Watercare
An Auckland Council Organisation

Omaha WWTP Consultative Group

Agenda and meeting actions #9

PROJECT: **Omaha WWTP Consultative Group**

DATE: 27/02/2016

REPORT PREPARED BY: NW

ATTACHMENTS:

Present	Apology	Copy	Name
☐	☒	☐	Bill Tucker
☐	☒	☐	David Stone (Omaha Shorebirds Protection Trust)
☒	☐	☐	Dean Grice
☒	☐	☐	Denis O'Callahan
☒	☐	☐	Elizabeth Foster (Whangateau Harbourcare Group)
☒	☐	☐	Fiona McKenzie (Manuhiri Kaitiaki Charitable Trust)
☒	☐	☐	Graham Painter (Omaha Beach Community)
☐	☒	☐	Hugh McKergow (Whangateau Residents & Ratepayers)
☒	☐	☐	Ian McDonald (Whangateau Harbourcare Group)
☒	☐	☐	Ines Curin (Point Wells Community & Ratepayers)
☐	☒	☐	John Cranston
☐	☒	☐	John Laurence
☒	☐	☐	John Linton (Omaha Beach Golf Club)
☐	☒	☐	Keith McSporran (Omaha Shorebirds Protection Trust)
☒	☐	☐	Mark Barnett
☐	☒	☐	Mike Bradbury (Point Wells Community & Ratepayers)
☐	☒	☐	Neville Johnson (Matakana Community Group)
☐	☒	☐	Noelene Cranston
☐	☒	☐	Raewyn Morrison (Forest & Bird Mid North Branch)
☐	☒	☐	Richard Muir
☐	☒	☐	Roger Grace (Whangateau Harbourcare Group)
☒	☐	☐	Theo Verryt
☐	☒	☐	Trish Allen
☐	☐	☒	Richard Brabant (Omaha Beach Golf Club)
☐	☐	☒	David Wilson (Department of Conservation)
☐	☒	☐	Megan Beard (Auckland Council)
☐	☒	☐	Chrissy Henley (Auckland Council)
☒	☐	☐	Alan Pattle (Pattle Delamore Partners)
☒	☐	☐	Aslan Perwick (Pattle Delamore Partners)
☒	☐	☐	Mark James (Aquatic Environmental Sciences)
☒	☐	☐	Phil Mitchell (Mitchell Partnerships)
☒	☐	☐	Nicholas Woodley (Mitchell Partnerships)
☒	☐	☐	Jim Cooke (Streamlined Environmental)
☒	☐	☐	Mark Bourne (Watercare)
☒	☐	☐	Andre Stuart (Watercare)

☐	☒	☐	Vila Souvannavong (Watercare)

Agenda/Actions	Responsibility	Due by
The purpose of this meeting was to present the findings of the groundwater and nutrient investigations. Andre from Watercare gave a brief presentation outlining possible next steps in terms of the application Alan Pattle and Aslan Perwick of PDP gave a presentation on the results of the groundwater investigations Jim Cooke of Streamlined Environmental gave a presentation on the results of the nitrogen study, phosphorus, and emerging contaminants. The key points of each presentation and the main items raised or discussed are outlined below.		
Omaha WWTP Consultative Group, 27 February 2016, Pt Wells Bowling Club – Next steps by Andre Stuart **Introduction** • Work identified in Investigation Plan now largely complete • Anticipate at least one more meeting to present findings • Followed by subsequent meeting(s) to discuss findings to attempt to achieve consensus, as per the terms of reference • Therefore, have not set a date for lodgement of application **Proposed forthcoming meetings** • Today's meeting present findings on o Groundwater o Nutrients and Emerging Contaminants • Meeting 12 March present findings on o Microbiology o Hydrodynamics o Ecology o Land use management • 10 April o Feedback session and discuss next steps/future meetings etc		
Fiona McKenzie asked about the standards that the discharge may be required to meet, for example what limits are required by Auckland Council for parameters such as E.coli or faecal coliforms Watercare will report back at the next meeting	**Watercare**	**12 March 2016**
Omaha WWTP – Groundwater Assessment Results – Alan Pattle and Aslan Perwick, PDP The presentation covered the following matters: • Investigations • Conceptual model of groundwater systems • Assessment and analysis of future treated wastewater irrigation		

