Treated Wastewater Reuse

Description

Treated wastewater could be reused for activities such as a plant nursery or golf course irrigation. Reuse treats wastewater as a resource, reducing the volume to be discharged elsewhere.

Improved treatment such as the addition of a tertiary membrane plant would be required to avoid public health impacts. Wastewater would not be suitable for stock or human potable uses, but would be suitable for a range of non-potable reuse options.

These options are likely to be sub-options of a wider wastewater treatment and discharge scheme.

Location

This would be dependent on the location of an activity that can accept significant volumes, or can provide year-round takes, of treated wastewater for use.

Examples of potential locations in and around Raglan are:

- Raglan Golf Club irrigation
- Boat wash at the boat ramp (with controls to limit risk of potable use)
- Irrigation to crops
- Use of existing storage ponds as a fish nursery (Raglan Eels proposal)

Treatment Option	Description
Existing ponds & UV	Wastewater is received at the inlet works, from where wastewater is piped to aerated ponds with aquamats installed. The pond wastewater discharges into a day pond for storage prior to discharge on the outgoing tide. From the day pond treated wastewater is pumped via an inline UV disinfection system to the new ocean outfall discharge location.
Existing ponds & UV incl TSS removal	Additional TSS removal can be achieved via tertiary treatment using a membrane. Wastewater flows through membrane modules, allowing only smaller particles to pass through. Some pathogens are removed through the membrane by a filtration process, whilst UV disinfection would provide additional pathogen removal.
Use of existing ponds as fish nursery	Utilization of the currently disused and reserved ponds for growing juvenile whitebait, long fin eel, short fin eel and grey mullet by installation and implementation of the Nitro EELS system.
Convert pond to activated sludge & UV	Converting one or more of the current ponds to an activated sludge process will target the TSS, BOD and ammoniacal nitrogen parameters. Total nitrogen and phosphorus can also be targeted if required. A new clarifier would need to be installed.
New separate activated sludge plant & UV	Construction of a new purpose-built activated sludge plant at the existing location, which is a more resilient option than conversion of one of the existing ponds to the activated sludge process. A new clarifier would need to be installed.
MBR & UV	A membrane bioreactor is an activated sludge process which uses membranes instead of a clarifier to separate solids from the treated wastewater. Nitrogen and phosphorus can be removed from this process. A new clarifier would need to be installed.
Existing ponds + fixed film process with clarification + UV	Utilising the same bacteria as activated sludge, a fixed film process (e.g. submerged aerated filter, trickling filter) uses biological material (biofilm) attached to media in a tank to treat the wastewater. A clarification step is also required to separate the solids that slough off the media. Fixed film processes could be used with the existing ponds, and will target BOD and ammoniacal nitrogen parameters.

Options Assessment Criteria

Criteria	Issue/Topic	Description/Explanation
Public Health	Microbiological quality of treated wastewater	Risk of public exposure to waterborne pathogens through:
		- Direct contact with the conveyance or treatment process
		- Direct contact with the receiving environment, for example through contact recreation
		- Indirect exposure, through food gathering (such as shellfish, fish, watercress, etc) and groundwater use.
	Health effects from irrigation	Risk of public exposure to pathogens from irrigation.
	Treated wastewater re-use	Risk of contamination from treated water for non-potable re-use.
Environment	Water quality	Potential effects on freshwater (surface and ground) and coastal/marine receiving environments
	Aquatic ecology	Potential effects on aquatic ecosystems
	Terrestrial ecology	Potential effects on terrestrial ecosystems and soils
	Coastal environment and resources	Potential effects on significant coastal and marine areas, existing harbour and coastal processes, and physical footprint within the harbour and coastal marine area.
Cultural	Mauri	Potential effects on mauri of land, water and air
	Kai moana	Potential effects on kai moana and the kaitiaki management of customary fishing
	Cultural values	Potential effects on the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu and other taonga
	Health and Wellbeing	Potential effects on the ability of the land, sea and air to support wairua in order to maintain health and wellbeing for Maori
Social and community	Amenity value and aesthetics	Potential effects on the natural and built environment (e.g. visual, odour, noise)
	Urban development	Extent to which the option enables residential and commercial development within the projected timeframe
	Recreation	Extent to which the project enhances or detracts from local recreational activities and opportunities
	Food gathering	Extent to which the project enhances or detracts from people's ability to collect food within the area
	Access to the coast	Extent to which an option effects access to the coastal marine area.
	Re-use potential of option	Extent that treatment by-products can be utilised beneficially now and into the future (i.e. irrigation/nutrients for food production)
Sustainability	Carbon footprint	Potential embodied and operational carbon footprint
Constructability	Geology, soil, groundwater conditions	Option suited to local environmental conditions
	Land availability, accessibility	Adequate and secure land must be available for the required infrastructure, timescales that fit within project timing
	Existing infrastructure	Potential to maximise use of existing infrastructure that has a valuable remaining economic life, e.g. power supply, treatment plants, pumps, conveyance pipes and existing sites.
Technology	Reliable, proven and robust technology	To be sustainable, an option should be based on proven technology and have adequate redundancy (spare operational capacity to provide back-up in case of failure)
	Adaptable and flexible	Due to the uncertainty associated with future growth, a feasible option must be able to adapt to changing conditions such as increased flows and loads, discharge quality requirements, input requirements, and energy availability.
	Able to be staged	The extent to which an option could be staged (e.g. through modularised components).
	Operational and engineering resilience	The option must be sufficiently resilient to natural hazards and operational failure.
Financial Implications	Capital cost	Is the cost of the project appropriate for the project area and the population served?
	Operating and maintenance cost	Can the capital infrastructure be maintained and operated in a cost-effective manner?
	Whole of life cost	How do the whole of life costs pf the various options compare?
	Financial risk	Is the option affordable even if growth does not occur as predicted?
Opportunities and Benefits	Opportunity for resource recovery	The provision of beneficial reuse of treated wastewater. (i.e. with emphasis on food production)
		The potential for beneficial reuse of biosolids. (i.e. with emphasis on food production)
Statutory Considerations	Consistency of the option with National Policy Statements (NPS)	Includes consistency with the New Zealand National Coastal Policy Statement (NZCPS), National Policy Statement for Freshwater Management (NPS-FM) and any other relevant NPS
	Consistency of the option with any other relevant legislation outside of the Resource Management Act	Includes consistency with the Reserves Act, and any other relevant Act

