inspections to make this certification.

(i) Council reserves the right to require further amendments and/or additions at a later date, should design errors or omissions become apparent in regard to the works relevant to the Operational Works approval.

(j) Council requires the provision of a bank guarantee, or a performance bond of not less that 10% (minimum of $5,000) of the value of the external municipal works. The bond/guarantee shall be retained by Council until such time the Developer provides a replacement or additional maintenance period bond/guarantee for entire Municipal Works (both external and internal) as security for the performance of the maintenance obligations.

External Municipal Works relates to those works external to the subject site and located in already dedicated public areas, for example existing road or drainage reserve, or private property not subject to Developer ownership.

21. General

(a) All disturbed verge areas and allotments shall be graded, grassed and left in a mowable condition. The grass cover shall be obtained as early as possible during the development and an acceptable grass cover shall be achieved before the development can be accepted "Off Maintenance".

(b) Street name signs shall be manufactured to Council specifications and shall be erected in accordance with Council's Standard Drawing SR.26 at each intersection.

(c) With reference to any works, on land under other private ownership, written permission for the works shall be obtained and forwarded to Council. Similarly, written clearances shall be obtained after the works are completed, unless otherwise accepted by the Senior Development Engineer.

(d) All works required for this development shall take due regard of any and all existing services and, if considered necessary by the relevant authority or the Senior Development Engineer, such works shall be altered at the cost of the Developer.

(e) Any allotment filling for a greater depth than 800 mm to provide for building platforms shall be conducted in accordance with Australian Standard 3798. Test results as required by Australian Standard 3798, and a certificate of quality and uniformity of fill shall be provided by a RPEQ. The level of responsibility shall be Level 1.

(f) A certificate from a RPEQ shall be issued to Council certifying that any retaining wall greater than 800 mm in height is structurally sound and capable of withstanding any likely surcharge loads. Retaining walls greater than 1.0 m in height are to be provided with railings or other barriers to provide pedestrian safety.

(g) Retaining walls shall be designed so that there are no imposed loads placed upon Council's underground services. This may include extending the footing to a level 300 mm below the invert of the pipe.

(h) The need for a retaining wall at the boundary of proposed lots 5, 6 and 9 on Plan Ref. Drawing No. A2 905/9 Instruction No. A04332 (prepared by DTS Group and dated 4 December 2006), will be reassessed at the time the Operational Works application is made. The developer will not construct the retaining wall if a RPEQ certifies that it is not required.

(i) Filling of gully areas if permitted shall be carried out strictly in accordance with Australian Standard 3798. Test results as required by Australian Standard 3798 and a certificate of quality and uniformity of fill, shall be provided by the Supervising RPEQ for all filled areas.

(j) For batters resulting from cutting and filling of the site and producing slopes greater than 1:6, Council requires a RPEQ to certify that they are stable and properly drained.

(k) Approval of the Senior Development Engineer is required for any fill intended to be placed over Council's underground services.

(l) If, after the preparation of detailed design plans for the various roads, it is found necessary to provide any additional dedicated road area, or modify the proposed dedicated roads to enable the full requirements of Council's standards, Queensland Streets, AMCORD and Austroads documents to be incorporated in any way (but particularly in the production of the required speed environment or because of longitudinal and cross sectional constraints) then the estate layout plan shall be altered accordingly.

(m) Components that will become Council assets at the end of maintenance are subject to the following service life requirements:

(i) Roadworks – 20 years.
(ii) Drainage elements – 50 years.
(iii) Structures – 50 years.
(iv) All others – 50 years.

(n) The Developer shall provide details of the intended method of installation and compaction of all public utilities (including stormwater) with the Operational Works applications, demonstrating that the proposed technique considers and avoids premature failure of the service conduit. In the case of stormwater, this information should be incorporated on the long section schedule.

(o) All structures undertaken for the development eg footpaths/cycleways, retaining walls, drainage components and the like, shall be designed in order that foundations effects, differential movements etc are accounted for and do not impeded the component operation or serviceability requirements during their expected lifetime eg avoidance of trip hazards, blockages, structural failures, traffic hazards etc.

(p) The Developer shall be responsible for ensuring that all approvals have been obtained from the relevant infrastructure stakeholders. All approvals shall be submitted in conjunction with the Operational Works.

(q) Earthworks on any lot shall not exceed a total maximum height of 2.0 m. Retaining walls shall not exceed a total maximum height of 1.2 m with 1:4 batters from the top and toe of the wall unless it can be demonstrated to the satisfaction of the Senior Development Engineer that a greater height is acceptable.

22. Stormwater Quality

(a) The Developer shall provide detailed stormwater quality management engineering drawings in accordance with the Master Plan Detailed Site Based Stormwater Management Plan by ETS Group (Issue 2, Dated December 2006), Council's Planning Scheme Policy 3 - General Works, Council's Standard Drawings and the Water Sensitive Urban Design Technical Design Guidelines for South East Queensland (Healthy Waterways - Version 1 June 2006). The drawings shall be submitted to Council and approved by the Development Manager in conjunction with a Development Permit for Operational Works.

(b) All soil/plant based treatment devices shall be vegetated with native ground covers, sedges and shrubs to ensure maximum treatment and soil stability. The use of grass in treatment devices is not permitted unless otherwise approved by Council.

(c) Details of the plan shall include schedules and timing, including a staging program for all works and implementation of the SQMP. The staging program shall consider how stormwater quality will be treated during the construction period and at what stage the final treatment to the bioretention trench will be constructed.

(d) The treatment train shall incorporate scour protection with a stabilised maintenance path suitable for excavator access.