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• Findings • Effects on Groundwater Users • Where to from here Investigations have included: • Coastline area survey • 'Land Drain' inspections • 14x auger holes • ~4 km of Ground Penetrating Radar surveys • ~3.1 km of Electro-Magnetic surveys • 6x groundwater quality samples • Installed 23x additional groundwater monitoring wells • Groundwater level gauging and chemistry sampling • Major Drains - flow gauging and surveying • Omaha Taniko Wetland – shallow geological investigation • Soil infiltration capacity testing • Soil permeability testing The information from these investigations was used to refine the conceptual groundwater model and then develop a computerised 3D groundwater model. The model was applied to recent irrigation data (2010-14) and the existing irrigation system was then ran through the entire climate data series from 1969-2014. In summer most treated wastewater is irrigated to the Omaha Beach Golf Course. During winter most goes to the Jones Road irrigation sites, except when it is particularly wet (~1 in every 6 years), when irrigation to the dunes is required. **Water balance of existing system** Jones Road • 64% of rainfall and irrigation returns to the atmosphere through evapotranspiration • 3% is runoff (but rainfall only) • 3% goes to groundwater and then discharges to the Omaha River Arm • 30% goes to groundwater and then discharges to the Waikokopu Creek Arm of the Whangateau Harbour (south of the causeway) Omaha Beach Golf Course • 45% of rainfall and irrigation returns to the atmosphere through evapotranspiration • 2% is runoff (but rainfall only) • 42-53% goes to groundwater and then discharges to the Waikokopu Creek Arm • 0-11% goes to groundwater and then discharges to Omaha Beach Omaha Dunes		

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• It is assumed that all the irrigated treated wastewater goes to groundwater • 0-10% goes to groundwater and then discharges to the Waikokopu Creek Arm • 90-100% goes to groundwater and then discharges to Omaha Beach **Key findings of existing irrigation rates** The results show that the current irrigation is suitable to deal with existing irrigation. The current system at Jones Road is being used at close to its capacity and therefore the existing area would need to be expanded to accommodate increase irrigation volumes. **What is the system capacity** Watercare owns additional unirrigated land at Jones Road, ~9.1 ha of which is at an even higher elevation than the existing irrigated land and is therefore suitable for irrigation. **To test capacity several assumptions / operational constraints were used** • No additional summer irrigation at the Golf Course • Irrigation must not o Raise water table to ground surface on Jones Road Site; and o Raise water level above 3.5m RL at the Golf Course – so that almost the entire golf course area remains playable. Using the groundwater model, but with greater irrigation volumes, the results showed that up to 153,195 m3 could be irrigated to the Golf Course dunes during wet winters. **Water balance of future system** Jones Road • 66% of rainfall and irrigation returns to the atmosphere through evapotranspiration • 3% is runoff (but rainfall only) • 2% goes to groundwater and then discharges to the Omaha River Arm • 29% goes to groundwater and then discharges to the Waikokopu Creek Arm of the Whangateau Harbour (south of the causeway) Omaha Beach Golf Course • 45% of rainfall and irrigation returns to the atmosphere through evapotranspiration • 2% is runoff (but rainfall only) • 48-53% goes to groundwater and then discharges to the Waikokopu Creek Arm • 0-5% goes to groundwater and then discharges to Omaha Beach		