Options Assessment

Treatment options for this discharge location are assessed based on the above criteria in the following table.

Key: Red – Largely fails to meet the criteria, Amber - Marginally meets the criteria, Green - Meets criteria well												
Treatment Process Option	Public Health	Environment	Cultural	Social & Community	Sustainability	Constructability	Technology	Financial Implications	Opportunities and Benefits	Statutory Considerations	Comments	Carry forward to short list?
Existing ponds & UV	Treated wastewater quality not sufficient for beneficial reuse.	Potential adverse effects related to discharge into another environment.	Hapū have reiterated opposition to marine options and support for re-use options. Avoidance of adverse public health and environmental effects obviously aligns with hapū ethics. Any option with elevated risk wouldn't be supported.	Option unlikely to have any adverse amenity and aesthetic effects	Low energy treatment and conveyance system, very low additional embodied carbon	Minimal new infrastructure.	Reliable and proven technology.	Low cost solution.	Limited opportunities for beneficial reuse of treated wastewater.	Dependent on ultimate discharge environment – to be assessed as part of preferred wastewater scheme.	Treated wastewater quality insufficient for beneficial reuse.	No
Existing ponds & UV Incl TSS removal	Higher quality treated wastewater – suitable for indirect potable re-use.	Potential adverse effects related to discharge into another environment.	Hapū have reiterated opposition to marine options and support for re-use options. Avoidance of adverse public health and environmental effects obviously aligns with hapū ethics. Any option with elevated risk wouldn't be supported	Option unlikely to have any adverse amenity and aesthetic effects	Low energy treatment and conveyance system. Additional embodied and operational carbon associated with membrane treatment.	Membrane process can be readily constructed.	Reliable and proven technology.	Relatively low cost solution.	Membrane treatment will produce a treated wastewater quality suitable for non-potable reuse.	Dependent on ultimate discharge environment – to be assessed as part of preferred wastewater scheme.	Treatment options involving tertiary filtration and UV disinfection (membrane upgrade) provide greater opportunities for beneficial reuse of treated wastewater.	**YES**