(e) A staged implementation approach shall be employed for the bioretention basin by using, in lieu of the final basin design, a temporary arrangement shallow topsoil (e.g. 50 mm) and instant turf (laid perpendicular to the flow path). This will allow the bioretention basin to function as a temporary erosion and sediment control facility throughout the construction/building phase. At time when ninety (90) per cent of allotments have had dwellings constructed, these temporary measures shall be removed with all accumulated sediment and the sandy loam, transition layer and gravel drainage laid and the basin landscaped.

(f) The 'on maintenance' period for all the stormwater quality treatment devices/measures shall be a minimum of twenty-four (24) months from the date when plants are established and ninety (90) per cent of allotments within each of catchments being treated have had dwellings constructed. Council will not accept assets which are not performing to design specification (e.g. blocked with construction sediment).

(g) The developer has the option of providing an uncompleted works bond to cover the staged implementation of the stormwater treatment devices. Should such a bond be provided the amount provided shall be 125% of all works (including landscaping and maintenance) associated with the final treatment. A schedule of all associated cost shall be lodged to Council and agreed upon prior to plan sealing. Once the treatment device is accepted on-maintenance the bonding amount may be reduced to cover ongoing maintenance.

(h) Should the selected saturated hydraulic conductivity of the bioretention filter media be less than ten (10) times that of the native surrounding soils an impermeable liner shall be constructed to prevent excessive exfiltration. Soil testing shall be conducted and a report outlining the testing methods, results and recommendations shall be provided to and approved by Council.

""

(i) Prior to lodgement of detailed operational works drawings the Developer shall receive certification from the consulting engineers which prepared the approved SQMP certifying that the detailed drawings are in accordance with the approved SQMP. A copy of the certification shall be lodged with the Operational Works application.

(j) Prior to on-maintenance the Developer shall provide to Council certification from a qualified water quality professional certifying that all stormwater quality treatment devices have been constructed in accordance with the approved SQMP. This shall include certification that the soils in the bioretention systems meet the following desired parameter levels:

- Hydraulic conductivity - for '*Sandy Loam*': Soils with a value of 100mm/hr are preferred with a suitable range would be approximately 36 to 180mm/hr. For '*Sandy Clay*': Soils with a value of 3.6mm/day are preferred with a suitable range of approximately 2 to 15mm/hr.

- Particle size distribution - for '*Sandy Loam*': Soils with the majority of particles in the following range are suitable: clay 5-15%, silt <30%, sand 50-70%. (assuming the following particle size ranges: clay <0.002mm, silt 0.002-0.05mm, sand 0.05-2mm). '*Sandy Clay*': Soils with the majority of particles in the following range are suitable: clay 15-25%, silt <30%, sand 40-60%).
- Organic matter content - between 3 and 10% w/w. For soils low in organic matter content, the top layer (~300mm) of the filter media should be amended to meet the specified organic matter content (3-10%w/w).
- pH - Preferably neutral, with a nominal range of pH 5.5 to 7.5 all acceptable.
- Electrical conductivity - <1.2dS/m
- Phosphorus concentration - <1000mg/kg.

23. Landscape and Rehabilitation Plan

(a) A Landscape and Rehabilitation Plan (prepared by a corporate member of Australian Institute of Landscape Architects), which conforms to the approved development plan shall be submitted to and approved by the Development Manager in conjunction with the Operational Works application.

(b) The Landscape and Rehabilitation Plan shall be in accordance with the 'Vegetation Assessment and Preliminary Management Report' (prepared by Terra Ark and dated October 2005), Council's Planning Scheme requirements for landscaping and detail all relevant items listed in Section 27 of Planing Scheme Policy 2 – Information Local Government May Request. Specifically, the amended plan shall include, amongst other necessary items, the following features:

(i) soils, mulch and sub-grade treatment;
(ii) tree and shrub planting shown in diagrammatic form in accordance with the Ipswich City Council Standard Drawings;
(iii) existing vegetation proposed to be retained and protection fencing;
(iv) location of services including drainage, sewerage, power, gas and communication (reference to other plans will not be accepted);
(v) contours and spot levels;
(vi) schedule of common name, plant species (only natives to be used), size and attributes;
(vii) details of retaining structures; and
(viii) details of design materials, colours, treatments etc.

(c) Where practical, the developer will plant trees and shrubs at the base of retaining walls.

(d) The Plan shall specify planting requirements in accordance with the approved Stormwater Quality Management Plan. Planting shall be provided for the floor, shelves and batters of the bio-retention basin. The bio-retention basin shall be planted with natives vegetation (e.g. sedges and tufted grasses) only. Turfing of any bio-retention will not be accepted.

(e) An electric barbeque is not required to be provided in the nominated park.

(f) Rehabilitation extending from the property boundary shall consist of 85% vegetation cover in the park which includes stabilisation, mulching, weeding and revegetation.

(g) All introduced, declared and environmental weeds shall be removed in accordance with the 'Vegetation Assessment and Preliminary Management Report' (prepared by Terra Ark and dated October 2005) and disturbed areas rehabilitated. Weed removal methods shall be outlined on the plan along with appropriate soil and bank stabilisation works.

(h) The Developer shall complete approved landscaping and fencing works in accordance with the approved Landscape Plans to the satisfaction of the Development Manager.

(i) Such landscaping and fencing shall be maintained in perpetuity to Council's satisfaction.

(j) The Developer shall provide three (3) play equipment items in the park to a maximum value of $50, 540. Details of the location and type of play equipment items shall be submitted to and approved by Council. The play equipment embellishment cost only may be offset against Level 3 Open Space (Parks) Contributions for Stage 2.