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Omaha Dunes • It is assumed that all the irrigated treated wastewater goes to groundwater • 10-45% goes to groundwater and then discharges to the Waikokopu Creek Arm • 55-90% goes to groundwater and then discharges to Omaha Beach **Key Finding of future system** The capacity of the irrigation system with the additional 9.1 ha at Jones Road is 300,000 m **Effects on other Groundwater Users** Potential effects predicted to be negligible: • Waitemata Group Aquifer is well confined from the near surface groundwater (Omaha Flats & Mangatawhriri Spit Quaternary Aquifers). • The takes are unlikely to have potential to 'reverse' the natural upward head gradient. • Aquifer essentially fully allocated – no / little room for additional takes		
Matters raised during the PDP presentation include: What is the Omaha River Arm and Waikokopu Creek Arm? The Omaha River Arm is that part of the Whangateau Harbour to the west of Pt Wells. The Waikokopu Creek Arm is that part of the Whangateau Harbour south of the Broadlands Drive causeway. Is evapotranspiration pure water and does this mean the remaining wastewater is more concentrated? Yes, but the other nutrients and emerging contaminants are discussed in the Streamlined presentation Does most of the groundwater entering the harbour discharge during low tides? Yes, at high tide the salt water limits the discharge of groundwater as it is heavier than the fresh water During wet winters (1:6 years) would there be no irrigation to the Jones Road sites? Correct, all irrigation would go to the Omaha dunes. What are the proportions of rain to irrigation on the Jones Road sites? Within the irrigation sites themselves, the ratio of rain to irrigation is approximately 2:1 During winter irrigation to the dunes, does most of it go eastwards to Omaha Beach? Yes		

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Do the surface water maps indicate winter breakout of the irrigation? No, it is more about the irrigated wastewater raising the groundwater level. Is there any interaction between the shallow aquifers (under Omaha Flats and Mangatawhiri Spit). Is there any interaction between these? No, the harbour separates the two shallow aquifers. Based on the average travel times it looks like the irrigation from the golf course may not have reached the harbour yet? That is correct. Golf Course irrigation started in 2002 and the average travel time to the harbour is 18-25 years. The capacity of the system (300,000 m3/yr) is less than the currently consented volume (390,000 m3/yr)? Yes, that is what the groundwater investigation has found Where is the rainfall data from that underpins the groundwater model? The Leigh rain gauge. What about large rainfall events? Large rainfall events are able to be managed through storage in the Omaha WWTP dam. No irrigation occurs during these times.		
Omaha WWTP consents – Fate of nutrients in treated wastewater irrigation and emerging contaminants – Jim Cooke, Streamlined Environmental Ltd The presentation covered the following matters: • Processes affecting nitrogen o Field investigations o Nitrogen model o Load to Whangateau Harbour • Fate and transport of phosphorus • Potential risks of emerging contaminants **Information for nitrogen model** • To develop the nitrogen model we needed to understand the following o Vegetation uptake (immobilisation) o Soil processes o Leaching to groundwater **Jones Road vegetation uptake** Eucalypts – 0-10 kg nitrogen/ hectare / year Natives – 0-10 kg nitrogen/ hectare / year **Golf course uptake** *Inputs*		

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Fertiliser (fairways) – 100 kg nitrogen / hectare / year Irrigation – 128 kg nitrogen / hectare / year Total – 228 kg nitrogen / hectare / year *Outputs* Immobilisation – 175 kg nitrogen / hectare / year Leaching – 53 kg nitrogen / hectare / year Total – 228 kg nitrogen / hectare / year **Summary of vegetation effectiveness at nitrogen uptake** • Very low uptake by vegetation at Jones Road sites • Quite high uptake by grass on Omaha Beach golf course, which is immobilised in turf **Soil processes** • If nitrogen is not taken up by vegetation, it can still be removed through soil processes before it enters surface water • To understand the soil processes we measured a number of parameters including: o Denitrification enzyme activity o In situ denitrification rate o Short-term Nitrification Activity o Nitrate /ammonia concentrations o Readily mineralisable carbon o Loss on ignition o Dissolved Organic Carbon **Samples** Soil samples were collected from a number of sites around the irrigation areas. **Results** • Whilst in-situ denitrification is highest under the eucalypts they are not orders of magnitude greater than the other landuses • There appears to be more than enough readily mineralisable carbon to sustain denitrification, so it would appear that something else is limiting. • There is measureable nitrification activity down to at least 800 mm depth and other measurements indicate that oxygen was present. • It is therefore likely that oxygen is limiting. • Denitrification clearly is still occurring but it will be limited to anaerobic areas rather than throughout the entire peat matrix. • However, the depth of the peat means that even though denitrification rate per unit of soil is relatively low, the depth of peat soil is such that nitrate supplied from wastewater and nitrification is removed to low levels. This is confirmed in modelling.		

