



ROTORUA
LAKES COUNCIL
Te kaunihera o ngā roto o Rotorua

Contract No. 22/038
Tarawera Sewerage Scheme
Construction - Stage 1
Fulton Hogan Limited

TABLE OF CONTENTS

SECTION A: CONDITIONS OF CONTRACT

1. Contract Agreement
2. General Conditions of Contract – NZS3910: 2013
3. Special Conditions of Contract
4. Schedule 5: Form of Contractor's bond in lieu of retentions (replaces Schedule 5 of NZS 3910:2013)
5. Schedule 15: Practical Completion Certificate (replaces Schedule 15 of NZS 3910:2013)
6. Schedule 16: Final Completion Certificate (replaces Schedule 16 NZS 3910:2013)

SECTION B: SPECIFICATIONS

SECTION C: PAYMENT

1. Basis of Payment
2. Schedule of Prices

SECTION D: THE CONTRACTOR'S PROPOSAL

1. Contractor's non-price attributes
2. Indicative Programme

CONTRACT AGREEMENT

CONTRACT FOR: Tarawera Sewerage Scheme Construction – Stage 1.

CONTRACT NUMBER: 22/038

This contract is made on the 11th day of November, 2022

BETWEEN FULTON HOGAN LIMITED ("the Contractor")

AND ROTORUA DISTRICT COUNCIL (RDC) a territorial authority under the Local Government Act 2002, and carrying on business under the name of Rotorua Lakes Council (RLC) ("the Principal")

WHEREAS

- A. The Principal has engaged the Contractor to perform the Services in respect of the Project (both as defined in the General Conditions) to be or being carried on by the Principal.
- B. The Agreement sets out the terms and conditions on which the Services shall be supplied.

IT IS AGREED AS FOLLOWS:

- 1. THE Contractor shall construct, complete, commission and deliver the Contract Works described in the Contract documents.
- 2. THE Principal shall pay the Contractor the sum of THIRTEEN MILLION, THREE HUNDRED AND THIRTY THREE THOUSAND, FIVE HUNDRED AND THIRTY SIX DOLLARS AND THIRTY NINE CENTS (\$13,333,536.39), inclusive of provisional sums, exclusive of GST, or such greater or lesser sum as shall become payable under the Contract documents at the times and in the manner provided in the Contract documents.
- 3. EACH party shall carry out and fulfil all other obligations imposed on that party by the Contract documents.
- 4. The Contract comprises the following documents:
 - (a) This Contract Agreement;
 - (b) Schedule 1: Special Conditions of Contract – Specific Conditions of Contract;
 - (c) Schedule 2: Special Conditions of Contract – Other Conditions of Contract;
 - (d) The General Conditions of Contract NZS 3910:2013 (including other Schedules);
 - (e) Specifications attached to this Agreement;
 - (f) The Contractor's Proposal attached to this Agreement
- 5. The documents comprising the Contract shall be taken as mutually explanatory, but in the case of ambiguity or conflict the priority of documents shall be as listed in clause 5 above, with each document prevailing over a document lower in the list.

- 6. This Contract shall constitute the entire agreement between the parties. This Contract supersedes all prior negotiations, representations, and warranties, except insofar as the same are expressly incorporated herein.
- 7. This Contract may be executed in any number of counterparts. All counterparts will constitute one instrument.
- 8. Any party may enter into this Contract by way of electronic signature in accordance with Part 4 of the Contract and Commercial Law Act 2017.

SIGNED BY

Authorised Signatory of Contractor

Anida Veiga Regional Manager

Name and Position

In the presence of:

Signature of Witness

Ken McLeod

Name of Witness

SIGNED BY

Authorised Signatory of Principal

Geoff Williams, Chief Executive

Name and Position

In the presence of:

Signature of Witness

Kim McGrath

Name of Witness

Schedule 1 – Special Conditions of Contract – Specific Conditions of Contract

Clause <i>in General Conditions</i>	Title and subject matter	Specific condition data
1.	INTERPRETATION	
1.2	Definitions	
	The Principal is:	Rotorua District Council
	of:	1061 Haupapa Street, Rotorua 3046
1.2, 10.2, 12.4.4	Separable Portions	
	• Are there any Separable Portions in this Contract?	No
	• If yes, the Separable Portions are as follows and as further defined in the Contract:	N/A
2.	THE CONTRACT	
2.1	Type of Contract	
2.1.1	This Contract is a:	
	(a) Lump sum contract governed by 2.2;	<input type="checkbox"/>
	(b) Measure and value contract governed by 2.3;	<input checked="" type="checkbox"/>
	(c) Cost reimbursement contract governed by 2.4.	<input type="checkbox"/>
2.4	Cost reimbursement contract	N/A
2.4.1	Allowance(s) which are to be added to Net Cost in a cost reimbursement contract or for parts of the Contract Works which are required to be carried out on a cost reimbursement basis: (If percentages are shown as zero or nil, allowances for overheads and profit are deemed to be included in Net Cost.)	
	• Allowance for On-site Overheads:	Nil (%)
	• Allowance for Off-site Overheads and Profit:	Nil (%)
2.4.4	Indicative estimates of the Contract Price:	
	Are indicative estimates required?	No
2.5	Local authority contracts	
2.5.1	Is this Contract a local authority contract to which 2.5.2 applies?	Yes
2.5.3	Is this Contract a contract in a public place to which B1 and B2 of Appendix B apply?	Yes
2.5.4	Is this Contract a road contract to which Appendix B applies?	No
	If yes, the allowance under B3 shall be:	N/A
2.6	Evidence of Contract	
2.6.2	How is the Contract Agreement to be executed?	Three sets of contract documents, signed by an authorised representative of the Principal will be forwarded to the Contractor for signing. Only the Contract Agreement is required to be signed by an authorised representative of the Contractor. The Contractor shall retain one set and return the other two sets to the Principal.
2.7	Documents prepared by the Engineer or Principal	
2.7.1	Copies of the Contract shall be supplied without charge to the Contractor in the following electronic form:	PDF or MS Word/Excel.

Clause <i>in General Conditions</i>	Title and subject matter	Specific condition data
3.	BONDS	
3.1	Contractor's Bond	
3.1.1	Is a Contractor's Bond required?	No
3.1.2	If yes, the amount of the Contractor's Bond shall be:	N/A
3.2	Principal's Bond	
3.2.1	Is a Principal's Bond required?	No
3.2.2	If yes:	
	The amount of the Principal's Bond shall be:	N/A
	The surety for the Principal's Bond shall be:	N/A
4.	SUBCONTRACTS	
4.2	Nominated Subcontractors	
4.2.1	Nominated subcontractors are:	N/A
5.	GENERAL OBLIGATIONS	
5.4	Possession of the Site	
5.4.1	The Contractor shall be given Possession of the Site:	(Select one to apply, (a) or (b))
	(a) 10 Working Days after the Date of Acceptance of Tender	<input type="checkbox"/>
	(b) On the following date: As agreed with the Principal	<input checked="" type="checkbox"/>
5.4.3	Limits on the Contractor's right of entry to adjoining properties are:	Refer to section 1.33 of the Specifications.
5.5	Separate Contractors	
5.5.1	Separate Contractors who may be carrying out work on the Site concurrently with the Contract Works are:	Nil
5.5.2	Are facilities for Separate Contractors required?	
	If yes, details of facilities required are:	N/A
5.6	Care of the works and Site	
5.6.6(g)	Further risks specifically excepted are:	Nil
5.10	Programme	
5.10.4	Is the programme required to be a Comprehensive Programme? Yes	
5.10.4(e)	If yes, other requirements for the Comprehensive Programme are:	Critical path shall be shown. Timing of any Materials to be provided by the Principal shall be shown.
5.10.5	The Comprehensive Programme shall use the following software:	MS Project
5.10.6	Updates of the Comprehensive Programme shall be provided at the following intervals:	Monthly to be provided for monthly contract meetings

Clause <i>in General Conditions</i>	Title and subject matter	Specific condition data
5.11	Compliance with laws	
5.11.3	Exceptions to the Principal's obligations to obtain licences under 5.11.3 are:	Any License described in the Specifications as a Contractor responsibility, including: Resource Consents - Refer to section 1.15.1 of the Specification Corridor Access Requests and other traffic management related licenses – Refer to section 1.18 of the Specification.
5.11.4	Exceptions to the Contractor's obligation to give notices and obtain other licences under 5.11.4 are:	Nil
5.17	Safety plan	
	A Contract-specific safety plan is required to be prepared by the Contractor	Yes
5.18	Quality plan	
	Is a quality plan required to be prepared by the Contractor?	Yes
5.19	Traffic management plan	
	Is a traffic management plan required to be prepared by the Contractor?	Yes
5.20	As-built drawings, manuals, and maintenance records	
5.20.1(a)	Are as-built drawings required to be prepared by the Contractor?	Yes
5.20.1(b)	Are operation and maintenance manuals required to be prepared by the Contractor?	Yes
6.	ENGINEER'S POWERS AND RESPONSIBILITIES	
6.1	Appointment of Engineer	
6.1.2	The Engineer is:	Eric Cawte
	whose professional qualification is:	TBA
8.	INSURANCE	
8.1	General	
8.1.1	The party identified below shall arrange the following insurances referred to in the following clauses:	
	8.3 and 8.8 Construction	Contractor
	8.8 Existing structure(s) and contents	N/A
	8.4 Plant	Contractor
	8.5 or 8.9 Public liability	Contractor
	8.5.2 Motor vehicle liability	Contractor
	8.6 Professional indemnity	Contractor
Pot8.1.6	The following forces of nature shall be specifically insured under 8.3, 8.8, or 8.9 as applicable:	
	(a) Landslip:	Yes
	(b) Earthquake:	Yes
	(c) Tsunami:	No

Clause <i>in General Conditions</i>	Title and subject matter	Specific condition data
	(d) Tornado:	No
	(e) Cyclone:	Yes
	(f) Storm:	Yes
	(g) Flood:	Yes
	(h) Lightning strike:	Yes
	(i) Volcanic activity:	Yes
	(j) Hydrothermal activity:	Yes
	(k) Geothermal activity:	Yes
8.3, 8.8	Construction insurance (These items are required to be completed whether the Contractor or the Principal is the insuring party (see 8.1 above))	
8.3.2, 8.8	The following shall have their respective interests noted in the construction insurance policy:	Nil
8.3.3, 8.8	Where construction insurance is required (see 8.1 above), the amount of insurance to be effected for the Contract Works and Materials shall be for not less than the sum of the Contract Price, after the acceptance of the offer, plus the following allowances:	Yes
	(a) An allowance for the Cost of demolition, disposal and preparation for replacement work, equal to:	
	(i) The amount in the right hand column:	(\$ Nil
	(ii) The percentage in the right hand column of the Contract Price adjusted as above:	-
	(b) An allowance for professional fees including the Cost of clerks of works and inspectors, equal to:	
	(i) The amount in the right hand column:	(\$)
	(ii) The percentage in the right hand column of the Contract Price adjusted as above:	5% of the Contract Price.
	(c) An allowance for items to be incorporated in the Contract Works, the Cost of which is not included in the Contract Price, equal to:	
	(i) The amount in the right hand column	(\$ Nil
	(ii) The percentage of the Contract Price adjusted as above, stated in the right hand column:	-
	(d) An allowance for an increase in the Contract Price due to Variations equal to:	
	(i) The amount in the right hand column:	\$
	(ii) The percentage of the Contract Price adjusted as above, stated in the right hand column:	5% of the Contract Price
	(e) An allowance for increased construction Costs due to inflation equal to:	
	(i) The amount in the right hand column:	(\$ Nil
	(ii) The percentage of the Contract Price adjusted as above, stated in the right hand column:	-

Clause <i>in General Conditions</i>	Title and subject matter	Specific condition data
8.4	Contractor arranged Plant insurance	
	Where Plant is required to be insured (see 8.1 above):	(select one to apply, (a) or (b))
	(a) The Contractor shall insure the following items of Plant on the Site for the amounts stated:	
	(b) The Contractor shall insure each item of Plant on the Site having a current market value of more than:	<input checked="" type="checkbox"/> (\$) 50,000
8.5	Contractor arranged public liability insurance	
8.5.1	Where required (see 8.1 above), public liability insurance shall be effected by the Contractor for an amount not less than:	<input checked="" type="checkbox"/> (\$) 10,000,000 in respect of any one incident
	Such public liability insurance may include sub-limits:	
	<ul style="list-style-type: none"> • For liability arising out of vibration, weakening or removal of support, of not less than: 	(\$) N/A
	<ul style="list-style-type: none"> • For liability under the Forest and Rural Fires Act 1977, of not less than: 	(\$) 2,000,000
8.5.2	Where required (see 8.1 above), motor vehicle third party liability insurance shall be effected for an amount not less than:	(\$) 2,000,000
8.6	Contractor arranged professional indemnity insurance	
8.6.1	Where required (see 8.1 above), professional indemnity insurance for design by the Contractor shall be effected for an amount not less than:	
	<ul style="list-style-type: none"> • For any one claim: 	(\$) 1,000,000
	<ul style="list-style-type: none"> • And for an amount in the aggregate of: 	(\$) Nil
8.6.2	Sub-limits of liability for design of parts of the Contract Works by Subcontractors shall be not be less than: (list specific part(s) of Contract Works and applicable \$ sub-limits for any one claim and for an amount in the aggregate, or state if not require(d))	N/A
8.8	Principal arranged construction insurance (refer also to 8.3)	
	In accordance with 8.7.2, the insurance policy wording title is:	N/A
	In accordance with 8.7.2, the extraordinary exclusions, conditions, warranties or endorsements to the policy are:	N/A
8.8.1	Where the Principal is required to effect construction insurance (see 8.1 above):	
	The lead insurer is:	N/A
	Address of lead insurer:	N/A
	The Nominal Deductibles are:	
	<ul style="list-style-type: none"> • For damage arising out of the Contract Works: 	N/A
	<ul style="list-style-type: none"> • For other claims: 	N/A
	<ul style="list-style-type: none"> • For natural perils: 	N/A
8.8.2(a)	The existing structures or properties are:	N/A
	<ul style="list-style-type: none"> • The replacement value to be insured is: 	(\$) Nil

