

**BEFORE INDEPENDENT HEARING COMMISSIONERS  
APPOINTED BY THE HAMILTON CITY COUNCIL**

**IN THE MATTER** of the Resource Management Act 1991 (**Act**)  
**AND**

**IN THE MATTER** of an application for subdivision and land use  
consent for the Amberfield development  
pursuant to the Act.

**APPLICANT** Weston Lea Limited

**CONSENT AUTHORITY** Hamilton City Council

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**EVIDENCE-IN-CHIEF OF KIERAN TROY MILLER  
FOR WESTON LEA LIMITED**

**Dated: 12 April 2019**

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## SUMMARY OF EVIDENCE

1. My name is Kieran Troy Miller and I am a freshwater ecologist with Boffa Miskell Limited. I summarise my evidence, according to the key headings in this statement, as follows:

### ***Assessment methodology*** (page 6)

- (a) Both desktop analyses and site investigations were used to complete the ecological assessment. The assessment followed the revised Ecological Impact Assessment guidelines (**EIANZ 2018**) to determine the level of effects on freshwater ecology values.

### ***Existing freshwater ecological values*** (page 7)

- (b) The site contains thirteen watercourses which vary in size, complexity and value. The majority of watercourses consist of negligible ecological value. However, there are several reaches in some of these watercourses which contain low ecological values, and one reach of one watercourse which I consider has moderate ecological value.

### ***Assessment of ecological impacts*** (page 10)

- (c) Effects on freshwater ecology values from the Project include: stream loss; erosion and sedimentation into receiving environments during construction; and discharge of stormwater into receiving environments. The level of effects on freshwater ecology values range from very low to low.

### ***Recommendations / proposed mitigation*** (page 13)

- (d) I have recommended mitigation for adverse effects which include perennial and intermittent stream enhancement as well as creating new stream habitat. Other recommended mitigation includes developing and implementing best practice erosion and sediment control and stormwater treatment, native fish salvage and relocation and implementing a monitoring plan.

***Issues Raised in Submissions***

*(page 15)*

- (e) Department of Conservation have raised two issues, specifically the absence of a mitigation plan and DOC's ability to assess its adequacy at mitigating effects on freshwater values and the potential for sediment to enter watercourses during storm events and earthworks.

***Issues Raised in s42A Report***

*(page 16)*

- (f) No issues were raised within the Section 42A Report.

***Conclusion***

*(page 16)*

- (g) The level of effects on freshwater ecological values from the Project range from very low to low and adverse effects will be mitigated through the recommendations provided.

## INTRODUCTION

2. My name is Kieran Troy Miller.
3. I am a senior freshwater ecologist and associate principle at Boffa Miskell Limited (**Boffa Miskell**), in Tauranga. I have been an ecologist at Boffa Miskell for three years, prior to which I was an ecologist with Tonkin and Taylor (4 years). I hold the qualifications of Bachelor of Science (Biological Sciences) and Master of Science (1<sup>st</sup> class honours) (Biological Sciences) from the University of Waikato.
4. I have listed a selection of projects I have worked on to highlight my experience and which is relevant to the evidence I shall give:
  - (a) Tauriko West urban growth area, Tauranga (2017 to present). I assessed ecological values over an approximately 330ha site, including several waterway networks. I am also part of the Technical Advisory Group which has been tasked with coming up with solutions to provide for urban growth while also maintaining ecological values present on site;
  - (b) Three Creeks subdivision in Ohauti, Tauranga (2015 to present). I assessed ecological values over a 20ha block of land proposed for subdivision. The ecological assessment included multiple streams and addressed the likely affects from the proposed development: and
  - (c) Otakiri Springs water bottling plant expansion, Otakiri (2017 – 2018). I assessed the freshwater and riparian values of a waterway receiving environment (proposed stormwater and process water discharges) as part of the expansion of an existing water bottling plant.
5. I have been retained by Weston Lea Limited to prepare a statement of evidence on its application for land use and subdivision consent from the Hamilton City Council for the Amberfield development.
6. My role in the Project has been to assess the ecological values of the freshwater waterways present on site, and the potential effects of the proposed land use and subdivision (**Project**) on those ecological values. In

addition, I have provided recommendations to mitigate potential adverse effects.

7. I am familiar with the application site and surrounding environment having visited the site on three occasions (all in 2018) to assess and discuss the freshwater ecological values.
8. My evidence covers the following:
  - (a) My assessment methodology for the ecological impact assessment;
  - (b) Existing ecological values present across the Project site;
  - (c) My assessment of ecological impacts;
  - (d) My recommendations and the proposed mitigation measures;
  - (e) Comments on issues raised through submissions; and
  - (f) Comments on issues raised in the section 42A report.
9. In preparing this evidence I have read the following documents:
  - (a) Statement of evidence prepared by Mr Ray O'Callaghan.
  - (b) Submissions.
  - (c) Council officer's report.