24. Vegetation Clearing

(a) In accordance with the 'Vegetation Assessment and Preliminary Management Report' (prepared by Terra Ark and dated October 2005), all trees to be retained shall be further assessed by a qualified arborist and either treated for retention or recommended for removal.

To this end, a Management Plan prepared by a suitably qualified arborist is to be submitted to and approved by the Development Manager in association with the Operational Works approval. The Plan shall reflect the management measures outlined in the 'Vegetation Assessment and Preliminary Management Report' (prepared by Terra Ark and dated October 2005), particularly sections 7.2 - 7.4.

(b) The Management Plan is to clearly delineate tree retention or removal, protection measures such as fencing and arboricultural care including soil decompaction, soil aeration, fertilising, mulching, watering and hazard reduction pruning where necessary.

(c) The Management Plan shall include the retention of all trees in the parkland and those trees nominated for retention on 'Preliminary Landscape Plan' Drawing No. CP01 Issue E (prepared by JW Concepts and dated 5 January 2007). If a qualified arborist determines that any tree presents an unacceptable liability, removal will need to be agreed upon by Council.

(d) The Developer shall construct a temporary star picket and three strand wire fence to Council's satisfaction along the development line separating the park from all other development activities.

(e) Fencing shall be installed prior to Operational Works and shall remain until the development has been put "On Maintenance" or an alternative approved barrier replaces it. Fencing shall be shown on all relevant Operational Works drawings and is to include nominated access points to allow for approved rehabilitation and bio-detention basin works.

(f) No unapproved construction activity is to occur beyond any protection fencing, including vehicle access, material stockpiling, storage or chemicals and/or maintenance fluids, site compound, the tapering or construction of batters, site spoil or rubbish etc.

(g) A qualified arborist shall perform all arboricultural care in accordance with the approved plan prior to any earthworks and supervise any works within 15 metres from protected trees. The

arborist shall perform a weekly inspection of protection measures during the earthworks stage making recommendations for any necessary improvements.

25. Fencing

A 1.8 metre high screen fence shall be constructed along the common boundary of the subject site and the following allotments:

(k) Lot 2 on RP112040;
(ii) Lot 1 on RP114375;
(iii) Lot 27 on RP802704;
(iv) Lot 1 on RP151903;
(v) Lot 2 on RP151903;
(vi) Lot 3 on RP116986; and
(vii) Lot 3 on RP122040.

Details of the fence shall be provided to and approved by the Development Manager as part of the Landscape and Rehabilitation Plan.

26. Contributions

In accordance with the relevant Planning Scheme Policies, the Developer shall pay the following monies to Council, prior to the signing of the plan of survey for the relevant stage:-

Contribution	Sector	Rate	Proposal	Calculation
Local Community Facilities	Goodna - Gailes	Level 1: $44.94/EP Level 2: $62.35/EP Level 3: $36.47/EP Unit Charge = 1.088 Total = Level 1: $48.89/EP Level 2: $67.84/EP Level 3: $39.68/EP	*Stage 1* Number of Lots (> 450m²): 1.000 @ 3.080 EP **Total = -3.080 EP**	Level 1: $48.89 x -3.080 = $0.00 Level 2: $67.84 x -3.080 = $0.00 Level 3: $39.68 x -3.080 = $0.00 **Total = $0.00**
			Stage 2 Number of Lots (> 450m²): 30.000 @ 3.080 EP **Total = 92.400 EP**	Level 1: $52.62 x 92.400 = $4,862.00 Level 2: $73.01 x 92.400 = $6,748.00 Level 3: $42.71 x 92.400 = $3,946.00 **Total = $15,556.00**
Open Space (Parks)	Goodna - Gailes	Level 1: $110.43/EP Level 2: $572.86/EP Level 3: $593.42/EP Unit Charge = 1.026 Total = Level 1: $113.30/EP Level 2: $587.75/EP	*Stage 1* Number of Lots (> 450m²): 1.000 @ 3.080 EP **Total = -3.080 EP**	Level 1: $121.91 x -3.080 = $0.00 Level 2: $632.44 x -3.080 = $0.00 Level 3: $655.14 x -3.080 = $0.00 **Total = $0.00**

		Level 3: $608.85/EP		
			Stage 2 Number of Lots (> 450m²): 30.000 @ 3.080 EP **Total = 92.400 EP**	Level 1: $121.91 x 92.400 = $11,264.00 Level 2: $632.44 x 92.400 = $58,437.00 Level 3: $655.14x 92.400 = $60,535 **Total = $130,236.00**
Water Supply	Goodna High Level Water Zone	$707.33/EP Unit Charge = 1.088 Total = $769.58/EP	*Stage 1* Number of Lots (> 450m²): 1.000 @ 3.300 EP **Total = -3.300 EP**	$828.28 x -3.300 = $0.00 **Total = $0.00**
			Stage 2 Number of Lots (> 450m²): 31.000 @ 3.300 EP **Total = 102.300 EP**	$828.28 x 102.3 = $84,733.00 **Total = $84,733.00**
Sewerage Catchment	Goodna Catchment (excluding Springfield)	$629.36/EP Unit Charge = 1.088 Total = $684.74/EP	*Stage 1* Number of Lots (> 450m²): 1.000 @ 3.300 EP **Total = -3.300 EP**	$736.98 x -3.300 = $0.00 **Total = $0.00**
			Stage 2 Number of Lots (> 450m²): 23.000 @ 3.300 EP **Total = 102.300 EP**	$736.98 x 102.3 = $75,393.00 **Total = $75,393.00**
Road Contributions	Goodna	$1,437.77/EP Unit Charge = 1.026 Total = $1,475.15/EP	*Stage 1* Number of Lots (> 450m²): 1.000 @ 3.100 EP **Total = -3.100 EP**	$1,587.30 x -3.100 = $0.00 **Total = $0.00**
			Stage 2 Number of Lots (> 450m²): 30.000 @ 3.100 EP **Total = 93.000 EP**	$1,587.30 x 93.000 = $147,619.00 **Total = $147,619.00**
Total for				**$0.00**

Stage 1				
Total for Stage 2				**$453,537.00**
Total for Development				**$453,537.00**

Calculations of contributions are based on the infrastructure contribution rates applicable at the date the development application was determined by Council. The contributions above shall be applicable for a period of twelve (12) months from the date of the development approval, and thereafter shall be based on the infrastructure contribution rates applicable at the date when payment is made.

