

RPSC TAG – Minimum Technical Compliance of Options 1-6

Prepared by Alison Lowe and Greg Manzano, 27 July 2015
 Issued by Jim Bradley, TAG Chair on behalf of TAG

Goals and Minimum Technical Requirements

A suite of “Minimum Technical Requirements” for options as alternatives to the existing land treatment system were established for the TAG based on the Steering Committee goals.

Steering Committee - Goals		TAG – Minimum technical* requirements *technical = engineering, environmental, economic																					
<p>The Committee is to select an alternative to the LTS, that is the overall Best Practicable Option, based on agreed goals</p> <p>Goals:</p> <ol style="list-style-type: none"> 1. Contributes to improving the water quality in Lake Rotorua by reducing nutrient and contaminant flows from the WWTP 2. Acceptably meets the cultural needs of tangata whenua 3. Achieves acceptable community environmental outcomes 4. Acceptably safeguards public health 5. Complies with regulatory requirements - national and regional 6. Is acceptably cost effective for local rate payers as well as RDC 7. Has acceptable community support 		<table border="1"> <thead> <tr> <th>TAG minimum requirements</th> <th>Criteria</th> </tr> </thead> <tbody> <tr> <td>Economically viable</td> <td>+ Total cost and capacity fit (fit)</td> </tr> <tr> <td>Meets LDA purpose</td> <td>+ Meets current and future needs in a way that is most cost-effective for households and business</td> </tr> <tr> <td>Technically viable</td> <td>+ Integrates with WWTP + Complete solution, technically possible, proven, robust, reliable, flexible + Engineering resilience (natural hazards and climate change)</td> </tr> <tr> <td>Legally viable and convertible from a technical perspective</td> <td>+ Meets key planning and statutory requirements + Appropriate available land access and long term use</td> </tr> <tr> <td>Meets Consent order (following abatement notice March 2012)</td> <td>+ To select and pursue a "viable alternative". The objective being to minimise, as far as practicable, the discharge of nutrients entering Lake Rotorua and its tributaries</td> </tr> <tr> <td>Meets previously agreed upon principles from the Clean Water workshop (Oct 2013)</td> <td>+ If discharging to water, is pure enough to support life + Discharge in Rotorua Catchment (unless agreed by those outside catchment) + Pathogens (e.g. UV light)</td> </tr> <tr> <td>Meets previously agreed upon conditions in principle relating to use of CN land</td> <td>+ Does not discharge to CN land + Could potentially be commissioned by 2019</td> </tr> <tr> <td>Protects Public health and avoids nuisance</td> <td>+ Protects Public health and avoids nuisance + Protects water supplies, food sources, recreation</td> </tr> <tr> <td>Consider cultural acceptability</td> <td>+ Cultural goals (if out of catchment, and if not, cannot be achieved then an agreeable compromise may be needed)</td> </tr> </tbody> </table>		TAG minimum requirements	Criteria	Economically viable	+ Total cost and capacity fit (fit)	Meets LDA purpose	+ Meets current and future needs in a way that is most cost-effective for households and business	Technically viable	+ Integrates with WWTP + Complete solution, technically possible, proven, robust, reliable, flexible + Engineering resilience (natural hazards and climate change)	Legally viable and convertible from a technical perspective	+ Meets key planning and statutory requirements + Appropriate available land access and long term use	Meets Consent order (following abatement notice March 2012)	+ To select and pursue a "viable alternative". The objective being to minimise, as far as practicable, the discharge of nutrients entering Lake Rotorua and its tributaries	Meets previously agreed upon principles from the Clean Water workshop (Oct 2013)	+ If discharging to water, is pure enough to support life + Discharge in Rotorua Catchment (unless agreed by those outside catchment) + Pathogens (e.g. UV light)	Meets previously agreed upon conditions in principle relating to use of CN land	+ Does not discharge to CN land + Could potentially be commissioned by 2019	Protects Public health and avoids nuisance	+ Protects Public health and avoids nuisance + Protects water supplies, food sources, recreation	Consider cultural acceptability	+ Cultural goals (if out of catchment, and if not, cannot be achieved then an agreeable compromise may be needed)
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Options

An initial long-list of options was initially identified. It was narrowed down to a short-list of 5 options as having potential to meet the agreed goals and minimum technical requirements. Options 1-5 were developed with a view to integrating TERAX. The options aimed to meet the minimum technical requirements, including a maximum annual discharge of 30 t/yr N and 3 t/yr P (3.4 mg/l N and 0.34 mg/l P based on predicted 2051 flows). Option 6 was developed at a later date as an alternative if TERAX is decoupled from the WWTP, ie the TERAX return liquor is not returned to the WWTP process, as a WWTP configuration that could meet the 30 and 3 t/yr N and P limit and maximise the use of carbon (reduce ethanol requirements without the TERAX return liquor).