#### **CODE OF CONDUCT**

3. I have read the Environment Court Code of Conduct for expert witnesses and agree to comply with it.
4. I confirm that the topics and opinions addressed in this statement are within my area of expertise except where I state that I have relied on the evidence of other persons. I have not omitted to consider materials or facts known to me that might alter or detract from the opinions I have expressed.

## ASSESSMENT METHODOLOGY

10. I undertook both desktop analyses (including literature research) and site investigations to complete my ecological assessment.
11. Desktop analyses included a review of:
  - (a) Relevant district and regional plans and policies, to assist in identifying ecological significance of any waterways within the Project site, including:
    - i. Hamilton City Council's (**HCC**) District Plan;
    - ii. Waikato Regional Council's (**WRC**) plans and policies;
  - (b) The preliminary freshwater ecological assessment prepared by Argo Environmental Ltd (Argo) from March 2018 which included assessments of habitat characteristics, macroinvertebrate communities, fish fauna and water quality; and
  - (c) Records from the New Zealand Freshwater Fish Database to supplement the fish survey completed by Argo.
12. I conducted an initial site visit on 11 April 2018 with a further site visit undertaken on 24 July 2018 to confirm/amend waterway classifications.
13. Site investigations included assessing the aquatic ecological values of the waterways present on site following methods described in Harding *et al.* 2009<sup>1</sup>. Detailed methods are provided in the ecological assessment included in the resource consent application.
14. The desktop analyses and site investigations were used to assess aquatic ecological values as well as to delineate waterway types. Auckland Unitary Plan definitions of ephemeral, intermittent and permanent streams were used to classify waterway types<sup>2</sup>. However, an additional figure was created using

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<sup>1</sup> Harding J, Clapcott J, Quinn J, Hayes J, Joy M, Storey R, Greig H, Hay J, James T, Beech M, Ozane R, Meredith A, Boothroyd I 2009. Stream habitat assessment protocols for Wadeable rivers and streams of New Zealand. University of Canterbury. Christchurch, New Zealand.

<sup>2</sup> Auckland Council 2016. Auckland unitary plan: operative in part 15 November 2016 – Chapter J Definitions. Document prepared for Auckland Council.

Waikato Regional Council definitions as requested by HCC as part of its section 92 further information request.

15. The assessment of ecological effects followed the Ecological Impact Assessment Guidelines<sup>3</sup> and involved assessing the magnitude of the Project's potential adverse effects combined with the site's ecological values to determine the level of effect. The Ecological Impact Assessment Guidelines have been updated since the initial assessment was completed. This ecological impact assessment follows the revised guidelines.<sup>4</sup>

### EXISTING FRESHWATER ECOLOGICAL VALUES

16. The site contains thirteen watercourses which vary in size and complexity. Generally, all watercourses flow in an easterly direction and discharge into the Waikato River which runs north along the eastern boundary of the site. In addition, seepages<sup>5</sup> are also present within the site including in grazed areas as well as in the larger gully systems.
17. The majority of the watercourses were assessed as either ephemeral or intermittent with three of the thirteen watercourses assessed as containing perennial reaches. An ephemeral water course has a stream bed above the water table at all times, with water only flowing during and after rain events. Ephemeral waterways are also defined as those reaches that do not meet the definition of permanent river or stream or intermittent stream. Whereas an intermittent waterway ceases to flow for periods of the year because the bed is periodically above the water table. These reaches are defined as those 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;

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<sup>3</sup> Environment Institute of Australia and New Zealand 2015. Ecological Impact Assessment (EcIA) – EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems. EIANZ, Melbourne.

<sup>4</sup> Environment Institute of Australia and New Zealand 2018. Ecological Impact Assessment (EcIA) – EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems (2<sup>nd</sup> edition). EIANZ, Melbourne.

<sup>5</sup> Wet area where the groundwater has emerged to create soils that are mostly saturated for all or large parts of the year.

