



Review of IAF application

Stormwater Enabling Works

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1 Introduction

Rotorua Lakes Council (RLC) engaged Tonkin +Taylor (T+T) to undertake a review of some elements of their application to the Infrastructure Acceleration Fund (IAF) for Stormwater Enabling Works. The elements selected for review are those that cover the following sub-catchments of Rotorua City:

- Central 03 and 04
- Central 05 and 06
- Central 08
- Central 09
- West 06
- West 07
- West 08

Our review has comprised three main tasks, these being:

- 1 Quick high level review of hydrological and hydraulic concepts proposed and assessment of their potential effectiveness in achieving the objectives of providing capacity for intensification of urban development within the sub-catchment.
- 2 Consideration of whether there are other obvious alternatives to achieve the objectives.
- 3 Review of the construction costs estimates for the concepts proposed in the application.

2 Review of the concepts proposed

We have reviewed the concepts for each sub-catchment and provide comment on the various development areas in the sub-sections that follow.

We understand that all options put forward to enable further intensification of (mainly) residential development will be subject to further options assessment, feasibility analysis and design work. This is consistent with our review findings.

2.1 Central 03 and 04

Proposed intensification of this area involves largely infill development of an existing residential area. The initially proposed stormwater management measures include a series of pipe upgrades and construction of a new pump station to meet the demands of increased impervious area that will result from intensification.

Parts of the area proposed for intensification are currently subject to flooding from significant rainfall events. Further development in this area could be more extensive if the existing flooding were to be addressed in advance of the intensification.

Alternatives to the initially proposed stormwater management measures have been suggested, and these include consideration of a large diversion which is described further in Section 3. This large diversion could potentially service development in other areas too (not just within Central 03 and 04), by reducing or removing existing flood constraints.

The other alternative suggested was to trim back the areas for intensification, and limit these to development in areas not currently prone to surface flooding (reduced yield). In addition, low impact design initiatives could be undertaken to reduce increases in surface runoff that would accompany intensification.

Further feasibility assessment of the options is recommended before the optimal approach can be confirmed.

Our review of the measurement of elements initially proposed has confirmed these within an acceptable margin of accuracy, although some increases in measurements may be warranted – as outlined below.

- 1 900mmØ replacement pipe (L=350 m). The length found using the GIS was 416 m (66 m different from the length provided in the schedule). This is due to the length between 36 Elizabeth St and the pump station being approximately 256 m as opposed to the provided 190 m in the initial measurement.
- 2 New 135 m long 1800 mmØ drain pipe along Fenton St. from Seddon to Malfroy Rd, Figure 13a shows this pipe to be 900 mmØ which is much smaller than the diameter noted in the IAF schedule of 1800 mmØ.

2.2 Central 05 and 06

Similar to development areas 03 and 04, the Central 05 and 06 areas cover existing residential development. Some of this area drains towards the Utuhina Stream (i.e. to the west) and the remainder drains towards the east (Puarenga Stream).

The initially proposed concept indicates that, given the existing high percentage of impervious cover in this catchment and the underlying soil types, the effect of further intensification on flood performance in extreme events (like 100-year ARI) are small. We agree with this in principle, although this lack of effect following intensification may not apply globally. Furthermore, increase to impervious cover is not the only effect that intensification may have. In compliance with building regulations, fill may be required which could cause flood displacement effects that would concentrate surface flooding.

As such we believe that further analysis and feasibility assessment is required in this development area to service the proposed intensification of development. We have suggested alternatives that include making changes to the areas proposed for infill development (i.e. would affect yield), making changes to the nature of infill development to at source control (i.e. low impact design) or by local area measures aimed at servicing small blocks of intensification (i.e. somewhere between an area-wide and a property specific solution).

Our review of the measurement of items is somewhat unnecessary in that, concepts may need to be varied from those proposed. However, the following did emerge from this review:

- 1 Replace existing pipe along Froude St. with 600 mmØ pipe (L=250 m). It is noted that under this item 170 m will be pipe replacement and 80 m will be new 600 mm pipe.
- 2 Replace existing drains along Maida Vale & Hilda Sts. With 600 mmØ pipe (L=360 m). The application document shows a 115 m 900 mmØ pipe along Hilda St which differs from the schedule.

