**BEFORE A HEARING COMMISSIONER**
**APPOINTED BY KĀPITI COAST DISTRICT COUNCIL**

| | |
|---|---|
| Under the | of the Resource Management Act 1991 |
| And | |
| In the matter | of an application for resource consent by Gresham Trustee Limited under section 88 of the Act, to undertake a 302-lot fee simple subdivision, the construction of 135 dwellings, and associated earthworks at 240 Kāpiti Road, Paraparaumu. |

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# STATEMENT OF EVIDENCE OF NEIL ANDREW JOHNSTONE (CIVIL ENGINEERING) ON BEHALF OF THE APPLICANT

Dated: 26 October 2022

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## INTRODUCTION

1. My name is **Neil Andrew Johnstone.**

2. I am a Chartered Professional Engineer, a member of Engineering New Zealand and a Director of Cuttriss Consultants Ltd. I have a Bachelor of Engineering (Civil) from Canterbury University (graduating in 2000), a New Zealand Certificate in Engineering (Civil) from Wellington Polytechnic (1997). I have over 20 years experience as a Consultant Civil Engineer.

3. I have worked for Cuttriss Consultants Ltd since February 2004 and prior to that I was employed by Opus International Consultants in Timaru, and Palmerston North for a period of 4 years.

4. I have worked in land development and have been involved in the areas of infrastructure design and construction monitoring, including stormwater disposal designs. I have been involved in a number of such projects, particularly in the Kapiti Coast area, over the last 17 years. These works have also included stormwater infrastructure designs and upgrades, and finding stormwater disposal solutions, for the Kapiti Coast District Council, and for developers undertaking land development projects.

### Code of conduct

5. I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2014. This assessment has been prepared in compliance with that Code, as if it were evidence being given in Environment Court proceedings. Unless I state otherwise, this assessment is within my area of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

### Background and role

6. I have been working on the Project since December 2021 and my input has included technical oversight and review of our Conceptual Stormwater Disposal Report and Engineering Infrastructure Report.

7. In preparing my evidence I have reviewed the memorandum prepared by Jacobs New Zealand Ltd dated 13 October 2022.

## Purpose and scope of the evidence

8. The purpose of my evidence is to respond to the Jacobs memorandum dated 13 October 2022 and attached to the Council's officer's section 42A report.

9. The Jacobs' memorandum reviews the proposed stormwater disposal methods outlined in the application for resource consent (RM220070) for 240 Kapiti Road, Paraparaumu.

## EXECUTIVE SUMMARY

10. Cuttriss Consultants Ltd have completed a conceptual stormwater disposal design for the proposed development. The conceptual design is based on site investigations and climate affected (2090) Isohyet rainfall depths have been used. Consideration has been given to managing the 1% Annual Exceedance Probability (AEP) rainfall event which is the Kapiti Coast District Council standard benchmark for managing flooding effects on residential development.

11. Based on the conceptual stormwater disposal design prepared by Cuttriss Consultants and subsequent amendments, I consider that stormwater runoff from on site will be appropriately managed for events up to the 1% AEP rainfall event, and off-site properties will not be impacted by the proposed development.

## RESPONSE TO JACOBS REVIEW

### Soakage rates

12. Jacobs' memorandum recommends that further soakage testing is carried out after the completion of proposed earthworks and in the location of proposed soakage devices.

    (a) I support the recommendation and agree that further testing should be carried out on completion of earthworks, as also outlined in the conceptual design report (section 5). It is intended that earthworks completed in the location of the proposed soakage disposal area are not over compacted to ensure existing pre-earthworks soakage properties are retained.

**Soakpit storage – Rainfall data**

13. Jacobs' memorandum recommends that the soakpit is recalculated considering a design rainfall depth of 162mm instead of 160mm.

    (a) We have completed this calculation and attach the updated calculations. The soakpit size will increase by 1.7% reflecting the increased rainfall depth.

    (b) The increased soakpit size can be accommodated within the area set aside for stormwater disposal within the proposed development.

**Soakpit storage – runoff calculations**

14. Jacobs' memorandum recommends that runoff calculations detailing a 10-minute duration storm to check individual pipe capacities.

    (a) A 10-minute duration storm can be calculated and submitted as part of the detailed design to confirm pipe capacities.