- (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 stream flow;
  - (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 processes, including scour and deposition.
18. A permanent stream is the continually flowing reaches of any river or stream. The location and waterway types across the project site are shown under Figure 1 of the letter dated 17 August 2018 and addressed to Mr Dean Miller and entitled “Amberfield subdivision development – Response to further information request”. For ease of reference, I have attached Figure 1 to this evidence under **annexure “A”**.
19. In general, the ephemeral and intermittent watercourses that I identified contained limited instream habitat which was often degraded. Intermittent and permanent watercourse reaches, which followed a more sinuous flow path, contained better quality instream habitat. Riparian vegetation (a factor in stream function) mostly consisted of pasture, although some downstream reaches contained taller stature vegetation. Stock were not excluded from watercourses over much of the site. Fish passage was limited in most watercourses due to perched/blocked culverts, intermittent nature of the watercourse and/or natural barriers such as waterfalls. Water depths ranged from less than 0.1m (too shallow for adult fish) to approximately 0.6m. Channel widths were narrow ranging from approximately 0.1m to 0.5m. The substrate of the watercourses largely consisted of fine soft sediment with areas of gravel occurring in faster flowing reaches of some watercourses.
20. Spot water quality measurements were taken from the downstream end of watercourses two, three and six. The measurements showed moderate to good dissolved oxygen concentrations and water temperature, neutral pH and low turbidity. These parameters fluctuate daily and seasonally but in general

provide favourable conditions for stream biota. Nutrient levels, particularly total nitrogen, total organic nitrogen, dissolved reactive phosphorus and total phosphorus, were over the applicable guidelines<sup>6</sup> indicating potential harm to stream biota.

21. The macroinvertebrate community (aquatic insects and snails) was sampled from watercourses one, two and three within intermittent and permanent reaches. The community was dominated by Diptera group (True flies) which are taxa generally associated with high organic loading (and often disturbed) and/or polluted environments. The Macroinvertebrate Community Index (MCI) scores ranged between poor water and/or habitat quality and fair water and/or habitat quality except for the second order intermittent section of watercourse three. That reach indicated good water quality and/or habitat quality.
22. The only fish species recorded was Shortfin eel, despite the fish survey being conducted within the best quality habitat over the site. Many of the watercourses are not suitable for fish surveys due to the lack of water. There were no records from the Freshwater Fish Database within the project site. Records from nearby waterways show a range of native fish species, including species classified as *At Risk*, that may be present in the lower permanent reaches of watercourse three. Restricted fish passage is the likely cause for low/no fish diversity.
23. No watercourses within the site have been identified as significant natural areas within the Hamilton District Plan. No watercourses have been identified significant under the Waikato Regional Council's Regional Policy Statement criteria. Waikato Regional Council's water classification maps show watercourse three as "River: unknown".

### ***Summary of ecological values***

24. Using the EIANZ (2018) guidelines, to assess representativeness, rarity, diversity/distinctiveness and ecological context, I determined that freshwater ecological values are variable across the watercourses. All ephemeral watercourses consist of negligible aquatic ecological value due to limited

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<sup>6</sup>

Table 3.3.10 of ANZECC 2000. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand.

habitat (water) available. The habitat that is available is degraded, and there is often poor connectivity within the reach and to downstream reaches. Intermittent stream reaches within watercourse two, three (excluding the farm drain), four and five have low ecological value with marginal/sub-optimal habitat, poor connectivity within the reach and to downstream waterways. Permanent stream reaches within watercourse two and six also have low ecological value characterised by sub-optimal habitat, poor connectivity to downstream waterways and high nutrient concentrations. The permanent stream reach within watercourse three was the only section to provide moderate ecological value with sub-optimal habitat, connectivity to downstream waterways, moderate MCI index and the presence of a common native fish species.

25. **Table 1** below provides a brief summary of the value of the watercourses. A more fulsome summary of the freshwater watercourses and their corresponding assessed ecological values is provided in Table 5 of the letter addressed to Mr Dean Miller, as part of the response to HCC's section 92 further information request (dated 17 August 2018).

**Table 1: Summary of ecological values across the watercourses.**

| Watercourse(s)                                                          | Ecological value |
|-------------------------------------------------------------------------|------------------|
| 1, 7, 8, 9, 10, 11, 12 and 13.                                          | Negligible       |
| Ephemeral and intermittent (farm drains) waterways of 2, 3, 4, 5 and 6. | Negligible       |
| Intermittent waterways of 2, 3, 4 and 5.                                | Low              |
| Permanent waterways of 2 and 6.                                         | Low              |
| Permanent waterway of 3.                                                | Moderate         |

## ASSESSMENT OF ECOLOGICAL IMPACTS

26. Activities associated with the construction and operation of the Project that may affect freshwater ecological values are likely to include:

- (a) Watercourse modification / removal;
- (b) Earthworks and sediment related discharges to water; and
- (c) Discharge of stormwater.

