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1 September 2014

Bay of Plenty Regional Council
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Tauranga 3141

3-38751.00

Dear Shanan

Resource Consent Application 67958
Kaituna River Re-diversion and Ongatoro/Maketu Estuary Enhancement
Response to further information request

We write in response to the request for further information dated 14 August 2014 relating to the Regional Council resource consent applications for the above. We have had feedback from each of the relevant technical experts on the points raised and respond to the request in the attached table.

In light of its discussions with its technical experts, the Applicant does not consider that any further detail is required in order to notify the application, for the following reasons:

- There is sufficient information contained in the applications, and the information supplied here, for potential submitters to understand the proposal and the effects.
- We consider that the DHI modelling questions are matters of detail that are considered highly unlikely to impact on the overall findings. These details will not affect which parties would choose to submit on the proposal, whether in support or opposition, or the nature of submissions.
- The ecology specialists have confirmed that the assessments in their reports will not change as a consequence of the proposed sensitivity testing.
- Responses are provided to Questions 2 to 5.

You will see in the table that, while DHI stands by its findings in respect of the morphological behaviour of the entrance, it has undertaken to conduct sensitivity test scenarios. The results of these and the associated commentary will be supplied to the consent authority no later than 30th September.

'Nice to haves'

The Applicant intends to respond to those items labelled as 'nice to haves'. This response will occur outside of the formal further information request process and will be provided in time for preparation of the officer's report.

Should you have any questions around the application, or this response, please contact Stephanie Brown (07 308 8932) or Simon Banks (07 571 5767) or by email.

Yours sincerely

Stephanie Brown
Principal Environmental Consultant

QUESTION	REPSONSE
1. DHI Modelling and Associated Reporting **a) Sediment Load from the Kaituna River** The peer reviewers of the DHI and Economos reports have raised concern over the fact that the morphological model has not incorporated incoming sediment from the Kaituna River. They consider that the exclusion of this input raises doubt over the model's ability to realistically provide an indication of future morphological behaviour. In particular, they raise concern over the potential that the model has underestimated morphological effects immediately downstream of the new diversion channel. Information requested: (i) Additional model runs are carried out that include bedload and suspended sediment load from the Kaituna River; and (ii) A discussion on the outcomes of these additional model runs is provided.	DHI stands by the findings that since the important hydrodynamic behaviour will not be significantly changed with the proposed option (i.e ebb tide volume and volume of water through the entrance for the majority of floods) the morphological behaviour of the entrance will not be significantly impacted. We believe this would be the same situation if river supplied sediment were to become more significant. However, to address this it is proposed to carry out some sensitivity simulations to assess morphological / sediment transport behaviour for typical year and extreme flood scenarios with sediment supply (approx. 30,000 m3 /yr) included at upper boundary of the model. This will illustrate if there are any impacts of increased river sourced sediment on the findings of comparative assessments between the existing situation and the proposed option. If the river is actually almost at a tipping point (due to sinks being filled in), where bed loads are about to increase significantly, then this may be a concern for the perceived impacts of re-diversion moving forward. The big question is whether additional bed load would lead to infilling at the river mouth. We consider that the present situation is not "sediment limited" so to speak. There is plenty of sediment supply from the sea on flood tide (gross transport of 400,000 m3 / yr along Maketu coastline) and there is probably already a dynamic balance between the flushing and the cross-section. **Proposed Action**: Carry out a small number of sensitivity test scenarios and comment on any potential for increased river supplied sediment.
b) Use of 'Typical Year' The peer reviewers have raised some concern over the use of the year 2006 as the 'typical' year and note that there is a large difference between the long---term	DHI does not agree with the statement that there is a large difference in the predicted long term rate and the 2006 rate. For the ten years simulated the rates range from 50,000 m3 /yr in a westerly direction to 250,000 m3 / yr in an easterly direction. With