27. Earthworks

Earthworks to bench lots to accommodate building construction are not permitted without prior written approval from the Development Manager.

28. Incineration

(a) No incineration of waste, including cleared vegetation, is permitted.

(b) All cleared vegetation must be removed from site or chipped/mulched and spread on site within one (1) week of it being felled.

29. Compliance with Conditions

(a) Unless otherwise stated all conditions shall be prior to signing of the relevant plan of survey or as determined by the Development Manager.

(b) All conditions shall be completed to the satisfaction of the Development Manager.

30. When Approval Takes Effect

This approval has effect in accordance with the provisions of Section 3.5.19 of the *Integrated Planning Act 1997* as follows:

(a) If the Applicant does not appeal the decision to the court - from the time the decision notice is given (or if a negotiated decision notice is given, from the time the negotiated decision notice is given); or

(b) If an appeal is made to the court - subject to the decision of the court, when the appeal is finally decided.

31. When Approval Lapses

(a) The currency period for this approval is 4 years starting the day the approval takes effect. The Developer is required to submit to Council an accurate plan of survey before the end of the currency period, otherwise the approval will lapse.

(b) An extended currency period may be agreed upon, pursuant to Section 3.5.22 of the *Integrated Planning Act 1997*, provided a written notice to Council is made before the end of the currency period. Such written notice is to be on Council's approved form, accompanied by the owner's consent and the prescribed fee in Council's Register of General Charges.

NOTE: Operational Works application(s) required to be submitted must be approved and works completed within the currency period stated above.

Conditions of Assessment Manager (Ipswich City Council)
Preliminary Approval for Building Works (Proposed Lots 1 - 32)

1. Basis of Approval

Subject to these conditions, the facts and circumstances set out in the application and all relevant Council Local Laws and/or Planning Scheme Policies shall be adhered to.

2. Minor Alterations

Notwithstanding the requirements detailed in this approval, any other minor alterations and/or modifications acceptable to the Development Manager will suffice.

3. Housing Diversity

A mix of housing types and styles should be provided within the estate, to the satisfaction of the Development Manager. In any given streetscape, no two (2) houses with the same street elevation are permitted to be established, unless otherwise approved in writing by the Development Manager. Variations in rooflines, verandahs, entries, materials and colours may be incorporated into housing design to achieve the intended diversity. To this end, for any slab on ground construction and/or brick construction dwelling, the Developer and/or landowner shall obtain the consent of the Development Manager for all housing designs, prior to the issue of a Development Permit for Building Works.

NOTE: Where more than one (1) dwelling within the estate is proposed to be constructed by a single entity, the Developer and/or Builder is encouraged to seek consent for all dwellings concurrently.

4. Vegetation Retention

(a) A Building Location Envelope (BLE) Plan shall be prepared for the following lots:-

- Lot 2;
- Lot 6;
- Lot 9;

- Lot 12;
- Lot 13;
- Lot 14;
- Lot 16;
- Lot 17;
- Lot 18;
- Lot 19;
- Lot 20;
- Lot 21;
- Lot 22;
- Lot 23; and
- Lot 24.

The BLE Plan shall nominate an appropriately sized envelope for a Single Residential dwelling on each lot. The BLE Plan shall be to the satisfaction of the Development Manager.

(b) No works, including clearing of vegetation, building and earthworks are permitted outside the approved building envelopes, unless otherwise approved in writing by the Development Manager.

(c) Limited clearing of vegetation to allow for vehicular access, fencing and connection of utilities is permitted, subject to a plan of the proposed works, including the site boundaries and the location of existing vegetation, being submitted to and approved by the Development Manager prior to the commencement of works. Utilities shall be co-located with the driveway, where practical.

5. Compliance with Conditions

All conditions shall be completed to the satisfaction of the Development Manager.

6. When Approval Takes Effect

This approval has effect in accordance with the provisions of Section 3.5.19 of the *Integrated Planning Act 1997* as follows:

(a) If the Applicant does not appeal the decision to the court - from the time the decision notice is given (or if a negotiated decision notice is given, from the time the negotiated decision notice is given); or

(b) If an appeal is made to the court - subject to the decision of the court, when the appeal is finally decided.

7. When Approval Lapses

The currency period for this approval is not limited and starts the day the approval takes effect.

Advice

The following advices are offered for your information only and should not be viewed as mandatory conditions of this approval.

Assessment Manager (Ipswich City Council)

1. Dwelling Construction

The use of construction techniques other than slab on ground (e.g. post supported structures) should be utilised on all lots greater than ten (10) percent slope, unless a proposed dwelling can be sited on an area of the lot that has less than ten (10) percent slope. Any dwelling on these lots should be constructed as a 'Hillside Home', as defined under the Reconfiguring a Lot Code of the Ipswich Planning Scheme, utilising alternative construction techniques that minimise the need for any surface disturbance and the need for earthworks. The use of extensive cut and fill earthworks is not permitted.