2.3 Central 08

In its current state this area is largely in impervious cover. It drains towards the east via culverts that pass beneath State Highway 30B. This area also receives runoff from a large urban catchment, some of which is being considered for further intensification (Central 05 and 06, Central 08). It is important to ensure capacity and upstream connectivity through this area to allow for intensification outside, but upstream, of the development area.

The effects of development are proposed to be mitigated through a series of culvert upgrades beneath SH30B.

Our review has confirmed these upgrades to be necessary, although the final sizing and design details around these require confirmation. In particular, the interaction of development in this area

with that which may occur elsewhere is of relevance. Upgrades to the stormwater network in this area cannot be undertaken in isolation.

Once the sizing and configuration of replacement culverts have been confirmed, more accurate costs will be able to be estimated.

As with other areas, a range of options should be considered at the planning and concept development stage, and the final solution may be a combination of pipe upgrades and other initiatives.

2.4 Central 09

The Central 09 development area is currently the area occupied by the racecourse at Arawa Park. As such further development here would constitute greenfield development, with stormwater drainage relying on outlets to the lake via culverts under SH30B. There is some upstream connectivity with existing developed area, and also with areas where infill is proposed (along Fenton Street).

The initially proposed stormwater management works include downstream pipe/culvert upgrades, onsite detention and conveyance upgrades. Detention sizing was omitted in the initial conceptualisation of these works, and this can be confirmed through subsequent feasibility analysis and hydrological design.

The initial cost estimation for servicing stormwater requirements for this area requires that additional items be included. This would increase the initially proposed costs for this area.

2.5 West 06

Proposed intensification in this area involves some greenfield development, together with increases to development density in existing residential areas. Most of this area is low-lying relative to the surrounding drainage network, and surface flooding has been shown to be likely in parts.

The initially proposed concepts involve pipe upgrades, onsite detention and slow release of additional runoff generated by intensification to the Waiohoro Stream, which enters the lake north of Kawaha Point. Sensitivity in this waterway to increased flood discharge is not known, and the proposed stormwater system involves this as the only outlet.

Alternatives have been considered that include reduction to the area proposed for infill development (will reduce yield) and establishment of a new pump station.

2.6 West 07

This development area covers the existing Springfield Golf Course, and spans two subcatchments, both of which discharge to the Utuhina Stream. Capacity constraints in the Utuhina Stream mean that discharge of additional stormwater to this system may be difficult, and long-duration on-site attenuation may be required to achieve acceptability.

Our review of the approach proposed has shown that attenuation volumes may be sufficient, yet the constructability of these may be challenging given their proposed location in areas that are currently flood prone. Further topographical analysis is required to determine the way in which the required storage can be formed, and this may show the area required could be increased. This would reduce section yield from the proposed development.

Alternatives to the suggested approach exist, whereby runoff generation from new development is minimised through planning controls (which could reduce any detention requirement). The large diversion option discussed in Section 3 would also aid this intensification area, in that capacity demand in the lower Utuhina Stream could be freed up.

Further analysis and benefit cost assessment would enable the proposed spend in this area to be optimised for the developable area.

2.7 West 08

Most of the West 08 development area is shown to be floodable in severe events, with much of the flooding coming from Utuhina Stream overflow. We understand that Bay of Plenty Regional Council have intention to reduce this overflow and that steps are being taken¹ to develop solutions. The initially proposed measures are rightly aimed at capacity upgrades to cater for frequent rainfall events, as the effects in more severe events are likely to be small. Furthermore, with this development area being located close to the lake, there are no downstream areas that may be adversely affected by upstream development.

A staged approach is suggested as an alternative, where the “easy-to-develop” land in this area could be developed first, pending delivery of BoPRC projects and further feasibility considerations being undertaken.

3 Large diversion

Flooding is an issue that is widely recognised in the Lower Utuhina Stream area. Examination of the contributing catchments shows there to be several waterways or drainage paths that converge on the stream, at a point about where the flow gauge off Depot Street is located. This is shown by the yellow dashed circle in Figure 3.1. Downstream of this, the waterway is constrained laterally by existing, historic development with little opportunity to widen the stream. Given the contributing area, an increase in outflow capacity from this point to the lake would potentially “free up” development elsewhere in the city.

