

**IN THE MATTER** of the Resource Management Act 1991

**AND**

**IN THE MATTER** of the hearing for Plan Change 13 – Uplifting  
Deferred Zones of a submission by Papamoa TA  
Limited Partnership

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**STATEMENT OF EVIDENCE OF BRONWYN RHYND**

**11 June 2021**

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**1 INTRODUCTION**

- 1.1 My full name is Bronwyn Patricia Rhynd. I am an environmental engineer with over 20 years' experience.
- 1.2 I hold a New Zealand Certificate in Civil Engineering, a Bachelor of Engineering, and a Masters in Environmental Engineering Science.
- 1.3 I am a full member of Engineering New Zealand and am registered as a Chartered Professional Engineer as well as being registered on the New Zealand Section of the International Professional Engineers
- 1.4 I have been made a Fellow of Engineering New Zealand and received this recognition of my contribution to the engineering industry on 21st March 2020.
- 1.5 I am a member of Water New Zealand and a member of their specialist Stormwater Interest Group. I have been actively involved in this group and recently stepped down from the committee where I spent 10 years organising the annual stormwater conference within New Zealand.
- 1.6 In 2019 I received the Stormwater Professional of the year award. This award is in recognition of the knowledge and commitment of the stormwater industry in New Zealand
- 1.7 My expertise is in the water resource area with a focus on stormwater treatment, disposal, and management. I also have experience and expertise in flood and flow regulation. I have undertaken assessments of effects with regard to stormwater and overland flow path management for projects and catchments that are either greenfields

or have established land uses from residential, commercial, and industrial including landfill operations.

- 1.8 I am currently employed by CKL NZ Ltd, where I hold the position of director and environmental engineer and have held that role since 1 May 2015. Previously, I was employed by Stormwater Solutions Consulting Ltd where I held the position of Managing Director and environmental engineer. I formed this company in 2004 and was the co-director since its inception on 4 September 2004 until merging with CKL NZ Ltd on 1 May 2015.
- 1.9 I have been engaged by the submitter, Papamoa TA Limited Partnership, to provide stormwater management evidence in respect of Plan Change 13 which seeks to uplift deferred zones.
- 1.10 My previous experience in the Waikato and Waipa District includes the following relevant projects:
  - (a) Rotokauri North catchment management plan, Green Seed Ltd, stormwater management plan for structure plan to support catchment wide residential development and private plan change application to Hamilton City Council.
  - (b) Te Awa Lakes, Horotiu, resource consent application for stormwater discharge in a disused sand mining operation for the purposes of a multi land use development
  - (c) Haultain Street, Kihikihi; 6.5ha residential development, stormwater management plan and environmental assessment of effects from greenfields to construction phases.
  - (d) Growth Cell T1, Te Awamutu; stormwater management plan to support private plan change. Included hydrological and hydraulic assessment, design of communal and on lot stormwater management devices to mitigate potential detrimental effects downstream.
  - (e) Ridgehaven development, Ohaupo; 45 large Lot residential development, including stormwater management plan which included downstream constraints of discharging to a drainage management area and sensitive ecological environment.
  - (f) Growth Cell T11, Te Awamutu, currently underway with a stormwater management plan for the growth cell including hydrological and hydraulic modelling of the Mangaohoi Stream catchment to assess effects of the fully developed growth cell.

- 1.11 I confirm that I am familiar with the area of Growth cell T6 and have visited the site associated with the T6 subcatchment west of St Leger Road and north of the tributary of Puniu River.
- 1.12 I confirm that I have read the 'Code of Conduct for Expert Witnesses' contained in the Environment Court Practice Note 2014 and my evidence to this hearing has been written in accordance with that Practice Note.

## **2 OUTLINE OF EVIDENCE**

- 2.1 My evidence considers Stormwater management matters with respect to Plan Change 13 and the T6 Structure plan
- 2.2 I have set out my Stormwater management evidence as follows:
  - Review of the PC13 T6 structure plan
  - Viability of stormwater reserves
  - Proposed amendment to T6 structure plan
- 2.3 A technical review has been undertaken by myself and CKL staff, under my direction, of the Plan Change 13 Supporting documentation, which was to accompany the submission by my client. This is appended for completeness and used as reference to support my evidence.
- 2.4 I have reviewed the information available on Plan Change 13 including:
  - 2.4.1 Te Awamutu T6 and T11 Structure Plans, Boffa Miskell, 25 June 2020.
  - 2.4.2 Three water assessment, Te Awamutu T6 and T11 Structure Plans, Tonkin & Taylor Ltd (T&T), August 2019.
  - 2.4.3 The section 42A report; and
  - 2.4.4 The section 32 Report.

