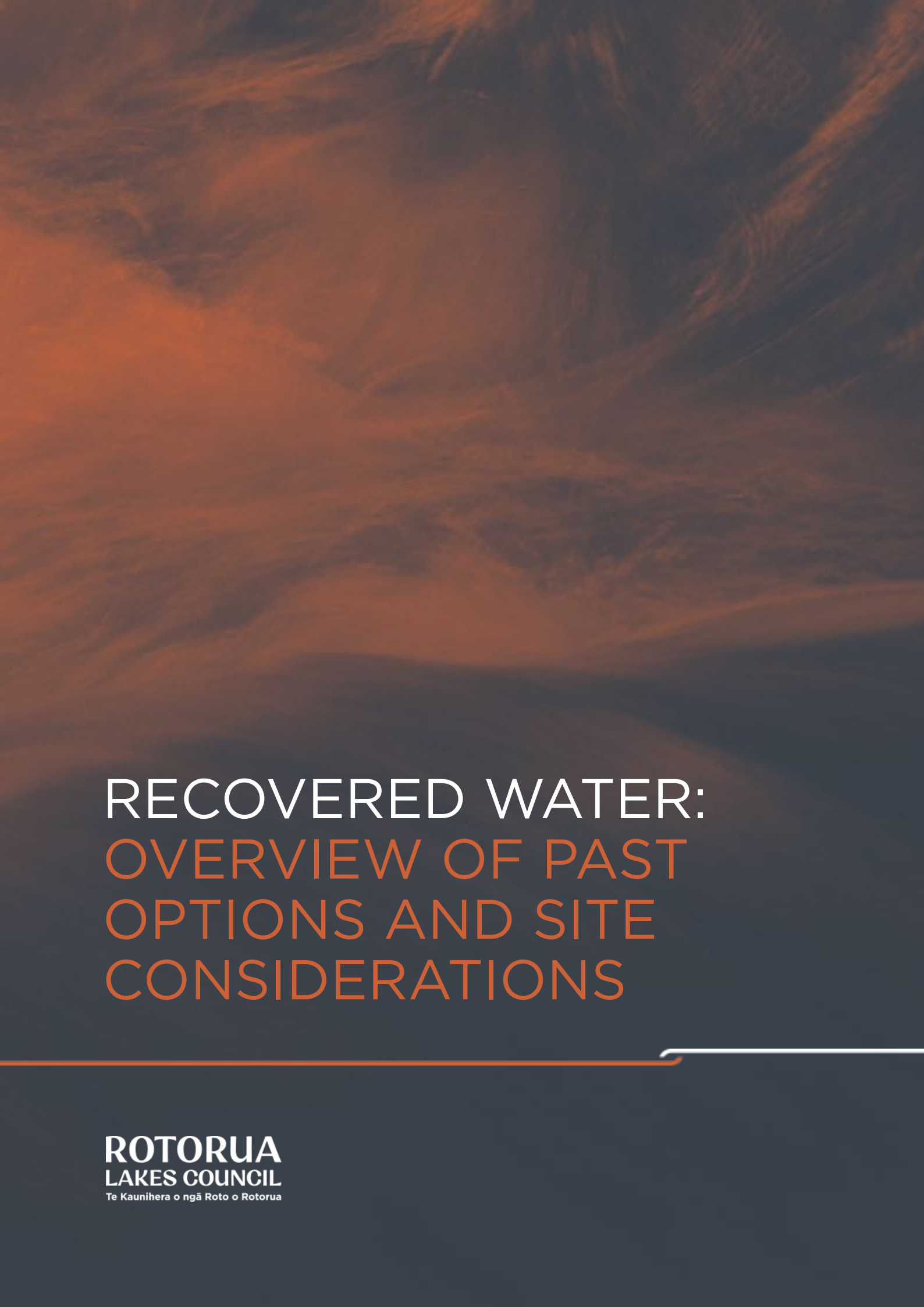


RECOVERED WATER: OVERVIEW OF PAST OPTIONS AND SITE CONSIDERATIONS

ROTORUA
LAKES COUNCIL
Te Kaunihera o ngā Roto o Rotorua

PREVIOUS EXPLORED OPTIONS AND SITES

A range of treated wastewater discharge and beneficial reuse options were previously considered by the Rotorua Project Steering Committee (RPSC) and a number of additional potential sites were identified at a high level (with no landowner through a Sustainable Forest Approach (SFA).

This followed direction from the Environment Court in 2013 to investigate alternative discharge options, arising from tāngata whenua concerns with the current land treatment system (LTS) in Whakarewarewa Forest.

The preferred treatment option identified by the RPSC is being implemented, and a discharge option is still being considered. This report provides an overview of the discharge options considered to date and links to more detailed information is appended.

Rotorua Project Steering Committee (RPSC)

A stakeholder workshop was held in 2013, with the agreed outcome being the establishment of a committee to consider options and provide a recommendation to RLC. The Rotorua Project Steering Committee (RPSC) was subsequently formed in 2014.

The RPSC was a community-led committee with an independent chair with representation from Te Arawa iwi, hapū and ratepayers. It was supported by a Cultural Assessment Subcommittee, a Technical Advisory Group and local and regional council officers. The Committee was to select an alternative to the LTS, that is the overall Best Practicable Option, based on agreed goals.

A range of treatment and discharge options, and combinations of these, were considered through a “long list” process, which was refined to a “short list” of options for assessment, before the preferred options for the upgrade and discharge were identified.

RPSC Long list of options

The RPSC developed a long list of options that included various treatment processes, add-on technologies, and concepts for returning the treated wastewater to the natural environment. The long list did not include specific discharge locations. but included the following concepts for the discharge:

- Alternative locations in the Lake Rotorua catchment
- Alternative locations outside of the Lake Rotorua catchment which would help achieve nutrient reductions to Lake Rotorua eg pipe to a land or water discharge south of Rotorua, in the lower Kaituna Catchment, Tarawera or Rotoiti catchments.
- Geothermal aquifer reinjection
- Direct and indirect discharge to water
- Dual discharge – base flows to land and stormflows to the lake

RPSC Short-list of options

The group considered treatment and discharge options separately. Six options for upgrading the treatment plant were short-listed and assessed and a preferred option was identified - to upgrade the WWTP to deliver a significant increase in capacity and achieve a water quality close to the practical limits of current nutrient removal technology. The upgrade includes double-barrier

disinfection and produces water that meets the relevant water quality criteria for recreational use and non-potable re-use. The upgrade was progressed and will be complete lake 2026.

