

BEFORE THE PORIRUA CITY COUNCIL AND GREATER WELLINGTON REGIONAL COUNCIL

IN THE MATTER

land use and subdivision consent (RC 6922-SL0046/15) to:

- Undertake a 148 lot subdivision consisting of residential lots, road and reserves to vest and balance lots, which includes contravening permitted activity standards in respect to earthworks, financial contributions, outdoor living area, private ways and driveways, site coverage, vehicle movements and front yard; and
- Vary or cancel a consent notice; and
- Vary or surrender existing easements; and
- Waive esplanade reserve requirements

discharge permits, diversion and land use consents (WGN160028) to:

- Divert Duck Creek; and
- Discharge sediment and chemical flocculant in treated stormwater runoff; and
- Discharge into water; and
- Discharge to land; and
- Undertake various works in respect to the bed of any river; and
- Place a stormwater pipe and a sewage pipe; and
- Construct temporary bridges, three permanent bridges, place inlet and outlet structures, and construct an outlet pipe to Duck Creek, a forebay in a pond system and an outlet channel from the pond to land where it will enter Duck Creek; and
- Undertake bank stabilisation works; and
- Reclaim the bed of Duck Creek.

APPLICANT

JAGGER NZ LIMITED

JOINT STATEMENT OF FLOOD AND EROSION EXPERTS

INTRODUCTION

1. Although not before the Environment Court this joint planning statement is prepared in a manner consistent with the protocol set out in Appendix 3 of the Court's practice note 2014.
2. This joint statement relates to conferencing on the topic of bank stabilisation and erosion matters for the applications lodged by Jagger NZ Limited ("the Applicant").
3. The conference that resulted in this statement was held on Wednesday 6 April 2016 at Porirua City Council (PCC) and following a site visit Mr. Kyle Christensen (Cardno) and Mr. Thomas Joseph (Mott MacDonald). The minutes of that conferencing were recorded by Mr Joseph and reviewed and updated by Mr Christensen. The minutes are provided in Annex 1 of this joint statement.
4. Both experts have agreed that two minor modifications upstream of the Bridge 2 and Bridge 3 are appropriate and a marked up plan showing these modifications is provided in Annex 2. Mr Christensen has presented these modifications to Mr Miller and Mr O'Callaghan and they have confirmed that they do not have any implications for either the ecological assessment or earthworks design respectively. Their written confirmation is provided in Annex 3.

Signed By:



Kyle Christensen - Cardno

Thomas Joseph – Mott MacDonald

6 April 2016

Annex 1 – Minutes of Expert Conferencing

Project title Brookside Development

Division Water

Subject Brookside Development Stream Bank Protection

Project no 367917

Location Duck Creek, Porirua

Date of meeting 05/04/16

Present Thomas Joseph (Mott MacDonald)

Kyle Christensen (Cardno)

Recorded by **Distribution**

Thomas Joseph Kyle Christensen, Michelle Conland, Sonia Baker

Item	Text	Action on
1	<p>Discussed the current discrepancy in the recommended stream bank / channel protection highlighted in the Mott MacDonald March 2016 peer review and the proposed stream bank / channel protection in the Cardno July 2015 Flood and Erosion Hazard Assessment Report. TJ pointed out that the review simply highlighted the discrepancy in the July 2015 report which states <i>"In areas where the velocity is less than 2.2 m/s then the proposed vegetation on the side slopes will be capable of withstanding erosion from the flow. Where the velocity is greater than 2.2 m/s rock protection which is capable of withstanding the velocity will be placed to restrict migration of the creek. The extent of rock protection required within the channel and side slopes within Duck Creek has been determined based on the flow velocity within the 10 year event."</i> (http://www.qw.govt.nz/assets/Resource-Consents/Duck-Creek-North/Consent-Application-Documents/Appendix-9-Flood-and-Erosion-Hazard-Assessment.pdf#page=16).</p> <p>Although the report states a 2.2 m/s velocity criteria for the 10 year event was used for bank / channel protection selection KC explained that this was only the starting point for the assessment and that a more detailed description of the methodology had been provided in evidence and the presentation (attached) on the first day of the hearing. The bank / channel protection selection was based on:</p> <ul style="list-style-type: none"> The figure shown below from the CIRIA (construction industry research and information association) Report 116: Design of Reinforced Grass Waterways 2.7 m/s velocity criteria for the 10 year event, Best engineering judgement and experience from Mr Christensen building on the same methodology that was used on the steeper upstream reach (Duck Creek South) which has performed in notable events (>10yr return period – 14 May 2015). 	No Action