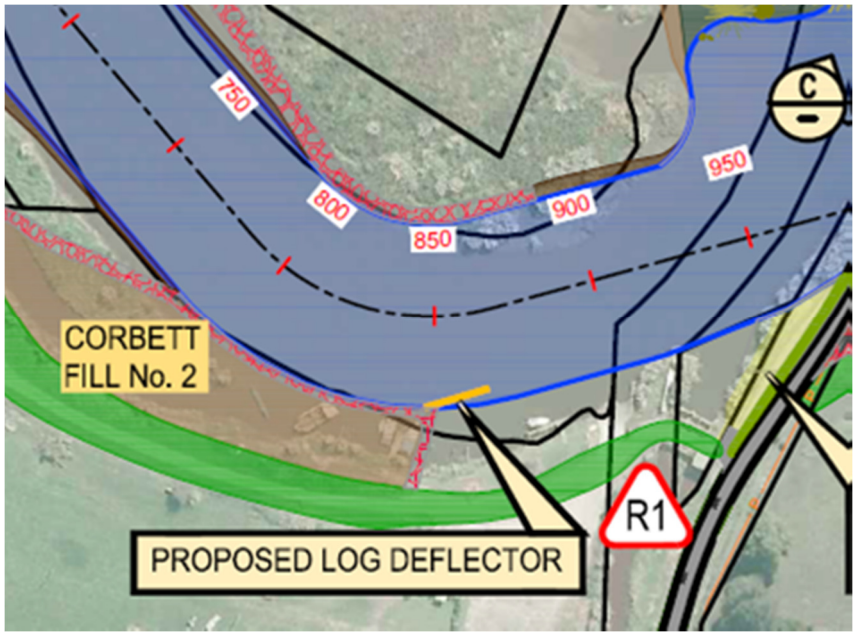
QUESTION	REPSONSE
sediment transport rate and the modelled 2006 rate. They also note that it appears that 2006 has been considered as a 'typical' year based solely on littoral drift transport and consider that river flows will also be a key physical process affecting the system. Information requested: (i) Further justification of the selection of 2006 as the 'typical' year; (ii) Further consideration and discussion on whether 2006 represents a 'typical' year in terms of river flows; and (iii) Additional model runs and reporting that stem from points 1b)(i) and (ii).	this variability in transport rates along the coastline in mind, we believe that 52,000 and 81,000 m3 / yr is actually quite comparable. We consider that 2006 is not atypical (i.e. a drought year or contains an irregular number of flood events). 2006 is a good year since it contains a number of flood events but also a period of approximately four months where no significant flood events occur. As a result you see any changes in the response of the river and estuary mouths for a range of conditions with and without the proposed option. We think it is important to note that the behaviour of the mouths is not only investigated for the typical year. The response of the mouths has also been assessed for the conservative situation of prolonged low river flow with adverse wave climate. We believe that the combination of this assessment with the typical year assessment is suitable for illustrating that impacts of re-diversion will be not significant for the long term behaviour of Te Tumu Cut. **Proposed Action**: Provide additional discussion of 2006 flows.
c) Outputs from 'Typical Year' Morphological Model The peer reviewers note that there are measureable differences at both the Te Tumu Cut and the Estuary inlet for the one year simulation. They raise concern over the fact that no allowance for any enlargement of the estuary inlet has been made in the model runs and the potential effects that this enlargement may have on tidal flux, flood hazard and water quality assessments. (iv) Additional model runs are carried out to understand the morphological response (particularly at the Te Tumu Cut and Maketu Estuary entrance); and (v) A discussion on the outcomes of these additional model runs.	It is DHI's opinion that differences in bathymetry highlighted by PDP is just illustrating the non-linear effects of the sediment transports equations and probably limitations of the models (i.e. we are not including all processes i.e. such as wind-blown sediment). It is important to understand that the models are not meant to be used to predict final locations of what are by their very nature dynamic channels, instead they are used to understand any likely overall changes to the size (width and depth) of these channels. We believe it is more important to look at the cross section area of the entrances and channels through the deltas and not the actual channel locations themselves. With regard to the slight enlargement of the estuary entrance, it is our opinion that it is unlikely to have a significant impact on tidal flux or flood hazard assessment. However, we propose one simulation to determine if a larger estuary mouth impacts the flow in and out of estuary. In addition, simulations to determine if a larger estuary mouth will result in more chance of coastal flooding at Maketu will be carried out. We would account for fact that flood flow from river will be partially prevented from entering the estuary during the highest risk flood events where these coincide with

