

Flooding Workgroup Pre-circulation:

From Ian and Rob

Thanks for the invite. We see a lot of people will be at the meeting. We (WRA) are a bit on the outside looking in but we have been doing some research and would like to put our best foot forward as a pre-circulation document – so your team can pick it over a bit before Thursday and if you think some of it has merits maybe HAL and Metis could be forewarned. If just 10% of what we have been thinking about seems sensible and your team add another 10% and HAL and Metis another 10% then something could be close to getting over the line.

The TCDC presentation on the 18th April had about 5-6 working solutions or potential projects. If we set a target to focus on these one at a time to get sufficient traction to become projects then we could walk away from the meeting with feelgood.

I would like this pre-circulation to focus on where we got to with the water table.

Water Table:

I want to call this the 'Hot Cross Bun' project.

Bear with me.

The bun is the golf course land.

The cross is a new network of pipes set at the 1.8m resilience if possible – if not then pumping may be required in 50 years.



In each of the 4 segments form depressions in the contour of the surface to collect surface water. Surface water will be when the bun water table is full up with rain water so has nowhere to soak to and pools on the surface.

Each of the segments has say 6-10 Well Points which are turned into sumps with risers like bubble ups. The well points are 2m deep and the risers come to the surface with grates. Each of the sumps is at the lowest points of the depressions. Surface water can drop into the Well Points. The surface grate for all the Well Points could be reference GL 0.00 but always over 1.8M resilience.

The Well Point sumps are all connected via pipes to a central pumping station. That pumping goes into above ground tanks for pre-separation of say 90% of the solids but not minerals. The pumps initially discharge into the 4th fairway pipes to the pond.

The crosses on the bun (below) are new pipes at the 1.8m resilience that have a main deliverable off through the walkway on Kiwi, criss-cross to Otahu and then into Park Avenue. One arm of the cross goes to each of Archilles, Bellina and Williamson. Where the pipes travel under Kiwi these could then have arms to connect to the existing sumps installed when the curb and channel was installed. This reduces about 200m of piping if Kiwi was piped to Archilles or Williamson.

Cutting into Williamson and Archilles means these pipe systems can be used to divert storm water catchment from the pond without requiring changing pipe sizes or even lifting old pipes. This saves all the upgrade costs.

Bringing in pipes midway along Tui, Kiwi, Bellona and through to Mary and Sylvia will reduce pipe lengths and spend rather than go to Williamson which would have needed enlarging to cope.



This is the overview of the 'Hot Cross Bun'

Eventually the pipes could cut into Ocean if heights allowed

Modelling:

I'm not the engineer so in very rough terms:

The golf course is about 100,000 sqm land area.

Opus state 50mm rain increases the water table by 100mm

To lower the water table 1m would mean 50,000m³ of water to be removed

Lowering the water table would cause a 'depression' in the overall water table beyond the golf course. Those crests would then drain back into the depressions and also require removal

I would put a factor of X10 to gain a stable level water table.

The initial 50,000m³ to be drained would stall quickly as the Well Points would dry up and become dry.

To overcome that the connecting pipes could also be holed to add soakage

If the pumps had a rate of 100m³ per hour it would take 500 hours if seepage equalled extraction at pump peak capacity.

If the pumps had to be shut down at night with say limited to 10 hours operation (to stop wining) that would mean 50 days to form a depression.

In those 50 days we can expect another 200mm of rain which would mean another 20,000m³ to pump away. Circular issue depending on rainfalls.

If the surrounding water table crests seeped to the 'Hot Cross Bun' low spots that would mean another 500,000m³ to drain plus the 200mm of rain on that ie another 200,000m³

So the concept of draining this larger 'Hot Cross Bun' would be a combination of:

Pump rates, seepage rates, surface water falling into the Well Points and gradual reduction of the depression around the Well Points.

If the surface water was immediately drained away then the water table may not need to be 1m down. In summer it definitely doesn't as the grass and trees would die. Unless we get a cyclone again.

The 4 quarters of the bun would then be contoured by Phil Tataurangi into fairways and greens with sufficient fall into the GL 0.00 of the Well Point sumps. Phil may need 6-10 in each quadrant??? Some parts of the golf course would intentionally be much higher. These would all feed surface water to the depressions.

The depressions could extend out to the neighbouring properties to provide the overland flow and relieve the surface ponding of these properties.

As the water table was lowered the surrounding crests will settle down to the Well Point residual levels and that would then allow the local soak pits to restart.

This whole process could take 1-2 years to optimise but every 50mm of reduction in water table level is likely to reduce surface water ponding. Getting the overland flow paths bedded in will certainly stop dwelling floors being flooded as the surface water has a way to escape.

I see the GL 0.00 along the first fairway should be -300mm from the surface level of the water as it currently stands. This means the club house goes and allows the properties behind it to drain away. The golf course carpark drains can be extended into a Well Point to be pumped away.

Same for the low lying properties along Kiwi, Bellona and Williamson.

Pipes:

Pumping of the water table would begin as delivering the water into the 4th fairway sump.

This would at 100m³/hour the pond is filled twice a day which would mean 50 days minimum without rain and another X10 for the surrounding properties as the water table depression fills back in. If the pumps delivered 1000m³/hour that would be a total pond every hour which would be catastrophic for the Beach.

We will show images of the erosion whilst the pumps were on and now as the water table exits.

My conclusion is we can probably sustain 100-200m³ per hour during winter but never in summer. Ie this is not a long term discharge solution.

Park Avenue is better suited and has the open area for treatment plants and become the central hub as and when we need pumps anyway if sea level does rise.

Pumping into the Estuary is better than dumping along the Coastal area considering we were the No1 surf beach 2018. Won't even be swimmable if we pump 1000m³/hour which may be needed if we got say 500mm of rain again over a 4 day period. That would be millions of M³ to remove.

Objective:

Brett it would be good to see some modelling around all this. Even if I'm only 10% accurate then its still a chance??