REPORT

Tonkin+Taylor

Estimation of Potential Esplanade Reserve Extent

Mangakootukutuku Stream

Prepared for Hamilton City Council Prepared by Tonkin & Taylor Ltd Date November 2019 Job Number 1011923.v2





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Document Control

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Executive summary

Hamilton City Council (HCC) are seeking to understand the potential extent of any esplanade reserves they may obtain through future development of the Mangakootukutuku Stream catchment upstream of Waterford Road.

To meet this need, a method for identifying the lineal extent of esplanade reserves was developed that used a combination of broad-scale field assessments and mapped flood extents derived from a hydrologic model.

Criteria for determining stream characteristics which would trigger an esplanade reserve were derived from legislation, plan rules and case law. A methodology previously developed elsewhere in New Zealand was also relied on but adapted for use in the incised gullies that are typical features of stream catchments in the Hamilton area.

Outputs from the field survey and hydrological model were combined using GIS to create a map showing the likely lineal extent of esplanade reserves if the Mangakootukutuku catchment upstream of Waterford Road was fully developed. As individual lots are developed and detailed assessments are undertaken, the extent and connectivity of the esplanade reserves presented could change.

The methodology used in this study could be applied in other Hamilton stream catchments where subdivision is likely to occur.

1 Introduction

Hamilton City Council (HCC) are seeking to understand the potential extent of any esplanade reserves they may obtain through future development of the Mangakootukutuku Stream catchment upstream of Waterford Road.

Methods for delineating esplanade reserves have been developed elsewhere in New Zealand and there is existing case law on the subject. However, it was not clear how readily these could be applied to the incised Hamilton gullies like those in the Mangakootukutuku Stream catchment.

The objective of this project was to identify the expected lineal extent of esplanade reserves, in the Mangakootukutuku catchment upstream of Waterford Road that may be obtained by HCC through future land subdivision. The Esplanade Extent maps provide an expected extent of Esplanade Reserves but are not intended to be a substitute for site-specific assessment when lots are being subdivided. Nor does this study remove the need to assess esplanade extents outside the mapped extent. A methodology for identifying when relevant legislation, plan rules and stream characteristics would trigger the vesting of Esplanade Reserves was developed as part of this project. This methodology could be used as a guide for identifying where future Esplanade Reserves may be obtained in other Hamilton streams.

This report has not been prepared specifically to support a change to the Hamilton City District Plan. In that regard, no rules or other statutory provisions associated with the esplanade extents have been developed or recommended in this report. The esplanade extents layer is however likely to be suitable to inform a plan change, subject to any modifications deemed appropriate through the Schedule 1 process of the Resource Management Act (RMA) or the application of the tests in section 32 of the RMA.

2 Criteria

The following data sources were used to define and map the potential extent of esplanade reserves;

- A procedure determining stream width for the purpose of setting aside esplanade reserves developed by Stumbles et al (2008)¹.
- Case law, specifically:
 - Whitby Coastal Estates vs Porirua City Council², and
 - Canterbury Regional Council vs Dewhirst Land Company Ltd³
- GIS flood extent layer based on the 2-year flood model⁴.
- Auckland Unitary Plan stream definitions and criteria.

2.1 Summary interpretation

Section 230 of the RMA states that an Esplanade Reserve of not less than 20 m shall be set aside along the bank of any river whose bed has an average width of 3 m or more. The definition of what constitutes the bed of river is central to determining when an Esplanade Reserve is vested with a council as part of the subdivision process.

Section 2 of the RMA defines "river" as "a continually or intermittently flowing body of fresh water; and includes a stream and modified watercourse; but does not include any artificial watercourse".

For the purposes of esplanade reserves, esplanade strips and subdivision, Section 2 of the RMA defines the "bed" as "the space of land which the waters of the river cover at its annual fullest flow without overtopping its banks". The "banks" of a river are not defined in the RMA, however, case law⁵ has provided two means of interpreting stream width and this was used in a methodology to determine esplanade width by Stumbles et al. (2008).

- 1 Width where the level is at the annual fullest flow without overtopping any bank.
- 2 Otherwise, the bank is the level where flow spills over on to a more extensive floodplain or secondary flow path.