## **3 REVIEW OF PC13 T6 STRUCTURE PLAN**

- 3.1 The T6 structure plan has been developed with stormwater reserves and conveyance systems to support the total growth cell.
- 3.2 To support the structure plan a high level stormwater management approach has been provided through the T&T three waters assessment.
- 3.3 The stormwater management requirements for T6 are summarised below.
  - On lot water efficiency measure such as detention tanks
  - A 23 m riparian margin
  - Peak flow control not recommended for the 2yr ARI and higher magnitude rainfall events
  - The St Leger Road culvert should be upgraded
  - Onsite soakage will need to be tested and designed on a lot-by-lot basis

- If water quality rainfall volume cannot be achieved through water tanks and soakage, then bio-retention device or a suitable wetland will need to be designed.
- Vegetated swales are recommended to convey overland flow
- Avoiding modification to existing channel corridors

3.4 In applying the above requirements, or objectives, to the area west of St Leger Road and north of the Puniu River tributary has highlighted that the structure plan stormwater reserve located in the far western sector of growth cell T6, is either redundant or unable to be utilized to its full extent.

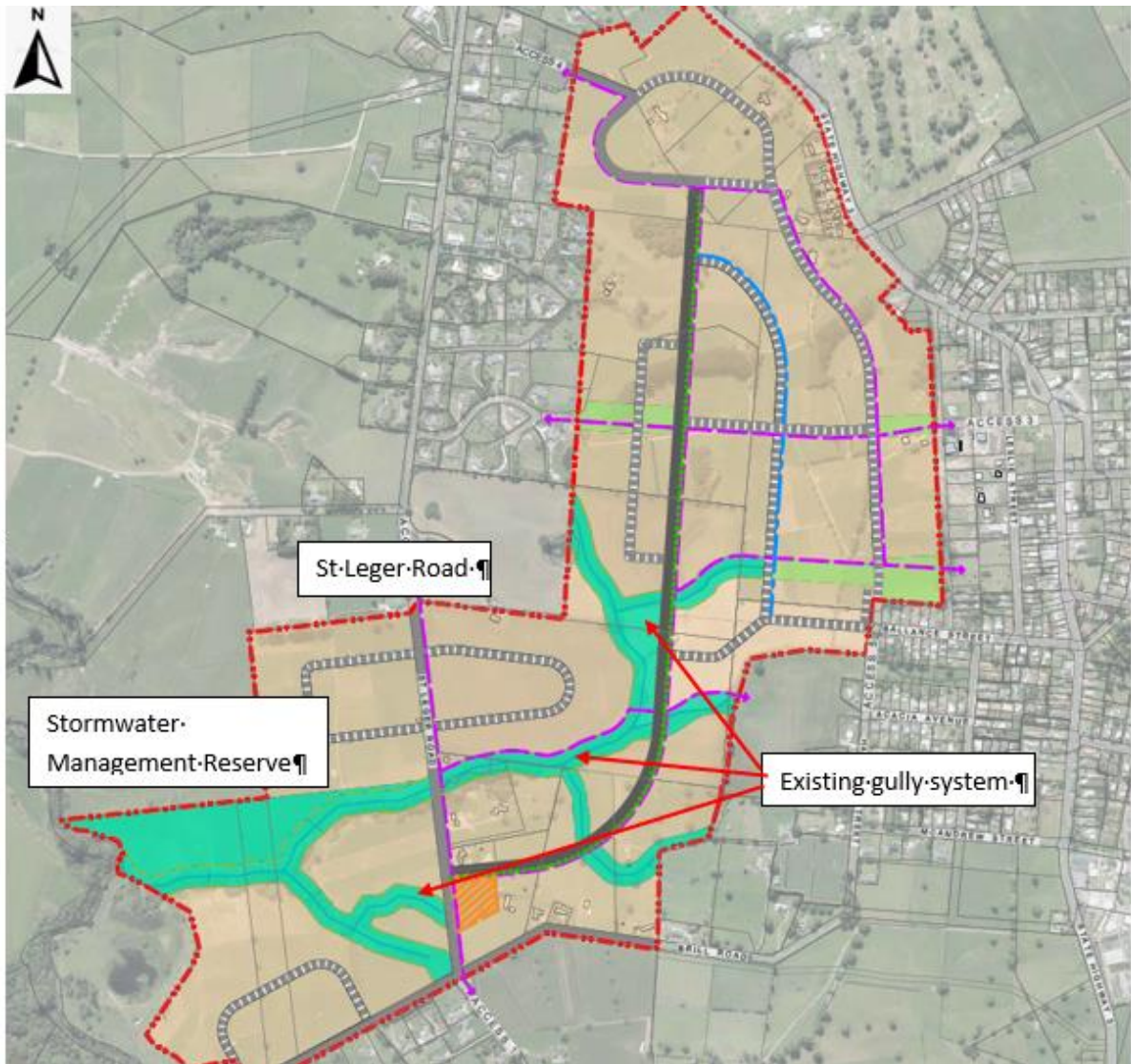
#### **4 VIABILITY OF STORMWATER RESERVES**