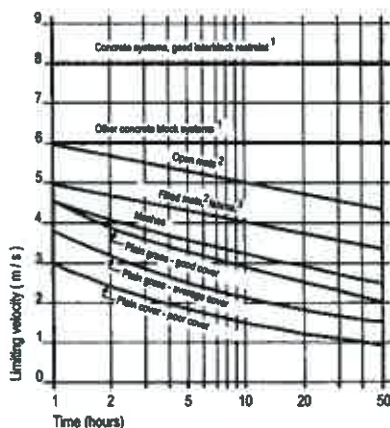


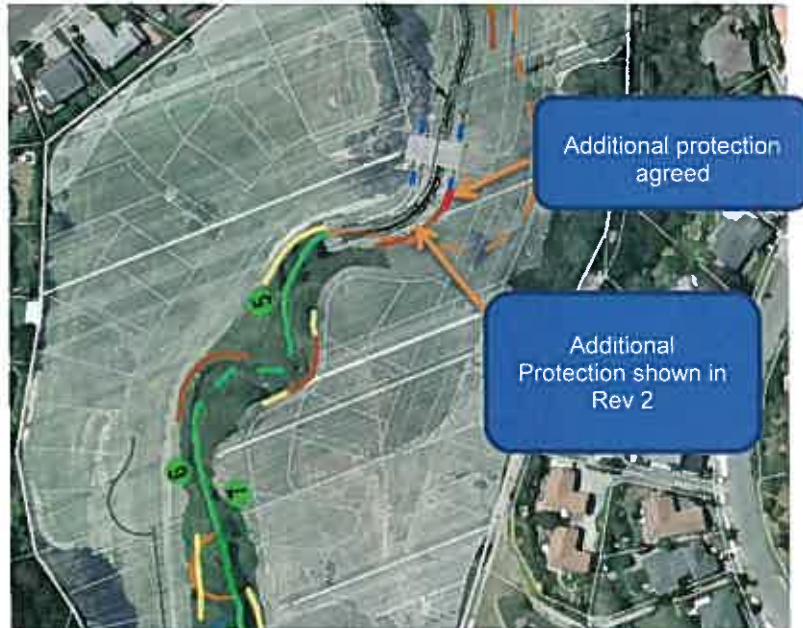
Figure 9 Recommended limiting values for erosion resistance of plain and reinforced grass

Notes: 1 Minimum superficial mass 130 kg/m², see Section 4.3.3 for other areas
 2 Minimum nominal thickness 20 mm
 3 Infiltrated with 20 mm of soil surface, or in conjunction with a surface mesh
 4 See Section 4.3.2 for other options for granular reinforcement
 5 These profiles should only be used for erosion resistance in professional flow. Values are based on available experience and information at date of this report
 6 All reinforced grass values include non-vegetational, good grass cover
 7 Other options (such as short-term protection, ease of installation and management, acceptability to vandals, etc) must be considered in choice of reinforcement