QUESTION	REPSONSE
	elevated sea levels. We suggest flood scenario 4 is most appropriate here. **Proposed Action**: Carry out a small number of sensitivity test scenarios.
d) Impacts Upon Other Reports I note that significant reliance has been placed on the outputs of the DHI model to assess the Project's potential effects within the various specialist reports (in particular those relating to ecological effects). These reports are, therefore, considered to be sensitive to any changes associated with the additional model runs requested within points 1 a), b) and c) of this request. Information requested: (vi) Confirmation be provided from each of the specialist report authors that they have received and considered the revised modelling outputs; and (vii) The various reports are amended, as necessary, in light of the revised model outs.	The authors of the ecological reports can confirm they have discussed the information requests relating to the modelling with DHI. The opinion of the authors is that the assessment and conclusions reached in the Hamill (2014) and MacGibbon (2014) are not affected by any of the proposed sensitivity testing proposed in a) to c) above. It is recognised that the Maketū estuary is a dynamic system and that there will be spatial and temporal variability. No amendments to Hamill (2014) and MacGibbon (2014) are necessary.
2. Hamill (2014) Ongatoro/Maketu Estuary Condition and Potential Effects Information requested: (i) Comment on the rationale for the site selection of the algal assessments transects; and	The transects sampled for algal biomass and the nutrient content of algae and sediments were chosen to reflect a range of algae cover as indicated by the aerial mapping of algae cover (see Figure 2.1 in Hamill 2014). We only sampled areas where there were the aerial mapping showed algae accumulations and the results were combined with the estimate of algae cover to estimate the biomass and nutrients over the entire estuary. We deliberately did not sample *Ulva* growing in the channel of the lower estuary because the intent of the investigation was to estimate the biomass and nutrients contained in the accumulations of algae and underlying mud. The monitoring of algae cover using transects was primarily intended to provide an indication of temporal variability. The transects assessing algae cover were located in the mid-estuary and southern estuary because the extent of algae cover in this part of the estuary was known to be variable, it is highly visible part of the estuary, and it is

QUESTION	REPSONSE
	easily accessible for repeated measurements.
(ii) Comment on whether the four composited algal samples collected are considered to be generally representative of nutrient content in algae throughout the estuary and/or the extent of possible variation in other areas and whether this has any bearing on the total mass of N and P estimated to be present in algae in the estuary	Yes, the composited algae and mud samples are considered to be representative of algae accumulations in the estuary. Macroalgae typically accumulate in bands parallel to the shore or channels. Our transects bisected these bands of algae in order to capture the variability in biomass etc in an unbiased way. There will be a high degree of spatial and temporal variability. An indication of the spatial variability within transects is seen in the replicates of the biomass (wet weight) in Table 1 below. The calculations adjusted for differences in algae cover in the estuary. Samples collected from Papahikahawai lagoon were different from those collected in the main estuary (i.e. higher N content and lower density), and these samples were used only for estimates of biomass and nutrient content in the lagoon itself. This work was intended to provide a broad scale estimate of biomass and nutrient content of accumulated algae and mud in the estuary. It is not sufficiently quantitative to allow a statistically robust comparison of algae biomass before and after the re-diversion. The monitoring proposed for assessing the effects of the re-diversion are described in the AEE, and includes regular aerial mapping of algae cover.
3. MacGibbon (2014) Terrestrial, Avian and Wetland Restoration Ecology Information requested: (i) Comment on the importance of the time of year that construction and re---establishment activities are to occur in terms of vegetation and avian ecology (i.e. breeding seasons, migration, and so on) and proposed mitigation measures;	Proposed construction activities may have some minor impact on wetland bird breeding along the western edge of the Titchmarsh wetland if construction work in this area occurs during the wetland bird breeding season – broadly September to December. The noise and disturbance caused by excavators etc will discourage birds nesting along the wetland edge adjacent to the proposed diversion channel. The only effective mitigation of the effects of this activity would be to avoid construction activity along the western edge of the Titchmarsh wetland during breeding season. Main channel construction activities are not expected to have any significant effect on birds occupying other parts of the Maketu estuary and lower Kaituna River. Migratory bird species are not likely to be affected by the proposed construction work.