Clause <i>in General Conditions</i>	Title and subject matter	Specific condition data
	<ul style="list-style-type: none"> The lead insurer is: 	N/A
	<ul style="list-style-type: none"> Address of lead insurer: 	N/A
	The Nominal Deductibles are:	
	<ul style="list-style-type: none"> For damage arising out of the Contract Works: 	\$
	<ul style="list-style-type: none"> For other claims: 	\$
	<ul style="list-style-type: none"> For natural perils: 	\$
8.8.2(b)	Other structures or property in the vicinity are:	N/A
	<ul style="list-style-type: none"> The replacement value to be insured is: 	(\$ Nil
	<ul style="list-style-type: none"> The lead insurer is: 	N/A
	<ul style="list-style-type: none"> Address of lead insurer: 	N/A
	The Nominal Deductibles are:	
	<ul style="list-style-type: none"> For damage arising out of the Contract Works: 	N/A
	<ul style="list-style-type: none"> For other claims: 	N/A
	<ul style="list-style-type: none"> For natural perils: 	N/A
8.8.2(c)	Contents insurance:	N/A
	<ul style="list-style-type: none"> The replacement value to be insured is: 	(\$ Nil
	<ul style="list-style-type: none"> The lead insurer is: 	N/A
	<ul style="list-style-type: none"> Address of lead insurer: 	N/A
	The Nominal Deductibles are:	
	<ul style="list-style-type: none"> For damage arising out of the Contract Works: 	N/A
	<ul style="list-style-type: none"> For other claims: 	N/A
	<ul style="list-style-type: none"> For natural perils: 	N/A
8.9	Principal's option to insure public liability	
8.9.1	Where required (see 8.1 above), the Principal shall effect public liability insurance for an amount not less than:	(\$ Nil
	The lead insurer is:	N/A
	Address of lead insurer:	N/A
	The Nominal Deductible is:	N/A
	In accordance with 8.7.2:	
	<ul style="list-style-type: none"> the policy wording title is: 	N/A
	<ul style="list-style-type: none"> extraordinary exclusions, conditions, warranties, or endorsements to the policy are: 	N/A
8.9.2	Such public liability insurance may include sub-limits for:	
	<ul style="list-style-type: none"> Liability arising out of vibration, weakening or removal of support: 	(\$ Nil
	<ul style="list-style-type: none"> Liability under the Forest and Rural Fires Act 1977: 	(\$ Nil
9.	VARIATIONS	

Clause <i>in General Conditions</i>	Title and subject matter	Specific condition data
9.3	Valuation of Variations	
9.3.9	For On-site Overheads:	
	(a) The prices and rates in the Schedule of Prices are inclusive of full allowance for On-site Overheads;	<input checked="" type="checkbox"/>
	(b) The prices and rates in the Schedule of Prices are exclusive of On-site Overheads.	<input type="checkbox"/>
9.3.7, 9.3.9	The allowance for On-site Overheads to be added in accordance with 9.3.9 is:	N/A
	(i) Agreed percentage:	<input checked="" type="checkbox"/> Nil (%)
	(ii) As nominated in the Schedule of Prices;	<input type="checkbox"/>
	(iii) As nominated in the Contractor's tender;	<input type="checkbox"/>
	(iv) A reasonable percentage.	<input type="checkbox"/>
9.3.10	For Off-site Overheads and Profit:	
	(a) The prices and rates in the Schedule of Prices are inclusive of Off-site Overheads and Profit;	<input checked="" type="checkbox"/>
	(b) The prices and rates in the Schedule of Prices are exclusive of Off-site Overheads and Profit;	<input type="checkbox"/>
9.3.11	For time-related Cost, the Working Day rate in compensation for time-related On-site Overheads and Off-site Overheads and Profit in relation to an extension of time to be applied in accordance with 9.3.11 is:	N/A
	(i) Agreed percentage:	<input type="checkbox"/>
	(ii) As nominated in the Schedule of Prices;	<input checked="" type="checkbox"/> Refer 5_Day Works Item 5.4 a) = \$4,172.23
	(iii) As nominated in the Contractor's tender;	<input type="checkbox"/>
	(iv) A reasonable percentage.	<input type="checkbox"/>
9.3.15	For processing of Variations, the percentage to be paid in accordance with 9.3.15 is:	
	(a) Agreed percentage:	<input checked="" type="checkbox"/> Nil (%)
	(b) As nominated in the Schedule of Prices;	<input type="checkbox"/>
	(c) As nominated in the Contractor's tender;	<input type="checkbox"/>
	(d) The reasonable Cost of processing Variations.	<input type="checkbox"/>
10.	TIME FOR COMPLETION	
10.2	Due Date for Completion	
10.2.1	The periods to be used for calculating the Due Date for Completion are:	
	(a) For the Contract Works:	375 Working Days in total, with at least 250 Working Days being after the pump station detailed design has been issued.
	(b) For any Separable Portions:	N/A
10.4	Practical Completion Certificate	

Clause <i>in General Conditions</i>	Title and subject matter	Specific condition data
10.4.5	Prior to the issue of the Practical Completion Certificate:	
	(a) Producer Statements in the form of Schedule 6 are required;	<input checked="" type="checkbox"/>
	(a) Producer Statements as set out in the following parts of the Contract are required:	<input type="checkbox"/>
	(a) Producer Statements are not required.	<input type="checkbox"/>
	(b) As-built drawings and operation and maintenance manuals are required.	<input checked="" type="checkbox"/>
10.5	Damages for late completion	
10.5.1	Liquidated damages shall be applied as follows:	
	<ul style="list-style-type: none"> • In respect of the Contract Works 	\$300 (\$ per Working Day)
	<ul style="list-style-type: none"> • In respect of any Separable Portion(s): 	N/A (\$ per Working Day for each Separable Portion)
10.6	Bonus for early completion	
	Is a bonus to be payable?	No
	<ul style="list-style-type: none"> • If yes, the bonus for the Contract Works is: 	
	<ul style="list-style-type: none"> • If yes, bonuses for any Separable Portion(s) are: 	
11.	DEFECTS LIABILITY	
11.1	Defects Notification Period	
	The Defects Notification Period shall be:	
	<ul style="list-style-type: none"> • For the Contract Works 	12 months following the commissioning of the first properties connected to the Contract Works.
	<ul style="list-style-type: none"> • For any Separable Portion(s): 	
11.3	Final Completion Certificate	
11.3.2(a)	Prior to issue of the Final Completion Certificate:	
	(a) Producer Statements in the form of Schedule 6 are required;	<input type="checkbox"/>
	(b) Producer Statements as set out in the following parts of the Contract are required:	<input type="checkbox"/>
	(c) Producer Statements are not required.	<input checked="" type="checkbox"/>
11.3.2(b)	Prior to the issue of the Final Completion Certificate:	
	(a) As-built drawings and operation and maintenance manuals are required;	<input type="checkbox"/>
	(b) As-built drawings and operation and maintenance manuals are not required.	<input checked="" type="checkbox"/>
11.5	Warranties	
11.5.1	(a) No warranties are required;	
	(b) The Contractor shall provide warranties as set out in the Contract for the following items of work: <ul style="list-style-type: none"> (i) Subcontractor and Supplier warranties as set out in the Specifications. 	<input checked="" type="checkbox"/>

Clause <i>in General Conditions</i>	Title and subject matter	Specific condition data
11.6	Guarantees	
11.6.1, 11.6.2	(a) No guarantees are required;	<input checked="" type="checkbox"/>
	(b) The Contractor shall provide guarantees in the following form:	<input type="checkbox"/>
12.	PAYMENTS	
12.1	Contractor's payment claims	
12.1.3(b) (iii)	Advances for Materials delivered to the Site	
	(a) Advances for Materials delivered to the Site but which have yet to be incorporated in the Contract Works shall not be made;	<input type="checkbox"/>
	(b) Advances for Materials delivered to the Site but which have yet to be incorporated in the Contract Works shall be made, subject to the following conditions:	Refer Addendum to Schedule 1.
12.1.3(b) (iv)	Advances for Temporary Works or Plant	
	(a) Advances for Temporary Works or Plant shall not be made;	<input checked="" type="checkbox"/>
	(b) Advances for Temporary Works or Plant shall be made, subject to the following conditions:	Nil
12.1.3(b) (iv)	Advances for Materials not yet on Site	
	(a) Advances for Materials not on Site shall not be made;	<input type="checkbox"/>
	(b) Advances for Materials not yet on Site shall be made, subject to the following conditions:	Refer Addendum to Schedule 1.
12.3	Retention monies	
12.3.1, 12.3.2	The percentage to be retained from each progress payment and the limit of the total sums retained shall be in accordance with the following:	
	(a) For the Contract Works, a total retention of: <ul style="list-style-type: none"> • 10% on the first \$500,000, and • 5% on amounts in excess of \$500,000, and • With a defects liability retention of half the total retention. 	<input checked="" type="checkbox"/>
12.3.3	Bond in lieu of retention	N/A
	(a) The Contractor may provide a bond in lieu of retentions;	<input checked="" type="checkbox"/>
	(b) The Contractor may not provide a bond in lieu of retentions.	<input type="checkbox"/>
12.8	Cost fluctuations	
	(a) Cost fluctuations shall not be paid;	<input checked="" type="checkbox"/>
	(b) Cost fluctuations shall be paid in accordance with the amended Appendix A.	<input type="checkbox"/>

Clause <i>in General Conditions</i>	Title and subject matter	Specific condition data
	(c) Cost fluctuations shall be paid in accordance with the method described in	<input type="checkbox"/>
12.13	Goods and services tax	
12.13.2	Payment Schedules provided by the Engineer:	
	(a) Shall not be in the form of a tax invoice;	<input type="checkbox"/>
	(b) Shall be in the form of a buyer created tax invoice and the parties agree not to issue any other tax invoice for items covered by the Payment Schedule.	<input checked="" type="checkbox"/>
13.	DISPUTES	
13.4	Arbitration	
13.4.3	If required, the arbitrator shall be nominated by the following Person:	Arbitrators' and Mediators' Institute of New Zealand
15.	SERVICE OF NOTICES	
15.1.2	For the purpose of service of written notice:	
	(a) The address of the Principal is:	Rotorua District Council
	Postal address:	Private Bag 3029, Rotorua Mail Centre, Rotorua 3046
	Delivery address:	1061 Haupapa Street, Rotorua
	Mark for the attention of:	Ian Stabler
	Email address:	ian.stabler@rotorualc.nz
	Other agreed means of electronic communication and address detail:	As mutually agreed by the parties from time to time
	(b) The address of the Contractor is:	Fulton Hogan Limited
	Postal address:	TBA
	Delivery address:	TBA
	Mark for the attention of:	Ken McLeod
	Email address:	ken.mcleod@fultonhogan.com
	Other agreed means of electronic communication and address detail:	As mutually agreed by the parties from time to time
	(c) The address of the Engineer is:	Eric Cawte
	Postal address:	Private Bag 3029, Rotorua Mail Centre, Rotorua 3046
	Delivery address:	1061 Haupapa Street, Rotorua
	Mark for the attention of:	Ian Stabler
	Email address:	ian.stabler@rotorualc.nz
	Other agreed means of electronic communication and address detail:	As mutually agreed by the parties from time to time

Addendum to Schedule 1**12.1.3(b)(iii)
and 12.1.3(b)(iv)**

Advances for Materials delivered to Site and advances for Materials not yet on Site may be made in accordance with the following:

1. The Principal may nominate Materials to be procured by the Contractor as Materials for which advance payments under 12.1.3(b)(iii) (**On Site Advance Payment Materials**) or 12.1.3(b)(iv) (**Off Site Advance Payment Materials**) shall be made.
2. At the request of the Principal the Contractor shall consult with the Principal to assist the Principal to identify Materials that are to be procured by the Contractor that would be suitable for advance payments by the Principal. As part of the consultation the Contractor shall, if requested by the Principal, use all reasonable endeavours to procure the supplier of any potential Off Site Advance Payment Materials to agree to enter into an Agreement for off-site Materials in the form set out in Schedule 14.
3. Following nomination of On Site Advance Payment Materials and/or Off Site Advance Payment Materials the Principal shall make advance payments to the Contractor pursuant to 12.1.3(b) (iii) and 12.1.3(b)(iv) respectively in accordance with the following:
 - (a) The advance payment shall be for the Cost to the Contractor of the applicable Materials;
 - (b) The Contractor shall provide an Off Site Materials Agreement in the form set out in Schedule 14 duly signed by the Contractor and the supplier (as Subcontractor) in relation to the Off Site Advance Payment Materials as a pre-requisite of making the applicable advance.
 - (c) In relation to the On Site Advance Payment Materials the Contractor shall provide as a pre-requisite to the making of the applicable advance:
 - (i) an On Site Materials Agreement in the form set out in Schedule 14, amended as is reasonably required to reflect that the Materials are owned by the Contractor and the Contractor is the bailee duly signed by the Contractor; and
 - (ii) evidence reasonably acceptable to the Principal that the Contractor has at the date of the claim acquired good title to the On Site Advance Payment Materials. Such evidence may include written confirmation from the supplier of the Materials that clear title has passed to the Contractor.
 - (e) The advance payment for the Materials shall be recovered progressively by deduction from progress payments as such Materials are incorporated into the Contract Works and shall otherwise be repayable on the termination of this contract or the resumption of possession of the site by the Principal under 14.2.3.