The following concepts for returning treated water to the environment, prior to it reaching Lake Rotorua, were considered, noting that locations in the forest were considered out-of-scope for the RPSC as they were tasked with identifying alternatives to a discharge in the forest:

- **To land**
- **Direct discharge to water** eg via an open pipe or rock passage
- **Indirect discharge to water** eg via a wetland, rapid infiltration beds, riparian gabions, or a monitoring pond

Discharge to Land

A constraints mapping exercise was carried out by consultants to identify potentially suitable land for slow-rate irrigation. It did not differentiate between multiple-owned Māori land and freehold title but noted that differences in land title would impact upon whether land could be purchased or leased. Three parcels were identified along with indicative costs **(Appendix 1)**. The option was "parked" by RPSC and not pursued further because of prohibitive cost and difficulty in acquiring potential sites. The discussion turned to rapid infiltration and options that would require less land than what is required for slow rate irrigation.

Discharge to Puarenga Stream After Land Contact

The RPSC considered discharging through riparian gabions to the adjacent Puarenga Stream **(Appendix 2)**. The Puarenga Stream discharge option did not proceed because of significant cultural impacts to local iwi, and instead recommended further consideration of either a piped discharge to Lake Rotorua or discharge via the Te Arikiroa Thermal Channel.

Direct discharges to water – shoreline and deep lake outfall

The RPSC considered discharging from the shoreline and into the deeper waters of Lake Rotorua **(Appendix 3).** This option was removed from the preferred scheme evaluation process at the RPSC's meeting on 20 August 2015. The decision was guided by Te Arawa Lakes Trust members on the RPSC, and was made following discussions about installing a land contact and cascade system at the wastewater treatment plant site prior to a discharge to the adjacent areas of Lake Rotorua.

Discharge to a Land Contact Bed and Te Arikiroa Channel (Preferred RPSC Option)

A discharge through the channel that was first passed through a land contact bed, was determined by the RPSC to be the preferred option (also referred to as "least disliked". **(Appendix 4).** That decision was not unanimous as recorded in the committee minutes. As outlined in the second CIA (Companion Document No. 2), the Cultural Advisory Group subsequently considered this option and determined that a natural-looking channel and a bund on the channel's eastern side to prevent any chance of flow across the Sulphur Flat to the Puarenga Stream would be an acceptable solution.

This option was developed and in 2018 Rotorua Lakes Council submitted a resource consent application, which Te Arawa Lakes Trust (TALT) opposed, and the consent application was placed on hold.

Potential Forest Sites

After the 2018 Consent application for the RPSC preferred option being placed on hold, RLC, CNI Iwi Holdings and TALT agreed to work together towards finding an alternative solution for discharging the treated wastewater. This was called the Sustainable Forest Approach (SFA). The agreement — Kawenata – Puarenga Catchment of Te Rotoruanui-a-Kahumatamomoe — is guided by Te Tūāpapa o ngā Wai o Te Arawa (the Te Arawa Cultural Values Framework).

While the RPSC was unable to consider the forest as a location for the short-listed discharge concept - to discharge to a wetland or land filter (rapid infiltration) – the introduction of the new SFA brought the forest locations into scope.

There was a preference for open water courses (rock-lined channels) instead of pipes, although pipes were included in the feasibility study areas where there are steep slopes as pumice and ask soils are easily eroded. The following locations were considered, and a map is appended **(Appendix 5)**

- **A. 1 - SH5:** Two locations east of State Highway 5 (SH5) were assessed, one forming higher ground (Site 1a) and the second (Site 1b) to the south forming a low-lying area near the Kauaka Stream. Surface drainage from both these locations would be into the Kauaka Stream to the southwest (draining north). These sites are existing wetlands with national significance and it was determined that it would be unlikely that a consent to discharge to them would be successful.

- **B. 2 - Duck Pond Gully:** Site 2 is within a native bush clad gully in plantation pine forest downstream of Duck Pond. Downstream of Site 2 the Waipa Stream flows through several culverts before emerging at the 'Secret Spot' and mountain bike car parking area. There are several businesses within approximately 700m of Site 2 including the Waipa Mill, although the stream flows in a well-defined channel approximately 2m below surrounding ground level.

- **C. 3 - Bakers Hollow:** Site 3 is in the mountain bike park and includes an area locally known as "Bakers Hollow" and contains a mountain bike trail (Tahi) and is downstream of the Waipa Mill. Vegetation is mainly exotic consisting of a mixture of pine and other non-natives and open grassed areas. No flowing streams were noted in the area. This option that appeared to have the least constraints Approximately 15 hectares is potentially available for this site with the potential for flood storage/detention to reduce flood flows into the Waipa Stream.

- **D. 4 - Wetland A/B**
  Located at the Nursery and Pohaturoa Rd Intersection discharging to Bakers Hollow
- **E. 4 - Wetland A/B**
  Located at the Nursery and Pohaturoa Rd Intersection discharging towards the mill
- **F. 5 - Wetland Pond C/D**
  The Wash and Spruce Rd intersection that discharges towards the mill
- **G. 1/10.22 - SH5 Waipa adjacent to Kauaka River**
- **H. 2/10.22 – SH5 Wetland stream.** Feeds into Kauaka
- **3/10.22 – Ohineuia**