### ***Habitat structure effects***

27. The extent of proposed earthworks and development have been amended since the initial freshwater ecological impact assessment, and associated requests for further information, was first completed. The Project will now result in the removal of approximately 2,300m of ephemeral waterway and 429m of intermittent waterway categorised as negligible ecological value, as well as 208m of intermittent and 23m of perennial waterway categorised as low ecological value. The reduced earthworks will result in smaller proportions of waterway removal for watercourses 1, 2 (slight reduction), 7, 8 and 9. Impacts on freshwater ecology values as a result of this change will be positive through reduced adverse effects on waterways. However, the reduced effects are not considered to be substantial as these watercourses (excluding 2) have been categorised as having negligible ecological value. The reduction in earthworks overall does not change my assessment of effects or proposed mitigation. Figure 2, attached to this evidence under annexure “A”, provides an overview of the waterways and the revised extent of the project footprint.
28. The magnitude of effect (again following the EIANZ 2018 prescribed system and using it at the local catchment scale) on watercourses varies from moderate to high, depending on the extent of waterway loss within the particular watercourse. **Table 2** below provides an overview of the ecological values of the affected watercourses, the magnitude of effects and the overall level of ecological effect. The overall level of ecological effect ranges from very low to low.

### ***Water quality effects***

29. Earthworks within the site have the potential to reduce water quality of the surrounding waterways (including the Waikato River) through erosion and sediment run off. The magnitude of effects on aquatic ecological values from sediment and erosion are likely to be negligible, provided a robust erosion and

sediment control plan is designed and implemented to the permitted standards outlined in the Waikato Regional Plan. There will likely still be sediment discharges, however they will be temporary and unlikely to significantly impact on instream fauna. As discussed, the habitat and its fauna continue to exist with current land use derived sediments and impacts (farming) and are tolerant to a reasonable degree of such disturbance. Sediment from discharges will settle in slower flowing stream reaches (such as pools) where the substrate is already dominated by silt and mostly robust aquatic fauna tolerant of fine sediment. Longer term, the land use change is likely to result in a reduction in sedimentation within the wider receiving environments.

30. Stormwater from the site (when developed and occupied) has the potential to reduce water quality of surrounding waterways through the input of urban contaminants. It is proposed to treat stormwater across the site through bio-retention devices such as rain gardens, swales, stormwater basins and sub-surface trench soakage. I consider the magnitude of effect of stormwater will be negligible, provided the stormwater treatment systems are designed to treat stormwater to the permitted standards outlined in the Waikato Regional Plan. The change in land use will likely result in a reduction of nutrients and E.coli, but zinc and copper and other urban contaminants may increase. As discussed in the evidence of Mr O'Callaghan, stormwater treatment will follow best practice methods as supported by the International Best Practice Management Database.

**Table 2: Overview of the level of ecological effects on freshwater values.**

| Watercourse(s)                               | Ecological value | Effect        | Magnitude of effect | Level of ecological effect |
|----------------------------------------------|------------------|---------------|---------------------|----------------------------|
| 1, 7, 8, 9 and ephemeral reaches of 4 and 5. | Negligible       | Waterway loss | High                | Very low                   |
| Intermittent reaches of 4 and 5.             | Low              | Waterway loss | High                | Low                        |

| Watercourse(s)                                                       | Ecological value       | Effect                    | Magnitude of effect     | Level of ecological effect |
|----------------------------------------------------------------------|------------------------|---------------------------|-------------------------|----------------------------|
| Ephemeral and intermittent (farm drains) reaches of 2, 3, 12 and 13. | Negligible             | Waterway loss             | Moderate                | Very low                   |
| Intermittent and permanent reaches of 2 and 3.                       | Low                    | Waterway loss             | Moderate                | Low                        |
| All watercourses                                                     | Moderate to Negligible | Erosion and sedimentation | Negligible <sup>7</sup> | Very low                   |
| All watercourses                                                     | Moderate to Negligible | Stormwater discharge      | Negligible <sup>8</sup> | Very low                   |

## RECOMMENDATIONS / PROPOSED MITIGATION

31. The primary adverse effects of the Project on freshwater ecological values are the loss of waterways. I recommend mitigation for the loss of waterways which have low ecological value and a low level of ecological effect as identified in Table 2. I acknowledge that watercourses classified as having negligible value still provide functions, such as decontamination of pollutants. However, I consider these functions will be provided by the proposed stormwater treatment system further described below and in Mr O'Callaghan's evidence. I have also taken the approach to replace the extent of permanent habitat loss.
32. I recommend the following to mitigate for the loss of 208m of intermittent and 24m of permanent waterway:

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<sup>7</sup>

This assumes a robust erosion and sediment control plan is designed and implemented.

<sup>8</sup>

This is based on the proposed stormwater treatment described in Mr O'Callaghan's evidence.