(For the Principal's option re Free Issue Materials refer 9.7.)

Schedule 2: Special Conditions of Contract – Other Conditions of Contract

The General Conditions of Contract, NZS 3910:2013 Conditions of contract for building and civil engineering construction, are amended as set out herein.

Clause numbers refer to the General Conditions, or additional clause numbers.

1 INTERPRETATION

1.2 Definitions

Add new definitions

Applicable COVID-19 Alert Level means: at the relevant time, the COVID-19 Alert Level in place for Rotorua, New Zealand. As at the date of the Contract Agreement this is confirmed as being COVID-19 Protection Framework Traffic Light Setting Orange.

Contractor's Proposal means the Contractor's Proposal as set out in Section C.

Good Industry Practice mean the standards, practices, methods and procedures conforming to law and to the degree of skill, diligence, prudence and foresight that would reasonably be expected from a highly skilled and highly experienced contractor engaged in activities of a similar scope, nature and complexity to those that are the subject of this Contract and being a contractor who is familiar with and experienced in best practices that are generally recognised in New Zealand as being applicable to such activities.

Health and Safety Requirements means the health and safety requirements set out in the Contract documents and the HSW Act.

HSE Regulator has the meaning set out in 5.7.4(a).

HSW ACT means the Health and Safety at Work Act 2015.

Intellectual Property means all intellectual property rights existing anywhere in the world under statute, common law or equity including but not limited to patents, designs, copyright, trade marks, and any rights of a similar nature whether registered or unregistered (and including applications, and the right to apply, for any of the foregoing), trade secrets, and rights in confidential information.

National Utilities Code means the National Code of Practice for Utility Operator's Access to Transport Corridors Approved 10 September 2015 as subsequently amended or replaced.

Notifiable Event has the meaning in 5.7.4(a).

Pandemic means a serious disease that is widespread in New Zealand and is declared to be a Pandemic by the New Zealand Government or other governmental authority or is the subject of a declaration of a state of National Emergency in New Zealand.

Pandemic Directive means:

- (a) any New Zealand Government directive made pursuant to law (whether by statute, regulation, bylaw or other legislative instrument) in response to a Pandemic; or
- (b) any Pandemic related directive made by the HSW Act Regulator, Ministry of Health or any other government entity having authority in relation to the Pandemic

as may be applicable from time to time during the Contract period.

Pandemic Restrictions means: a Pandemic Directive that prohibits or seriously impedes the progress of the Contract Works on the Site.

PCBU means a person conducting a business or undertaking. PCBU has the meaning set out in the HSW Act.

Principal's Intellectual Property means all Intellectual Property owned by or licensed to the Principal and provided to the Contractor for the purpose of carrying out the Contract Works.

RMA means the Resource Management Act 1991.

Transport Corridor has the meaning set out in the National Utilities Code.

Works Access Permit has the meaning set out in the National Utilities Code.

Add new clause:

1.3.9

Words or expressions used in the Contract that are defined in the National Utilities Code shall, where the context allows, have the meaning set out in the National Utilities Code.

2. THE CONTRACT

2.3 Measure and Value Contract

2.3.1 Add at the end of 2.3.1:

The measured quantity shall not include any quantity of work carried out by the Contractor that:

- (a) does not meet the requirements of the Contract; or
- (b) is additional to the work reasonably required to properly perform the relevant task, or is required to be reperformed, in each case as a result of:
 - (i) damage to or loss of the relevant Contract Works arising out of an event for which the Contractor is responsible under the Contract;
 - (ii) a defect in the Contractor's performance of the Contract Works; or
 - (iii) an act or omission of the Contractor or a breach by the Contractor of its obligations under the Contract;
- (c) is not supported by the supporting documentation and evidence required under the Specifications and/or Basis of Payment.

2.3.6 Add new clause

Where the Schedule of Prices under a measure and value contract provides for lump sum items, 2.2.1, 2.2.4 and 2.2.5 shall apply to each such lump sum item.

2.5 Local authority contracts, contracts in public places, and road contracts

2.5.2

Delete clause and replace with:

The Contractor acknowledges that the Principal in terms of its regulatory function as a local authority is obliged to and shall act as an independent local authority and not as a party to this Contract. The Contractor expressly acknowledges that it shall have no right or claim against the Principal in its capacity as party to this Contract as a result of any lawful action, decision or determination made by the Principal in the performance of its regulatory function as a local authority. Any consent or approval of the Principal acting in its regulatory capacity shall not be construed as a consent or approval of the Principal as a party to this Contract.

2.7.7

Amend clause as follows:

The Contractor shall comply with all additional instructions, documents and Drawings issued pursuant to clauses 2.7.4, 2.7.5 and 2.7.6.

If the Contractor suffers delay in completion of the Contract Works or incurs additional Cost by reason of the late issue by the Engineer or the Principal of any instructions, documents or Drawings in accordance with 2.7.6, that late issue

shall be treated as a Variation. If the Contractor suffers delay in completion of the Contract Works or incurs additional Cost by reason of the issuing to the Contractor of instructions, documents, Drawings or Specifications under 2.7.5, and that delay or additional Cost could not have been foreseen by the Contractor when tendering, such issuing shall be treated as a Variation.

Add new clause:

2.7.8

All Drawings, Specifications and other Contract Information issued by the Engineer or the Principal under this Contract shall remain the property of the Principal and shall not be copied or used by the Contractor for any purpose other than the Contract.

2.9 Assignment

2.9.1

Delete clause and replace with:

The Contractor may not assign, sublet, subcontract or transfer the whole or any substantial right or obligation under the Contract without the written consent of the Principal, which may be given or withheld in the Principal's entire discretion.

Add new clause

2.13 - Warranties - Construction Obligations

The Contractor warrants and undertakes to the Principal that:

- (a) the Contractor and the Contract Works will, when completed, comply with Good Industry Practice and will comply in all respects with any warranties, standards and/or representations contained in the Contractor's proposal and the Specifications;
- (b) no goods or Materials which are generally known or become known prior to incorporation within the Contract Works to be harmful or otherwise not in accordance with Good Industry Practice have been or will be specified or selected by or on behalf of the Contractor; and
- (c) the Contractor is fully experienced and properly qualified, licensed, equipped, organised and financed to perform and complete the Contract Works to the extent specified under the Contract.

4. SUBCONTRACTS

4.1 General

4.1.3 Add to the end of 4.1.3

and the Contractor shall be responsible for the acts, defaults and neglects of any Subcontractor or Subcontractor's agents, employees or consultants as fully as if they were the acts, defaults and neglects of the Contractor or the Contractor's agents, employees or consultants.

5. GENERAL OBLIGATIONS

5.3 Control of employees

5.3.2 Number the existing clause "5.3.1" and add new 5.3.2:

The Contractor must employ the Key Personnel named in the Contractor's Proposal, Special Conditions, and/or Specifications, in the positions nominated in the Contractor's proposal, the Special Conditions or the Specifications. The Contractor shall not remove any such Key Personnel from their stated position without the prior written consent of the Engineer whose consent shall not be unreasonably withheld. The Contractor shall engage with the Principal regarding the replacement of any Key Personnel including involving the Principal the replacement process.

5.7 Protection of Persons and property

Delete 5.7.1 – 5.7.7 and replace with:

5.7.1 So far as the Site, Materials and the Contract Works are under the Contractor's management or control, the Contractor

shall ensure so far as is reasonably practicable that the Site, Materials and Contract Works, including the means of entering and exiting the Site and anything arising from the Site are without risks to the health and safety of any persons.

5.7.2 The Contractor shall ensure so far as is reasonably practicable that the health and safety of any:

- (a) workers involved in carrying out the Contract Works;
- (b) workers whose activities in carrying out work are influenced or directed by the Contractor; and
- (c) any other person;

is not put at risk from the carrying out of the Contract Works.

5.7.3 The Contractor must have in place and operate throughout the carrying out of the Contract Works:

- (a) ongoing hazard and risk identification and mitigation processes;
- (b) proper procedures for dealing with emergencies that may arise;
- (c) a plan to ensure compliance with any directions of the Government, or other authority that has jurisdiction in relation to a communicable infection or disease and its effect on the Site and the Contract Works; and
- (d) an effective drug and alcohol policy that applies to its workers, which must provide for a valid random testing programme.

5.7.4 The Contractor shall:

- (a) keep a record of all deaths, injuries, illnesses and notifiable incidents which are required by law to be notified (“**Notifiable Events**”) to WorkSafe or the relevant designated regulatory agency under the HSW Act (“**HSE Regulator**”) for at least 5 years from the date on which notice of the relevant event is given to the public authority;
- (b) as soon as possible after becoming aware that a Notifiable Event arising out of the carrying out of the Contract Works has occurred, ensure that the HSE Regulator is notified of the event;
- (c) so far as the Site and the Contract Works at which any Notifiable Event has occurred are under the Contractor’s management or control, take all reasonable steps to ensure that the Site or the Contract Works where the Notifiable Event occurred is not disturbed until authorised by the HSE Regulator; and
- (c) ensure compliance with any directions of the Government, or other authority that has jurisdiction, in relation to a communicable, infectious, or quarantinable disease and its effect on the Site and the Contract Works.

5.7.5 Following any Notifiable Event the Contractor shall:

- (a) give to the Principal through the Engineer a copy of any information or notice which the Contractor is required to provide or make to the HSWA Regulator relating to that Notifiable Event;
- (b) provide the Principal through the Engineer a report giving complete details, including results of investigations, into the cause of the Notifiable Event and any recommendations or strategies for prevention of any similar Notifiable Event in the future; and
- (c) provide the Principal with such assistance as may be reasonably necessary to conduct a Notifiable Event, incident or accident investigation.

5.7.6 The Contractor must, as soon as possible, notify the Principal through the Engineer of any proceedings and/or enforcement action issued against the Contractor.

5.7.7 The Contractor shall provide the Principal with access to the Site in order to review, monitor or audit the Contractor’s health and safety procedures and practices as deemed appropriate by the Principal. The Contractor shall participate in any health and safety audits conducted by the Principal or any person appointed by the Principal. The Contractor shall rectify any issues raised in any such audit

5.7.8 The Principal shall notify the Contractor through the Engineer of any safety hazards or risks associated with the Contract Works or the Site, or special safety measures required, of which the Principal or the Engineer are aware, and with which an experienced contractor may not reasonably be expected to be familiar.

5.7.9 The Contractor shall provide all watching and provide, erect, maintain and when no longer required remove all barricades,

fencing, temporary roadways and footpaths, signs, and lighting necessary for the effective protection of property, for traffic, and for the safety of persons.

- 5.7.10 The Contractor shall, so far as is reasonably practicable, engage with workers (including all workers of the Contractor and Subcontractors and any workers who are likely to be directly affected by the Contract Works) involved in carrying out the Contract Works in relation to health and safety matters concerning the Site or the Contract Works. The Contractor shall have procedures in place that provide reasonable opportunities for such workers to participate effectively in improving health and safety in respect of the Site and the Contract Works on an ongoing basis.
- 5.7.11 The Contractor shall so far as is reasonably practicable co-ordinate, consult and cooperate with all other PCBUs and other duty-holders in relation to the Contract Works, including the Principal. The Contractor shall facilitate engagement between the Contractor, the Engineer and the Principal (and where requested by the Principal, its designers) in relation to health and safety matters.
- 5.7.12 If during the term of the Contract the Engineer considers the Contractor is:
- (a) not conducting the Contract Works in compliance with the Site-specific safety plan, relevant legislation, regulations, applicable codes of practice or standards, or any other requirements for health and safety set out in the Contract; or
 - (b) conducting the Contract Works in such a way as to endanger the health and safety of the Contractor's employees or Subcontractors, or any other person,

the Engineer may instruct the Contractor to suspend the Contract Works until the Contractor has rectified its failure to comply with its obligations to the satisfaction of the Engineer.

- 5.7.13 The Contractor shall hold health and safety accreditations which have been approved by the Principal and shall be pre-qualified under the Health & Safety Pre-Qualification Scheme described in Section 2 of the Specifications.
- 5.7.14 Without limiting any other provision in the Contract, the Contractor shall comply with the Health and Safety Requirements and shall be responsible for any non-compliance by any Subcontractor with the Health and Safety Requirements.
- 5.7.15 The Contractor undertakes that before a Subcontractor commences work on the Site, the Contractor shall comprehensively induct the Subcontractor into the Contractor's health and safety system and ensure the Subcontractor is bound by the obligations in this 5.7 in relation to the subcontract works or separate works.
- 5.7.16 If the Contractor fails to comply with any of the Health and Safety Requirements after having been given reasonable notice to comply, or if the Contractor is issued with an improvement or prohibition notice by Worksafe NZ or the HSWA Regulator and fails to implement suitable remedies promptly, such failure or prosecution shall be deemed to be a Contractor default which will entitle the Principal to terminate the Contract or resume possession of the Site, in accordance with 14.2.1(d). Alternatively, where the default is capable of remedy the Engineer may instruct the Contractor to suspend the Contract Works until the Contractor has rectified its failure to comply with its obligations to the satisfaction of the Engineer.
- 5.7.17 The Contractor shall take all reasonable steps to avoid nuisance to prevent damage to property.
- 5.7.18 Notwithstanding the foregoing the Contractor shall comply with its obligations and shall take all reasonable endeavours to ensure that all Subcontractors comply with their obligations under the HSW Act and all regulations made under the HSW Act and all approved codes of practice under the HSW Act.