4.1 The structure plan shows the existing gully and channels are enhanced with a 23m wide riparian margin, and convey flow from within the T6 growth cell towards the Puniu River.

4.2 There is no information within the Three Waters assessment as to how the stream and gully system will utilise the stormwater reserve as the following aspects have not been considered:

- Stormwater management reserve is elevated above the channel and gully system
- The reserve can only receive runoff from the sub catchment west of St Leger Road and north of the Puniu River tributary (tributary) due to topographical constraints
- Should topography allow the stormwater reserve to be implemented then the primary system would bypass tributary and the resultant starvation of the tributary would occur.

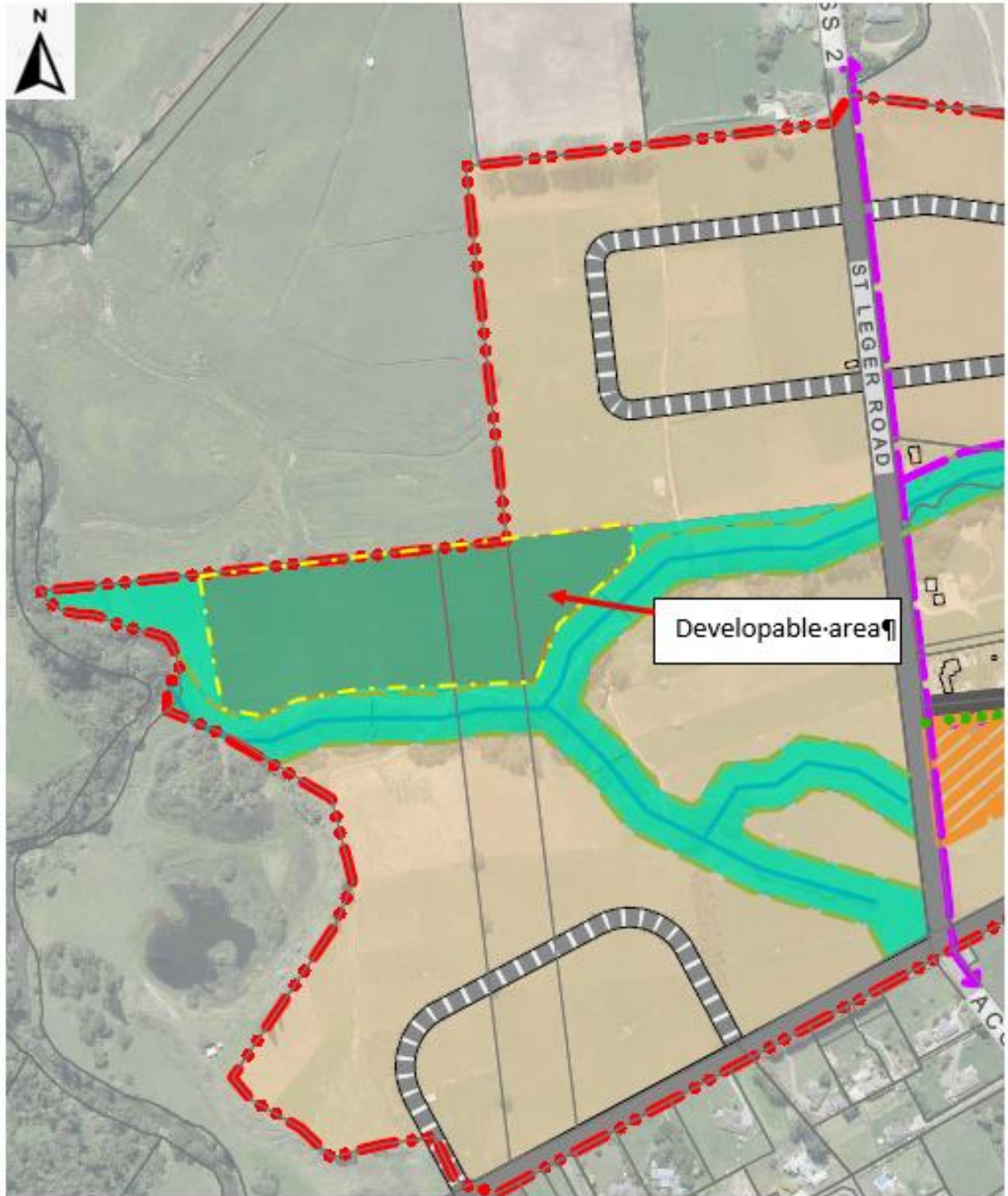
- 4.3 The location of the stormwater management reserve is elevated above the adjacent channel and gully. Therefore, connectivity of the channels and gully system to the stormwater reserve is impractical.
- 4.4 In addition, there is very little elevation difference between the east and west of St Leger Road ground topography. Therefore, it is considered difficult and ineffective to convey the flow across the St Leger Road and towards the stormwater management reserve.
- 4.5 The following figure shows the gully system, St Leger Road and the relationship with the stormwater reserve location