15. Jacobs' memorandum recommends that runoff is recalculated to reflect the new updated plans.

    (a) The updated design reduces the number of dwellings from 139 to 135, consequently the roof area is reduced. The impervious surface area, however, does not reduce as the roof area reduction is replaced with impermeable surfacing such as paving or similar.

    (b) Detailed design will be completed, and all roof areas and impervious surfaces will be re-calculated and updated accordingly.

**Soakpit Base Level and Water Table**

16. Jacobs' memorandum recommends that further consideration of the effects of the water table on the proposed solution are made and that there is allowance for this in the design solution.

    (a) We agree that the water table can vary, and the applicant has agreed to install a piezometer on site to monitor ground water levels over a period of time.

    (b) Initial site testing confirmed the level of the proposed soakage device to ensure it was above the anticipated water table.

(c) Detailed design will take into account any results from the piezometer and will be adjusted accordingly.

**Flood Hazard Assessment – Proposed Stormwater Network**

17. Jacobs' memorandum recommends that the performance of the collection network (pipes and overland flood paths) for the 1% AEP event are confirmed through hydraulic modelling during detailed design.

(a) I support the recommendation and agree that hydraulic modelling to confirm pipe capacity should be carried out at detailed design.

**Flood Hazard Assessment – Offsite effects**

18. Jacobs' memorandum recommends that further justification of the performance of the system is made or alternative solutions such as surface storage within the site to avoid increasing the hazard outside the site are designed.

(a) The design of the overall development affords the ability to lower the park area to generate additional surface storage, if required, however this should not be required unless any design input parameters do not meet the expected criteria to confirm the design will work as anticipated. These include a confirmed soakage rate post earthworks, confirmed water table level, modelling of hydraulic grade lines on the piped network and the calculation of final impervious areas. We therefore propose that during detailed design this information is provided to demonstrate the performance of the detailed stormwater disposal design and if any criteria impact the design, then additional surface storage can be provided if determined necessary.

**Finished floor levels**

19. Jacobs' memorandum recommends that further information is provided to confirm that the proposed finished floor levels are above the 1% AEP water levels along overland flow paths within the site (including climate change allowance) and will also meet Building Code requirements in relation to the crown of road outside the site.

(a) The detailed design will take into account final road levels internally to the development and overland flow paths. The level of the crown of the road on Halsey Grove has been surveyed as 5.4 metres above mean

sea level and Kapiti Road has a crown level ranging from 6.3m-6.5m above mean sea level. Finished floor levels will be above the crown of the road levels or will be more than 150mm above the lowest point on the site, as required by the Building Code Clause E1 Surface Water. Detailed design will determine final overland flow path levels however we anticipate they will not impact the finished levels proposed by more than 50-100mm in height.

**RESPONSE TO SUBMISSIONS**

20. Mr and Ms Ward raise stormwater runoff in their submission. Cuttriss' proposed conceptual stormwater disposal design report addresses stormwater disposal, as does the assessment provided above.

**RESPONSE TO COUNCIL OFFICER'S SECTION 42A REPORT**

21. I have read the conclusions reached in the Council officer's s42A Report, which propose to address the Jacobs' recommendations by way of conditions.

22. It is my recommendation that the consent conditions proposed should more directly address the matters that Jacobs' peer review has raised.

23. It is my recommendation that conditions 42 and 43 are replaced with the following conditions:

    (a) On completion of earthworks and prior to commencing construction of the stormwater disposal system, further soakage testing should be carried out in the location of the stormwater disposal system for the purpose of confirming the soakage rate used to determine the size of the stormwater disposal system.

    (b) Prior to works commencing the consent holder shall submit a detailed stormwater design for approval to the satisfaction of the Council's Development Engineer. The detailed stormwater design should align with the conceptual stormwater design lodged with the resource consent and updated as following:

        (i) Updated calculations to confirm final roof and impervious areas;

        (ii) Updated calculations to confirm pipe capacities for a 10 minute duration rainfall event;

(iii) Confirmation that the design solution accounts for water table fluctuations;

(iv) Confirm the performance of the collection network (pipes and overland flow paths) for the 1% AEP event through hydraulic modelling;

(v) Provision of details required by conditions (i-iv) above will confirm the performance of the stormwater disposal system and if any further detailed design criteria provided impact the performance then an alternative solution which may include surface storage within the site will be provided;

(vi) Confirm finished floor levels are at or above the 1% annual exceedance probability water levels along overland flow paths within the site (including climate change allowance) and confirm compliance with the Building Code Clause E1 Surface Water.