The Contractor will also comply with the requirements of 5.17.

5.8 Setting out

5.8.2

Delete clause and replace with

The Contractor is responsible for all setting out necessary to carry out the Contract Works. The Contractor shall refer to the Engineer for instructions in any cases which come to the notice of the Contractor where dimensions or levels are inconsistent or where any portion of the Contract Works appears to encroach beyond the Site boundaries.

5.8.5

Amend clause as follows:

If at any time prior to the issue of a Practical Completion Certificate any error shall appear in the position, levels or dimensions of any part of the Contract Works set out by the Contractor, the Contractor unless otherwise directed by the Engineer shall rectify the error. The Cost of rectification shall be borne by the Contractor except and to the extent that any error arises out of incorrect information supplied by the Principal or by the Engineer, and which was not known, (or should be known by a reasonably competent Contractor), by the Contractor to be incorrect, in which case it shall be treated as a Variation. This clause is in addition to and shall not limit the Principal's rights and remedies in respect of any error in setting out by the Contractor.

5.9 Materials, labour and Plant

Add new clause:

5.9.4

Ownership of Materials shall vest in the Principal at the earlier of the following:

- (a) When the Principal pays for the Materials;
- (b) When title passes in terms of any separate agreement between the Principal and the Contractor relating to the Materials; or
- (c) On incorporation into the permanent Contract Works.

5.10 Programme

5.10.1 Add to the end of 5.10.1

The programme shall include a forecast of all anticipated monthly payments, excluding retentions, to be made under the Contract. This forecast shall be updated monthly.

Add new clause

5.10.4A

The programme shall make adequate allowance for review and approval (as applicable) by the Engineer.

Add new clause

5.10.11

The Contractor shall carry out the Contract Works in accordance with the agreed programme.

5.11 Compliance with laws

5.11.1

Amend clause as follows:

In respect of the Contract Works the Principal and the Contractor shall comply with the provisions of all licences, statutes, regulations and bylaws of government, local and other public authorities that may be applicable to the Contract Works.

5.11.4

Amend clause as follows:

Except as otherwise provided in the Special Conditions the Contractor shall at the Contractor's expense give all notices and obtain all other licenses:

- for Temporary Works and for the Contractor's methods of carrying out the Contract Works (except in each case to the extent that they are specified or designed by or on behalf of the Principal);—
- temporary amenities and temporary services required for the construction of the Contract Works; and
- required for the construction of the Contract Works that are not to be obtained by the Principal under 5.11.3.

The Principal shall at the Principal's expense obtain any such licences stated in the Special Conditions under 5.11.4.

5.11.10

Amend clause as follows

If after the date of signing the Agreement the making of any statute, regulation, or bylaw, or the imposition by Government or by a local authority of any royalty, fee, or toll increases or decreases the Cost to the Contractor of performing the Contract, such increase or decrease, not being otherwise provided for in the Contract, the effect shall be treated as a Variation.

Add the following additional clauses

- 5.11.11 The Contractor shall not do anything or omit to do anything, or use materials, substances or processes which:
- (a) would or is likely to discharge a contaminant into the environment that is not in compliance with any licences applicable to the Contract Works; or would or is likely to cause the total emission of noise from the Site to exceed prescribed boundary noise levels; or that would or is likely to cause any adverse effect on the environment; or
 - (b) is a breach of any duty or obligation of the Contractor under the Resource Management Act 1991 ("RMA"); or
 - (c) does or is likely to give rise to the issue of an abatement notice, enforcement proceedings or an excessive noise direction under the RMA against the Principal, Contractor or Subcontractor.
- 5.11.12 Before a Subcontractor commences work the Contractor shall obtain similar undertakings as those stated in 5.11.11 from that Subcontractor in relation to the subcontract works.
- 5.11.13 To the extent permitted by law the Contractor shall indemnify and keep indemnified the Principal from all costs, damages, fines, penalties, loss and expense incurred or suffered by the Principal in respect of any breach of the RMA directly or indirectly related to a breach by the Contractor of any of the warranties set out in 5.11.11 except that the Contractor's liability shall be reduced proportionately to the extent that the Principal or any person for whose acts or omissions the Principal is as between itself and the Contractor responsible, caused or contributed to that liability.
- 5.11.14 If the Contractor becomes aware that it is or may be in breach, or is likely to be in breach of any of its obligations under 5.11.11 or any Subcontractor is or may be in breach of or is likely to breach the matters set out in the agreement between the Contractor and Subcontractors pursuant to 5.11.12 then the Contractor shall immediately notify the Engineer of such breach or anticipated breach.
- 5.11.15 The Contractor shall hold the environmental accreditations which have been approved by the Principal and which satisfy any national management system standards stated in the Special Conditions.

5.13 Underground and above-ground utilities

5.13.1

Amend clause as follows:

The ~~Principal~~ Contractor shall arrange for the searching of records to determine the existence and position of pipes, cables and other utilities on or about the Site.

For the purposes of this clause 5.13, the term "utilities" shall include any cadastral survey mark, as defined in the Cadastral Survey Act, and which at any time have been set in or on the ground for the purposes of survey. Where survey marks are likely to be affected by the Contract Works, the Contractor shall advise Land Information New Zealand (LINZ) prior to work on the Site and arrange for the survey marks to be relocated or replaced.

5.13.2

Amend clause as follows:

The Contractor shall be responsible for physically locating the position of all such utilities and shall arrange with the controlling authorities for any necessary exploratory work, location, protection, isolation, offsetting, reinstatement or alterations required. The Contractor shall record any alterations which it makes to such utilities, and shall provide an accurate record to the Principal and the controlling authority of the location of all utilities located.

5.13.5

Add new clause

The Contractor shall allow for a reasonable margin of error in records regarding the positioning of pipes, cables and other utilities on or about the Site and shall take reasonable care when working in the vicinity of such utilities.

5.17 **Safety plan****Delete 5.17.1 to 5.17.5 and replace with:**

5.17.1 Where required by the Special Conditions, the Contractor shall prior to commencement of the Contract Works on Site:

- (a) undertake a Site-specific risk assessment; and
- (b) prepare and submit to the Engineer a Site-specific health and safety management plan (“**Safety Plan**”) for the execution of the Contract Works.

5.17.2 The Safety Plan shall:

- (a) address the means by which the Contractor intends to meet its obligations under 5.7 and any other requirements for the Safety Plan set out in the Contract; and
- (b) detail how the Contractor will maintain a healthy and safe work environment and ensure legislative and best practice compliance.
- (c) The Safety Plan shall incorporate the following together with all other matters that are required to be covered in the Safety Plan in order to comply with the Contractor’s obligations under this Contract:
 - (i) Procedures for the prior identification and assessment of hazards arising in connection with the Site and the Contract Works and the steps proposed to eliminate, isolate or minimize significant hazards.
 - (ii) Procedures for the identification and management of new hazards arising during the carrying out of the Contract Works.
 - (iii) Procedures for the management of safety on the Site generally including the allocation of responsibilities both within the Contractor’s employees and as between the Contractor and Subcontractors.
 - (iv) The need for and provision of correct protective equipment and training in the use of protective equipment.
 - (v) Standard work procedure methodologies to minimise hazards.
 - (vi) Emergency procedures.
 - (vii) Procedures for consultation, co-operation co-ordination and communication with Separate Contractors and each other Person having duties as a PCBU in relation to the Site and the carrying out of the Contract Works.
 - (viii) Procedures for safety training and safety induction of persons coming onto a Site.
 - (ix) The training and supervision of the Contractor’s employees engaged in carrying out the Contract Works.
 - (x) Procedures for ensuring that the Contractor contracts with Subcontractors having the required safety competence, that Subcontractor’s activities are coordinated with the activities of other contractors and Persons on the Site, that all Subcontractors have proper safety plans and will comply with the requirements of the HSW Act and this Contract.
 - (xi) The audit and inspection of the Contractor’s health and safety procedures, the Contract Works and the Sites to ensure compliance with the safety requirements of the HSW Act and this Contract.
 - (xii) The engagement with workers and the promotion of health and safety principles and encouraging of a commitment to health and safety by the Contractor’s employees and Subcontractors.
 - (xiii) The notification of notifiable events and the keeping of records in relation to notifiable events.

- 5.17.3 Within 5 Working Days of receipt of the Safety Plan, or revised Safety Plan, the Engineer shall notify the Contractor in writing whether or not the Safety Plan is accepted. Such acceptance shall not be unreasonably withheld. Where the Engineer does not accept the Safety Plan, the notice shall include the Engineer's reasons, and the Contractor shall submit a revised Safety Plan.
- 5.17.4 The Contractor shall not commence any part of the Contract Works on Site unless the Engineer has accepted the Safety Plan or revised Safety Plan.
- 5.17.5 The Contractor shall comply with the Safety Plan accepted by the Engineer under 5.17.4. Compliance with the Safety Plan shall not relieve the Contractor from any of its duties, obligations, and liabilities under the Contract.

Add new clause:

5.17.6

- (a) The Contractor shall appoint a single person as the Site safety officer for the Contract Works. The Site safety officer shall be the primary point of contact on all health and safety matters. The Contractor will give written notice of the name and contact arrangements for the Site safety officer to the Engineer.
- (b) The Contractor acknowledges that it has the primary responsibility for the identification of hazards relating to the Site and the Contract Works. The Contractor will provide a comprehensive hazard analysis to all Subcontractors, Separate Contractors and other persons who intend to carry out any work on the Site.
- (c) The Contractor will implement and carry out an audit and inspection regime as shall be required to ensure compliance by all persons on the Site with the Contractor's health and safety plan and compliance with the Contractor's obligations under this Contract.
- (d) The Contractor shall immediately advise the Engineer if the Contractor receives any provisional improvement notice, improvement notice, prohibition notice, non-disturbance notice or suspension notice or any warning, notice of proceedings or other formal notice under the HSW Act. The Contractor shall promptly provide to the Engineer copies of:
 - (i) all such notices received; and
 - (ii) all enforceable undertakings provided by the Contractor under the HSW Act.
- (e) The Contractor shall provide written advice to the Principal of the outcome of all investigations, formal proceedings of any nature or prosecutions promptly after the completion of the investigation, proceeding or prosecution.
- (f) The Contractor shall ensure it obtains all authorisations required for the carrying out of the Contract Works under Subpart 2 of Part 5 of the HSW Act prior to commencing the applicable work.

Add new clause:

5.17.7

The Contractor shall comply with the health and safety requirements applicable to the Principal as Utility Operator set out in the National Utilities Code and all applicable Works Access Permits when carrying out Contract Works within Transport Corridors.

5.20 As-built drawings and operation and maintenance manuals**5.20.4****Add new clause**

Where required by the Special Conditions, the documents and information required to be provided by the Contractor under 5.20 shall be in sufficient detail and in a form appropriate to allow the Principal to accurately update the Principal's records, including Geographical Information System (GIS) records.

5.22**Add new clause****5.22 Other plans**

- 5.22.1** Where a plan is stated to be required by the Special Conditions, the Contractor shall prepare and submit to the Engineer that plan by the date stated in the Special Conditions or Specifications. That plan must comply with any requirements stated in the Specifications.
- 5.22.2** Within five Working Days of receipt of a plan, or a revised plan, the Engineer shall notify the Contractor in writing whether or not he or she accepts the plan. Such acceptance shall not be unreasonably withheld. Where the Engineer does not accept the plan, the notice shall include the Engineer's reasons, and the Contractor shall submit a revised plan for consideration by the Engineer in accordance with 5.22.1.
- 5.22.3** Compliance with a plan shall not relieve the Contractor from any of its duties, obligations, and liabilities under the Contract.

Add new clause 5.23 as follows:**5.23 Resource Management Act and Resource Consent compliance****5.23.1**

The Contractor shall execute the Contract Works in accordance with the Project Resource Consents (and any further resource consents which relate to the Contract Works).

5.23.2

The Contractor shall:

- (a) immediately advise the Principal in writing as to any notification of any application, plan change or other matter received or of which the Contractor has become aware which relates to or may affect any of the Project Resource Consents;
- (b) comply with all enforcement orders, abatement notices or other requirements issued to the Principal or the Contractor under the Resource Management Act 1991 or any other law relating to the protection of the environment, hazardous material or public health or safety which relate to the execution of the Contract Works; and
- (c) put in place and duly carry out procedures which shall adequately monitor compliance with all Project Resource Consents relating to the execution of the Contract Works.

5.23.3

The Contractor shall, to the extent permissible by law, pay all fines and penalties arising from all breaches by the Contractor of the Contractor's obligations under the Project Resource Consents whether such fines or penalties are imposed on the Contractor or the Principal. The Contractor shall, on receipt of written demand from the Principal pay the amount of any such fine or penalty imposed on or otherwise paid or payable by the Principal to such person.

6. ENGINEER'S POWERS AND RESPONSIBILITIES**6.4 Inspection, recording, measuring, and testing****6.2.5****Delete clause and replace with**

No comment, review, acceptance or approval by the Engineer or the Principal shall relieve the Contractor of any responsibility for that part of the Contract Works or diminish or release the Contractor from any liability it shall have under the Contract, nor shall any such action be treated as an acceptance by the Principal of responsibility for, or the waiving by the Principal of, any claim it might otherwise have in respect of any matter arising in relation to the execution of the Contract Works, or otherwise as to any obligation or liability of the Contractor under this Contract.