- (a) Riparian enhancement (native planting) along approximately 154m of permanent stream habitat within Watercourse three.
  - (b) Riparian enhancement along approximately 130m of perennial stream habitat within Watercourse two.
  - (c) Riparian enhancement along approximately 423m of intermittent stream habitat within Watercourse three.
  - (d) Creating a minimum 120m long stream channel within existing intermittent stream habitat (outside of the proposed 423m of intermittent stream habitat enhancement) of Watercourse three, with the aim of creating permanent habitat.
33. Figure 3 of the ecological assessment included in the resource consent application and attached to this evidence under annexure “A”, provides an overview of the proposed mitigation sites. The figure has since been updated to reflect the changes in earthworks extent.
34. I also recommend:
- (a) A robust erosion and sediment control plan (approved by Waikato Regional Council) is developed and implemented;
  - (b) Stormwater treatment systems are designed to treat stormwater as per best practice guidelines, before being discharged into any watercourses present within or adjacent to the site;
  - (c) Native fish relocation practices are implemented with native fish relocated to suitable habitat downstream; and
  - (d) A monitoring plan is developed to address potential ecological effects from erosion and sedimentation and the discharge of stormwater. The plan should be approved by an experienced and qualified freshwater ecologist at Waikato Regional Council before any earthworks are undertaken.
35. A stream mitigation plan will be prepared which will provide more detail on the proposed mitigation / recommendations. The plan will be implemented prior

to the removal of some stream reaches and may be progressed on a staged basis to match the loss of stream lengths within the development area.

## **ISSUES RAISED IN SUBMISSIONS**

36. The Department of Conservation (**DOC**) have raised the following issues:
  - (a) The absence of the freshwater mitigation plan, and subsequent content, and DOC's ability to assess its adequacy at mitigating the potential effects of the proposed activity on freshwater values; and
  - (b) The potential for sediment to enter watercourses during storm events and earthmoving activities which will have negative impacts on freshwater values in the downstream environment (Waikato River).
37. These latter concerns are dealt with in my evidence in chief (Paragraphs 29 and 30). In essence, the values and conditions of the watercourses on site are such that there is a low risk of failure of the mitigation proposal I have outlined (Paragraphs 31 to 35). Stream enhancement will primarily include riparian planting but will also include the removal (or replacement) of culverts which currently restrict fish passage. A stream channel will also be created with a diversity of habitats for instream fauna (as well as riparian enhancement). More detail will be provided within the stream mitigation plan. Waikato Regional Council will be required to certify any freshwater mitigation and will assure appropriate considerations are included and compliance is adhered to.
38. As to the earthwork related sediment discharge, the values and robustness of the systems on site lead to a very low risk of degrading ecological values. At worst, a small area would decline from moderate to low value / condition while the low and very low values remain tolerant. It is highly unlikely sediments will be lost to the Waikato River in any amount that could have a measurable effect on such a large waterbody.
39. Monitoring will also be included as part of the stream mitigation plan to address potential ecological effects from erosion and sedimentation and the discharge of stormwater. Monitoring will likely include sediment quality and macroinvertebrates with monitoring sites dependent on stormwater treatment

and discharge locations as well as the staging of earthworks. The proposed monitoring, as part of the stream mitigation plan, will require certification from Waikato Regional Council and will need to meet/adhere to any Waikato Regional Council consent conditions.

#### **ISSUES RAISED IN SECTION 42A REPORT**

40. I have read through Hamilton City Council's Section 42A Report and as far as I am aware, there are no issues related to freshwater ecology.

#### **CONCLUSION**

41. In summary, I conclude that:
- (a) Freshwater ecology values vary across the 13 watercourses over the Project site and are mostly low but range from negligible to moderate.
  - (b) Effects on freshwater ecology values from the Project include: stream loss; erosion and sedimentation into receiving environments during construction; and discharge of stormwater into receiving environments.
  - (c) The level of effects on freshwater ecology values from the Project range from very low to low.
  - (d) Recommended mitigation for adverse effects includes permanent and intermittent stream enhancement as well as creating a stream channel.

- (e) Other recommended mitigation includes developing and implementing best practice erosion and sediment control and stormwater treatment, native fish relocation and developing and implementing a monitoring plan. These recommendations have been included as proposed draft consent conditions.