Stumbles et al. (2008) also interpreted the RMA definition of the bed of a river as including wetland areas that are wet during normal stream flows and levels. This is important within the context of Hamilton gullies where wetlands typically form along the gully floor.

2.2 Uncertainties and how we dealt with them

Mean Annual Flow (MAF) has been identified as the most appropriate measure of annual fullest flow. However, information on the spatial extent of MAF was not available for this study. Instead, the two-year flood flow (Q_2) was used as a proxy for MAF. MAF is statistically equivalent to a 2.33-year flood flow so using the Q_2 could be expected to provide more narrow flows widths than using MAF.

Literature reviewed does not explicitly state that the flow assessment should be made using existing or future development scenarios nor does it address the matter of climate change. We have elected to use the existing development scenario without allowance for climate change as it provides the

¹ Stumbles, C., Levy, G., Brown, N. and Carter, B., 2008. How wide is the stream? <u>https://www.waternz.org.nz/Attachment?Action=Download&Attachment_id=1236</u>

² Decision No. W61/2008

³ Court of Appeal of New Zealand CA4/2019

⁴ Supplied by HCC. It is understood that the model is currently being developed by AECOM and is subject to change.

⁵ Decision No. W61/2008 as described in Stumbles et al (2008)

best estimate of flow width at the present time i.e. an 'as-is/where-is' assessment relevant to the time of an application for subdivision is made.

The broad-scale approach used for this scale of assessment has meant that the resolution is much courser than that in the procedure developed by Stumbles et al. (2008) and did not include any weighted averaging of cross-section widths. The broad-scale approach was considered adequate for the purposes of the current study but could be insufficient for determining esplanade extent at the lot level when subdivision of individual lots takes place. Site-specific assessment using cross-sections at 20 m centres and weighted averages may potentially change the result, particularly in the upper headwaters where stream width is typically narrower.

Delineating the transition between perennial/intermittent and ephemeral watercourses is difficult to define accurately and generally relies on expert judgement. Criteria developed for the Auckland Unitary Plan⁶ (refer Appendix B) were used in the field assessments as they were considered the most practical field guidance available. No such guidance is available from Waikato Regional Council.

The presence of wetlands was determined using the definition in the RMA which "includes permanently or intermittently wet areas, shallow water, and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions".

It is important to note that the outputs of this study are a here and now estimate based on flow and geomorphic conditions at the time field surveys were completed. Changes in flow resulting from development and/or restoration of the catchment could influence the future lineal extent of where esplanade reserves may be taken.

⁶ Chapter J Definitions in the Auckland Unitary Plan Operative in part (updated 24 October 2019)

3 Methodology

The process developed to identify the potential longitudinal extent of esplanade reserves is summarised in the flow chart presented in Figure 3.1. The process was developed so that it could be applied to streams in the local Hamilton area and not just the study area of interest in this report.



Figure 3.1: Process for identifying where an esplanade reserve would be required.

3.1 Field assessments

Initially, we reviewed available stream walk over data undertaken by various consultants and held by HCC. The stream walkover data available was not suitable as a specific measurement of bank full width was not recorded.

Field assessments were conducted (where access permissions were granted) to inform the esplanade identification process in the Mangakootukutuku Stream upstream of Waterford Road. It was necessary to take a broad-scale approach to completing field assessments due to the size of the catchment and the resources (time/budget) available. Cross-sections were assessed at approximately 100 m intervals along the main stem of the stream and as many tributaries as possible. The location of transects was recorded using an iPad integrated GPS with a likely accuracy of +/- 5 m depending on satellite reception in the gullies. Additional transects were added where marked transitions in channel form were noted, particularly at the interface between intermittent and ephemeral streams. There were a number of properties where access to the stream could not be obtained, most notably a large tributary running along the Western side of Hall Road which includes the 'Shaw Ponds'. Assessments have been made in these areas based on available information including aerial imagery and previous site visits undertaken by T+T⁷.

Field assessments were undertaken on October 22, 24-25 and November 1 2019. Rainfall occurred on all of the days apart from November 1.