6.7 Suspension of work

6.7.4

Amend clause as follows:

If a suspension (other than a suspension due to the default on the part of the Contractor) remains in effect for more than 3 Months, the Contractor may request the Engineer in writing to permit the suspended work to be continued. If the Engineer does not grant permission to continue within 1 Month of receipt of the request, then the Contractor shall be entitled to treat the suspension as a Variation deleting the uncompleted portion of the suspended work from the Contract, or where the suspension affects the whole of the Contract Works as an abandonment of the Contract by the Principal.

7 INDEMNITY

7.1 Indemnity

7.1.1

Amend clause as follows:

Except as otherwise provided in the Contract the Contractor shall indemnify the Principal against:

- (a) Any loss suffered by the Principal which may arise out of, or in consequence of the construction of, or remedying of defects in, the Contract Works and that is attributable to the negligence or breach on the part of the Contractor or any person for whom the Contractor is responsible;
- (b) Any liability incurred by the Principal in response of injuries to Persons or damage to property which may arise out of, or in consequence of the construction of, or remedying defects in the Contract Works; and
- (c) Any Costs the Principal may incur in respect of that loss or liability.

Add new section as follows:

7.2 Limitation of Liability

7.2.1

Notwithstanding any other provision in this Contract:

- (a) Neither party will under any circumstances be liable under the law of tort (including negligence), contract or otherwise or under any indemnity or for breach of statutory duty or otherwise for any loss of profits or savings economic loss, loss of profit or revenue, loss of production or production stoppage, loss of data and information, cost of capital, loss arising out of third party contracts, or loss of opportunity or for any indirect or consequential loss or damage, however caused, arising out of or in connection with this Contract.
- (b) The maximum aggregate amount of damages or indemnity payable by one party to the other under this Contract whether for direct or indirect losses or whether under the law of contract, tort (including negligence) or otherwise is limited in the aggregate to the amount equivalent to the Contract Price.

8. INSURANCE

8.5 Contractor arranged public liability insurance

8.5.1 Delete sub paragraph (c) and add new sub paragraphs to the end of 8.5.1 as follows

- (d) Liability for damage to underground services;
- (e) Liability arising from the use of construction machinery, including hired Plant, except when being used as a motor vehicle as defined in the Land Transport Act 1998; and
- (f) Liability for loss or damage to any existing structures, or other structures in the vicinity and the contents of any of them, that are not specifically identified in Schedule 1 under 8.8.2 (a), (b) and (c).

8.8.2

Delete clause

9. VARIATIONS

9.1 Variations permitted

9.1.1

Amend clause as follows:

The Engineer may order any Variations to the Contract Works within the scope of the Contract that:

- (a) Increase or decrease the quantity of any work;
- (b) Omit any work;
- (c) Change the character or quality of any Material or work;
- (d) Require additional work to be done;
- (e) Change the level, line, position, or dimensions of any part of the Contract Works;
- (f) Change the timing and/or sequence in which the Contract Works are to be carried out; or
- (g) Change the hours within which work may be carried out.

9.2 Variation orders

Add new clause:

9.2.5

For the purposes of 9.2.2 and 9.2.3 oral notice which is recorded in written records such as Site minutes, correspondence or memoranda held by the Contractor and by the Engineer or Principal shall not be treated as written notice.

9.4 Daywork

9.4.3 In the last sentence of 9.4.3 delete "in such case" and replace with "in the case of records signed by the Engineer"

9.5 Unforeseen physical conditions

9.5.1

Amend clause as follows:

The term physical conditions shall include artificial obstructions but shall not include weather conditions or conditions due to weather.

Add new 9.6 as follows:

9.6 Pandemic

9.6.1

If after the Date of Commencement the Site shall be subject to Pandemic Restrictions which and only to the extent compliance with such Pandemic Restrictions increases or decreases the Cost to the Contractor of carrying out the Contract Works, the effect shall, for the purposes of 9.3, be treated as a Variation.

9.6.2

9.6.1 shall not apply and the Contractor shall not be entitled to claim a Variation pursuant to 9.6.1 to the extent any such increase in Cost is due to any unauthorised act or omission on the part of the Contractor, excluding any act or omission by the Contractor which is in compliance with the Pandemic Restrictions requirements.

9.6.3

In addition to any other rights of termination that the Principal may have under the Contract or at law generally, the Principal reserves the right in its absolute discretion to terminate the Contract at any time due to the impacts of any Pandemic Restrictions. When exercising this right the Principal shall give at least 20 Working Days' notice of termination stating the date of termination.

9.6.4

If the Principal issues a notice of termination under 9.6.3, the Contractor shall:

- (i) upon receipt of the Principal's notice of termination do everything necessary to comply with the notice of termination and demobilise from the Site as soon as is practicable;
- (ii) be entitled to be paid the amount calculated in accordance with 14.1.2 as if the Contract had been terminated for frustration; and
- (iii) take, and shall procure that Subcontractors take, all reasonable steps to mitigate the amounts referred to in 14.1.2(b) to (e).

Add new 9.7 as follows:

9.7 Principal Supplied Materials**9.7.1**

The Principal may nominate Materials required for the carrying out of the Contract Works to be procured by the Principal directly from the Contractor's supplier to be provided to the Contractor on a free issue basis as Principal Supplied Materials.

9.7.2

At the request of the Principal the Contractor shall consult with the Principal to assist the Principal to identify Materials that are to be procured by the Principal as Principal Supplied Materials. The Contractor will provide full details of the quantities required and the Contractor's procurement arrangements as reasonably required to enable the Principal to ascertain whether or not to nominate any Materials as Principal Supplied Materials and to enter into supply and purchase arrangements with the supplier of those Materials.

9.7.3

On the nomination (in writing) of Principal Supplied Materials:

- (a) The Principal shall procure the Principal Supplied Materials on the terms and conditions and at the price negotiated by the Contractor with the Contractor's supplier. If required the Contractor shall novate or assign any such procurement arrangements to the Principal.
- (b) The Contract shall be varied by the removal of the Principal Supplied Materials from the Materials to be supplied by the Contractor;
- (c) The Principal Supplied Materials shall be supplied by the Principal to the Contractor on a free issue basis;
- (d) The Principal shall arrange for the Principal Supplied Materials to be, as elected by the Contractor, either delivered to Site or uplifted from the supplier by the Contractor.
- (e) The Contract Price payable by the Principal under this Contract shall be reduced by the Cost to the Principal of

- the procuring and if applicable delivery to Site of the Principal Supplied Materials;
- (f) The Cost of uplift (if applicable) and unloading at Site shall be payable by the Contractor.
 - (g) The Principal Supplied Materials shall remain in the ownership of the Principal after delivery to Site or uplift by the Contractor;
 - (h) The Contractor shall be responsible for insuring the Principal Supplied Materials in transit, for acceptance of the Principal Supplied Materials (including verifying the Principal Supplied Materials are in good condition and order) and for the safe and secure storage and insuring of the Principal Supplied Materials pending incorporation of the Principal Supplied Materials in the Contract Works.
 - (i) Following uplift or delivery to Site:
 - (i) The Contractor shall ensure that the Principal Supplied Materials are retained on the Site. The Contractor shall not allow any other person to remove the Principal Supplied Materials from the Site and will immediately notify the Engineer of any attempt to remove the Principal Supplied Materials from the Site.
 - (ii) The Contractor shall keep the Principal Supplied Materials in "as new condition" and shall take every precaution to prevent any damage or loss to or deterioration of the Principal Supplied Materials.

10 TIME FOR COMPLETION

10.3 Extension of time

10.3.1

Amend clause as follows:

The Engineer shall grant an extension of the time for completion of the Contract Works or for any Separable Portion if the Contractor is delayed in achieving Practical Completion by reason of:

- (a) The net effect of any Variation;
- (b) Weather sufficiently inclement to interfere with the progress of the works;
- (c) Any strike, lockout or other industrial action except any industrial actions restricted to the Contractor's (or any Subcontractor's) workforce;
- (d) Loss or damage to the Contract Works or Materials, other than loss or damage caused by the Contractor's error or omission or other breach of its obligations under this Contract;
- (e) Flood, volcanic or seismic events;
- (f) Not used
- (g) Any failure to provide information, services or materials, delay or impediment or other act of prevention by the Principal, the Engineer or any other Person acting for behalf of the Principal;
- (h) Epidemic but only to the extent it is a Pandemic; or
- (i) Any further circumstances (other than the circumstances described in this clause 10.3.1) that were not reasonably foreseeable by an experienced contractor at the time of tendering and not due to the fault of the Contractor.

No extension of time will be granted unless the delay has affected the critical path of the Contract Works such that Practical Completion cannot be achieved by the Due Date for Completion.

10.3.1 Add to the end of 10.3.1

10.3.2(b)**Amend subclause as follows:**

The notice is given as soon as is practicable and in any event within 20 Working Days after the circumstances arise which are relied on as the grounds for extension;

10.3.2(c)**Amend subclause as follows:**

The notice either gives details of the period of extension sought or is followed as soon as is practicable and in any event within 30 days of the cessation of the circumstances giving rise to the extension of time claim by a further notice giving such details.

10.3.4**Amend subclause as follows:**

Upon receipt of notice of a claim for extension of time the Engineer shall investigate the claim. The Engineer shall within 20 Working Days or as soon as practicable thereafter determine whether or not the Contractor is entitled to an extension and shall notify the Contractor of his or her decision. In making his or her determination under this clause the Engineer may take into account (together with all other relevant matters):

- (a) the extent to which the Contractor has used reasonable endeavours to minimise the effect of the delaying cause or event;
- (b) the impact of the delaying cause or event on critical path activities.

10.3.8**Add new clause**

The Contractor shall take all reasonable steps to minimise the effect of the delaying cause or event.

Add new clause**10.3.9**

Notwithstanding that the Contractor is not entitled to or has not claimed an extension of time in accordance with 10.3, the Engineer may in the Engineer's discretion (and acting as representative of the Principal under 6.2.1(a)) grant an extension of time for completion of the Contract Works or for any Separable Portion.

Add new clause**10.3.10**

Where the Contractor is delayed in achieving Practical Completion due to Pandemic Restrictions the Contractor shall be entitled to time related Costs determined as follows:

- (a) The Contractor shall be entitled to reasonable compensation for time related On-site Overheads and Off-site Overheads and Profit as shall be fair and reasonable in accordance with the principles that the Contractor's fixed costs should be recognised, that governmental subsidies and costs savings accrued by the Contractor (if any) should be taken into account and that the Contractor should not derive an overall financial betterment.

10.4 Practical Completion Certificate**10.4.1****Amend clause as follows:**

Practical Completion is that stage in the execution of the work under the Contract when:

- (a) all requirements for achieving Practical Completion and for the issue of the Practical Completion Certificate both under 10.4.5 and as set out in the Contract have been completed or provided; and
- (b) the Contract Works are complete except for minor omissions and minor defects:

- (i) Which in the opinion of the Engineer the Contractor has reasonable grounds for not promptly correcting;
- (ii) Which do not prevent the Contract Works or Separable Portion from being used for their intended purpose; and
- (iii) Rectification of which will not prejudice the convenient use of the Contract Works or any Separable Portion.

11 DEFECTS LIABILITY

11.2 Remediating of defects

11.2.1

Amend clause as follows

The Contractor shall remedy:

- (a) defects and damage in the Contract Works resulting from defective workmanship or Materials or omission by the Contractor; and
- (b) damage to the Principal's existing structures or other property caused by defective workmanship or Materials or omission by the Contractor

that arise before the end of the Defects Notification Period. The Engineer shall, during the Defects Notification Period or within 5 Working Days thereafter, give notice in writing to the Contractor of defects or damage to be remedied. The Contractor shall remedy any such defects or damage within 5 Working Days of receipt of the Engineer's notice or within such other reasonable time as agreed by the Engineer in writing.

11.2.5

Amend clause as follows

The Contractor shall not be liable for fair wear and tear during the Defects Notification Period, or for any degradation in the Works due to time elapsed between the issue of the Practical Completion Certificate and the beginning of the Defect Notification Period.

11.2.9

Add new subclause

During the Defect Notification Period, the Contractor shall supply the Principal with a regular summary of all call-outs to the Works, or other reactive maintenance required, showing the incident location and a description of the issues and/or faults determined as the cause of each incidence, if requested by the Principal.

11.3 Final Completion Certificate

11.3.1

Add new subclause

- (c) The Contractor has remedied all non-conforming work and repairs or maintenance to any Transport Corridor Work notified by the applicable Corridor Manager or the Principal prior to the expiry of the Defects Notification Period. (Note the obligations of the Contractor under the Transport Corridor Work warranty continue for the applicable periods set out in the National Utilities Code).

11.3.2

Delete clause and replace with:

If required by the Special Conditions, prior to the Engineer issuing a Final Completion Certificate:

- (a) the Contractor shall provide to the Engineer:
 - (i) Producer Statements in the form set out in Schedule 6, or other form(s) as noted in the Special Conditions; ~~and~~
 - (ii) As-built drawings and operation and maintenance manuals required under 5.20.1 in final form in accordance with 5.20; ~~and~~
 - (iii) All requirements for the issue of the Final Completion Certificate as set out in the Contract documents;
 - (iv) Where required by the Contract, all things required to procure the issue of the code compliance certificate(s) for the Contract Works or Separable Portion; and
- (b) The Contractor shall complete the remedying of all non-conforming work and repairs or maintenance to any Transport Corridor Work notified by the applicable Corridor Manager or the Principal prior to the expiry of the Defects Notification Period. (Note the obligations of the Contractor under the Transport Corridor Work warranty continue for the applicable periods set out in the National Utilities Code).