We suggest that it would be worthwhile undertaking a feasibility type investigation into how this additional capacity may be able to be formed. With additional capacity there would be less reliance on upstream detention to mitigate peak flows, with those areas currently required for detention being potentially freed up for other use.

¹ BoPRC (2021), File reference A3728368, Kaituna Catchment Control Scheme Advisory Group Meeting Wednesday 3 March 2021.

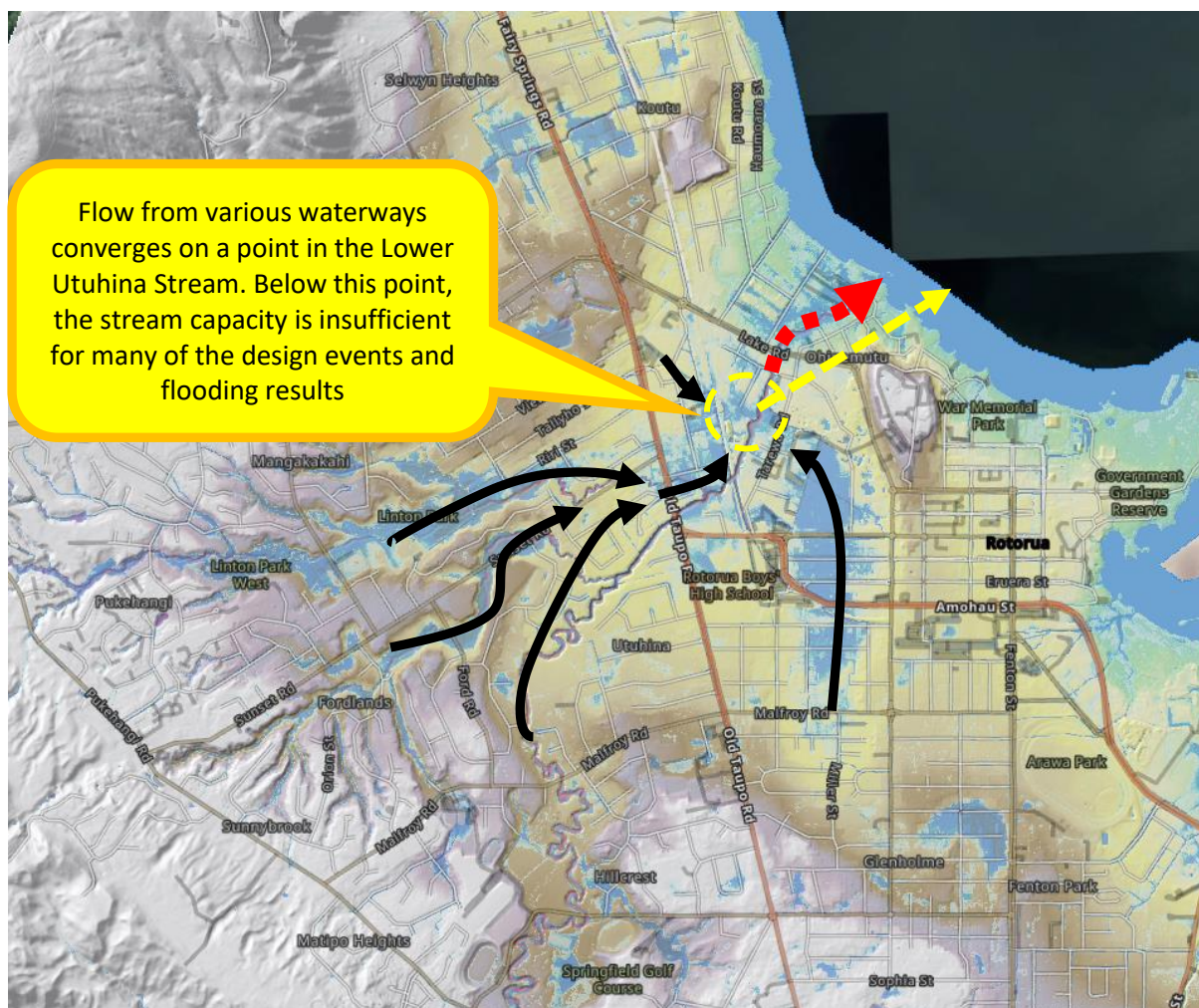


Figure 3.1: Flow conversion in the Lower Utuhina Stream.

