

Workshop with TAG

Alternative Land Treatment Sites



Rotorua WWTP

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Scope of Works

- ☐ Identify potential sites for discharge of treated wastewater in the Rotorua Lake Catchment.
- ☐ Establish size and expected nutrient removal performance
- ☐ Establish land use of alternatives
- ☐ Scope and recommend the preferred discharge methodology
- ☐ Scope and size transfer main and pumping system options
- ☐ Establish site layouts and details
- ☐ CAPEX, OPEX and NPV
- ☐ Identify risks, construction & commissioning requirements, further investigative works



Alternatives Assessed

| Option | Name | Description |
|--------|-----------------|--|
| 4 | Dual Discharge | Discharge of one third of the total treated wastewater from the Membrane Bio-reactor to water with the remaining flow discharged to land |
| 5 | Total Discharge | Discharge of the entire treated wastewater to a new alternative land site within the catchment |

- ☐ For both options, the discharge limits are set at 30T of nitrogen and 3T of phosphorus per annum



Treated Wastewater Quality

- ☐ Treated wastewater is very low in ammonia <1mgN/L and organic nitrogen
- ☐ Relatively high levels of nitrate (40-60% of N)
- ☐ Nitrate is usually mobile in the soil and moves with soil water
- ☐ Wastewater composition is very different to other schemes such as Taupo where the goal is to remove all nitrogen via the land
- ☐ Limiting factor assumed to be how much water can be applied rather than how much N



Land Area Requirements

| Option | Discharge | Annual Average Daily Flow (m ³ /day) | Land area (ha) | Application Rate (mm/day) |
|--------|-----------|---|----------------|---------------------------|
| 4 | Dual | 16,510 | 360 | 5 |
| 5 | Total | 23,810 | 500 | 5 |

* Derived by hydraulic capacity (not nutrient limitation)



Nitrogen Loading

- ❑ Nitrogen in (combined) wastewater from plant – 5.9mgN/L
- ❑ Over 500ha this is a loading rate of 105kgN/ha/yr
- ❑ Taupo LTS consented loading rate is 650kgN/ha/yr for cut and carry
- ❑ Most of the N removal “work” done at the treatment plant
- ❑ Significant P removal required by LTS

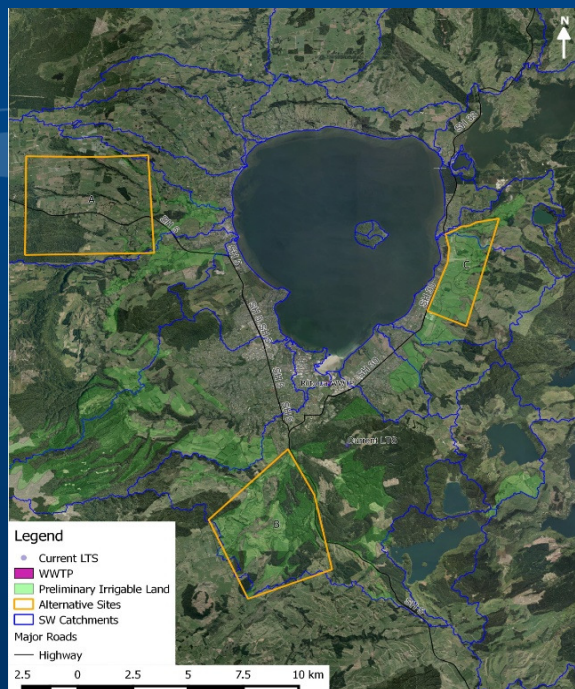


Preliminary GIS Mapping Constraints

| Parameter | Limit/Constraint |
|-----------------------------|---------------------------------------|
| Slope | < 20° |
| Soil | Well to moderately drained |
| Flood return – Lake Rotorua | Not within 1:20 FRI and landward SH30 |
| FRI – rivers and streams | Flood class 1 to 3 (< 1:20 FRI) |
| Distance WWTP | Within 10 km of WWTP |
| Urban areas | Exclude |