11.5 Warranties

11.5.4

Add new subclause

All warranties from manufacturers and suppliers on Materials and equipment incorporated into the Works shall be transferred to the Principal at the completion of the Defect Notification Period.

12. PAYMENTS

12.2 Progress Payment Schedules

12.2.2(c)

Amend clause as follows:

- (c) Identify the date when the Progress Payment Schedule is to be provided;

12.2.2(h)

Amend clause as follows

- (h) State the Progress Payment Schedule is provisional only until the expiry of 12 Working Days after the date on which the relevant payment claim was served on the Engineer, after which time the sum under 12.2.2(d) shall become the scheduled amount unless within that time a replacement Progress Payment Schedule is provided under 12.2.5.

12.2.3

Amend clause as follows

- (a) The Engineer shall not include in the sum to be certified under 12.2.2(d) any item of the Contractor's payment claim where the Contractor has not provided sufficient validating documentation or requirements identified as pre-conditions to payment of such item that are set out in the Contract.
- (b) Subject to (a) above, if any item of the Contractor's payment claim cannot be verified within the prescribed time, the Engineer shall within that time certify under 12.2.2(d) a reasonable estimate of the amount due.

12.2.8

Amend clause as follows:

The scheduled amount under 12.2.2(d) or 12.2.5(d) as the case may be, shall be paid by the Principal to the Contractor within 17 Working Days after the date on which the Contractor's payment claim was served on the Engineer under 12.1.1. The Principal shall, subject to the provision by the Contractor of a valid tax invoice, pay goods and services tax on the scheduled amount at the time the scheduled amount is payable under this clause.

Add new clause:**12.2.10**

The Engineer may in any Payment Schedule make any proper modification or correction to any amount certified in a prior Payment Schedule.

12.3 Retention Monies**12.3.2****Amend clause as follows:**

The monies retained, less any deductions which the Principal is entitled to make, shall be paid to the Contractor as follows:

- (a) By payment, as part of the first progress payment after the issue of the Practical Completion Certificate for the whole of the Contract Works or for the Separable Portion, of any amount in excess of the defects liability retention applicable after Practical Completion specified in the Special Conditions less the Engineer's assessment of the value of any Contract Works remaining to be completed other than minor omissions and minor defects under 10.4.1;
- (b) By payment, as part of the first and any subsequent progress payment after the end of the Defects Notification Period for the whole of the Contract Works or for the Separable Portion, of the balance of the defects liability retention specified in the Special Conditions less the Engineer's assessment of the value of the Contract Works remaining to be completed in accordance with 11.2 at the time of the progress payment. The assessed value of such remaining Contract Works shall be the assessed Cost to the Principal of making good those omissions and defects in accordance with 11.2.2 and 11.2.3; and
- (c) By payment of any remaining defects liability retention (after deduction of all amounts owing to the Principal under 11.2.3) 10 Working Days after the date of the Final Completion Certificate for the whole of the Contract Works or of the Separable Portion.

12.3.3**Amend clause as follows:**

Unless otherwise provided in the Special Conditions, the Contractor may provide a bond in lieu of retentions in addition to any bond required under 3.1. The bond shall be in an amount equal to the limit of total sums required to be retained under 12.3.1. Where such a bond is provided, 12.3.1 and 12.3.2 shall not apply. The bond shall be in the form set out in Schedule 5 and shall be executed by the Contractor and by the surety named in the tender or approved by the Principal. The bond shall be released upon issue of the Final Completion Certificate for the whole of the Contract Works.

The Contractor may, in its discretion, provide two bonds in lieu of retentions in accordance with the following:

- (a) The first bond shall be in an amount equal to 50% of the limit of total sums required to be retained under 12.3.1. This bond shall be in the form set out in Schedule 3.
- (b) The second bond shall be in an amount equal to 50% of the limit of total sums required to be retained under 12.3.1. This bond shall be in the form set out in Schedule 5.

12.3.4**Add new clause:**

Without limiting the Principal's rights and remedies under this Contract or at law the parties agree that, to the extent permitted by law, the deductions which the Principal is entitled to make under 12.3.2 include:

- (a) all moneys payable by the Contractor to the Principal under 14.2.4 and 14.2.5; and
- (b) all moneys payable by the Contractor to the Principal to remedy defects in the performance of the Contractor's obligations under this Contract.

12.3.5**Add new clause:**

The parties agree that for the purposes of section 18FC(4) of the Construction Contracts Act 2002 the accounting and other records that the Contractor may request be made available for inspection are:

- (a) A statement of the amounts credited and debited to the retentions moneys held in trust by the Principal for the Contractor relating to this Contract including the current balance of such moneys; and
- (b) A certificate signed by the Chief Financial Officer or other senior member of the Principal's accounting staff certifying that:
 - (i) Such moneys are held in trust for the Contractor pursuant to section 18C of the Construction Contracts Act 2002; and
 - (ii) That the Principal holds cash or other liquid assets equal to or in excess of the aggregate current balance of all retentions held by the Principal pursuant to all commercial construction contracts having retention moneys in excess of the de minimis amount entered into by the Principal after 31 March 2017.

12.5.6**Amend clause as follows:**

If the Engineer is unable to provide a Final Payment Schedule within the period of 20 Working Days referred to in 12.5.1, and provided the Contractor shall have provided all supporting information and/or verification reasonably requested by the Engineer, the Engineer shall before the expiry of that period issue a statement of the reasons why a Final Payment Schedule cannot be issued or otherwise dealt with in accordance with the Contract. Unless the Engineer is delayed in the completion of the Final Payment Schedule by the failure of the Contractor to provide information, the Engineer shall also issue further explanatory statements at Monthly intervals (or other periods determined by the Engineer as reasonable) until the issue of the Final Payment Schedule under 12.5.1. At the time of issuing any explanatory statement under 12.5.6, the Engineer shall issue a certificate in the form of a Progress Payment Schedule in accordance with 12.2.2 for all amounts due under the Contract which can reasonably be certified at that time, and the process under 12.2 shall apply as if the final payment claim had been served as a progress payment claim 7 Working Days prior to the date of the Progress Payment Schedule issued under 12.5.6.

12.6 Effect of Final Payment Schedule**12.6.2****Add new clause**

Notwithstanding the issue of the Final Payment Schedule the Contractor shall remain liable for fulfilment of any obligation of the Contractor under the Contract which then remains unperformed or not properly performed.

12.7 Interest**12.7.1****Amend clause as follows:**

The Principal shall pay the Contractor interest compounding Monthly on all scheduled amounts shown as payable in any Payment Schedule and remaining unpaid after the expiry of the time provided for payment other than amounts that are genuinely disputed by the Principal in which case the Principal will only pay interest on the amount finally determined as being payable.

The Contractor shall pay to the Principal interest compounding Monthly on all moneys payable by the Contractor to the Principal and remaining unpaid after the expiry of the time provided for payment. This includes any monies paid by the Principal under Adjudication which are subsequently required to be refunded by the Contractor under the dispute resolution provisions in this Contract.

12.7.5**Amend clause as follows:**

The right to interest shall be additional to any other remedy to which the payee may be entitled at law.

12.13 Goods and services tax**Add new clause:****12.13.3**

The parties each agree that all payments made under this Contract are progressive or successive supplies for the purposes of section 9(3)(aa) of the GST Act and for determining the time of supply under the GST Act. Each party agrees that it shall account for all payments and receipts under this Contract as progressive supplies in the party's GST returns.

12.14 Add new 12.14**12.14 Set off**

The Principal may, and is by this clause authorised by the Contractor to, deduct any moneys payable by the Contractor to the Principal under this Contract from any moneys payable by the Principal to the Contractor under this Contract.

13 DISPUTES**13.2 Engineer's review****13.2.2****Amend clause as follows:**

The Engineer or the Principal or the Contractor may, before or after the Engineer has given a decision (other than a decision under 13.2.4) ask for a meeting, and in such case the Engineer, the Principal and a representative of the Contractor shall meet as soon as practicable and endeavour to resolve the dispute amicably.

13.3 Mediation**13.3.1****Amend clause as follows:**

If either:

- (a) The Principal or the Contractor is dissatisfied with the Engineer's decision under 13.2.4; or
- (b) No formal decision is given by the Engineer within the time prescribed by 13.2.4; or
- (c) A dispute has arisen after one Month of the issue of the Final Payment Schedule

then either the Principal or the Contractor may by notice require that the matter in dispute be referred to mediation.

13.3.3**Amend clause as follows:**

Where a request for mediation is made and is acceded to by the other party then the Principal and the Contractor shall endeavour to agree on a mediator and shall submit the matter in dispute to him or her. Where the parties cannot agree on a mediator within 10 Days of the giving of notice under 13.3.2 either party may request the New Zealand chapter of the Resolution Institute to appoint the mediator. The mediator shall discuss the matter with the parties and endeavour to resolve it by their agreement. All discussions in mediation shall be without prejudice, and shall not be referred to in any later proceedings. The Principal and the Contractor shall bear their own Costs in the mediation and shall each pay half the costs of the mediator.

13.4 Arbitration

13.4.1

Amend clause as follows:

If:

- (a) The Principal or the Contractor is dissatisfied with the Engineer's decision under 13.2.4;
- (b) No formal decision is given by the Engineer within the time prescribed by 13.2.4; or
- (c) A dispute has arisen after one Month of the issue of the Final Payment Schedule

then either the Principal or the Contractor may by notice require that the matter in dispute be referred to arbitration.

14. FRUSTRATION AND DEFAULT

14.1 Frustration

Add new clause:

14.1.3

Should any Pandemic continue for a period in excess of 90 days that prevents the carrying out by the Contractor of all or a material part of the Contract Works then on the written request of the Principal the parties shall consult and endeavour to agree a methodology and pricing that would enable the resumption of the Contract Works.

If such methodology and pricing cannot be agreed within 15 Working Days of the date of the Principal's written request then the Principal may, by written notice, terminate this Contract.

On the issue by the Principal of such written notice this Contract shall be at an end and the Principal shall pay to the Contractor the amounts determined in accordance with clause 14.1.2 of this Contract.

14.2 Default by the Contractor

14.2.1 Delete 14.2.1 and replace with

The Principal may at its option after giving notice to the Contractor either terminate the Contract or resume possession of the Site in the event of:

- (a) The Contractor failing to execute the Contract Agreement under 2.6 or to provide the Contractor's Bond under 3.1;
- (b) The Contractor assigning or subletting the whole or substantially the whole of the Contract Works without the consent in writing of the Principal;
- (c) The Engineer certifying in writing to the Principal that in his or her opinion the Contractor:
 - (i) has abandoned the Contract;
 - (ii) is in substantial breach of the Contract;
 - (iii) has failed to commence the Contract Works in accordance with 10.1.2; or
 - (iv) is persistently, flagrantly or wilfully neglecting to carry out its obligations under the Contract; or
- (d) The Engineer certifying in writing to the Principal that in his or her opinion the Contractor is in breach of any of its obligations under 5.7 or 5.17,

and the Contractor's default under (a), (b), (d) or (e) has not been remedied to the satisfaction of the Engineer within 10 Working Days of receiving the notice.

14.2.4

Amend clause as follows:

On completion of the Contract Works, any Plant, Temporary Works and surplus Materials of which the Principal has taken possession shall be handed back to the Contractor. The Engineer shall enquire into the Cost to the Principal of completing the Contract Works and certify accordingly. Should the amount certified exceed the Cost to the Principal had the Contract Works been completed by the Contractor, the difference between the two amounts shall be certified by the Engineer and paid by the Contractor to the Principal. The Contractor acknowledges and agrees that the Principal may apply any Contractor's Bond funds and retention funds it holds in payment of any Costs incurred by the Principal in completing the Contract Works. If the amount certified be less than the Cost to the Principal had the Contract Works been completed by the Contractor, the difference between the two amounts shall be paid by the Principal to the Contractor.

Add new clause:

14.2.6

Without limiting the Principal's rights and remedies under this Contract or at law, the parties agree that, to the extent permitted by law, the Principal may apply all or any part of the retentions held by the Principal under 12.3.1 against amounts payable by the Contractor to the Principal under 14.2.4 or 14.2.5.

14.3 Default by the Principal

14.3.1

Amend subclause (b) as follows:

(b) Failing to pay the Contractor the amount due under any Payment Schedule by the required time;

14.3.2

Amend clause as follows:

If the Engineer fails to issue a Payment Schedule within the periods provided in 12.2 or 12.5 or, where 12.5.6 applies, a certificate within the time provided in 12.5.6, the Contractor shall notify the Principal and the Engineer of the failure. Such notice must state that it is given under this clause and that failure to provide the Payment Schedule or certificate within the required time will allow the Contractor to terminate the Contract. If the Payment Schedule is not issued within a further 5 Working Days after the notice, the Principal shall be deemed to be in default.

15 SERVICE OF NOTICES

15.1 General

Add new clause:

15.1.9

For the purposes of clause 9(3)(a) of the Construction Contract Regulations 2003 each party's email system shall be the designated information system for that party and the time any email communication enters the recipient's system shall be the time the claim or schedule is served.

16 MISCELLANEOUS

16.1 Official information legislation

16.1.1

The parties acknowledge that Principal is subject to the Local Government Official Information and Meetings Act 1987 and that under that Act the Principal may be required to release information about the Contract and the Contractor.

