

Variable Scenario	Current	Diversion	APPLICANT RESPONSE
	Natural stream channel with mature native riparian areas >20m	Diversion constructed stream through bedrock	Stream channel occurs in same bedrock as existing stream
Hydraulic			
Vchann	Score for 'Natural channel with no modification'	0.64 - Estimate AC/DOC Score for 'Natural channel with no modification' not retained. 'The 'Natural channel, but flow patterns affected by reduction in roughness elements' fits better due to increased gradient and engineered channel.	Roughness and habitat elements are designed into the realignment. It has been strongly emphasised that this realignment is not a 'chute' like structure, and nor is it a constant steep gradient. The realigned channel will reflect the characteristics of Mangapū Tributary in part by applying the SEV information to the channel design.
Vlining	Score 0.95 for 'Natural channel with no modification', 0.05 for 'Bed with unnatural loading of fine silt'	Score 0.01 for 'Natural channel with no modification' for natural sections, score 0.1 for Bank OR bed lined with permeable artificial lining increased to take into account the creation of the rock riffles and enhancements. Scored of 0.8 for bed or bank lined with impermeable lining (as per design method). This also results in a loss of hyporheic exchange.	The realignment channel will exist in exactly the same rock base as the existing Tributary and accordingly the same attributes of the stream features exist. I am doubtful of significant hyporheic exchange in the existing Tributary given the nature of the stream hard rock base. The existing stream has large areas underlain by bedrock, with limited hyporheic exchange. The proposed design seeks to reflect the natural characteristics. The scoring as impermeable also assumes other factors such as an increase in water speed and reduction in roughness, which is incorrect for the realigned stream
Vpipe	No stormwater pipes present	Score remains the same.	ok
Vbank	Score 1 for 'Movement of flood flows onto and across the floodplain is not restricted by any artificial structures or modifications'	Score 1 for floodplain present, but connectivity to the full floodplain restricted by modification. This is due to confinement of diversion between pit and rock wall leading to limited floodplain and constrictions. Floodplain constructed is a maximum of 10m and then only on one side of the stream. This scoring is considered generous.	Movement of water out from the realignment banks to the floodplain is not restricted. This parameter is not about the extent of floodplain but whether flood water can leave the stream channel. For the realigned channel water can move out of the channel even if the floodplain is not extensive.
Vrough	Scored for mature indigenous vegetation with diverse canopy and under-story.	Scored for likely outcome of planting as: Regenerating indigenous vegetation in late stage of succession. Again, within the time period contemplated for restoration of value, this is generous.	ok
Vbarr	No barriers	No change (although waterfall is proposed)	At least three waterfalls occur in the existing tributary. These are not barriers to the climbing fish present (no swimming fish are recorded in the Mangapū tributary). Proposed waterfall is not a barrier as suggested in the Diversion comment.
Vchanshape	Auto Populated	Auto Populated	
Biogeochemical			
Vshade	Score 70% as very high shading and 30% for High shading.	Narrow riparian areas in parts will limit the potential shading. The high rock wall to the east will create some more shade. Score 50% for high shading, 25% for moderate shading and 25% for Low shading.	Narrow riparian margin does not limit shading and the scoring is not dependent on riparian width (that is riparian below). Shading can be and is expected to be contributed through near edge low stature planting as well as higher canopy planting. Narrow riparian margins can affect the potential resilience of the riparian planting (mitigated through plant types, density of planting, and maintenance). Given the stream diversion principals and planting described in Management Plan we do not anticipate any section of the stream realignment to have low shading. Additionally, the staged livening will increase shade by allowing time for planting to establish. The predicted score is meant to be "Predictions are the best scores possible if the sites were to be restored as far as practical from present with current best-practice".
Vdod	Scored as optimal	Score stays the same with design features to maintain this.	ok
Vveloc	Relatively uniform velocity across 10 points	Velocity figures used are the same as the existing measurements. Design should be able to achieve this.	ok
Vdepth	Based on existing channel	This is estimated for low flow at 0.2 (also considering Table 5 in the Preliminary Design and Effects Technical Report). This is not an important metric in the calculation and follows existing values.	ok
Vripar	Score for 20 m either side of watercourse	Based on design, scored 0.25 as planting of woody vegetation is limited to a maximum of 5m either side of channel.	Based on design, riparian width is indicated some 5 to 8 m but will vary along length of realigned channel.
Vdecid	No deciduous species, score of 1	No deciduous species, score of 1	ok
Vmacro	The reach scored 2% for small amount of macrophytes.	Assumed to be the same.	ok
Vretain	Auto Populated	Auto Populated	
Vsurf	Substrate mix of gravels and boulders. Interestingly no wood from a mature canopy recorded.	Assumed the mix of gravels and boulders to be the same, however this will not likely be flow formed materials.	ok
Vripfilt	Scored 1 for 'Very high filtering activity'	Channel confined with limited inflows along length. Scored as moderate filtering activity	Much less surface runoff area to 'filter' and with little contaminant source to consider. Runoff anticipated to be diffuse through the planned thick organic litter layer. Width of riparian buffer less than 5x channel width has been assumed. Moderate ok - could be 0.8.
Habitat Provision			
Vgalspwn	A total of 40 m of near-flat banks	This is difficult to estimate based on the designed provided so assume similar.	ok
Vgalqual	Indicated medium quality	No change	ok
Vgobspwn	Auto Populated	Auto Populated	
Vphyshab	Existing stream has optimal habitat diversity, habitat abundance, hydrologic heterogeneity, shade and riparian bank integrity. Scored 0.91	Scores maintained for habitat diversity, habitat abundance, hydrologic heterogeneity. Score reduced for channel shade due to narrow riparian extents in places (sub optimal) and riparian integrity within 20m (marginal). Scored 0.79	Shade and integrity likely to be higher than estimated and low optimal/high suboptimal. Scores maintained for habitat diversity, habitat abundance, hydrologic heterogeneity. Shade adjusted to reflect very high/high. Riparian vegetation integrity reflective of narrower margin. We note that in DOC/AC calcs with Aquatic habitat, abundance was actually increased from the original scores.
Vwatqual	Wellshaded so scored 1	Partial shade so scored 2	Upstream catchment remains exactly the same as present. Score should be same as current.
Vimperv	Scored 0.8 - < 10% impervious and medium first flush controls.	Scored as impervious of catchment increased with rock faces and reduced first flush processing.	Most of the upstream catchment is retained as is. Runoff diversions on rock face benches. Valuation remains similar to present or close to.
Biodiversity			
Vfish	No change - guidelines do not allow for assumption to this variable	No change - guidelines do not allow for assumption to this variable	No change - guidelines do not allow for assumption to this variable
Vmci	No change - guidelines do not allow for assumption to this variable	No change - guidelines do not allow for assumption to this variable	No change - guidelines do not allow for assumption to this variable
Vept	No change - guidelines do not allow for assumption to this variable	No change - guidelines do not allow for assumption to this variable	No change - guidelines do not allow for assumption to this variable
Vinvert	No change - guidelines do not allow for assumption to this variable	No change - guidelines do not allow for assumption to this variable	No change - guidelines do not allow for assumption to this variable
Vripcond	Auto Populated	Auto Populated	Auto Populated
Vripconn	Score 1 as none of stream is impeded	Score decreased to 0.8 to reflect limited riparian connectivity in places due to confinement.	Not clear what is meant by confinement as the guidance is 'proportion of the stream channel where the connections between riparian vegetation and the stream channel (e.g., through root linkages) are not prevented parameter'. Connections between riparian margin and channel are not limited. Whilst the extent of riparian margin is constrained in places - the connection between riparian and channel is not limited.