2. Flooding

The subject site was inundated in the 1974 flood. Council, and its servants and agents, accept no liability or responsibility for any loss or damage to person or property of whatever nature or however caused as the direct or indirect consequence of the granting of the approval herein contained. Such approval has been granted at the request of the Developer and in reliance of information submitted by the Developer in support thereof.

3. Portable Long Service Leave

From 1 January 2000, the Building and Construction Industry (Portable Long Service Leave) Levy must be paid prior to the issue of a development permit where one is required for the 'Building and Construction Industry'. This applies to Building Works, Operational Works and Plumbing and Drainage Works applications, as defined under the *Integrated Planning Act 1997*, where the works are $80 000 or more and matching the definition of 'Building and Construction Industry' under the *Building and Construction Industry (Portable Long Service Leave) Act 1991*.

Council will not be able to issue a Decision Notice without receipt of details that the Levy has been paid. Should you require clarification in regard to the amendments to the *Building and Construction Industry (Portable Long Service Leave) Act 1991*, you should contact QLeave on 1800 803 481 (free call) or (07) 3212 6855.

4. Fire Ants (Restricted Area)

In accordance with the *Plant Protection Act 1989* and the Plant Protection Regulation 1990, a quarantine notice has been issued for the State of Queensland to prevent the spread of the Red Imported Fire Ant (ant species Solenopsis invicta) and to eradicate it from the State.

It is the legal obligation of the land owner or any consultant or contractor employed by the land owner to report the presence or suspicion of Fire Ants to the Queensland Department of Primary Industries on 132523 within 24 hours of becoming aware of the presence or suspicion, and to advise in writing within seven days to:

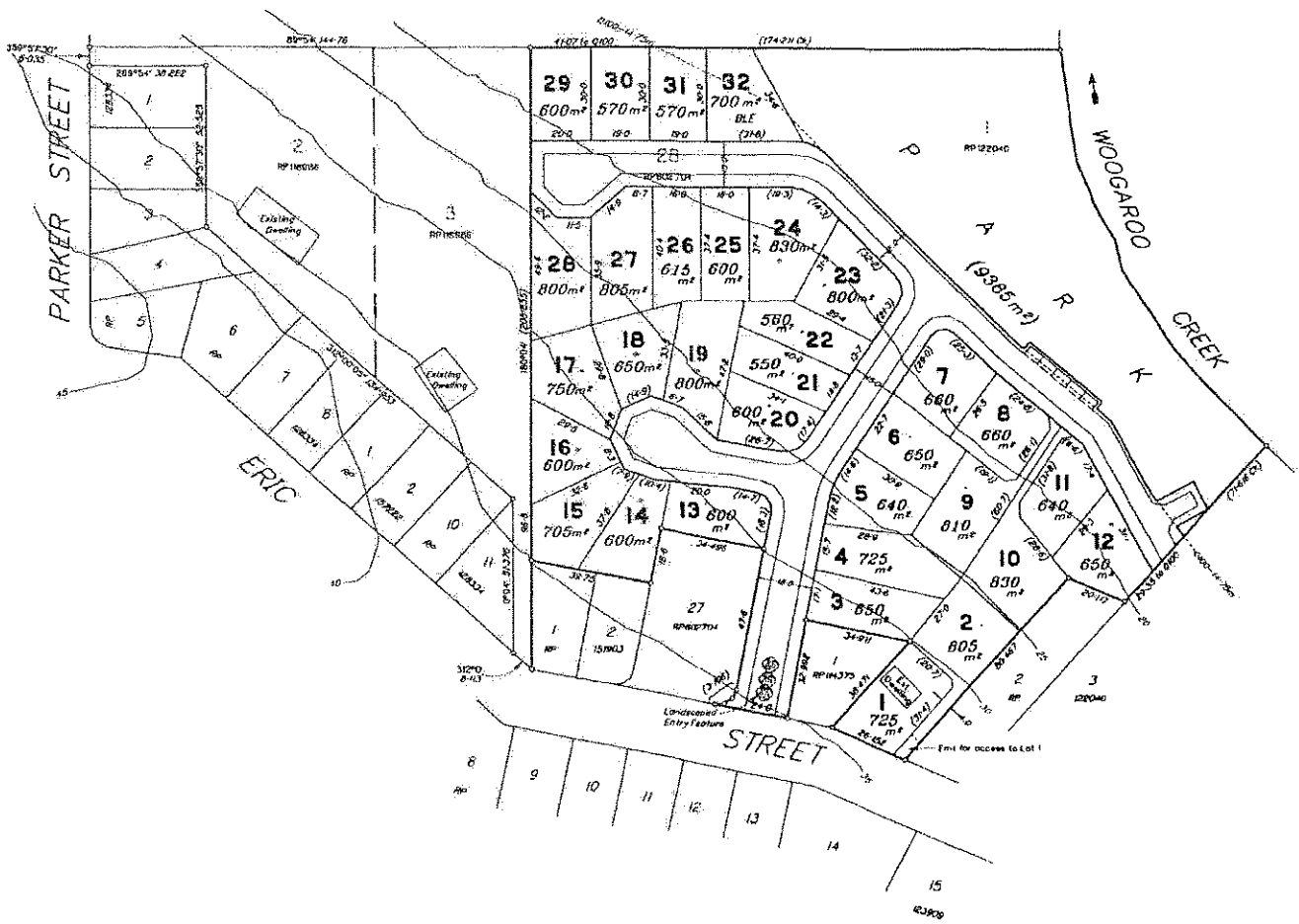
Director General
Department of Primary Industries
GPO Box 46, Brisbane QLD 4001

It should be noted that the movement of Fire Ants is prohibited, unless under the conditions of

an Inspectors Approval. More information can be obtained from the Queensland Department of Primary Industries website www.dpi.qld.gov.au.