Field Assessment Date	Rainfall (mm) – preceding day	Rainfall (mm) – on day	Total			
22/10/2019	2.6	2.8	5.4			
24/10/2019	7.8	3.8	11.6			
25/10/2019	3.8	0	3.8			
1/11/2019	1.6	0	1.6			

Table 3.1:Rainfall conditions (as measured at the Hamilton Rainfall Gauge) prior to undertaking
field assessments in the Mangakootukutuku Stream upstream of Waterford Road

At each transect the following parameters were recorded where they were apparent:

- Watercourse classification: was the stream perennial, intermittent or ephemeral?
 - Waikato Regional Plan definitions were found to be unhelpful for supporting field assessments so definitions and supporting guidance was taken from the Auckland Unitary Plan (see Appendix B).
- Wetted channel width.
 - Many online man-made ponds were observed. We treated these as a 'modified watercourse' and therefore considered them to be part of the wetted stream.
- Bankfull channel width.
 - This was the most difficult variable to define due to the shape of the gully. If there was no marginal wetland then bankfull channel width was measured between points where there was a significant decrease in bank slope above the wetted channel. If there were one or more channel benches making delineating the channel difficult then the width of each one was measured. If there were marginal wetlands and they were contiguous with the stream, then they were considered to be part of the bankfull channel width.

⁷ T+T letter 'Shaw Ponds – Initial Review' (Ref: 1009146), dated 22/1/19 issued to HCC as part of the Southern Links project

- Floodplain width.
 - In practice, this feature was rarely apparent as the bed of the gully tended to gradually slope up from the wetted channel.
- Photos were taken and a sketch made of the channel shape to support any post-field work assessments of the data.

4 Data interpretation and mapping

Field data was exported to an excel spreadsheet where it was checked before being imported to ArcGIS. Cross-section points were overlaid with the two-year flood flow extent layer to determine whether the flow would exceed 3 m within the vicinity of the survey point. The flood layer consists of 2 x 2 m cells so it was necessary to apply category based on the following levels of certainty:

- ≤1 cell = No, flood flow levels not exceeding 3 m
- 2 cells = Possible that flow levels exceed 3 m
- >2 cells = Yes, flood flow levels exceeding 3 m

The flood level information and field assessment data were then used to identify whether, at each assessment point, an esplanade reserve would be triggered (Yes), not triggered (No), possibly triggered (Possible). The dataset was then re-mapped in ArcGIS to allow further checks of whether the results were logical in a spatial sense. This included checking all 'No' results as well as any 'Yes' results located upstream of 'No' results. An indicative esplanade reserve layer was then added to the digital map by plotting a 20 m buffer along the centre of the streamline. The results of the mapping are presented in Appendix A and provided in shapefile form.

5 Applicability

This report has been prepared for the exclusive use of our client Hamilton City 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.

This report has not been prepared specifically to support a change to the Hamilton City District Plan. In that regard, no rules or other statutory provisions associated with the esplanade extents have been developed or recommended in this report. The esplanade extents layer is however likely to be suitable to inform a plan change, subject to any modifications deemed appropriate through the 1st Schedule process of the Resource Management Act (RMA) or the application of the tests in section 32 of the RMA.

Tonkin & Taylor Ltd

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Authorised for Tonkin & Taylor Ltd by:

Bryn Quilter Project Director

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Appendix B: Watercourse Classification Definitions

Definitions taken from Chapter J of the Auckland Unitary Plan Operative in Part (Updated 24 October 2019)⁸.

Permanent river or stream

The continually flowing reaches of any river or stream.

Intermittent stream

Stream reaches that cease to flow for periods of the year because the bed is periodically above the water table. This category is defined by those stream reaches that do not meet the definition of permanent river or stream and meet at least *three* of the following criteria:

(a) it has natural pools;

(b) it has a well-defined channel, such that the bed and banks can be distinguished;

(c) it contains surface water more than 48 hours after a rain event which results in streamflow;

(d) rooted terrestrial vegetation is not established across the entire cross-sectional width of the channel;

(e) organic debris resulting from flood can be seen on the floodplain; or

(f) there is evidence of substrate sorting process, including scour and deposition.

Ephemeral stream

Stream reaches with a bed above the water table at all times, with water only flowing during and shortly after rain events. This category is defined as those stream reaches that do not meet the definition of permanent river or stream or intermittent stream.

⁸ https://unitaryplan.aucklandcouncil.govt.nz/pages/plan/Book.aspx?exhibit=AucklandUnitaryPlan_Print

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