Assessment of forest sites

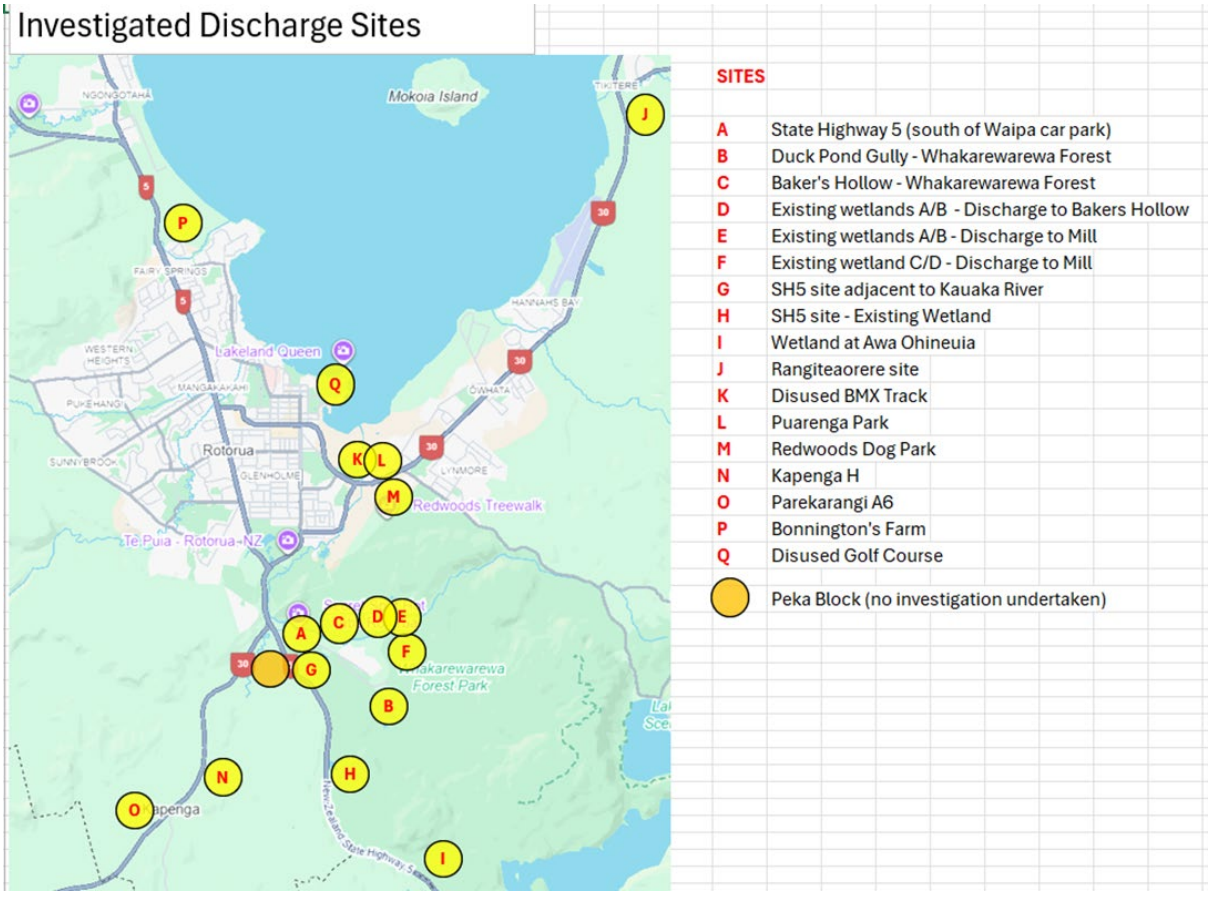
The assessments included investigations and site walkovers. Site 3 (including Bakers Hollow) and Wetland A/B (with a Site 3 discharge) appeared to have the least constraints (Appendix 6). These sites

- are close to existing RLC Land Treatment System storage pond infrastructure resulting in significantly lower construction and operation costs than Sites 1 and 2,
- should be the easiest to construct,
- are likely to have favourable ground conditions for soakage of discharged water. However, groundwater from Wetland A/B has the potential to affect receptors including the Waipa Mill and has a relatively small area available for wetland development.

There was opposition from some landowners It was suggested that other site options need to be considered - wider than CNI land.

Additional potential sites

A wider search was carried out to identify additional potential sites (J-Q). It is noted that this was high-level only i.e. sites identified as potential options, with no landowner engagement, discussions, or agreements to date. A land parcel review was carried out with the following criteria: proximity; size location and land use; slope; soil and accessibility. The following sites were identified within the Rotorua catchment as being potential.



Appendix 1 - Discharge to Land

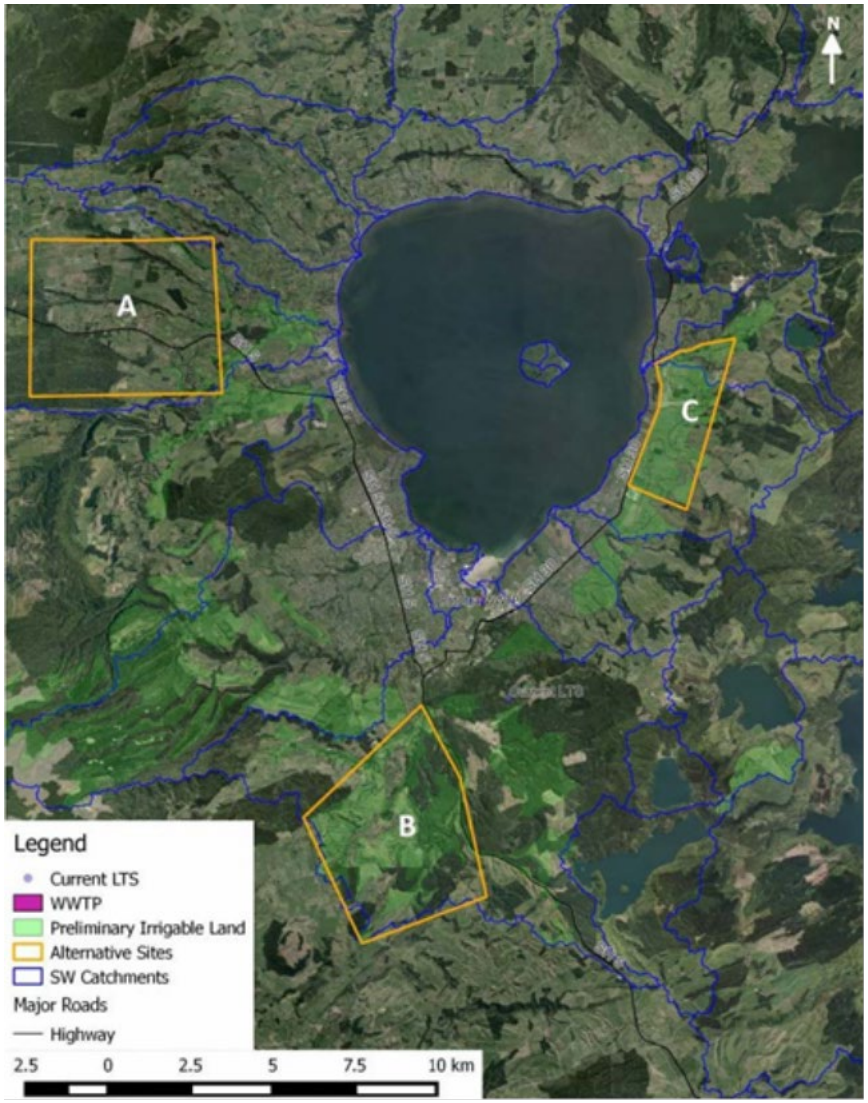
A preliminary constraints mapping and costing exercise was carried out in 2015 to identify contiguous land in the catchment that could potentially be suitable for irrigation.