Record of meeting/discussion Continuation sheet



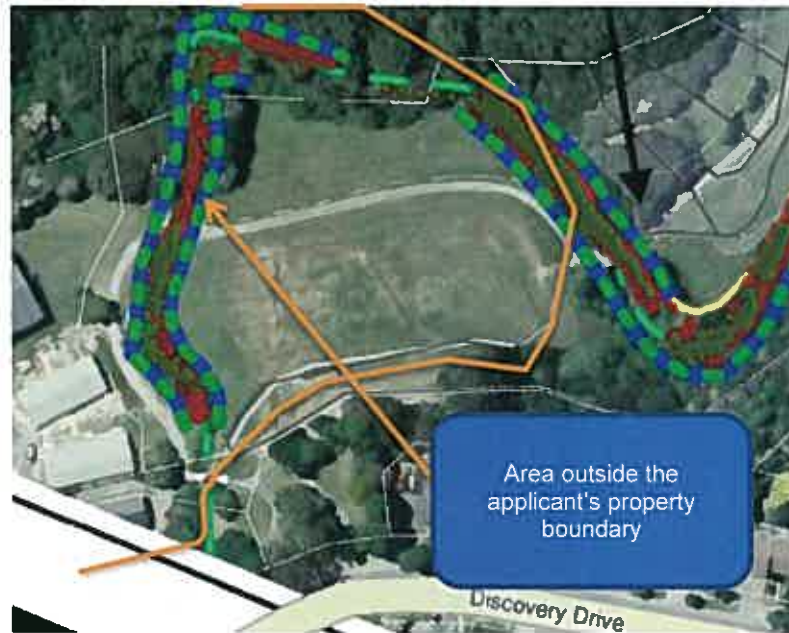
- 2 TJ highlighted the findings from his research of local (NZ) and international (USA) standards all of which indicate erosion velocity criteria around 2 m/s which is significantly lower than the CIRIA standard presented. At this stage it is difficult to compare the varying standards in any detail as no contextual text has been provided with the CIRIA standard and the document is not publicly available. The standards that TJ has highlighted include:
- New Zealand Transport Agency (NZTA) – Stormwater Treatment Standards for State Highway Infrastructure (<https://www.nzta.govt.nz/assets/resources/stormwater-management/docs/201005-nzta-stormwater-standard.pdf>)
 - Auckland Council – TR2012013018 –Hydraulic Energy Management: Inlet and Outlet Design for Treatment Devices - (<http://www.aucklandcouncil.govt.nz/SiteCollectionDocuments/aboutcouncil/planspoliciespublications/technicalpublications/tr2013018hydraulicenergymanagementinletoutletdesignfortreatmentdevices.pdf>)
 - Natural Resources Conservation Service (NRCS): PART 654 Stream Restoration Design National Engineering Handbook. (<http://directives.sc.gov.usda.gov/OpenNonWebContent.aspx?content=17784.wba>)
- 3 KC noted the threshold velocities referenced in the above standards refer to channel average velocities whereas the model outputs are using peak velocities from the 2-D model. KC noted that around bends it is common to multiply the average channel velocity by 2 (Ciria 551 & Pilarczyk 1995) to account for the acceleration around the outside of the bend. The use of outputs from the 2-D model already factors in this increase. KC also noted that the above references generally refer to un-vegetated sediments which have far lower velocity thresholds than vegetated scenarios. TJ agreed, however identified that the NRCS reference does have specific criteria for vegetated surfaces which are much lower than the Cira thresholds. KC regards the Ciria 116 vegetated thresholds as being more realistic and consistent with what is observed in the field. KC was in the field last week physically measuring erosion thresholds with renowned erosion expert Dr Andrew Simon who has completed thousands of measurements all around the world. As a general rule Dr Simon has found that vegetated surfaces have an order of magnitude higher shear stress threshold for erosion to occur. TJ agreed that the velocities outlined in the standards presented in item 2 are relatively low and in general TJ and KC noted that areas with a lower velocity (2.2 m/s) could be considered for the more frequent events (2 year event) whilst maintaining higher velocity criteria (2.7 m/s) for the less frequent events (10 year ARI).
- 4 It was identified that TJ was working with an out of date plan (Drawing 115065-PL-C251 Rev 1 03/07/15) a later version (Rev 2 - 25/08/15) has some additional bank / channel protection which has eliminated one area of the discrepancy. Specifically an area upstream of Bridge 3 as described in the figure below. In addition a small section of additional protection on the right bank just upstream of the bridge was agreed to be added by KC. This is also shown in the figure below.



5

TJ agreed that the Mott MacDonald report highlighted potential issues that are outside of the applicant's property boundary where there were no effects associated with the proposed development and therefore the applicant would have little control or requirement to undertake works. This was highlighted in the review for completeness and possibly could have been picked up as an effect of the Duck Creek South development. Given that we are currently discussing only the Duck Creek North development TJ has accepted that this area should be removed from the current recommendation. However it should be noted by PCC as a potential area where further investigation may be required. KC noted that much of this area has been stable for the past decade and has mature vegetation on the banks however could not comment on the erosion potential immediately downstream of the Discovery Drive Culvert