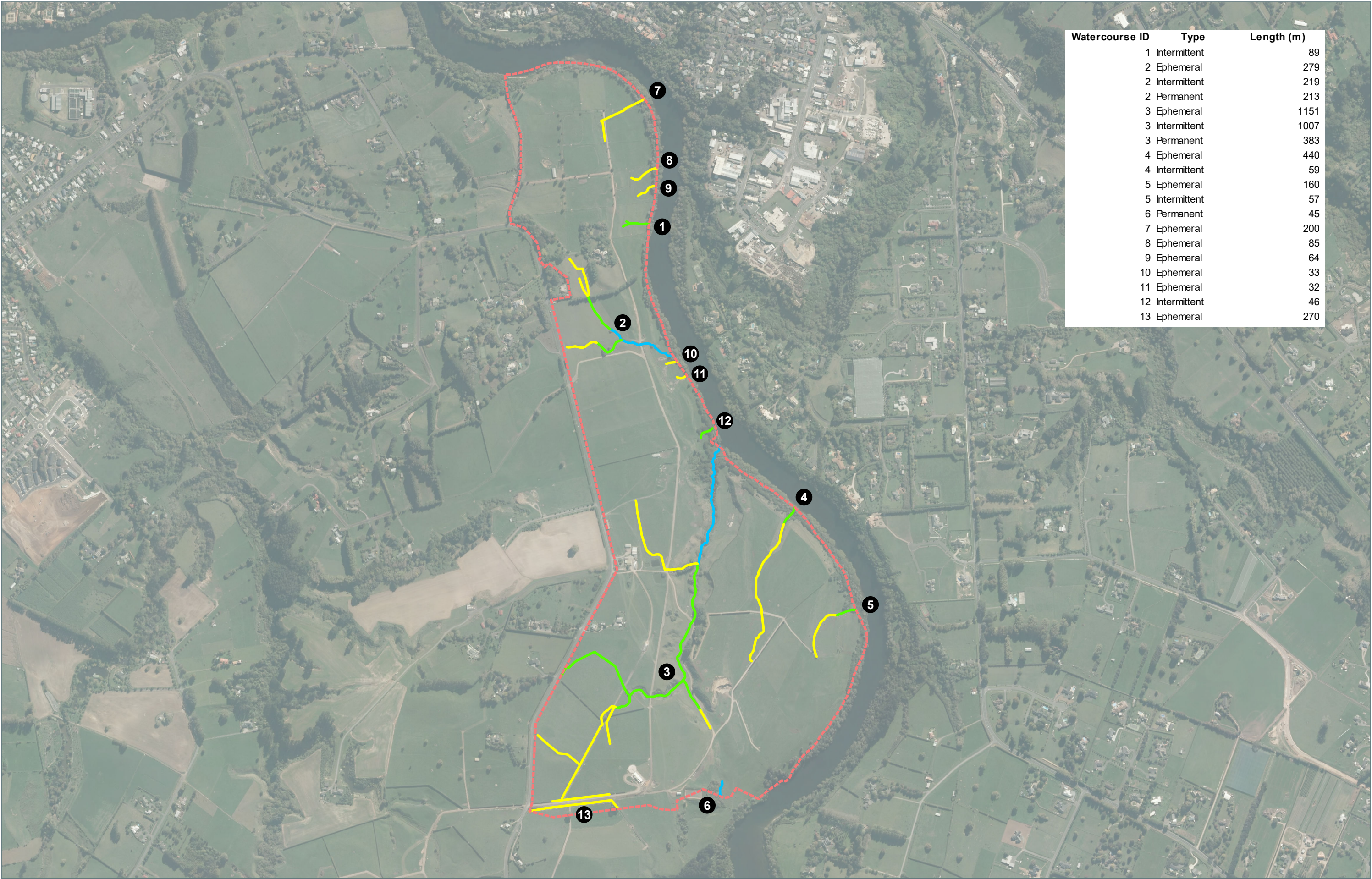
**Dated this 12<sup>th</sup> day of April 2019**



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**Kieran Miller**

## **ANNEXURE “A”**



| Watercourse ID | Type         | Length (m) |
|----------------|--------------|------------|
| 1              | Intermittent | 89         |
| 2              | Ephemeral    | 279        |
| 2              | Intermittent | 219        |
| 2              | Permanent    | 213        |
| 3              | Ephemeral    | 1151       |
| 3              | Intermittent | 1007       |
| 3              | Permanent    | 383        |
| 4              | Ephemeral    | 440        |
| 4              | Intermittent | 59         |
| 5              | Ephemeral    | 160        |
| 5              | Intermittent | 57         |
| 6              | Permanent    | 45         |
| 7              | Ephemeral    | 200        |
| 8              | Ephemeral    | 85         |
| 9              | Ephemeral    | 64         |
| 10             | Ephemeral    | 33         |
| 11             | Ephemeral    | 32         |
| 12             | Intermittent | 46         |
| 13             | Ephemeral    | 270        |