QUESTION	REPSONSE
	The estuary tidal mud flats preferred by migratory species are generally well removed from the proposed construction areas. While there is likely to be a period when algae is flushed through the estuary and some increased sediment load may occur during construction this is not expected to have any prolonged impact on wading and shore bird food sources. Planting of the areas proposed for vegetative restoration should occur from May to the end of September when soil moisture conditions are reliable, except in the wettest areas where other times of year may also be suitable. This planting will not have any adverse effects on bird breeding success because the land to be planted is mostly open grassland or salt meadow unsuitable for nesting.
(ii) Comment on the vegetation survey methodology (including, but not limited to, justification of vegetation transect localities and soil chemical characteristics);	The vegetation survey methodology consisted of a walk-over of all vegetation on the Maketu Spit, around the margins of the estuary and alongside the lower river from just upstream of the Titchmarsh wetland down the river to the coast and to the Ford's Cut junction with Maketu Estuary, and the establishment of vegetation transect lines at various locations along the estuary and lower Kaituna margins. The transect lines were located at sites that represented areas where changes in water salinity and chemistry might have different effects on the estuary and lower river margin vegetation. Transects have been located at intervals along the Maketu spit, across the southern edge of Papahikahawai Island, through the remnant salt marsh area beside Maketu Road, and across the Titchmarsh wetland. Access to the Brain land and Ford Island was not available, consequently transects could not be installed in these areas. Transects will be added to both locations if access should be approved in the future. The intention with these transect lines and the accompanying marked vegetation plots is to be able to detect and record any significant changes in vegetation composition post re-diversion. The transects traverse the narrow bands/zones of vegetation that occur from the tidal part of the estuary through to the fully terrestrial substrate that occurs above the spring tide zone.
(iii) Comment on the presence and significance of the threatened tussock species *Poa billarierei* at eastern---most 800 metres of the spit and any mitigation measures proposed during the pre, during and post---	The *Poa billiardierei* plants growing on Maketu spit will not be affected by the changes that are likely to occur as a result of river re-diversion. This species is an inhabitant of the terrestrial sandy substrate along the spit and does not grow in the wet estuarine

QUESTION	REPSONSE
construction phases of the Project;	margins that are likely to change. It should also be noted that most of the *Poa billiardierei* on the spit have been planted.
(iv) Salinity models of average river flow and average tidal cycle at water surface, mid water and bed; and	The average salinity levels predicted by the DHI modelling can be extrapolated from the DHI report (Tables 9-3, 9-4 and 9-5). Predominant upper quartile and lower quartile salinity levels and changes are likely to be more significant influences on vegetation changes than average figures.
(v) Further comment on proposed avian monitoring and mitigation recommendations (for example, whether relocation during construction is appropriate and is there a proposed avian monitoring regime).	As stated above, the effects of the project on estuarine and lower river bird life are expected to be minor. Furthermore, monitoring of the bird population, using standard estuary bird census methods, is unlikely to be able to identify changes in bird diversity, abundance or behaviours that are directly attributable to the re-diversion. Consequently, no avian monitoring regime is recommended as necessary. Relocation of estuarine of wetland birds would be impractical and unnecessary (even if it could be achieved). If construction timing avoids bird breeding season the effects on bird life are not expected to be significant and do not warrant any additional mitigation measures.
4. Log Deflector Information requested: (i) As a minimum, please provide some details of the proposed design and construction of the proposed 'log deflector'. Please note that these do not have to be final and the purpose would be to enable Council to set some parameters around a 'final' plan for later certification by Council (should resource consent be granted).	The log deflector is shown on drawing sheets 2 and 16 (extract below). It is a structure designed to prevent debris in the river entering the backwater created by the proposed 'Corbett Fill No 2'. The fill is proposed to end as shown on the drawing so that the existing users of the river launching area (Boy Corbett, Motiti Barge Operator) can continue to use this location. The log deflector needs to let water into the embayment but prevent debris (floating and submerged logs and weed mats) from doing so. It is proposed that it be constructed in a similar fashion to that shown on Photo 1, i.e. driven wooden piles with horizontal rails. The vertical height of the structure will be designed to prevent debris entry between low tide and flood levels. Using driven piles will reduce the construction effects. The exact detail will be finalised during detailed design.