## 5 Proposed amendment to T6 structure plan

- 5.1 A review of the structure plan's stormwater management proposed for the sub catchment west of St Leger Road and north of the tributary highlights the following:
- the stormwater reserve is located in an area which is elevated and unobtainable for the majority of the Growth Cell T6.
  - stormwater management could be achieved "at source and on lot" for this sub catchment

- 5.2 Based on these findings this area could have the same development potential as the areas south of the tributary and west of St Leger Road.
- 5.3 Therefore, the land currently assigned as a stormwater reserve, as presented below, can potentially be developed into future residential subdivision.



5.4 Alternatively, there could be a communal stormwater reserve applied for this subcatchment to accommodate the stormwater treatment and extended detention requirements for this sub catchment only. The area required for a communal stormwater reserve is in the order of 1.6ha (which is approximately 10% of the sub catchment area) and illustrated in the figure below.



## 6 RECOMMENDATIONS

6.1 I recommend that Structure Plan be amended to:

- accommodate the practicalities of delivering a stormwater reserve to service the T6 growth cell that is east of St Leger Road and south of the tributary.
- Provide for sub catchment stormwater management west of St Leger Road and north of the tributary that includes:
  - On lot and at source management; and/or
  - Communal stormwater reserve

- 6.2 Should the communal stormwater reserve be deemed best practical option then the Structure Plan stormwater reserve is somewhat smaller than illustrated in PC13 documentation and the remainder of this area returned to residential development potential.
- 6.3 Should On lot and at source stormwater management be deemed best practical option then the Structure Plan stormwater reserve is removed in PC13 documentation, and this area returned to benefit the residential development potential.

## **7 CONCLUSIONS**

- 7.1 I have undertaken a review of the stormwater management requirements under the current three waters assessment provided by Tonkin and Taylor Ltd to support PC13 T6 growth cell structure plan.
- 7.2 The stormwater management reserve located in the sub catchment west of St Leger Road and north of the Puniu River tributary cannot be utilized by the whole T6 catchment due to topographical and hydraulic connectivity constraints.
- 7.3 The stormwater management for this sub catchment can include a “on lot and at source” approach to ensure that the discharge from this fully developed site will not have detrimental effects on the receiving environment.
- 7.4 The best practical stormwater management approach could include a communal management device in a reserve area. However, this area will be substantially smaller than the area illustrated in the T6 structure plan.
- 7.5 I recommend that the area assigned for stormwater management reserve be reviewed and either removed or reduced in size to support a practicable approach to the stormwater management of the contributing sub catchment west of St Leger Road and north of the Puniu River tributary



**Bronwyn Rhynd**

**11 June 2021**





## MEMO

**To:** Papamoa TA Limited Partnership  
**From:** Tony Wang – Engineer  
**Reviewed:** Bronwyn Rhynd – Director  
**Re:** **Stormwater strategy review - T6 -164 St Leger Road, Te Awamutu**

**Date:** 19 April 2021  
**CC:**  
**CKL Ref:** C20149

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### 1 Introduction

The purpose of this memo is to provide an overview of the stormwater strategy proposed under the Te Awamutu T6 structure plan for Allot 72 Punui PSH and Lot 2 DPS 85136, 164 St Leger Road.