Legend

- Site Boundary
- Watercourse Type
  - Ephemeral
  - Intermittent
  - Permanent

HAMILTON SOUTH DEVELOPMENT

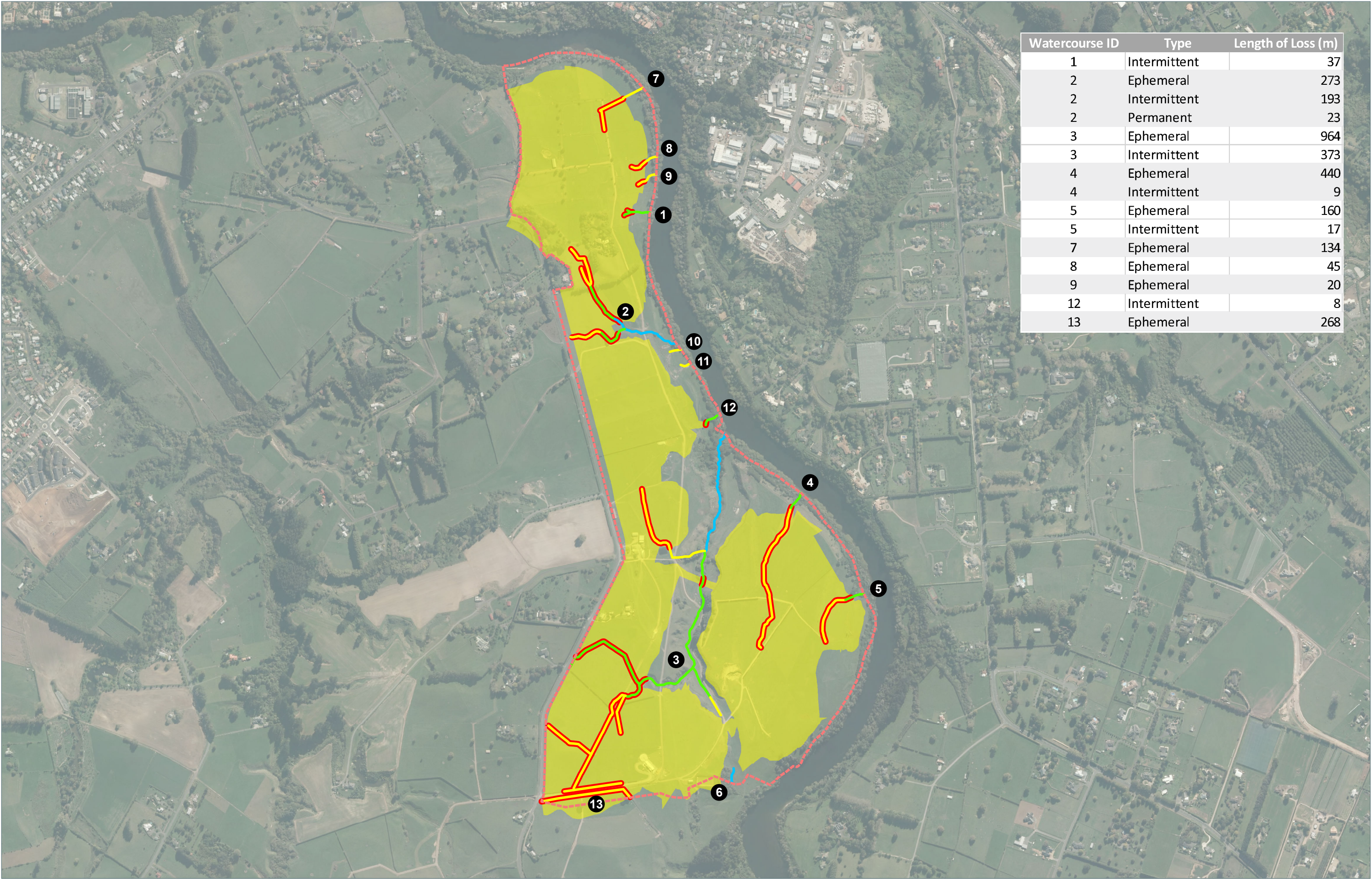
Watercourse Type

Date: 31 July 2018 | Revision: 0

Plan prepared for Adare Co Limited by Boffa Miskell Limited

Project Manager: Rachel.deLambert@boffamiskell.co.nz | Drawn: JWa | Checked: KMi

Figure 1



| Watercourse ID | Type         | Length of Loss (m) |
|----------------|--------------|--------------------|
| 1              | Intermittent | 37                 |
| 2              | Ephemeral    | 273                |
| 2              | Intermittent | 193                |
| 2              | Permanent    | 23                 |
| 3              | Ephemeral    | 964                |
| 3              | Intermittent | 373                |
| 4              | Ephemeral    | 440                |
| 4              | Intermittent | 9                  |
| 5              | Ephemeral    | 160                |
| 5              | Intermittent | 17                 |
| 7              | Ephemeral    | 134                |
| 8              | Ephemeral    | 45                 |
| 9              | Ephemeral    | 20                 |
| 12             | Intermittent | 8                  |
| 13             | Ephemeral    | 268                |



Legend

- Site Boundary
- Watercourse Type
  - Ephemeral
  - Intermittent
  - Permanent
- Watercourse Loss - revised earthworks
- Earthworks Extent