Parameter	Limit/Constraint
Slope	< 20°
Soil	Well to moderately drained
Flood return	1:20 FRI, landward SH30
Rivers and streams	Flood class 1 to 3 (< 1:20 FRI)
Distance WWTP	Within 10 km of WWTP
Urban areas	Exclude

Approximately 500 ha would be required for slow-rate irrigation at 5mm per day or 150ha for rapid irrigation at 20mm per day.

It did not differentiate between multiple owned Māori land and freehold title but noted that differences in land title would impact upon whether land could be purchased or leased.

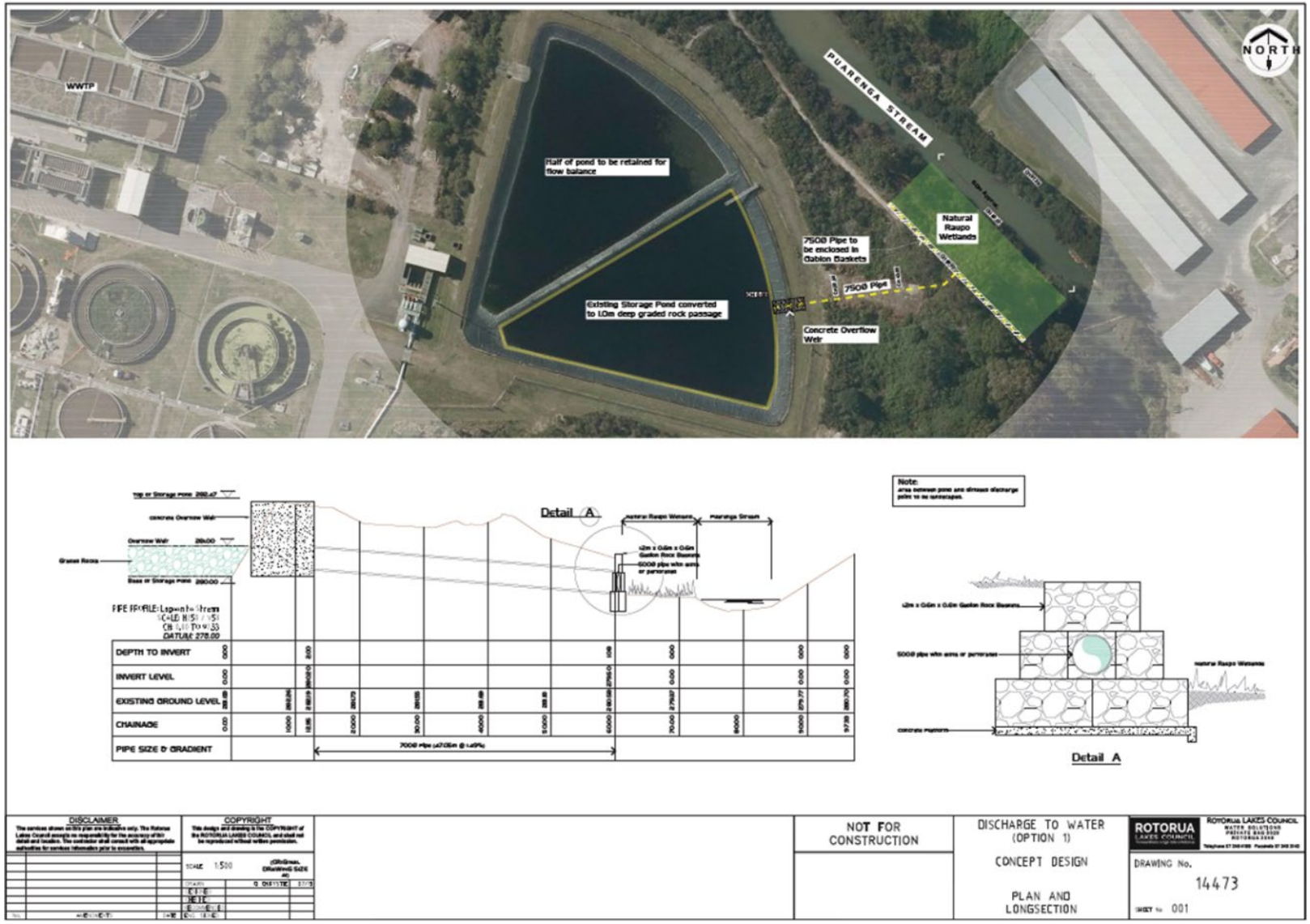
Three parcels or irrigable land were identified along with preliminary indicative costs (2015).