The land over which you have made a development application is within a suburb known to have Fire Ants and as such is within a "Restricted Area". The presence of Fire Ants on the site may affect the nature, form and extent of works permitted on the site. In view of this it will be necessary for you to contact the Department of Primary Industries to investigate the site and for you to implement any necessary matters required by that Department prior to the commencement of any works.

End of Conditions



A1 Scale 1:750 - Lengths are in Metres.

A2 Scale 1:1000 - Lengths are in Metres.

DTS GROUP QLD PTY LTD
DEVELOPMENT CONSULTANTS
TOWN PLANNING
SURVEYING & DRAFTING

STATISTICS
Total Area of Subdivision - 3·865 ha
Number of Lots - 32
Length of New Road - 459 m

Contour Interval - 5 metre

PROJECT
Eric Street, Goodna

CLIENT
Rescom Property Group Pty Ltd

PLAN SHOWING
PROPOSED SUBDIVISION OF LOTS 1 - 32
CANCELLING LOT 1 ON RP122040 & LOT 28 ON RP802704
PARISH OF GOODNA COUNTY OF STANLEY
LOCAL AUTHORITY IPSWICH CITY COUNCIL

NOTES
This plan has been prepared by DTS Group Qld as a proposal plan and should not be used for any other purpose. The information contained on this plan is approximate only, has not been verified and may be subject to change. The intellectual property on this plan remains the property of DTS Group Qld. The contours shown on this plan have been derived from field survey.

SCALE 1:1000 | DRAWN SDM | DATE 4/12/2006
INSTRUCTION NO A04332 | DRAWING NO A2 905/9
A04332P3.DWG

Annexure NP-13

Stormwater Conditions from ICC Approval dated 4 April 2006

3. Plan of Survey

(c) The Developer shall grant, free of cost to or compensation payable by council, minimum 4.0 m wide easements located centrally over proposed stormwater drains, water mains and sewerage rising mains, where they are located within private property. The documentation associated with these easements may be prepared by the Developer in a form satisfactory to Council's City Solicitor, or the Developer may submit easement plans, only where Council is party to the easements, to Council for the preparation of easement documents at the Developer's expense.

(d) Easements required for discharge of stormwater over adjacent land shall be agreed to in writing by the owner of the subject land prior to construction works commencing.

(e) Easements shall be centrally located over the alignment of stormwater paths and be of a width sufficient to encompass the overland flow from a storm event with an ARI of 100 years.

(g) Land required for detention basins or equivalent is to be dedicated as drainage reserve in favour of Council and not included within parkland dedication unless approved as parkland by Council.

(h) The area of land to be dedicated as drainage reserve shall be dedicated at no cost to Council.

16. Stormwater

(a) The Developer shall provide all necessary stormwater drainage (both internal and external to the development) and such drainage works (except for roofwater systems) shall be designed and constructed in accordance with QUDM such that the overall drainage system caters for a storm event with an ARI of 100 years.

Overland flow paths shall be suitably designed to cater for the water from a storm event with an ARI of 100 years. In the case where the piped system is carrying part of the flow, the overland flow paths shall be designed to cater for that volume which is represented by the difference between the predicted volume from the storm event with an ARI of 100 years and the capacity of the pipe system, noting the requirements of QUDM.

(b) A suitable roofwater system shall be designed in accordance with QUDM, for allotments that do not have adequate fall from within the allotment to the design invert level of the kerb and channel. The design is to be to a minimum Level II in QUDM.

(c) All stormwater flows within and adjacent to the development, other than inter-allotment drainage, shall be confined to dedicated roads, drainage reserves, registered drainage easements or within parkland. The registered drainage easements, if related to piped drainage, shall be centrally located over such underground pipe system and shall be not less than 4.0 m wide, except for drainage easements required for side boundaries which may be 3.0 m wide where approved by the Senior Development Engineer. In addition, the easements shall be of suitable width to contain the predicted overland flow from the storm event with an ARI of 100 years in that location.

(d) No ponding or redirection of stormwater shall occur onto adjoining land unless specifically approved by Council in consultation with the owner of the adjoining land.

(e) Due consideration shall be given in the design and construction of the development in relation to the effect of the developed catchment flows on the downstream discharge receival areas. Suitable stormwater control devices are to be provided to ensure that there is no increase in flow in watercourses. Such control devices are to be designed so as to integrate the landscaping, recreational, infrastructural and drainage roles of watercourses.

(f) All stormwater runoff from the development shall be discharged in a manner and to a point to be approved by the Senior Development Engineer.

(g) Stormwater drainage plans and calculations are to be submitted and approved by the Senior Development Engineer, in conjunction with the submission of an Operational Works application.

(h) Appropriate works shall be carried out to ensure that stormwater drainage from the new kerb and channel discharges suitably into the existing drainage system.

(i) There shall be minimal disturbance to vegetation in the gully areas, unless prior written approval is obtained from Council. Stormwater drainage outlets shall be the subject of detailed design in the preparation of plans for each stage of the development.

(j) The Developer shall provide a roofwater connection point to all lots which have a concrete footpath along the lot frontage and which drain to the street. The connection shall be located at the lowest corner of the lot on an alignment of 1.2 m from the side boundary and shall discharge to the kerb and channel via a 100 mm by 75 mm galvanised RHS. The RHS should extend 0.5 m into the property and have a suitable adaptor to allow connection to a roofwater pipe. All other lots, which drain to the street and

do not have a concrete footpath along the lot frontage, do not require kerb adaptors.