The stormwater strategy review is based on the following information sources:

- Te Awamutu T6 and T11 Structure Plans, Boffa Miskell, 25 June 2020
- Three water assessment, Te Awamutu T6 and T11 Structure Plans, Tonkin & Taylor Ltd (T&T), August 2019.

### 2 Structure Plan

We have reviewed the structure plan requirements and assessments to understand the basis of the structure plan development. The sub sections below present the outcomes of the review.

#### 2.1 Te Awamutu T6 Structure Plan -Boffa Miskell

The T6 structure plan has been developed with stormwater reserves and conveyance systems to support the total growth cell. The proposed stormwater management areas which include reserves and stream setbacks is shown in Figure 1.



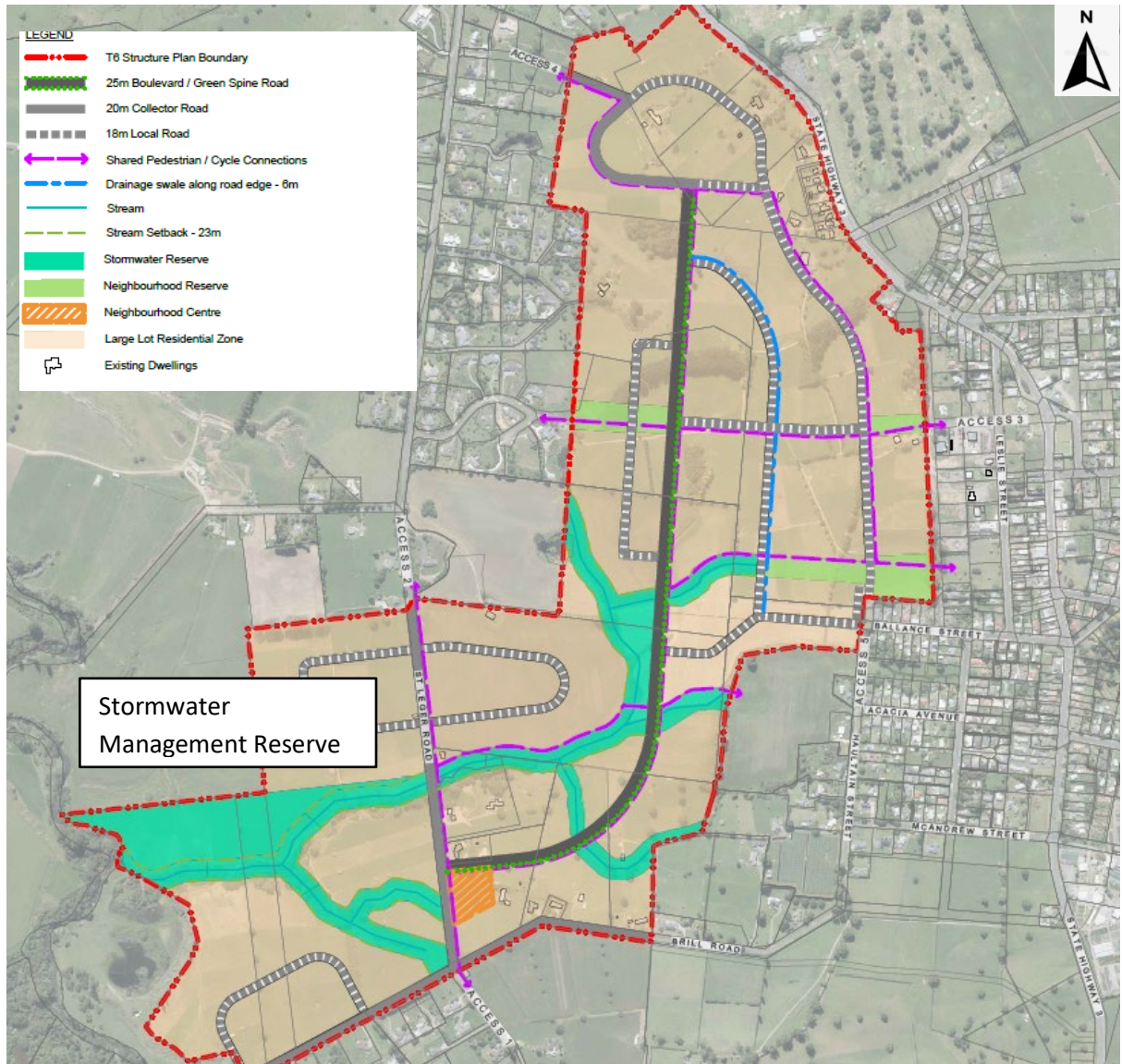


Figure 1: T6 structure plan

The stormwater management and peak flow control requirements are summarised below.