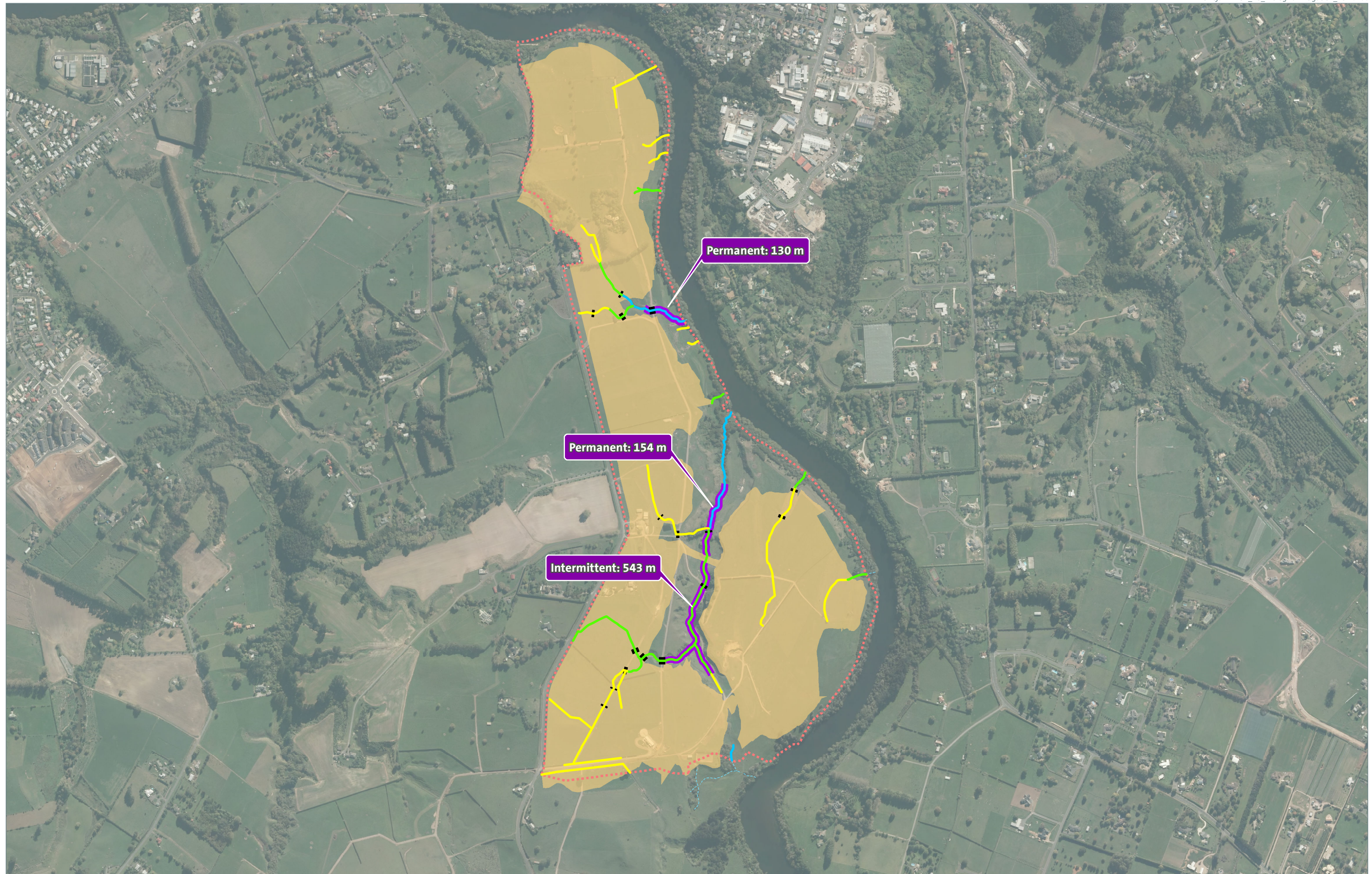
HAMILTON SOUTH DEVELOPMENT  
Watercourse Loss

Date: 13 February 2019 | Revision: B

Plan prepared for Adare Co Limited by Boffa Miskell Limited

Project Manager: Rachel.deLambert@boffamiskell.co.nz | Drawn: JWa | Checked: KMi

Figure 2



#### Legend

#### Watercourse Type

Flow Winter

-  Ephemeral
-  Intermittent
-  Permanent

 Existing Culvert

 Site Boundary

 Outside site

 Earthworks Extent

 Proposed Mitigation

#### HAMILTON SOUTH DEVELOPMENT

#### Ecological Mitigation

Date: 28 February 2019 | Revision: E

Plan prepared for Adare Co Limited by Boffa Miskell Limited

Project Manager: Rachel.deLambert@boffamiskell.co.nz | Drawn: JWa | Checked: KMi

Figure 3