QUESTION	REPSONSE
	
5. Culvert Serving the Lower Kaituna Wildlife Management Reserve I note that section 5.2 – Construction Activities on Page 50 of the AEE sets some 'likely' dimensions for the proposed additional culvert serving the Lower Kaituna Wildlife Management Reserve but a to---scale plan has not been provided showing the approximate location of this culvert. Information requested: (i) Please provide a to---scale plan identifying the proposed approximate location of this proposed culvert;	As stated in the application, modelling has been done on an option to convey more water from the Kaituna River into the Lower Kaituna Wetland Management Reserve. The option chosen (a 900mm culvert located at intake 2) showed that the reduced

QUESTION	REPSONSE
(ii) Please clarify the maximum dimensions of this culvert, maximum earthworks and whether any additional works are proposed (for example nature and likely extent of erosion mitigation measures; Please note that these do not have to be final and the purpose would be to enable Council to set some parameters around a 'final' plan for later certification by Council (should resource consent be granted).	volume into the wetland caused by the project could be mitigated but the exact detail needs to be discussed and agreed with the stakeholders. However it is likely that the culvert will be no larger than 1200mm in size and it will be located between Intake 1 and Intake 2. It will be very similar to the existing 1800mm culvert at Intake No 2 (photos attached) and it will have the required erosion protection on both its river inlet and wetland outlet.

Question 2 (ii) - Table 1: Algae biomass samples that were summarised in Table 2.2 of Hamill 2014.

Site	Site name	replicate	wet weight (g)	total wet weight (g)	total wet weight (kg/m2)
A	upper estuary	1	100.33	188.9	0.76
A	upper estuary	2	778.07	866.6	3.47
A	upper estuary	3	696.33	784.9	3.14
A	upper estuary	4	103.5	192.0	0.77
A	upper estuary	5	121.8	210.3	0.84
B	Papakahawai lagoon	1	2452.9	2591.5	10.37
B	Papakahawai lagoon	2	2603.4	2742.0	10.97
B	Papakahawai lagoon	3	2040.8	2179.4	8.72
G	Mid estuary drains W	1	1192.9	1269.4	5.08
G	Mid estuary drains W	2	575.9	652.4	2.61
G	Mid estuary drains W	3	1842	1918.5	7.67
G	Mid estuary drains W	4	1940.9	2017.4	8.07
G	Mid estuary drains W	5	1904.7	1981.2	7.92
H	Mid estuary drains E	1	1442.4	1519.8	6.08
H	Mid estuary drains E	2	790	867.4	3.47
H	Mid estuary drains E	3	107.41	184.8	0.74
H	Mid estuary drains E	4	504.6	582.0	2.33
H	Mid estuary drains E	5	991.96	1069.3	4.28