16.1.2

In addition, the Contractor agrees to comply with the requirements of the Local Government Official Information and Meetings Act 1987 in relation to all information relating to the Principal held by the Contractor or its employees.

16.1.3

The Contractor will only release information to a third party under the Local Government Official Information and Meetings Act 1987 through the Principal unless compelled by a competent authority, in which case it will immediately advise the Principal as to the information released.

16.2 Advertising**16.2.1**

The Contractor shall not at any time, without the Principal's prior written consent, make any statement or claim that might be construed as an endorsement by the Principal of its services.

16.4 Amendment**16.4.1**

This Contract cannot be amended, modified or varied or supplemented except in writing signed by duly authorised representatives of the parties.

16.5 Severance**16.5.1**

The illegality, invalidity or unenforceability of any provision in this Contract will not affect the legality, validity or enforceability of any other provisions.

16.6 Waiver**16.6.1**

No right under this Contract shall be deemed to be waived except by notice in writing signed by each party.

16.6.2

A waiver for either party will not prejudice its rights in respect of any subsequent breach of this contract by the other party.

16.6.3

The failure by either party to enforce any clause of this contract, or any forbearance, delay or indulgence granted by a party will not be construed as a waiver of that party's rights under this Contract.

16.7 Entire Agreement**16.7.1**

This contract represents the entire agreement between the parties. No party shall be bound by any prior warranty or representation unless included in this Contract.

16.8 Joint and several obligations**16.8.1**

The obligations of two or more parties under this Contract shall be joint and several.

16.9 Finalisation of Detailed Design

The parties acknowledge that aspects of the Contract are subject to further development and finalisation following completion of the Detailed Design for the Contract Works. Both parties are committed to using reasonable endeavours to adapt the Contract Works to accommodate required changes in the Specification and/or the Contract Conditions that arise out of the final Detailed Design, in a manner that is fair and equitable to both parties, giving consideration to the actual increase or decrease in Net Cost, any viable alternative solutions and the desired Contract outcomes.

SCHEDULE 5

Delete Schedule and replace with the following

SCHEDULE 5 - FORM OF CONTRACTOR'S BOND IN LIEU OF RETENTIONS

Contract for.....

THIS DEED is made on.....

BY

of ('the Contractor')

AND ('the Surety')

of ('Address of Surety for service')

IT IS MADE IN THE FOLLOWING CIRCUMSTANCES:

- A The Contractor has entered into an agreement as identified above (**Contract**) with **ROTORUA DISTRICT COUNCIL (Principal)** to carry out and fulfil the obligations imposed on the Contractor by the Contract.
- B The Contractor has agreed to provide the Principal with security in the form of a bond in lieu of retentions additional to any other bond required under the Contract.
- C The Surety and Contractor have agreed to provide this bond in favour of the Principal.
- D Words and phrases with capital letters that are not otherwise defined in this bond shall have the meaning set out in the Contract.

BY THIS DEED

1. **THE** Contractor and Surety are jointly and severally held and bound to the Principal in the sum of [*insert words*] \$NZ [*insert figures*] (**Bond Amount**) and bind themselves, their successors and assigns jointly and severally for the payment of that sum.
 2. **THE** conditions of this bond are that it shall be released if and when:
 - (a) A Final Completion Certificate has been issued for the whole of the Contract Works in accordance with 11.3 of the General Conditions and either:
 - (i) the Contractor has carried out and fulfilled all the obligations of the Contractor under the Contract; or
 - (ii) the Contractor has paid to the Principal all damages sustained by the Principal arising from the default of the Contractor pursuant to the Contract.
- OR
- (b) The Surety receives a notice from the Principal releasing the Contractor and Surety from this bond;
3. **EXCEPT** as provided in clause 2 above this bond shall be and remain in full force and effect.
 4. **THE** Surety shall not be released from any liability under this bond:
 - (a) By any alteration in the terms of the Contract;
 - (b) By any alteration in the extent or nature of the Contract Works to be completed, delivered and having defects remedied;
 - (c) By any allowance of time by the Principal or by the Engineer appointed by the Principal under the Contract:

- (d) By any forbearance or waiver by the Principal or by the Engineer in respect of any of the Contractor's obligations or in respect of any default on the part of the Contractor;
- (e) By an indulgence or additional or advance payment, forbearance, payment or concession given to the Contractor;
- (f) By the compromise or resolution of any dispute under the Contract; or
- (g) By the failure to detect or prevent any default by the Contractor under the Contract.
5. **NOTWITHSTANDING** any other provision of this bond, the Surety may at any time at the Surety's discretion, whether or not the Surety has received a demand, terminate its obligations under this bond by paying the Principal the Bond Amount or the balance outstanding of the Bond Amount, or any lesser amount that the Principal may require.
6. **PAYMENTS** under this bond shall be made free and clear of and without any deduction for any present or future taxes, levies, impost duties, fees, deductions, set off or withholding of any nature.
7. **PAYMENT** by the Surety will be made forthwith upon receipt of a written demand purporting to be signed by the Principal and such payment will be made without reference to and notwithstanding any instruction from the Contractor to the Sureties not to pay the same. Payment or part payment will be made as demanded under this bond up to the maximum aggregate amount expressed herein.
8. **NO** waiver or any breach or failure to enforce any provision of this bond at any time by the Principal shall in any way limit or waive the right of the Principal to subsequently exercise its rights under this bond.
9. **NOTICES**
- (a) All demands, notices and other communications provided for and permitted under this bond which are required to be in writing shall be sent by registered mail with postage prepaid, by hand delivery or by courier as follows:
- In the case of the Principal:
- []
- In the case of the Contractor at their address for service set out in the Contract.
- In the case of the Surety [to be inserted in executed bond].
- or to such other address or person as any party may specify by notice in writing to the others.
- (b) All such notices or communications shall be deemed to have been duly given or made:
- (i) 3 days after being deposited in the mail by the sender with mail postage prepaid;
- (ii) On delivery when delivered by hand or by courier.
10. **WHERE** the Contractor or Surety:
- (a) fails to execute or become bound by this bond; or
- (b) cease for any reason to have any liability or continuing liability under this bond including, without limitation, pursuant to a release by, concession from or compromise with the Principal
- then the remaining party (or parties) who has signed this bond shall continue to be bound by this bond.
11. **THIS** bond shall be governed by New Zealand law. The parties submit to the non-exclusive jurisdiction of the courts of New Zealand.

SIGNED on behalf of the Surety by

Director

Director

in the presence of

Witness:

Occupation:

Address:

SIGNED on behalf of the Contractor by

Director

Director

in the presence of

Witness:

Occupation:

Address:

NOTE: This bond shall be executed by the Contractor and by the Surety in the manner required for execution of a deed. Any of these parties which are a company must execute the bond by having it signed, under the name of the company, by two or more directors. If there is only one director, it is sufficient if the bond is signed under the name of the company by that director, but the signature must be witnessed by another person. The witness shall not only sign but must also add his or her occupation and address. Alternatively, companies may execute under power of attorney. Any party which is a body corporate (other than a company) must execute in the same manner as a company by persons in a comparable position to a company director or otherwise in accordance with section 9 of the Property Law Act 2007. In the case of a party who is an individual the party shall sign and the signature shall be witnessed by another person. The witness shall also add his or her occupation and address.

SCHEDULE 15

Delete Schedule and replace with the following

SCHEDULE 15 – PRACTICAL COMPLETION CERTIFICATE

Practical Completion Certificate

This Practical Completion Certificate is issued under 10.4.3(a) or 10.4.4.

Contract No......

Contract for:.....(Contract)

Principal: Council

Contractor:.....

This certificate relates to:

The whole of the Contract Works under the Contract.

Separable Portion

[Delete one]

1. Receipt of the Contractor's notice dated and issued in accordance with 10.4.2 is acknowledged.
2. In accordance with [10.4.3(a) OR 10.4.4] the Engineer certifies that the Contract Works or Separable Portion to which this certificate relates have been completed subject to the minor omissions and minor defects referred to below.
3. Practical Completion of such Contract Works was achieved on .
4. The month Defects Notification Period relating to the Contract Works or Separable Portion to which this certificate relates will commence on this date.
5. **[OPTION]**This certificate relates to the whole of the Contract Works. Accordingly the Contractor's Bond is hereby released. It shall be the Contractor's responsibility to advise the surety that the Contractor's Bond has been released. The Contractor's Bond will be provided to the surety by the Principal.
6. **[OPTION]**This certificate relates to part only of the Contract Works. The Contractor's Bond is not released.
7. **[OPTION]**This certificate relates to the whole of the Contract Works. However the Principal contends that the Contractor has failed to carry out and fulfil all of its obligations under the Contract up to Practical Completion and/or has not paid damages payable by the Contractor to the Principal under the Contract. Accordingly the Contractor's Bond is not released.
8. Please note the requirement to maintain Contractor insurance policies in accordance with 8.3.4(c) and 8.5.3 of the General Conditions until the Final Completion Certificate is issued.
9. Health and safety management for the *[Site/part of the Site comprising the Separable Portion]* will now be the responsibility of the Principal. Please contact to arrange access to the *[Separable Portion]* Site for outstanding minor omissions and defects work (as below) and/or remedying of defects.

- 10. The attached list details minor omissions and minor defects outstanding as at the date of Practical Completion which are to be completed by the Contractor pursuant to 11.2.1 and 11.2.8 of the General Conditions and where applicable the Engineer’s view of the reasonable period of time for completing such work.
- 11. Capitalised terms used in this certificate that are defined in the General Conditions have the meaning set out in the General Conditions.

Signed by the Engineer:

Engineer’s name:

Date:

Minor Omissions and Minor Defects at Practical Completion of the Contract Works or Separable Portion referred to above.	
Minor omission or minor defect	Time for completing (Note when no time is entered remediation is to be completed within 5 Working Days of the issue of this certificate.)

SCHEDULE 16

Delete Schedule and replace with the following

SCHEDULE 16 – FINAL COMPLETION CERTIFICATE

File Ref: _____

Final Completion Certificate

Contract No.

Contract for:

Principal: [] Council

Contractor:

Practical Completion Date:.....

This certificate is a Final Completion Certificate issued under 11.3.1 of the General Conditions.

This certificate relates to:

The whole of the Contract Works

Separable Portion []

[Delete one]

In accordance with 11.3.1 I hereby certify:

- (a) That the months Defects Notification Period for the Contract Works to which this certificate relates has expired.
- (b) That, insofar as can reasonably be determined, all minor omissions and minor defects included in the Practical Completion Certificate in accordance with 10.4.1 and defects notified in accordance with 11.2.1 for the Contract Works to which this certificate relates have been satisfactorily remedied.
- (c) All further requirements:
 - (i) to be provided by the Contractor prior to the issue of this certificate in accordance with 11.3.2 have been provided; and
 - (ii) to be provided or completed by the Contractor prior to the issue of this certificate in accordance with the Contract documents have been provided or completed.

Note:

- 1. The Contractor remains liable for the fulfilment of any obligation which remains unperformed or not properly performed notwithstanding this certificate in accordance with 11.4.1.
- 2. The Contractor's obligation to insure:
 - (a) the Contract Works under 8.3.4(c); and
 - (b) for public liability under 8.5.3

ceases as at the issue of this certificate.

3. Retention moneys retained by the Principal in accordance with 12.3.1 for the [*whole of the Contract Works/Separable Portion the subject of this certificate*] are now payable.

OR

3. The bond in lieu of retentions (if any) provided by the Contractor in accordance with 12.3.3 is released on the issue of this certificate.
4. If not already submitted the Contractor should provide its final payment claim in accordance with 12.4.1.