- On lot water efficiency measure such as detention tanks
- A 23 m riparian margin
- Peak flow control of the 2yr ARI and higher magnitude events is not recommended
- The St Leger Road culvert should be upgraded
- Onsite soakage will need to be tested and designed on a lot by lot basis
- If water quality rainfall volume cannot be achieved through water tanks and soakage, then bio-retention device or a suitable wetland will need to be designed.
- Vegetated swales are recommended to convey overland flow
- Avoiding modification to existing channel corridor

## 2.2 Three Water Assessment – Tonkin and Taylor

The following was recommended under three waters assessment by Tonkin and Taylor

### Stormwater

- The St Leger Road culvert should be upgraded.
- Retention, reuse and onsite soakage of the post-development water quality volume will be required to provide stormwater treatment and erosion control. Water tanks for each lot are recommended to help meet these requirements and water supply demands.
- Onsite soakage will need to be tested and designed on a lot by lot basis. Bio-retention devices or a suitable wetland will need to be designed if the water quality volume cannot be achieved through retention, reuse and onsite soakage.
- If on-site soakage investigations show that the post-developed water quality rainfall volume cannot be achieved through water tanks and soakage then bio-retention devices or a suitable wetland will need to be designed.
- Vegetated swales are recommended to convey overland flow.
- Avoid modification to existing channel corridors and an ecological survey is recommended

### Flood Risk

- Pass forwarding the 2 year ARI or great event flood flow without peak flow control is recommended.
- The difference between pre and post development total volume for smaller storms up to the 2 year ARI event be retained (rainwater re-use, soakage or bio-retention) where possible.
- It is likely that the pre to post 2 year ARI volume difference will be smaller than the post-developed water quality volume and erosion volume can therefore be managed through stormwater treatment,

## 3 Comments and proposals

The review of the T6 structure plan and stormwater management objects has set the scene for the application of the stormwater strategy for the sub catchment associated with the area west of St Leger Road and north of the Stream.

An assessment of the stormwater treatment and conveyance together with the site topography has been undertaken to test the applicability of a lower catchment stormwater reserve, within this sub catchment.

### 3.1 Treatment and Conveyance

Retention, reuse and onsite soakage of the post-development water quality volume will be required to provide stormwater treatment and erosion control. Water tanks for each lot are recommended to help meet these requirements and water supply demands.

Under the structure plan on lot retention tank is recommended and as an example, the indicative tank size required per lot is shown in Table 1. It is considered that retention tanks are to be located within the lot boundary. The application of retention tanks should be prioritised to achieve the water supply demands.

**Table 1: Indicative retention tank volume**

Lot (m <sup>2</sup> )	Impervious Area(m <sup>2</sup> ) <sup>1</sup>	C	WQ Rainfall (mm)	Tank Volume (m <sup>3</sup> )
2500	375	0.95	24.5	8.7
3000	450	0.95	24.5	10.5
3500	525	0.95	24.5	12.2

<sup>1</sup> Assumed maximum impervious coverage = 15%

Vegetated swales are considered appropriate to convey overland flows to the stream channels. The swale is likely to be aligned adjacent to roads. It can provide water quality treatment for the road catchment and convey the overland flows towards the downstream receiving environment.

### **3.2 Site Terrain -topography**

The existing gully and proposed channel system are shown in Figure 2. The existing gully and channel are shown as intercepting and conveying flow from within the T6 growth cell towards the Puniu Stream. There is no connection as to how the stream and gully system will utilise the stormwater reserve as the following aspects have not been considered:

- Stormwater management reserve is elevated above the channel and gully system
- The reserve can only receive runoff from the sub catchment west of St Leger Road and north of the tributary due to topographical constraints

In addition should there be a system that utilised a stormwater reserve (should the topography allow) then the primary system would bypass tributary and the resultant starvation of the tributary would occur.