24. It is my professional opinion with the above conditions in place the stormwater can be managed on site so as not to cause a nuisance for increased hazards downstream.

**Neil Andrew Johnstone**

## Proposed Development Catchment Calculations

**Hydrology - Rational Method**

Assumptions:

1. Catchments as per scheme plan
2. Stormwater neutrality required
3. The in-situ soil on the site is typically dune sand
4. Small strip of Kapiti Road reserve flows into site in existing scenario
5. Runoff coefficients from NZBC E1 Table 1
6. Soakage is the preferred disposal methodology

**Rainfall Data**

**NORMALISED RAINFALL DEPTHS**
**240 Kapiti Road**

| Event | Rainfall Depth (mm/24hrs) |
|---|---|
| 2 | 78 |
| 5 | 96 |
| 10 | 108 |
| 20 | 126 |
| 50 | 145 |
| 100 | 162 |

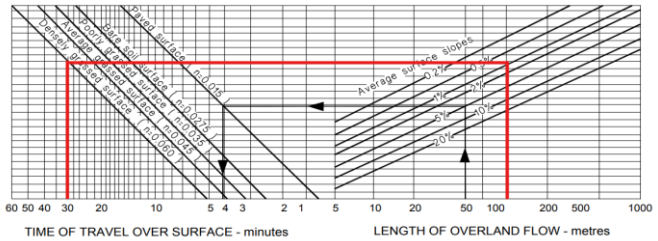
| Duration | Normalised Rainfall Depth | 2Yr Rainfall Depth | 2Yr Rainfall Intensity | 5Yr Rainfall Depth | 5Yr Rainfall Intensity | 10Yr Rainfall Depth | 10 Yr Rainfall Intensity | 20 Yr Rainfall Depth | 20 Yr Rainfall Intensity |
|---|---|---|---|---|---|---|---|---|---|
| 10 | 0.11 | 9 | 51.5 | 11 | 63.4 | 12 | 71.3 | 14 | 83.2 |
| 30 | 0.19 | 15 | 29.6 | 18 | 36.5 | 21 | 41.0 | 24 | 47.9 |
| 60 | 0.26 | 20 | 20.3 | 25 | 25.0 | 28 | 28.1 | 33 | 32.8 |
| 120 | 0.35 | 27 | 13.7 | 34 | 16.8 | 38 | 18.9 | 44 | 22.1 |
| 180 | 0.46 | 36 | 12.0 | 44 | 14.7 | 50 | 16.6 | 58 | 19.3 |
| 360 | 0.60 | 47 | 7.8 | 58 | 9.6 | 65 | 10.8 | 76 | 12.6 |
| 720 | 0.81 | 63 | 5.3 | 78 | 6.5 | 87 | 7.3 | 102 | 8.5 |
| 1440 | 1 | 78 | 3.3 | 96 | 4.0 | 108 | 4.5 | 126 | 5.3 |

| Duration | Normalised Rainfall Depth | 50Yr Rainfall Depth | 50 Yr Rainfall Intensity | 100Yr Rainfall Depth | 100Yr Rainfall Intensity |
|---|---|---|---|---|---|
| 10 | 0.11 | 16 | 95.7 | 17.8 | 106.9 |
| 30 | 0.19 | 28 | 55.1 | 30.8 | 61.6 |
| 60 | 0.26 | 38 | 37.7 | 42.1 | 42.1 |
| 120 | 0.35 | 51 | 25.4 | 56.7 | 28.4 |
| 180 | 0.43 | 67 | 22.2 | 74.5 | 24.8 |
| 360 | 0.60 | 87 | 14.5 | 97.2 | 16.2 |
| 720 | 0.81 | 117 | 9.8 | 131.2 | 10.9 |
| 1440 | 1 | 145 | 6.0 | 162.0 | 6.8 |

**Existing Scenario**

| | | | |
|---|---|---|---|
| Tc = | 30 | min | Refer Figure 1 below |
| Storm duration (D) = | 30 | min | |
| Return Period = | 100 | years | |
| Rainfall intensity from above table = | 61.6 | mm/hr | |