Area & Option	Loading Rate (mm/day)	Land Area Including Buffer Zones (ha)	CAPEX ($M)	OPEX ($M/Yr)	NPV ($M)	Key Risks
Area A (Option 5)	5	600	106.90	3.11	154.26	Geotechnically challenging and ability to consent the activity
	20	150	59.91	2.62	105.33	
Area B (Option 5)	5	600	70.44	2.45	110.47	High number of streams, hilly, complex irrigation arrangement and ability to consent the activity
	20	150	38.08	1.96	73.24	
Area C (Option 5)	5	600	77.83	1.42	94.12	Sandy soils, proximity to Lake Rotorua, likely to have relatively high land value and ability to consent the activity
	20	150	37.52	0.97	51.58	

The option was “parked” by RPSC and not pursued further because of prohibitive cost and difficulty in acquiring potential sites. The discussion turned o rapid infiltration and options that would require less land than what is required for slow rate irrigation.

Appendix 2 - Concept for a discharge to Puarenga Stream

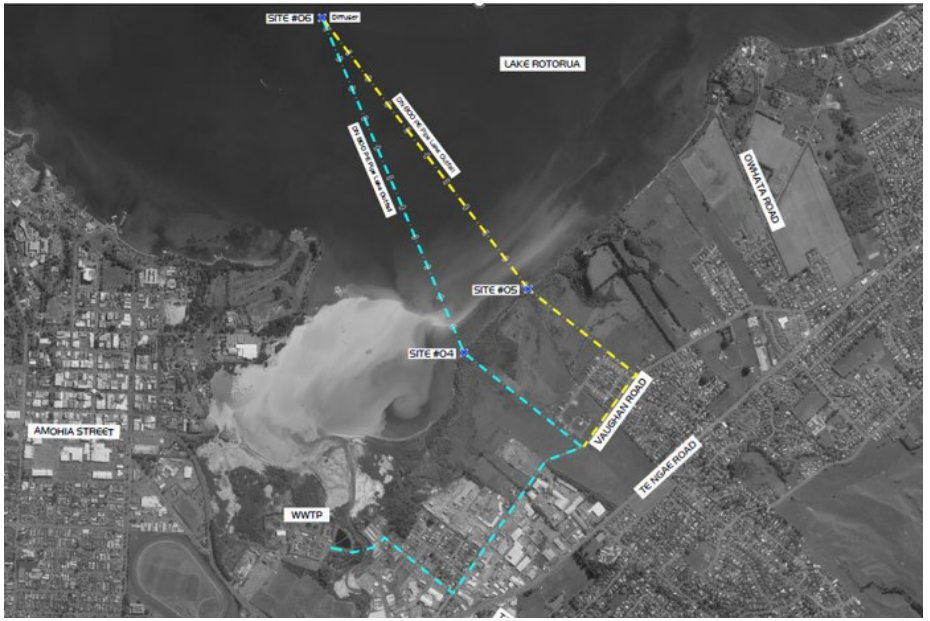


Appendix 3 - Direct Discharge to Water: Shoreline and Deep Lake Outfall

- Puarenga Stream - sites 1 and 3
- Te Arikiroa thermal channel - site 2
- Out from Vaughans Rd – sites 4 and 5
- Offshore outfall piped from sites 4 and 5 to site 6

Concept of discharge to shoreline

Concept of discharge to lake



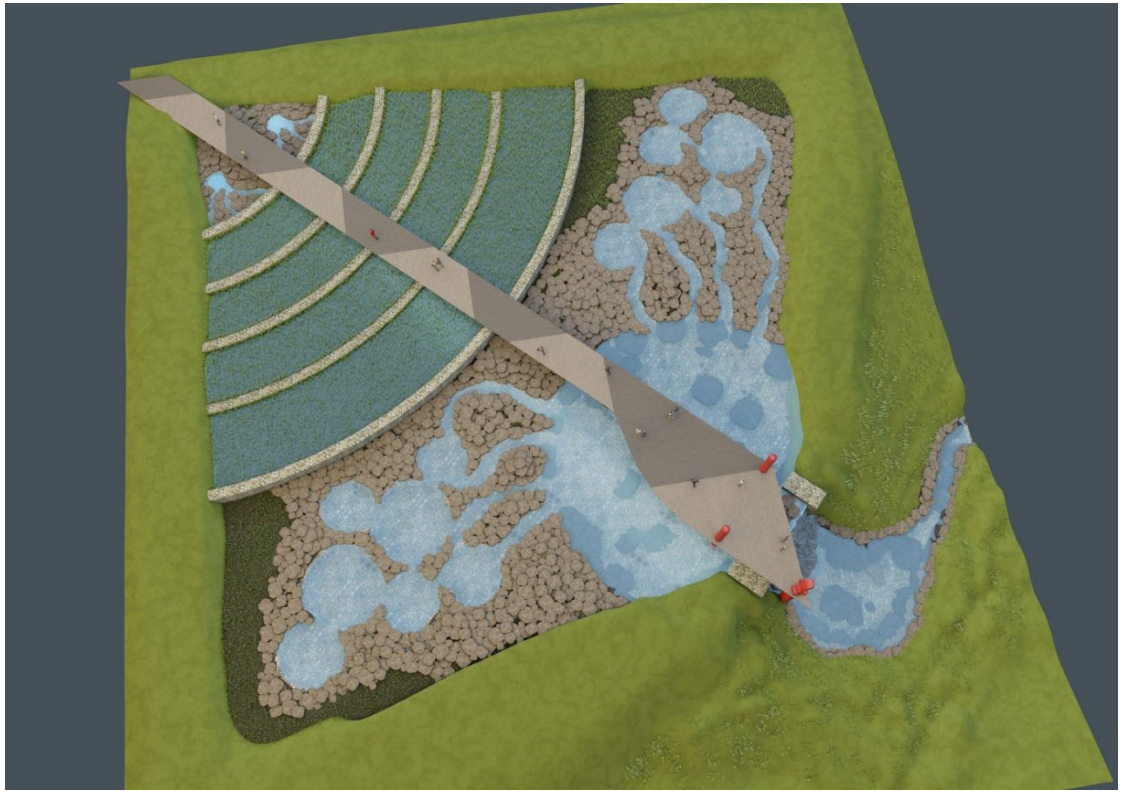
Appendix 4- Discharge to Te Arikiroa a Thermal Channel after a Land Contact Bed (Preferred RPSC option)

The RPSC preferred discharge option was through a land contact bed to the Te Arikiroa Thermal Channel. The focus turned toward the developing the concept for the land contact bed which would be installed immediately after the new wastewater treatment plant and prior to the discharge to the thermal channel. The land contact bed concept was developed by RLC's technical personnel and the CAS in consultation with a Mātauranga Māori experts' group.