(k) The Developer shall provide an extended stormwater detention and/or retention device (or equivalent) on the subject land, which shall be designed and constructed in accordance with QUDM. Where applicable, the detention/retention devices (or equivalent) shall be constructed to ensure that flows, run-off volumes and velocities, at any point downstream in the catchment, are not increased by the development for any combination of frequency and duration from the storm event with an ARI of 2 years up to and including the storm event with an ARI of 100 years. Additional calculations are to be provided demonstrating that the proposed stormwater management system, and all embankments and discharge structures, will be contained within the drainage reserve where applicable (except where connecting to the street drainage), and that the basin shape, volume and surface area will perform according to the attenuation results requirements.

Annexure NP - 14

Stormwater Conditions from Court Order dated 21 March 2007

3. Plan of Survey

(c) The Developer shall grant, free of cost to or compensation payable by council, minimum 4.0 m wide easements located centrally over proposed stormwater drains, water mains and sewerage rising mains, where they are located within private property. The documentation associated with these easements may be prepared by the Developer in a form satisfactory to Council's City Solicitor, or the Developer may submit easement plans, only where Council is party to the easements, to Council for the preparation of easement documents at the Developer's expense.

(d) Easements for the purpose of overland water flow are to be provided on lots 31 and 32. These easements shall be granted over the land extending from the Q100 line as shown on Plan Ref. Drawing No. A2 905/9 Instruction No. A04332 (prepared by DTS Group and dated 4 December 2006) to the eastern and northern boundaries of each lot. Retaining walls shall not be built on these easements. Open style fencing that does not prevent overland flow shall be provided on the eastern and northern boundaries of lots 31 and 32 which are subject to the overland flow easements.

(e) Easements required for discharge of stormwater over adjacent land shall be agreed to in writing by the owner of the subject land prior to construction works commencing.

(f) Easements shall be centrally located over the alignment of stormwater paths and be of a width sufficient to encompass the overland flow from a storm event with an ARI of 100 years.

(g) Easements shall be of sufficient width to contain any fitting, access chamber etc located on the stormwater drains, water mains, and sewerage rising mains.

(h) Land required for detention basins or equivalent is to be dedicated as drainage reserve in favour of Council and not included within parkland dedication unless approved as parkland by Council.

(i) The area of land to be dedicated as drainage reserve shall be dedicated at no cost to Council.

17. Stormwater

(a) From a stormwater perspective the subject site shall generally be developed in accordance with the Site Based Stormwater Management Plan (SMP) prepared by MRG Consulting and dated December 2006. Additionally the Developer shall submit to Council in conjunction with operational works

application RPEQ certification from the SMP author certifying that the proposed civil works comply with the recommendations and requirements of the approved SMP.

(b) The Developer shall provide all necessary stormwater drainage (both internal and external to the development) and such drainage works (except for roofwater systems) shall be designed and constructed in accordance with QUDM such that the overall drainage system caters for a storm event with an ARI of 100 years.

Overland flow paths shall be suitably designed to cater for the water from a storm event with an ARI of 100 years. In the case where the piped system is carrying part of the flow, the overland flow paths shall be designed to cater for that volume which is represented by the difference between the predicted volume from the storm event with an ARI of 100 years and the capacity of the pipe system, noting the requirements of QUDM.

(c) A suitable roofwater system shall be designed in accordance with QUDM, for allotments that do not have adequate fall from within the allotment to the design invert level of the kerb and channel. The design is to be to a minimum Level III in QUDM.

(d) All stormwater flows within and adjacent to the development, other than inter-allotment drainage, shall be confined to dedicated roads, drainage reserves, registered drainage easements or within parkland. The registered drainage easements, if related to piped drainage, shall be centrally located over such underground pipe system and shall be not less than 4.0 m wide, except for drainage easements required for side boundaries which may be 3.0 m wide where approved by the Senior Development Engineer. In addition, the easements shall be of suitable width to contain the predicted overland flow from the storm event with an ARI of 100 years in that location.

(e) No ponding, concentration or redirection of stormwater shall occur onto adjoining land unless specifically approved by Council in consultation with the owner of the adjoining land.

(f) Due consideration shall be given in the design and construction of the development in relation to the effect of the developed catchment flows on the downstream discharge receival areas. Suitable stormwater control devices are to be provided to ensure that there is no increase in flow in watercourses. Such control devices are to be designed so as to integrate the landscaping, recreational, infrastructural and drainage roles of watercourses.

(g) All stormwater runoff from the development shall be discharged in a manner and to a point to be approved by the Senior Development Engineer.

(h) Stormwater drainage plans and calculations are to be submitted and approved by the Senior Development Engineer, in conjunction with the submission of an Operational Works application.

(i) Appropriate works shall be carried out to ensure that stormwater drainage from the new kerb and channel discharges suitably into the existing drainage system.

(j) There shall be minimal disturbance to vegetation in the gully areas, unless prior written approval is obtained from Council. Stormwater drainage outlets shall be the subject of detailed design in the preparation of plans for each stage of the development.

(k) The Developer shall provide a roofwater connection point to all lots which have a concrete footpath along the lot frontage and which drain to the street. The connection shall be located at the lowest corner of the lot on an alignment of 1.2 m from the side boundary and shall discharge to the kerb and channel via a 100 mm by 75 mm galvanised RHS. The RHS should extend 0.5 m into the property and have a suitable adaptor to allow connection to a roofwater pipe. All other lots, which drain to the street and do not have a concrete footpath along the lot frontage, do not require kerb adaptors.