Selected Land Options

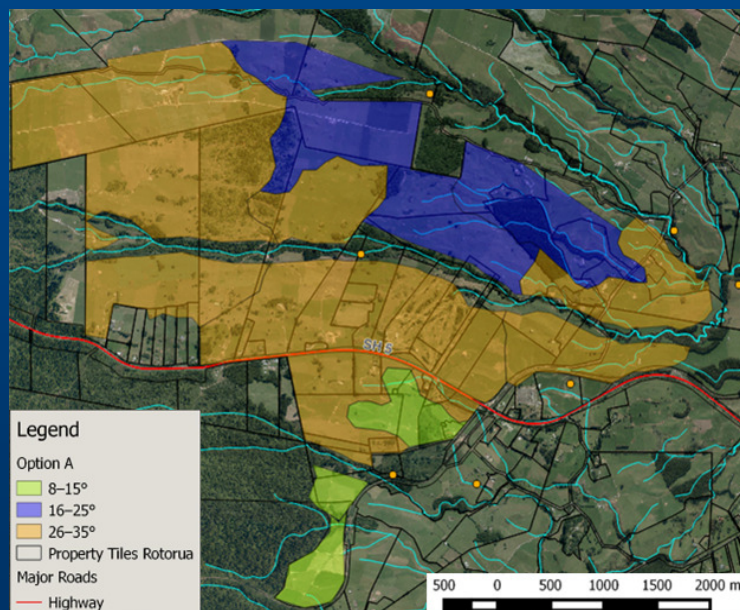


Option A

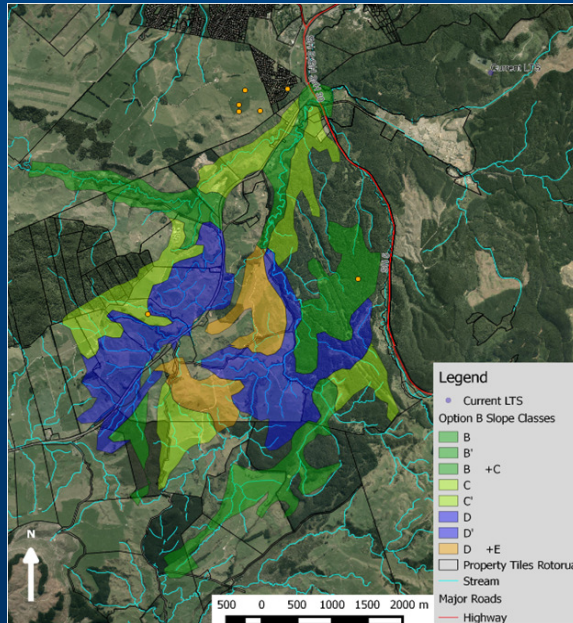
- ❑ Outside of 10km distance from WWTP
- ❑ Total area is 1,082 ha
- ❑ 300 ha meets initial design criteria
- Note: Option 4 requires 350 ha while Option 5 requires 500 ha
- ❑ Area restricted by:
 - Volcanic mound formations (granite) and
 - River valleys
 - Steep
- ❑ Currently livestock farming/forestry and some patches of significant natural forest