**Figure 1:** Times for Overland Flow
Paragraph 2.3.2 b) i)



**Stormwater Catchment Calculations for**
**Resource Consent for Proposed New Development**
**240 Kapiti Road, Paraparaumu**

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**Proposed Scenario**

| | | |
|---|---|---|
| Tc = | 60 | min |
| Storm duration (D) = | 60 | min |
| Return Period = | 100 | years |
| Rainfall intensity from RSWS Appendix 2 = | 42.1 | mm/hr |

## Site Data

**Pre Development**

| | | Area (m2) | C | Peak flow (L/s) | |
|---|---|---|---|---|---|
| Catchment 01 - Dwellings | | 125 | 0.90 | 1.92 | |
| Catchment 02 - Trees Coverage | | 2540 | 0.25 | 10.86 | |
| Catchment 03 - Grass coverage | | 16905 | 0.30 | 86.72 | |
| Catchment 04 - Chip seal driveways | | 65 | 0.85 | 0.94 | |
| | Total | 19635 | 0.30 | 100.45 L/s | - Some Kapiti Road berm currently flows into the site so pre and post development site areas are different. |
| Existing western culvert flow | | 6634 | 0.31 | 35.17 L/s | |

**Post Development**

| | | Area (m2) | Area (Ha) | C | Peak flow (L/s) |
|---|---|---|---|---|---|
| Catchment 05 - Roofs | | 5254 | 0.5254 | 0.90 | 55.32 |
| Catchment 06 - Back yard concrete | | 1234 | 0.1234 | 0.85 | 12.27 |
| Catchment 07 - Back yard turf | | 1976 | 0.1976 | 0.40 | 9.25 |
| Catchment 08 - Terraces | | 645 | 0.0645 | 0.85 | 6.41 |
| Catchment 09 - Front yards | | 625 | 0.0625 | 0.25 | 1.83 |
| Catchment 10 - Roads and carparks | | 4266 | 0.4266 | 0.85 | 42.43 |
| Catchment 11 - Footpaths and waste | | 2052 | 0.2052 | 0.85 | 20.41 |
| Catchment 12 - Balance (gradens) | | 2942 | 0.2942 | 0.25 | 8.61 |
| | Total | 18994.00 m2 | | 0.70 | 156.5 L/s |

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# INDICATIVE SOAKPIT DESIGN FOR STORMWATER RUNOFF DISPOSAL

## DESIGN TO E1/VM1 (NZ BUILDING CODE) FOR STORMWATER INTO SOAKPIT (MODULE)

### Estimated Dimensions of Soakpit

| | | | | | |
|---|---|---|---|---|---|
| Width = | 60 | cells | Length = | 37 | cells |
| = | 24.0 | m | = | 26.5 | m |

$A_{sp}$ = 634.9 $m^2$ (area of base of soakpit)

### Estimated Catchment Area

$S_r$ = 78 mm/hr (factor of safety of 4 applied to raw soakage)

| | | |
|---|---|---|
| C = | 0.70 | Weighted runnoff coefficient |
| I = | 42.1 | mm/hr for the 60min, 100 year storm |
| A = | 18994 | m2 |
| = | 1.8994 | Ha |
| Q100 = | 0.155 | m3/s |
| Duration = | 60 | min |
| Rc = | 559.75 | $m^3$ |

$V_{soak} = A_{sp} \times S_r / 1000$ = 49.68 $m^3$/hr (base soakage)

$V_{stor} = R_c - V_{soak}$ = 510.07 $m^3$ (design storage)

### Dimensions of Chambers

$V_{cells}$ = 536.92 $m^3$ (based on void ratio of 0.95)

$D_{cells} = V_{cells}/A_{sp}$ 0.85 m (min. required cell depth)
Select cell depth = Double Select cell depth
= 0.86 m (actual cell depth)
Cell depth acceptable
Trafficable? Yes
Min cover = 0.60 m

### Indicative Soakpit Dimensions

| | | |
|---|---|---|
| **W =** | **24.0 m** | |
| **L =** | **26.5 m** | |
| **cavation depth (min) =** | **1.46 m** | (provided that sands/ gravels are encountered) |
| **Storage volume =** | **519 m3** | Assuming 95% voids |