- Option 1** WWTP base upgrade: flow balancing, DRP-removal, UV treatment
- Option 2** WWTP base upgrade + tertiary filtration (disc filters, sand filtration, in-line membranes)
- Option 3** WWTP base upgrade + denitrifying tertiary filtration (sand filtration, carbon beds)
- Option 4** Dual Discharge. No WWTP upgrade. MBR discharge to surface water. Bardenpho discharge to land at 5 mm/d or 20 mm/d.
- Option 5** Land Treatment. No WWTP upgrade. Current flow discharged to land at 5mm/d or 20 mm/d.
- Option 6** WWTP base upgrade (UV as a second pathogen removal barrier), primary bypass (decommission primary treatment), full MBR for the secondary process, sludge dewatering with centrifuges.

Minimum Technical Requirements

The options were assessed for compliance with each of the the previously agreed Minimum Technical Requirements (Table 1), where:

- ✓ achieves minimum technical requirement
- P could “Potentially” achieve minimum technical requirement
- ? uncertainty around achieving the minimum technical requirement
- ✗ does not achieve the minimum technical requirement

Option 1 – does not achieve minimum technical requirement

A base-upgrade to the WWTP reduces DRP but the clarifiers do not reduce particulate-P sufficiently. Both TN and TP in the discharge exceed the minimum requirement. With a variable concentration of suspended solids in the discharge, the single barrier approach to pathogen kill is more risky.

Option 2 – does not achieve minimum technical requirement

A base-upgrade to the WWTP with tertiary filtration reduces DRP as well as particulate-P (depends on the filtration). TP levels below the minimum requirement of 0.34 mg/l (3 t/yr) can be achieved using sand filtration or in-line membrane filters. While this option also removes particulate nitrogen, the requirement for a TN concentration of 3.4 mg/l (30 t/yr) can not be met. Suspended solids are low and UV treatment provides an effective single barrier approach to pathogen kill.

Option 3a – achieves minimum technical requirement

A base-upgrade to the WWTP with a denitrifying sandfilter to provide both filtration of the particulate fractions as well as an additional nitrate removal. This upgrade can achieve TP around the minimum requirement of 0.34 mg/l (3 t). This upgrade option provides the lowest risk of meeting the N limit of 3.4 mg/l (30 t) during normal operations as more nitrogen is removed (having two N-removal processes in series is more efficient than just one). Sandfiltration, as part of the filtration process, returns the back-wash to the treatment plant which can add to the variability in the plant. During storm flows or when other issues occur that impact settlability in the clarifiers, and the frequency of backwashing to clear the filters is high, the performance of the plant will reduce. Recovery time depends on the volume and mass of solids being received by the sand filter. There is a risk with this option that during extreme events bypass of filtration may be required. UV treatment provides an effective single barrier approach to pathogen kill, but there is some risk if the capacity of the sand filter is exceeded.

Option 3b – does not achieve minimum technical requirement

A base-upgrade to the WWTP with a carbon bed to provide both filtration of the particulate fractions as well additional nitrate removal. TP levels will be around the minimum requirement of 0.34 mg/l (3 t/yr) can be achieved and TN levels will be reduced to around the minimum requirement of 3.4 mg/l (30 t/yr). While potentially technically possible, carbon beds have not been proven on this scale, with these very low concentrations of nitrate or over a long timeframe. With a variable concentration of suspended solids in the discharge (either pre- or post- Ca-bed), the single barrier approach to pathogen kill is more risky.

Options 4 and 5 – currently parked

Option 6 – achieves minimum technical requirement

A base-upgrade to the WWTP with that bypasses the primary tanks to make full use of the carbon in a the secondary processes, and reduce sludge production, with some reconfiguration of the Bardenpho to optimise N-removal, with full MBR incorporated into the secondary process. This can achieve the lowest TP in the WWTP discharge, below the requirements of 0.34 mg/l (3 t), and around the required 3.4 mg/l (30 t) N. Has the disadvantage of being hydraulically limited (can only pass a fixed amount through membranes) so careful selection of membranes and management of stormflows is essential. Membranes and UV provide an effective double barrier approach to pathogen kill.