Key: Red – Largely fails to meet the criteria, Amber - Marginally meets the criteria, Green - Meets criteria well												
Treatment Process Option	Public Health	Environment	Cultural	Social & Community	Sustainability	Constructability	Technology	Financial Implications	Opportunities and Benefits	Statutory Considerations	Comments	Carry forward to short list?
Existing ponds + use of sludge ponds as fish nursery (Raglan Eels proposal)	Treated wastewater quality not sufficient for beneficial reuse (from a human health perspective).	Potential adverse effects related to discharge into another environment. However, offset by potential beneficial effects of providing native fish habitat.	Hapū have reiterated opposition to marine options and support for re-use options. Avoidance of adverse public health and environmental effects obviously aligns with hapū ethics. Any option with elevated risk wouldn't be supported	Option unlikely to have any adverse amenity and aesthetic effects	Low energy treatment and conveyance system, very low additional embodied carbon.	Minimal new infrastructure.	Unproven technology – no other demonstration sites. Potential for a trial at the Raglan site.	Low cost solution.	Opportunities for beneficial reuse of treated wastewater. Some opportunity for beneficial reuse of biosolids.	Dependent on ultimate discharge environment – to be assessed as part of preferred wastewater scheme.	Raglan Eels proposal is not proven but could be trialled at a small scale, depending on how sludge storage lagoons are incorporated into wider options.	**YES**
Convert pond to activated sludge & UV	Higher quality treated wastewater – suitable for indirect potable re-use. However, pathogen concentrations would be higher than tertiary filtration options and further assessment would be required on disinfection.	Potential adverse effects related to discharge into another environment.	Hapū have reiterated opposition to marine options and support for re-use options. Avoidance of adverse public health and environmental effects obviously aligns with hapū ethics. Any option with elevated risk wouldn't be supported	Option unlikely to have any adverse amenity and aesthetic effects	Moderate energy requirements associated with activated sludge treatment process. Low embodied carbon as existing assets reused.	Replacement of existing outfall and conversion to activated sludge can be readily constructed.	Reuse of existing pond liner is a risk – potential leakage resulting from damaged liner.	Moderate cost option	Activated sludge and UV will produce a treated wastewater quality suitable for non-potable reuse. Possibly some form of tertiary filtration may be required.	Dependent on ultimate discharge environment – to be assessed as part of preferred wastewater scheme.	Treated wastewater could be reused, however pathogen concentrations higher than membrane filtration options.	No
New separate activated	Higher quality treated wastewater –	Potential adverse effects	Hapū have reiterated opposition to	Option unlikely to have any	Moderate energy requirements	New activated sludge process can be	Reliable and proven technology.	High CAPEX & OPEX cost	Activated sludge and UV will	Dependent on ultimate discharge	Treated wastewater could be	No

Key: Red – Largely fails to meet the criteria, Amber - Marginally meets the criteria, Green - Meets criteria well												
Treatment Process Option	Public Health	Environment	Cultural	Social & Community	Sustainability	Constructability	Technology	Financial Implications	Opportunities and Benefits	Statutory Considerations	Comments	Carry forward to short list?
sludge plant & UV	suitable for indirect potable re-use. However, pathogen concentrations would be higher than tertiary filtration options and further assessment would be required on disinfection.	related to discharge into another environment.	marine options and support for re-use options. Avoidance of adverse public health and environmental effects obviously aligns with hapū ethics. Any option with elevated risk wouldn't be supported	adverse amenity and aesthetic effects	associated with activated sludge treatment process. Moderate embodied carbon as new treatment assets required.	constructed. Further site investigations needed to determine site suitability for new tanks.			produce a treated wastewater quality suitable for non-potable reuse. Possibly some form of tertiary filtration may be required.	environment – to be assessed as part of preferred wastewater scheme.	reused, however pathogen concentrations higher than membrane filtration options.	
MBR & UV	Higher quality treated wastewater – suitable for indirect potable re-use.	Potential adverse effects related to discharge into another environment.	Hapū have reiterated opposition to marine options and support for re-use options. Avoidance of adverse public health and environmental effects obviously aligns with hapū ethics. Any option with elevated risk wouldn't be supported	Option unlikely to have any adverse amenity and aesthetic effects	Carbon footprint higher	New MBR process can be readily constructed. Further site investigations needed to determine site suitability for new tanks.	Reliable and proven technology.	Very high CAPEX & OPEX cost	Very-high quality treated wastewater suitable for non-potable reuse.	Dependent on ultimate discharge environment – to be assessed as part of preferred wastewater scheme.	Treatment options involving tertiary filtration and UV disinfection (membrane upgrade and MBR) provide greater opportunities for beneficial reuse of treated wastewater. MBR will provide additional nutrient removal.	**YES**
Fixed media process & UV	Higher quality treated wastewater – suitable for	Potential adverse effects related to	Hapū have reiterated opposition to marine	Option unlikely to have any adverse	Carbon footprint higher	New fixed media process can be readily constructed.	Reliable and proven technology.	Moderate CAPEX and OPEX costs.	Fixed media and UV will produce a treated	Dependent on ultimate discharge environment –	Treated wastewater could be reused,	No

Key: Red – Largely fails to meet the criteria, Amber - Marginally meets the criteria, Green - Meets criteria well												
Treatment Process Option	Public Health	Environment	Cultural	Social & Community	Sustainability	Constructability	Technology	Financial Implications	Opportunities and Benefits	Statutory Considerations	Comments	Carry forward to short list?
	indirect potable re-use. However, pathogen concentrations would be higher than tertiary filtration options and further assessment would be required on disinfection.	discharge into another environment.	options and support for re-use options. Avoidance of adverse public health and environmental effects obviously aligns with hapū ethics. Any option with elevated risk wouldn't be supported	amenity and aesthetic effects		Further site investigations needed to determine site suitability for new tanks.			wastewater quality suitable for non-potable reuse. Possibly some form of tertiary filtration may be required.	to be assessed as part of preferred wastewater scheme.	however pathogen concentrations higher than membrane filtration options.	