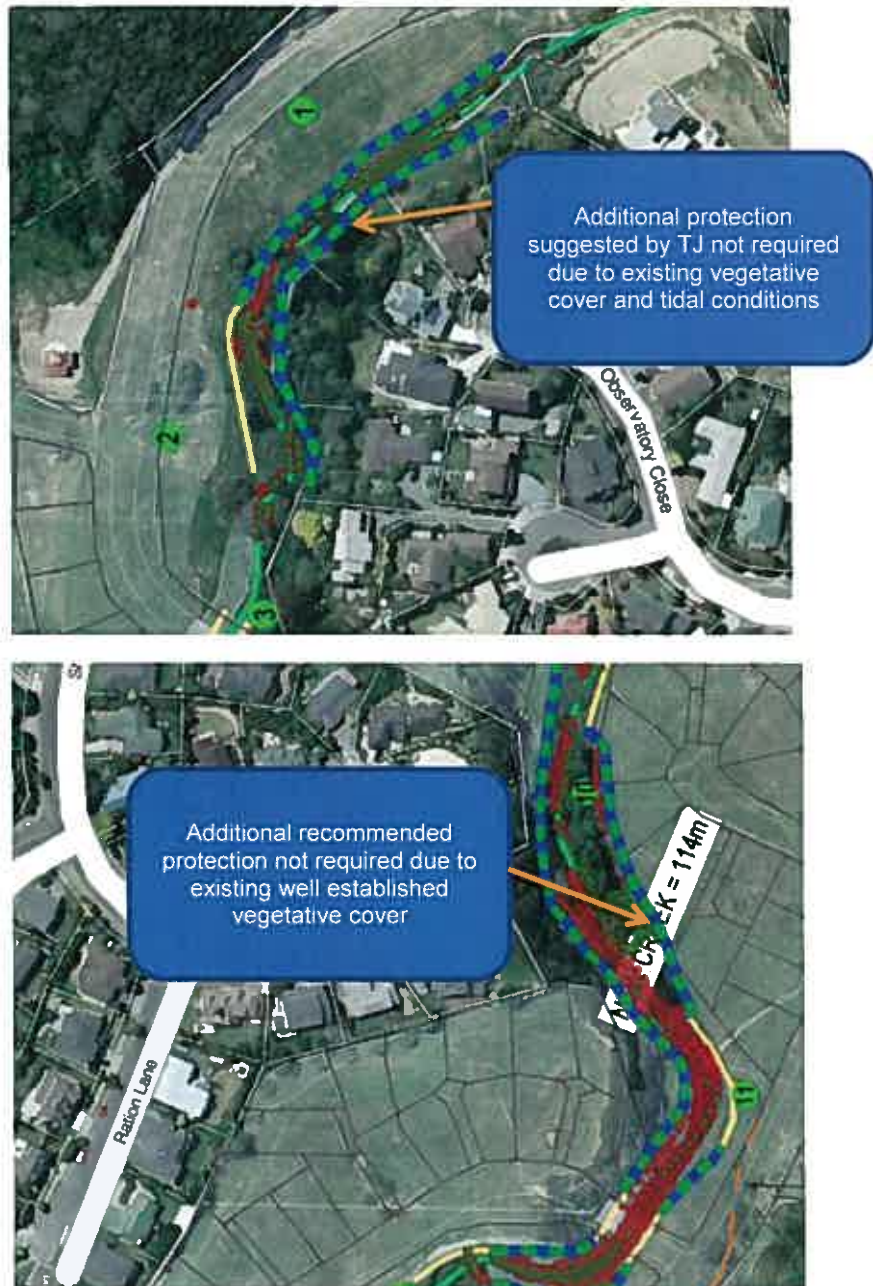
TJ



- 6 KC agreed to investigate additional stream bank / channel protection upstream of Bridge 2 to protect the fill face and tie in with the bridge rock work. KC



- 7 Following a site visit TJ concluded that two areas where he had previously recommended additional protection are likely not required due to very flat tidal conditions with little evidence of existing erosion and well established existing vegetative cover. It will however be essential to ensure that the riparian vegetation in these areas is re-established as rapidly as possible to minimise erosion risk on bare soil with high velocity potential predicted. KC noted that riparian restoration planting is proposed throughout this reach. TJ



8

TJ discussed with KC that Mott MacDonald are still not fully satisfied with the response to recommendation 3 from the March 2016 peer review related to volume balance in the model.

Annex 2 – Marked up Drawing Providing Agreed Extents of Erosion Protection