4 Review of construction cost estimates

We have found that the approximate costings undertaken in the application are likely to be low relative to current construction costs, partly due to rates used being on the low side, and partly due to potential omissions in the estimates.

4.1 RLC rate basis

We have carried out an initial evaluation of the rates used by RLC in calculating the quantum of their IAF application.

We understand that RLC have estimated the construction cost of the works on the following rates basis:

Item	Units	Rate needs to include	Potential shortcomings
Stormwater Pipes	Per metre length of main lines of each diameter (or section for box culverts)	Design, Contractor's P&G, consents, manholes, catchpits, catchpit leads, connections, headwalls, traffic control, services clearance, supply, excavate, lay, backfill, road reinstatement, test, abandon/remove existing pipes and MSQA. RLC have confirmed that the rates used in their estimates include design, contractor's P+G, and contingency.	Based on background data provided by RLC it appears that the following (at least) are unlikely to be included in the rates: Consents, catchpits, catchpit leads, headwalls, abandon / remove existing pipes and MSQA. T+T check of rates against our own database indicate that the rates used are low especially if they are assumed to include design, contractor's P+G, and contingency.
Pumpstations	Single lump sum per station	Design, Contractor's P&G, consents, connections, traffic control, services clearance, supply, excavate, construct, install M&E, power supply, SCADA, commission, backfill, test and MSQA. RLC have confirmed that the rate is based on total costs for recent sewage pumps stations multiplied by a factor of 3.	To be effective, stormwater pump stations are typically design for much higher flow rates than sewage pumps stations so larger pumps and pipes needed. Same lump sum used for both a new pumpstation and refurbishment of an existing pumpstation. High level of uncertainty given no work yet on design flow rate.
Wetlands/ Detention dams	Per cubic metre of stored water volume	Design, Contractor's P&G, consents, manholes, catchpits, catchpit leads, connections, headwalls, traffic control, services clearance, supply, excavate, lay, backfill, road reinstatement, test, abandon/remove existing pipes and MSQA. RLC confirmed that estimates were calculated based on estimates in the T+T Masterplan for detention storage ponds on a m ³ of storage pro rata basis.	Rates used are non-uniform. High level of uncertainty given concept not developed yet.

4.2 Comment on cost estimates

The table above provides comments relating to a high degree of uncertainty in the estimates, and potential for some of the estimates to be low.

At this early stage there is uncertainty in whether the concept is the optimum solution – further work could potentially lead to an increase or decrease in the quantum of work.

There is a high level of uncertainty in sizing pumps, pipes and detention storage as the design work has not been done – further work could lead to an increase or decrease in the quantum of work.

It is expected that items are missing from the estimate given the very preliminary stage of the concept development – further work is likely to result in an increase in cost estimates. It is normal to apply a large contingency (50-60%) at this stage in the project cycle as costs always increase as detail is developed.

Given the above comments, we suggest that the base cost estimates are increased, and a range of costs is put forward to indicate the uncertainty. We recommend the current base estimates are increased by 25% for a lower indication, and 60% for an upper indication.

It should also be mentioned that there will be escalation of costs between now and actual implementation as well as potential impact of COVID on materials costs and labour rates.

The IAF application should recommend further work to investigate a range of options to enable selection of the most cost effective and sustainable solution.

5 Conclusion

Our review, outlined above, has indicated opportunity to consider some alternative options, and optimise many of the development proposals. Additional analyses may reveal alternatives to be either preferable or able to offer augmentation to the initially proposed measures aimed at servicing future intensification.

Our review of the costs estimates indicate that actual design and construction costs at the time of the works is likely to be significantly higher than allowed for in the estimates completed to date. However, given that the upgrade concepts are initial preliminary concepts with little supporting analysis, and no design, there remains a high level of uncertainty in costs estimates. It is common to apply a range in cost estimates at this early stage in the project cycle.

We recommend that a degree of options development and preliminary design work is required as well as establishment of reliable, current, local construction rates for individual items before cost can be estimated with any degree of certainty.

6 Applicability

This report has been prepared for the exclusive use of our client Rotorua Lakes Council, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

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