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Summary of results relevant to nitrogen production • There are very high nitrification rates measured in the native block • Consequently accumulation of nitrate-N also occurs under this landuse down to 1m. • Significant (but lower than native block) nitrification measured in eucalypts down to 80 cm. • In contrast, relatively low nitrification activity was measured Kahikatea forest and the Golf Course. **Results of nitrogen model** The most likely estimates are the following: • Irrigated – 2200 kg nitrogen per year • Leaving unsaturated zone (to groundwater) – 655 kg nitrogen per year • Entering Whangateau Harbour (from groundwater) – 0 kg nitrogen per year **Key findings** • High denitrification rates in soil mean that nitrogen from Jones Road irrigation is almost entirely removed prior to entering Whangateau Harbour. • Accordingly, vegetation type at Jones Road is of no practical consequence for nitrogen removal • There is significant uptake by grass on Golf Course fairways but not on the dunes. • The denitrification rates in sands beneath Golf Course are low, but nitrogen removal will occur in saturated (groundwater) organic sediments • Overall assessment is that negligible nitrogen from the irrigation will enter the Whangateau Harbour **Phosphorus** • Phosphorus from the Omaha WWTP irrigation is unlikely to enter the Whangateau Harbour • In any event, phosphorus concentrations in the Whangateau Harbour are declining **Emerging contaminants** • Emerging contaminants from the irrigation of treated wastewater from the Omaha WWTP currently present a low risk to the Whangateau Harbour • We recommend periodic reassessment of the risk presented by emerging contaminants		
Matters raised during the Streamlined Environmental presentation include: Is the fertiliser used at the golf course included in the model? Yes Also it was pointed out that the OBGC does not apply fertiliser in winter.		

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What is the capacity of the peat to continue denitrification? Very great, thousands of years Ministry of Primary Industries have extended cockle ban in Whangateau Harbour. They have said they think there is something wrong with the Harbour. What happens to nitrogen load if irrigation is double on Jones Road? Very little difference There is a considerable increase of irrigation to the Omaha dunes. Little nitrogen is immobilised, so what is likely to happen in terms of this nitrogen? We will go away and look at this matter and report back	**Watercare, PDP, SEL**	**12 March 2016**
The Omaha WWTP dam has had problems in the past, is there a risk of it breaking, what happens if it does break and what is being done about it? What monitoring is being undertaken? The dam had a weep which Watercare fixed. Watercare controls the most dams of any organisation in New Zealand. All the dams are regularly monitored and maintained. We'll present the monitoring programme at a future meeting.	**Watercare**	**12 March 2016**
There is something significant in the unirrigated native block on Jones Road, possibly a frog. This is why it wasn't irrigated in the originally. This area has recently been surveyed but we will look through the historic records to see what we can find.	**Watercare**	**12 March 2016**
Next Steps The next meeting is scheduled for **Saturday 12 March, 10am at the Point Wells Bowling Club.** The purpose of this meeting will be to present the results of the following workstreams: o Microbiology o Hydrodynamics o Ecology o Land use management Watercare will also report back on the matters raised at this meeting.	**Mark James**	