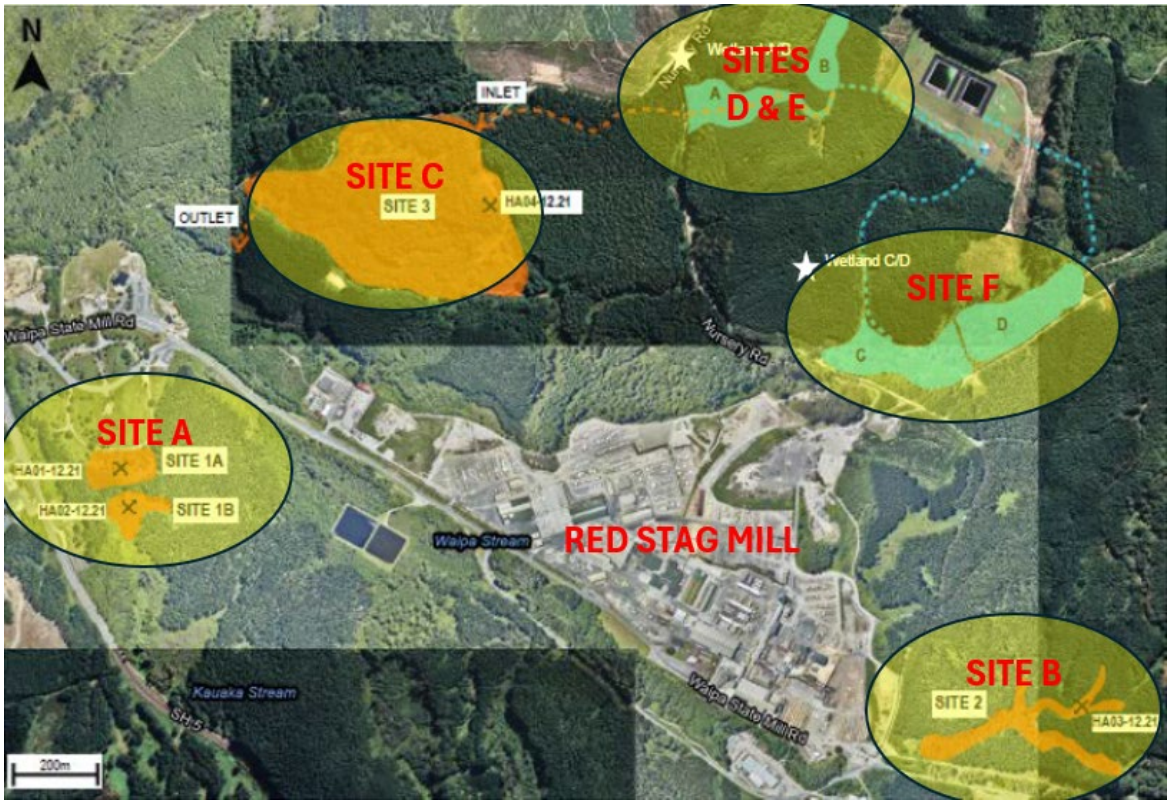
The components of the preferred scheme involved:

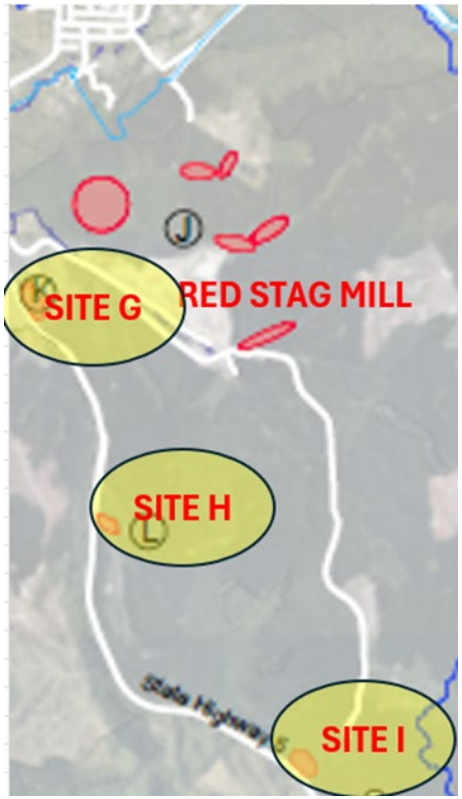
- Constructing a treatment facility that incorporated Mātauranga and Mātapono Māori. The facility involved a range of aggregate and wetland type sections representing natural and cultural environments.
- Repurposing an existing retention pond within the WWTP for the land contact bed concept.
- Directing the treated wastewater to the land contact bed and then discharging to the Te Arikiroa Thermal Channel via a waterfall spillway structure.
- Discharging the treated wastewater into Sulphur Bay (also known as Puarenga Bay), part of Lake Rotorua.

An engagement plan was developed with the Mātauranga Māori expert group, exploring cultural requirements of the proposed bed and discharge structure.