(l) The Developer shall provide an extended stormwater detention and/or retention device (or equivalent) on the subject land, which shall be designed and constructed in accordance with QUDM. Where applicable, the detention/retention devices (or equivalent) shall be constructed to ensure that flows, run-off volumes and velocities, at any point downstream in the catchment, are not increased by the development for any combination of frequency and duration from the storm event with an ARI of 2 years up to and including the storm event with an ARI of 100 years. Additional calculations are to be provided demonstrating that the proposed stormwater management system, and all embankments and discharge structures, will be contained within the drainage reserve where applicable (except where connecting to the street drainage), and that the basin shape, volume and surface area will perform according to the attenuation results requirements.

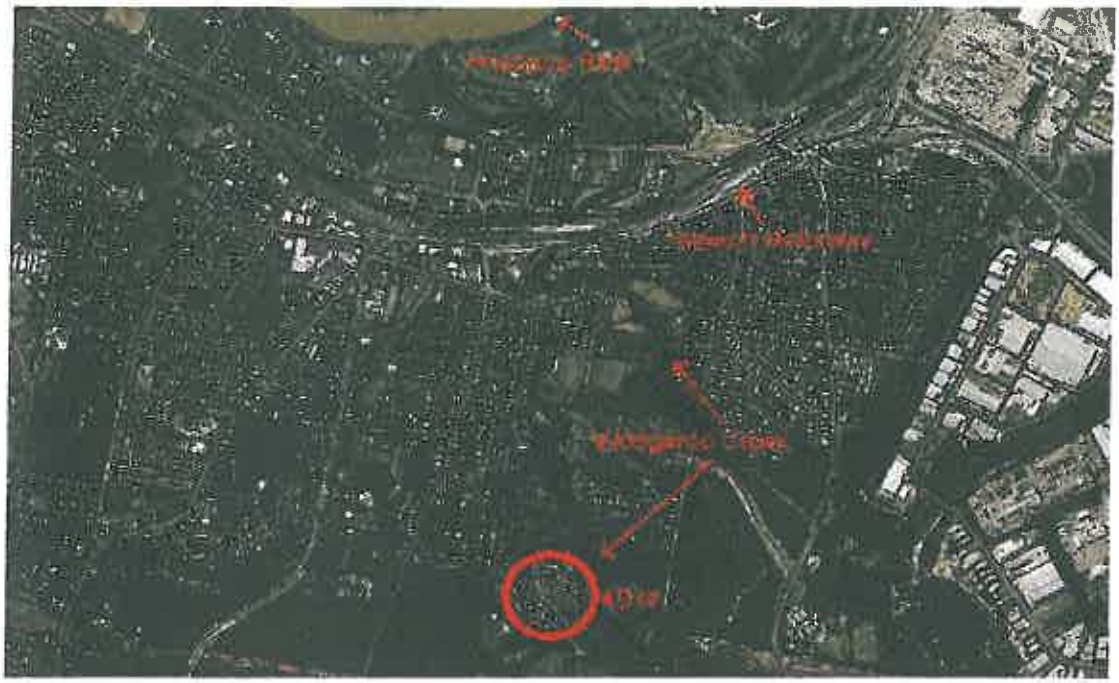


Figure 1: Location Plan

Figure 2: 1 in 20 Development Line

Figure 3: 1 in 100 Flood Line

Figure 4: 2011 Flood Event

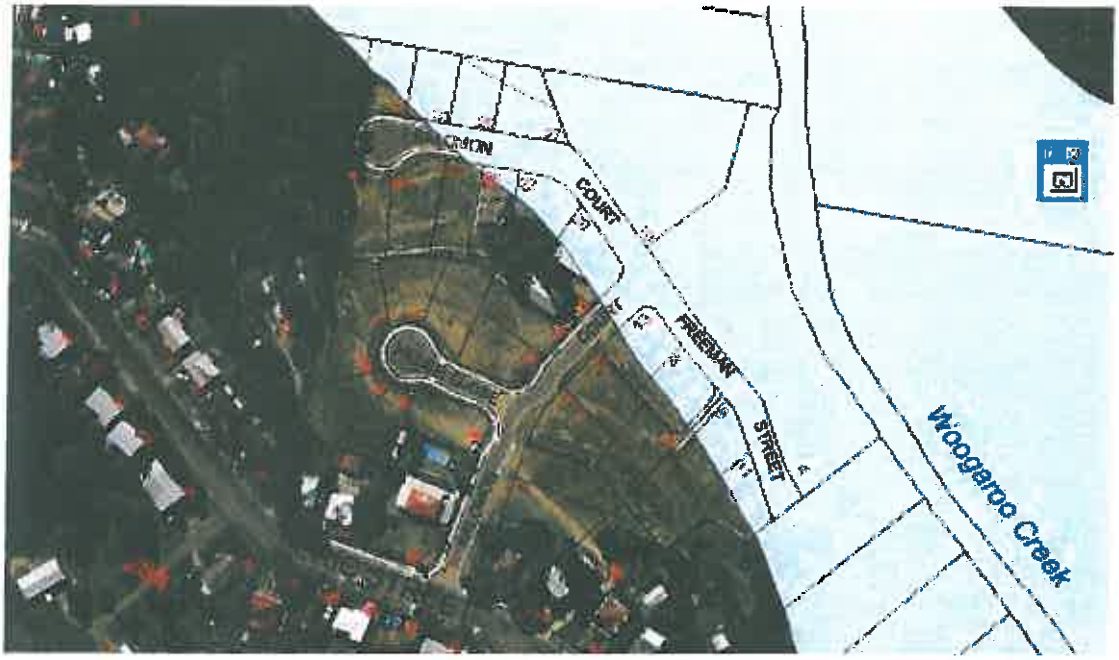


Figure 5: Adopted Regulated Flood Line under TLPI (equivalent to 1974 flood line)

Figure: Comparison between 1 in 2, 1 in 100, 2011 and 1974 flood events