The biggest concern with the location of the stormwater management reserve is that it is elevated above the adjacent channel and gully, see Figure 3. Therefore, it is considered difficult and ineffective to convey the flow across the St Leger Road and towards the stormwater management reserve.

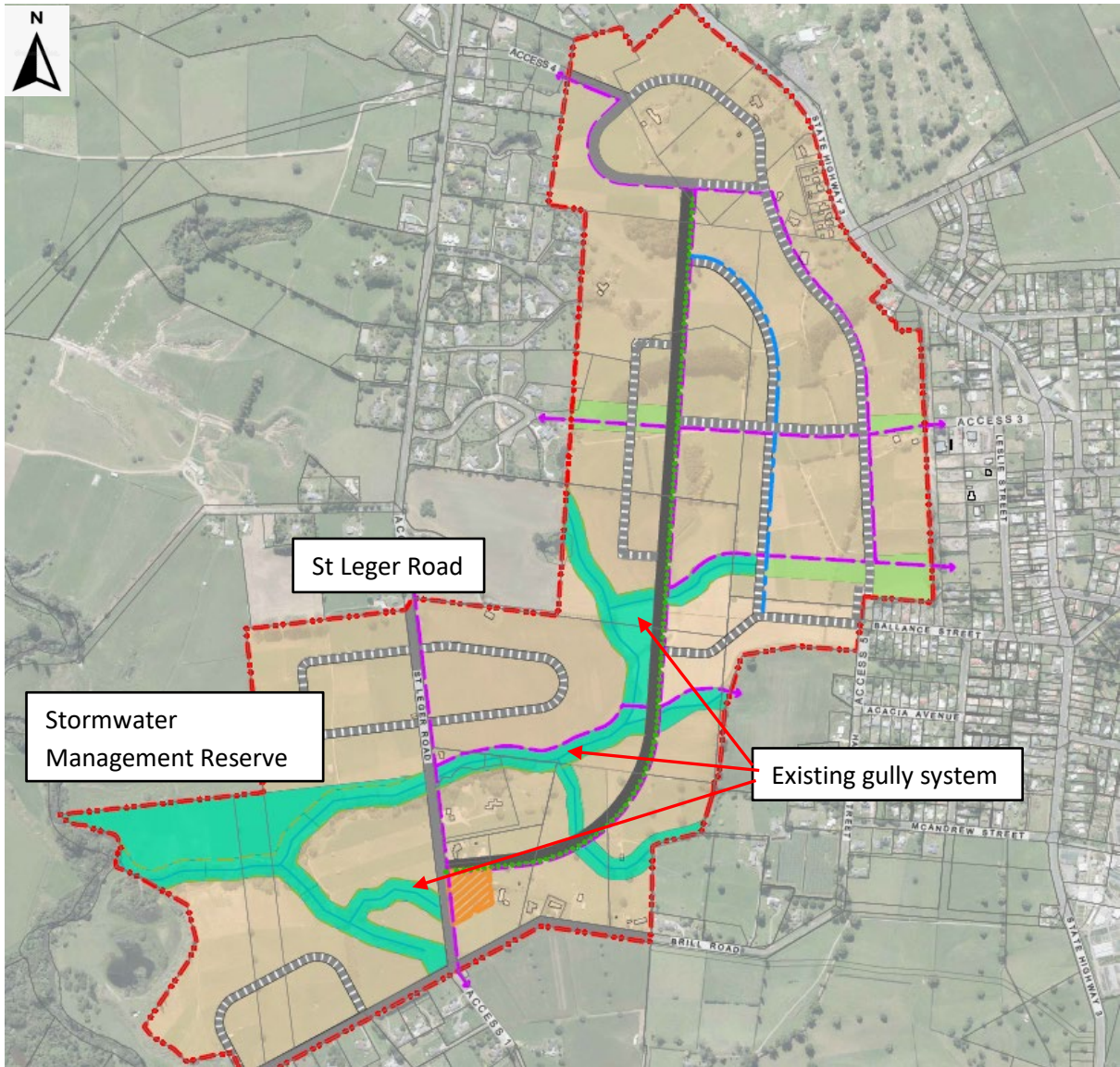


Figure 2: Channel and Gully Locations



Figure 3: Existing site contour

### 2.3 Potentially Developable Area

As stated in the reporting, as per Section 2, the water quality treatment volume could be achieved at source and on lot. Therefore it is considered that the land currently assigned as a stormwater reserve can potentially be developed into future residential subdivision.