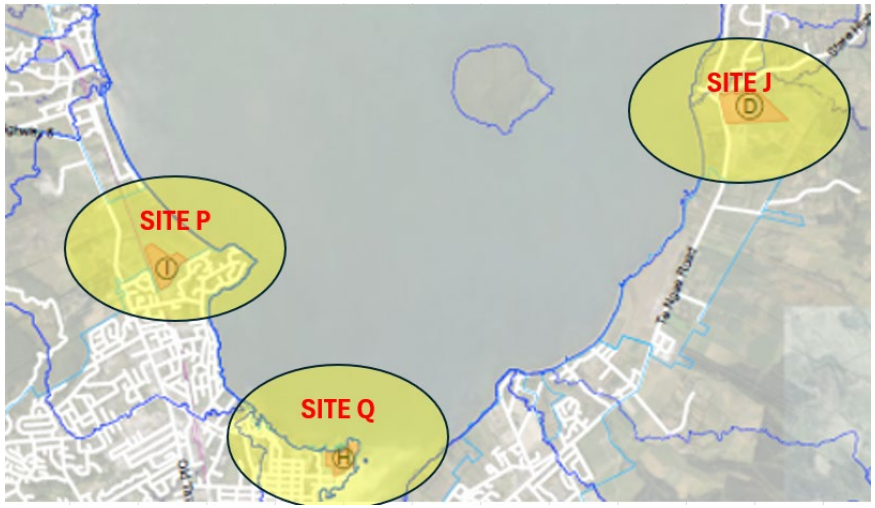


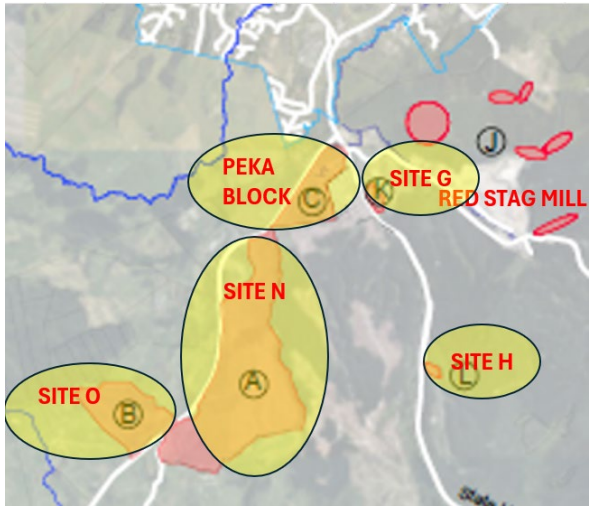
Appendix 5. Potential Forest and Additional Sites

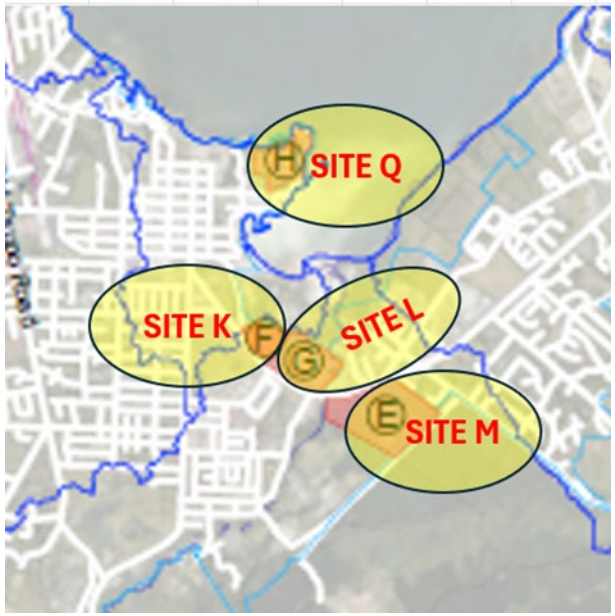




A	State Highway 5 (south of Waipa car park)
B	Duck Pond Gully - Whakarewarewa Forest
C	Baker's Hollow - Whakarewarewa Forest
D	Existing wetlands - Discharge to Bakers Hollow
E	Existing wetlands - Discharge to Bakers Hollow
F	Existing wetland - Discharge to Mill
G	SH5 site adjacent to Kauaka River
H	SH5 site - Existing Wetland
I	Wetland at Awa Ohineuia







J	Rangiteaorere site
K	Disused BMX Track
L	Puarenga Park
M	Redwoods Dog Park
N	Kapenga H
O	Parekarangi A6
P	Bonnington's Farm
Q	Disused Golf Course

Appendix 6 Evaluation of potential forest wetland sites

SFA Site Selection Evaluation

01.11.22

Criteria	Weighting	Site						Additional Sites Oct 2022			Consideration (for each criterion / constraint)
		1 - SH5	2 - Duck Pond Gully	3 - Bakers Hollow	4 - Wetland A/B (Bakers Discharge)	4 - Wetland A/B (Mill Discharge)	5 - Wetland C/D (Mill discharge)	Site 1/10.22	Site 2/10.22	Site 3/10.22	
Location	1	2	4	5	5	4	4	2	3	2	Location/availability in general cadastral boundaries, ownership, caveats, land use etc.
Groundwater	**1.5**	6	3	7.5	6	3	1.5	6	6	6	Flow direction, down gradient development and effects
Surface water	1	3	2	4	4	2	2	2	1	1	Flooding potential, dry and wet watercourses, water quality/ecology effects inc. wetlands.
Geotechnical	1	3	2	3	3	1	1	2	2	2	Slope instability settlement, erosion, channel formation etc.
Anticipated infiltration	**2**	4	2	10	8	8	6	2	2	2	Permeability of soils under the wetland and down gradient, depth to groundwater
Māori Cultural	1	3	3	3	3	3	3	3	3	3	Sites of special significance, any archaeological, other
Constructability factors	1	2	2	5	4	2	2	2	1	1	Requirements, difficulties, ease of construction and operation
Infrastructure	1	1	2	4	5	2	2	1	1	1	Connection from WWTP, LTS storage basins, relative costs
Potential downgradient effects	**2**	6	6	8	8	4	2	6	6	6	Land use, infrastructure (flooding) - both actual and perceived
Recreation considerations	**0.5**	1.5	1.5	2	2	2	2	1.5	0.5	0.5	Existence of recreation areas now and planned
TOTAL (out of 5)		**2.6**	**2.3**	**4.3**	**4.0**	**2.6**	**2.1**	**2.3**	**2.1**	**2.0**	