Option A with slope classes



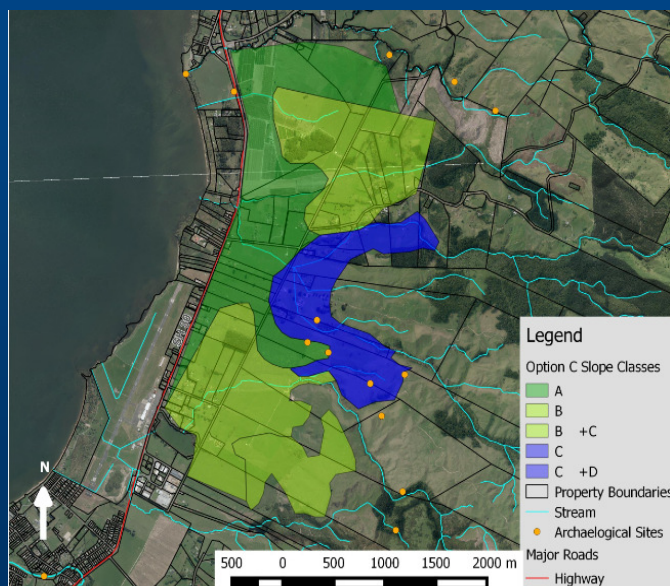
Option B with slope classes



- ☐ Total area is 1,399 ha
- ☐ Meets the initial design criteria
- ☐ Livestock farming, dairying, forestry and scrub
- ☐ Close to WWTP and LTS
- ☐ Potential reuse of existing infrastructure with this option



Option C with slope classes



- ☐ Total area is 676 ha
- ☐ Meets the initial design criteria
- ☐ Relatively flat
- ☐ Close to WWTP
- ☐ Livestock farming, tree nursery, life style blocks



Nutrient Removal Assessment

| Option | Nitrogen | Phosphorus |
|--------------------|---|--|
| 4 | 12.03 T requires removal | 15.6 T requires removal |
| 5 | 17.35 T requires removal | 22.6 T requires removal |
| Assumptions | <ul style="list-style-type: none"> 100% removal of ammoniacal-N 100% particulate organic N 60% soluble organic N | Assume for P: <ul style="list-style-type: none"> 100% particulate organic P 87% soluble organic P |
| Summary | <input type="checkbox"/> Consent limit would be achieved. | <input type="checkbox"/> Likely to meet consent limit. <input type="checkbox"/> If not, dose with alum at the plant to offset |



Infrastructure Requirements

| Option | Irrigation Method | Land Area (ha) | Total Head (m) | No. of Pumping Stations | Transfer Main Length (m) | Pumping Head (m) | Holding Ponds (m³) |
|--------|-------------------|----------------|----------------|-------------------------|--------------------------|------------------|--------------------|
| A (4) | Fixed sprinkler | 350 | 202 | 3 | 17,060 | 202 | 28,000 |
| A (5) | Fixed sprinkler | 500 | 195 | 3 | 17,060 | 195 | 40,000 |
| B (4) | Fixed sprinkler | 350 | 137 | 2 | 9,670 | 137 | 28,000 |
| B (5) | Fixed sprinkler | 500 | 133 | 2 | 9,670 | 133 | 40,000 |
| C (4) | Pivot | 350 | 45 | 1 | 8,610 | 45 | 28,000 |
| C (5) | Pivot | 500 | 41 | 1 | 8,610 | 41 | 40,000 |

Summary

Note: Cost estimates include land acquisition and professional fees.

| Option | Land Area (ha) | CAPEX (\$M) | OPEX (\$M) | NPV (\$M) | Key Risks |
|--------|----------------|-------------|------------|-----------|--|
| A (4) | 350 | 83.0 | 2.02 | 93.7 | Geotechnically challenging. |
| A (5) | 500 | 102.4 | 2.73 | 118.8 | |
| B (4) | 350 | 54.9 | 1.53 | 64.9 | High no. of streams, hilly, complex irrigation arrangement. |
| B (5) | 500 | 69.2 | 2.07 | 83.7 | |
| C (4) | 350 | 56.9 | 0.82 | 56.4 | Sandy soils, proximity to Lake Rotorua, likely to have relatively high land value. |
| C (5) | 500 | 73.3 | 1.04 | 72.4 | |

Additional Risks

- ☐ Access to lay pipes – easements etc required
- ☐ Scheme may need to cater for all flows (even dual discharge) as redundancy might be required when MBR is off line or if there are any issues with maintaining consent limits
- ☐ Securing land for purchase