As presented in the Structure plan the sub catchment west of St Leger Road and north of the tributary could have the same development potential as the areas south of the tributary and west of St Leger Road. Therefore, the stormwater reserve is considered oversized.

The land that could potentially be development is show in Figure 4.



Figure 4: Developable area

Alternatively, there could be a communal stormwater reserve could be applied for the subcatchment west of St Leger Road and north of the tributary to accommodate the stormwater treatment and extended detention requirements for this sub catchment only. This is in the order of 1.6ha (which is approximately 10% of the sub catchment area) and illustrated in the figure below.

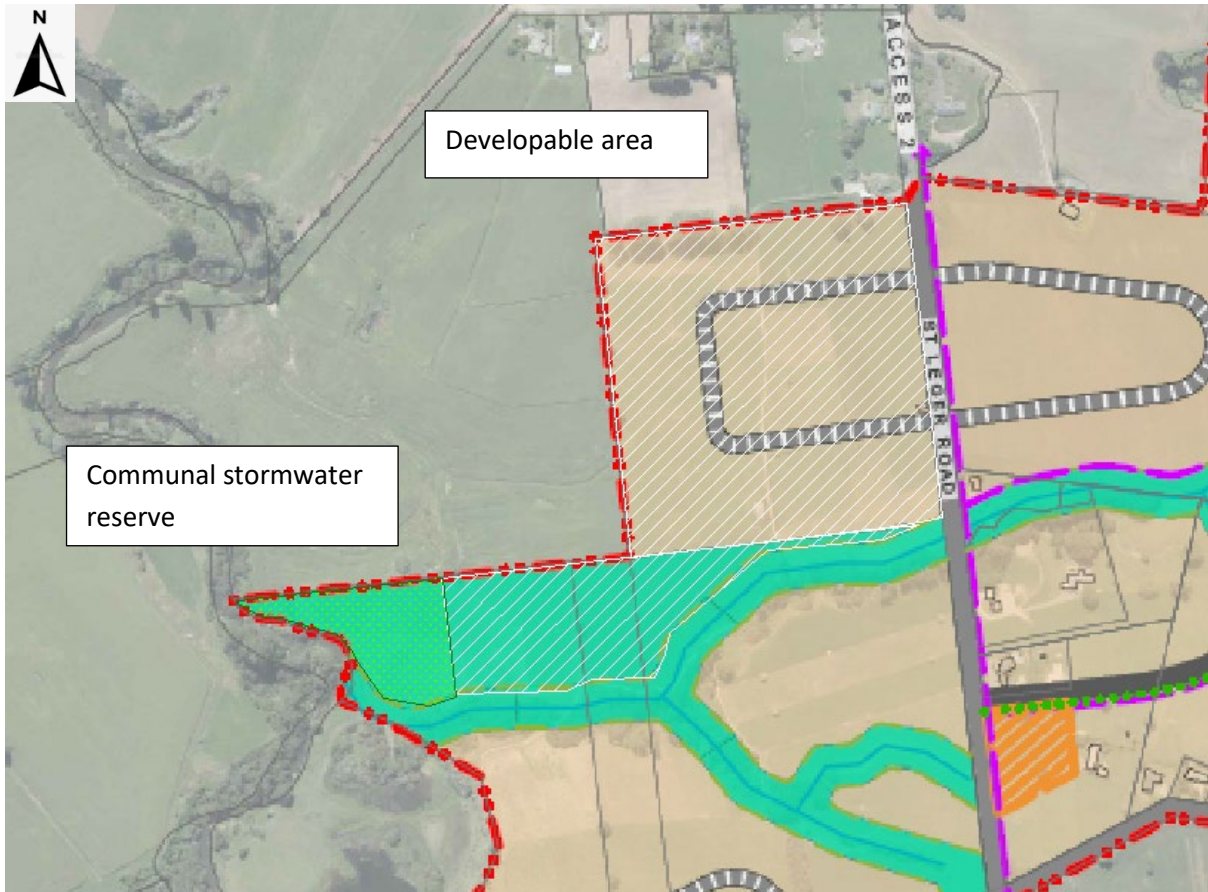


Figure 5: Communal Stormwater reserve

#### 4 Recommendation

It is recommended that retention, reuse and onsite soakage of the post-development water quality volume to be provided on lot.

It is also recommended that the stormwater management and flood risk assessment for the subject site are to be addressed in a sub catchment integrated catchment management plan (ICMP) before the subject site being developed.