Key

1 Fatal ecology flaw

2 Potential fatal ecology flaw

Note - Additional Oct.2022 site assessment is high level

Evaluation of additional potential sites

Note:
The scoring criteria for sites J to Q were different to those for sites A To I
Scores for sites J to Q in the table below represent the best alignment to the criteria used for sites A to I.
Site suitability is scored from 1 to 5, with 1 being 'least suitable' and 5 being 'most suitable'

Criteria Used For SFA Investigations	Weighting	Site							
		J	K	L	M	N	O	P	Q
		Rangiteaorere	BMX Track	Puarenga Park	Dog Park	Kapenga H	Parekarangi A6	Bonningtons Farm	Golf Course Site
Location	1								
Groundwater	1.5								
Surface water	1	2	8	8	8	5	5	2	5
Geotechnical	1	8	8	8	8	2	2	5	8
Anticipated infiltration	2	6.8	6.8	5.0	8.0	3.7	3.7	6.8	5.0
Māori Cultural	1								
Constructability factors	1	5	5	5	8	2	2	5	5
Infrastructure	1	2	8	8	8	2	2	2	5
Potential downgradient effects	2	5	5	5	8	2	2	5	5
Recreation considerations	0.5								
TOTAL (out of 5)		**2.1**	**3.3**	**3.2**	**4.0**	**1.3**	**1.3**	**1.9**	**2.7**

Appendix 7. Links to further information

RPSC options and assessments

Rotorua WWTP Applications for Resource Consents and Assessments of Environmental Effects. 20 August 2018.

- Main document ECM_22312701_v1_Rotorua WWTP AEE FINAL 2018-08-20.
  - Section 9 Consideration of Alternatives/Options (p125-168)
  - Section 4.4.4 Land Contact Bed and Discharge Structure (p35-40)
  - Section 4.4.5 Te Arikiroa Thermal Channel Discharge Arrangement (p41-42)

- Companion documents ECM_22307513_v1_Combined Companion Documents FINAL 2018-08-20

  No. 1 Cultural Impact Assessment of Rotorua Land Treatment System Alternatives April 2017. Prepared by Antoine Coffin of Te Onewa Consultants; and

  No.2 Cultural Impact Assessment of a Discharge of Treated Wastewater to Lake Rotorua through a Land Contact Bed at Puarenga Bay, Rotorua April 2018. Prepared by Antoine Coffin of Te Onewa Consultants.

- Support documents https://r3nk7o.digitalcityplatform.online/RedPublishPROD/api/docs/22307576?f=inline

No. 1 Lakes Water Quality Society Project Rotorua Clean Water Proceedings September 2013;

No. 2 Mott MacDonald Four Alternatives Reports:

2A. Mott MacDonald. (2014, December). Detailed Feasibility Study of Alternatives to Land Treatment. Rotorua District Council;

2B. Mott MacDonald. (2015, June). Alternative Land Treatment Sites - Revision Four;

2C. Mott MacDonald. (2015, June). Supplementary Report - Alternative Land Treatment Sites - Version 2;

2D. Mott MacDonald. (2015, June 8). Wastewater Strategy Version 3;

No. 3 University of Waikato - Lake Rotorua Treated Wastewater Discharge: Environmental Effects Study October 2015 ERI Report 80. Prepared by Jonathan Abell, Chris McBride, David Hamilton;

No. 4 University of Waikato - Assessments of Effects of Proposed Treated Wastewater Discharge to the Thermal Channel and Sulphur Bay (Lake Rotorua) June 2018. ERI Report 91. Prepared by A Dada, B Hick, N Ling and D Hamilton;

No. 5 Analysis of Selected Emerging Organic Contaminants in MBR Treated Effluent and at Two Sites Within and Outside the Discharge Point Mixing Zone with Lake Rotorua, November 2017. Prepared by Dr Grant Northcott;

No. 6 Public Health Risk Assessment, Stantec, November 2017 incorporating the Quantitative Microbial risk Assessment for Treated Rotorua Wastewater NIWA March 2017;

No. 7 Te Arikiroa Thermal Channel Effects Assessments and Alternatives Considered (11 Documents)

- Stantec Technical Note, Rotorua Lakes Council Wastewater Resource Consent Project, Te Arikiroa Thermal Channel – Concept Design, (March, 2018)
- Rotorua Wastewater Treatment Plant Upgrade (July, 2018). 1D Modelling of Te Arikiroa Channel, Revision 3, Stantec
- Rotorua Wastewater Treatment Plant Upgrade (July, 2018). 2D Modelling of Te Arikiroa Channel, Stantec
- Rotorua Wastewater Treatment Plant Upgrade, Discharge Channel, Construction Methodology, (July, 2018). Rotorua Lakes Council, Jacana Consulting
- Thermal Channel Feasibility Options Information (April-May 2018) Jacana Consulting
- Geothermal Assessment of Te Arikiroa Thermal Channel (Sulphur Bay, Rotorua), (May, 2018) GNS
- Rotorua WWTP Consenting Project Te Arikiroa Thermal Channel Contamination Assessment, (July, 2018) Stantec
- Rotorua WWTP Consenting Project Te Arikiroa Thermal Channel Site Management Plan, (July, 2018) Stantec
- Ecological Management Plan for Part of Sanatorium Reserve, Rotorua (May 2017), Wildlands Consultants
- Ecological Assessment of Works Proposed for the Discharge Channel from the Rotorua Wastewater Treatment Plant (August, 2018), Wildlands Consultants
- Rotorua Wastewater Treatment plant Te Arikiroa Thermal Channel – Assessment of Effects on Natural Character, Landscape, and Amenity (August, 2018), Wildlands Consultants

No. 8 Project Consultation Information

Potential Forest Locations

Stantec NZ. Rotorua Wastewater Investigations Sustainable Forest Approach Stage 2 Site Selection, March 2022 (Rev.1 19.08.22)
ECM_22315311_v1_SFA Site Selection Report_FINAL_20220819

Stantec NZ. Rotorua Wastewater Investigations Sustainable Forest Approach Stage 2 Site Selection, MCA addendum Nov 2022
ECM_22315835_v1_Forest Sites_ MCA addendum_final draft 20221125

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