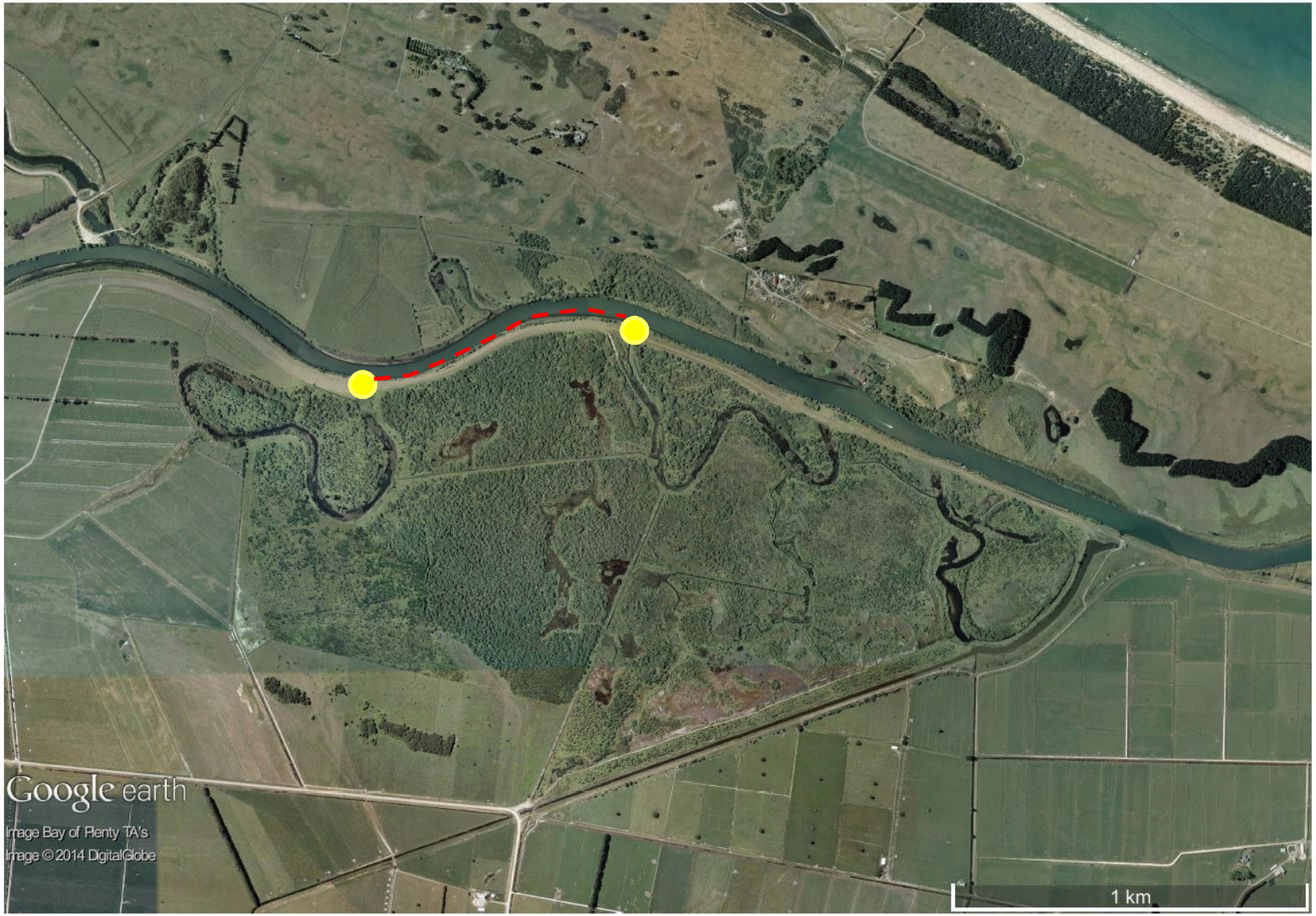
Question 4 Log Deflector

Photo 1 Example of log deflector

Question 5 Culvert Serving the Lower Kaituna Wildlife Management Reserve

Intake No. 2 culvert

Intake No. 2 culvert



Location Plan – culvert to be located between Intake No. 1 and No. 2