Signed by the Engineer: _____

Engineer's name: _____

Date: _____

1.	Construction General.....	4
1.1.	General overview.....	4
1.2.	Scope of the Contract Works.....	4
1.3.	Key deliverables.....	6
1.4.	Site meetings.....	6
1.5.	Reporting.....	7
1.6.	Programme.....	8
1.7.	Monthly Progress Meetings.....	8
1.8.	Project Communications.....	8
1.9.	Public statements.....	9
1.10.	Community and Cultural Impact Considerations.....	9
1.11.	Risk.....	10
1.12.	Hours of work.....	10
1.13.	Setting out.....	11
1.14.	Method Statements.....	11
1.15.	Permits and Consents.....	12
1.16.	Quality.....	12
1.17.	Environmental.....	14
1.18.	Traffic control.....	16
1.19.	Damage to existing features and infrastructure.....	17
1.20.	Removal of Existing Structures.....	17
1.21.	Coordination with other contractors and authorities.....	17
1.22.	Ownership of information.....	17
1.23.	Materials and workmanship.....	18
1.24.	Land for Contractor's use.....	22
1.25.	Contractor's amenities.....	23
1.26.	Stockpile areas.....	23
1.27.	Disposal of Unsuitable or Surplus Material.....	23
1.28.	Disposal Areas.....	24
1.29.	Cleaning Up.....	24
1.30.	Adverse Weather.....	24
1.31.	Water Supply.....	24
1.32.	Potholing.....	25
1.33.	Access to sites.....	25
1.34.	Access to Works by Engineer.....	25
1.35.	Public Relations and Access to Private Property.....	26
1.36.	Services.....	27
1.37.	Emergency Works.....	28
1.38.	Archaeological sites.....	28
1.39.	As-built Drawings and Records.....	28
2.	Health and safety.....	30
2.1.	Health and Safety - General.....	30
2.2.	Health and Safety Plan.....	31
2.3.	Documentation and Reporting.....	32
2.4.	Incidents/Accidents.....	32
2.5.	Safety Audits.....	32
2.6.	Safety in Design.....	33
3.	Earthworks.....	33
3.1.	Scope.....	33
3.2.	Reference Standards.....	33
3.3.	Not Used.....	33
3.4.	General Requirements.....	33
3.5.	Clearing of Site.....	33
3.6.	Stripping Topsoil, Removal of Weak Subgrade and Backfilling.....	34
3.7.	Unsuitable Material.....	34
3.8.	Excavation.....	34

3.9.	Trench Widths.....	35
3.10.	Classification of Excavated Materials.....	36
3.11.	Hydrogen Sulphide Gas.....	36
3.12.	Temporary Works.....	36
3.13.	Backfilling of Excavated Areas.....	36
3.14.	Compaction Requirements.....	37
3.15.	Dewatering and Drainage.....	38
3.16.	Subgrade Foundation Approvals.....	38
3.17.	Installation by Horizontal Directional Drilling.....	38
3.18.	Final Site Trimming.....	39
3.19.	Re-spreading of Topsoil and Grassing.....	39
3.20.	Protection of Pipes beneath Earthworks Area.....	40
3.21.	Sediment and Erosion Control.....	40
4.	Concrete Work.....	41
4.1.	Scope and General Requirements.....	41
4.2.	Standard Specifications.....	41
4.3.	Materials.....	41
4.4.	Concrete Supply.....	42
4.5.	Concrete Placement.....	42
4.6.	Inspections.....	43
4.7.	Testing.....	44
4.8.	Reinforcing Steel.....	44
5.	Sewer System Materials and Installation.....	44
5.1.	Scope.....	44
5.2.	Reference standards and codes of practice.....	44
5.3.	General.....	45
5.4.	Pipes and Fittings Materials and Types.....	45
5.5.	Pre-Acceptance Materials Testing.....	46
5.6.	Isolation Valves.....	46
5.7.	Tolerances and Rejection.....	48
6.	Pipe Laying – Open Trench.....	51
6.1.	General.....	51
6.2.	Inspections.....	51
6.3.	Laying.....	51
6.4.	Surface Reinstatement.....	54
7.	Pipe Laying – Trenchless.....	55
7.1.	General.....	55
7.2.	Thrusting.....	55
7.3.	Tracer Wire.....	56
8.	Pipe Joints.....	56
8.1.	Butt Fusion Jointing.....	56
8.2.	Electrofusion Jointing.....	60
9.	Appurtenances.....	63
9.1.	Manholes.....	63
9.2.	Valves.....	65
10.	Pressure Sewer Laterals.....	65
10.1.	Scope of work.....	65
10.2.	Pressure Sewer Lateral.....	66
10.3.	Testing.....	66
10.4.	Reinstatement.....	66
11.	Sewer Line Testing.....	66
11.1.	General.....	66
11.2.	Testing of Pressure Sewer Reticulation and Rising Mains.....	67
11.3.	Charges for Failed Tests.....	69
12.	Structural Steelwork and Miscellaneous Metalwork.....	69
12.1.	Scope.....	69
12.2.	Standard Specifications.....	69

12.3.	Structural and Miscellaneous Mild Steel Work	69
13.	PUMP STATION WORKS	72
13.1.	Scope	72
13.2.	Set-Out	72
13.3.	Earthworks	72
13.4.	Pumps	72
13.5.	Wetwells	72
13.6.	Valve Chamber	73
13.7.	Flowmeter Chamber	73
13.8.	Emergency Storage Tank	73
13.9.	Internal Pipework	74
13.10.	Interconnecting Pipework between Chambers	74
13.11.	Electromagnetic Flowmeter	74
13.12.	Odour Filter	74
13.13.	Level Transducers and Back-Up Float Switches	74
13.14.	Electricity Supply	74
13.15.	Crash Barrier	74
13.16.	Vehicle Access	75
13.17.	Site Security and Fencing	75
13.18.	Fibre Optic Cable Duct Between Pump stations	75
13.19.	Site Levels and Finishes	75
13.20.	Commissioning	75
13.21.	Operation and Maintenance Manuals	76
14.	Reinstatement	77
14.1.	General	77
14.2.	Carriageway Rehabilitation	77
14.3.	Asphaltic Concrete Reinstatement	78
14.4.	Kerb and Channel	78
14.5.	Vehicle Crossings	79
14.6.	Roadway Ancillaries	80
14.7.	Service Covers	80
14.8.	Grassed Berm	80
15.	Electrical & Controls	80
15.1.	Scope Of Work	80
15.2.	Information to Be Provided By Electrical Contractor	83
15.3.	Drawings	84
15.4.	Standard Specifications	84
15.5.	Corrosion Protection: Main Switchboards / Motor control cubicles:	85
15.6.	Electrical Requirements	85
15.7.	Supervision	89
15.8.	External Envelope Enclosure Construction To IP55.	90
15.9.	Internals of Enclosure Construction To IP54	90
15.10.	Motor Control Centre	91
15.11.	Variable Speed Drives (where applicable)	92
15.12.	MCC Internally Mounted Equipment	92
15.13.	Silent Operation for Contactors and Relays	94
15.14.	Installation of Motor Control Centres	94
15.15.	Commissioning and Testing	94
15.16.	Socket Outlets	95
15.17.	Specialist Technical Attendance on Site:	95
15.18.	Functional Control Description	95
15.19.	Commissioning	95
15.20.	As-Built Drawings and Operation and Maintenance Manuals	95
15.21.	Practical Completion	96
15.22.	Guarantee and Warrantee	96
15.23.	Completion	96
	Appendix A Cultural Impact Assessment	98

1. Construction General

1.1. General overview

This Specification sets out the principal's requirements for the supply of all materials, plant, equipment, temporary works, tools, labour, superintendence, and incidentals necessary for execution of the works described according to the plans, drawings, specifications, General Conditions of Contract, Special Conditions of Contract and Schedule of Prices either within the document or developed as part of the design phase. The compliance with all parts of this Specification applies to all stages of the works.

1.2. Scope of the Contract Works

1.2.1. Scope - General

The required outcome of the implementation of the Tarawera Scheme is the safe collection and conveyance of wastewater from properties within the Area of Benefit to the Rotorua Wastewater Treatment Plant, via a connection into the existing Rotorua sewerage network.

The Tarawera Scheme shall comprise of LPGP units installed on each property within the Area of Benefit, connected to low pressure street mains, and a trunk main to the agreed connection point of the existing network at the junction of Okareka Loop Road and Tarawera Road.

Communication with landowners and residents shall be undertaken by the Contractor, with the Contractor providing sufficient notice of the works affecting each of the properties.

The scope of this contract covers Stage 1 of the construction works, being the construction of the reticulation network, trunk main and pump stations. The LPGP units and connection of properties to the network will be delivered under a separate Stage 2 contract.

1.2.2. Phases of the Scheme Development

The phasing of the Tarawera Wastewater Reticulation Project is shown below. The Contract Works covered by this contract covers Stage 1 of both Phases 3 and 4 of the wider project:

Phase 1: Preliminary Design – Including the general layout of the street mains within the Area of Benefit, the identification of the recommended route for the trunk main and connection point to the existing Rotorua wastewater network, an investigation of the impact of the Contract Works on the Okareka St pump station and downstream infrastructure, and preparation of the preliminary version of the Design Report. This phase includes any surveying or geotechnical testing required to determine the feasibility of the scheme layout and the recommended trunk main route.

Phase 2: Detailed Design – Including the detailed design of all street mains, on-property installations and the trunk mains and pump stations through to the connection point, preparation of the Detailed Design Report.

Phase 3: Construction – Construction of the Contract Works in accordance with the Contract Documents and the detailed Design Report. Phase 3 will be delivered in two stages:

- Stage 1: Construction of the reticulation network, boundary kits, trunk main and pump stations.
- Stage 2: Construction of the on-property works and connections to the boundary kits.

The installation of the boundary kit on each property is the point of demarcation between Stage 1 and Stage 2.

Phase 4: Commissioning – Commissioning of the Contract Works in accordance with the commissioning guidelines, following their approval by the Engineer. Phase 4 will follow the same two stages as Phase 3, respectively.

1.2.3. Activities related to the Contract Works

The Contract Works include (but are not necessarily limited to) the supply of all labour, plant, materials and equipment for the construction and completion of the following activities, in accordance with the Contract Conditions and this Specification:

- a) Production of “Issued for Construction” drawings off the Detailed Design drawings provided.
- b) Supply, construction, installation and commissioning, including civil, mechanical and electrical aspects, of:
 - a. The low pressure gravity street mains and property laterals including installation of and connection to each Boundary Assembly, and all associated works, including any required valves, flush points, scour points, chambers, culvert crossings, bridge crossings, road crossings, and all associated pipelines and fittings.
 - b. The trunk main connecting the Area of Benefit to the Rotorua wastewater network and all associated works, including any required valves, flush points, scour points, chambers, culvert crossings, bridge crossings, road crossings, and all associated pipelines and fittings.
 - c. The three new pump stations and all associated works (two transfer stations and one booster station), including but not limited to earthworks, wet well, valve chamber, flow meter chamber, pipework, valves, odour filter (if required), concrete works, crash barrier, fencing and electrical works.
 - d. Installation of mains feed cables from Unison-supplied point of connection to each pump station electrical cabinet, testing and livening of such.
- c) All reinstatement of areas disturbed as part of the Contract Works.
- d) Other remedial work as required.
- e) Provision of As-Built records of the works.
- f) Attendance at all meetings with Council and/or stakeholders.
- g) Progress and performance reporting as required by this Specification.
- h) All consents, permits and approvals in accordance with applicable legislative requirements.
- i) Liaison with utility companies for the location of existing services, protection of services and any temporary diversions or relocations that may be required.
- j) Safety, Environmental and Quality planning, management and monitoring.
- k) Liaison with RLC’s Cultural Impact Team (if required) and attendance at cultural inductions and ongoing engagement.
- l) Traffic management and planning as required.
- m) Relocation of any existing buried services as required to carry out the Contract Works.
- n) Any other items required to carry out the Contract Works in accordance with the requirements and intent of the Contract Documents.
- o) Management of the works described above.

1.2.4. Issuing of For Construction Drawings

The Principal will provide the Contractor will a full set of Detailed Design drawings. These drawings will be of the same level of detail and content as expected of For Construction drawings.

Once the Contractor has received all necessary consents, permits and approvals for the Contract Works, and final procurement and supply arrangements have been confirmed, the Contractor shall submit a record of all proposed Detailed Design drawing amendments to the Engineer for review. The Engineer may either approve the amendments or seek input from the Design Consultant regarding the

impact of any changes and if required, the Contractor and the Design Consultant shall meet to discuss the resolution of any issues raised by the proposed amendments.

Following resolution and acceptance of the proposed amendments by the Engineer, the Contractor shall make any required changes to the Detailed Design drawings and issue For Construction drawings.

Note that an extensive design review of the Detailed Design drawings is not required.

1.3. Key deliverables

Deliverables should be provided as electronic files in a format to be agreed with the Engineer prior to submission. Additionally, drawings may be required as hard copies as requested by the Engineer.

The following are the key deliverables:

Description	Section Reference	Indicative date for delivery
Project specific management plans (health and safety, quality, environmental, traffic management)	2 1.16 1.17 1.18	No less than 20 working days prior to the commencement of works on site.
Issued For Construction Drawings	1.2.4	Dependent on design contract duration. Note that initial designer focus will be on confirming pipe lengths, sizes and ratings to allow installation to progress in the absence of detailed drawings
Method Statements	1.14	Minimum of 5 working days prior to the commencement of the subject work.
Any applicable consents, work permits, corridor management notices.	1.15	Prior to the commencement of the works they refer to
Monthly Report, detailed programme, progress claim, and invoice	1.5.5	Monthly
All warranties, data, producer statements (as required), operations and maintenance manuals, test results (as required), critical spares.	Many	Date of Practical Completion
Commissioning Plan	13.20	No less than 20 working days prior to introduction of energy into part or all of the scheme (Energy includes electrical power, hydraulic potential or chemical loading).
As built documents Commissioning report(s)	1.39	Monthly as works are completed but no later than the date of Practical Completion.

1.4. Site meetings

As well as normal day to day supervision, site meetings with the Contractor or its agent and the Engineer may be held at times and intervals as reasonably required by the Engineer.

1.5. Reporting

1.5.1. Reporting - General

All Reports shall be in electronic form. The timing and format of reports may be amended at any time by the Engineer. Reporting must be in a format acceptable to the Engineer including comparisons of actual results against targets. These comparisons should be documented through graphs or charts in the report.

Where applicable, all data must be recorded in accordance with the relevant Council policy and legislation.

The content of reports shall have emphasis on concise, relevant, meaningful and accurate information. The reports shall at least contain the information set out below.

1.5.2. Immediate Reports

Immediate Reports shall be prepared by the Contractor and delivered directly to the Engineer as soon as practicable following the event(s).

Contents:

- Accident and incident reports
- Loss of service
- Written complaints including about Contractor's conduct

1.5.3. Daily Reports

Daily Reports shall be prepared by the Contractor and delivered directly to the Engineer by the end of the Working Day.

Contents:

- All non-compliance events and activities.

1.5.4. Daily Job Record Form

The Contractor's Quality Manager shall fill in a Daily Job Record form on every Working Day regardless of whether any actual work is completed on the day, and on any non-Working Day when work is carried out, from the date of Possession of Site to the date of Practical Completion.

The completed Daily Job Records shall be supplied to the Engineer on demand. A copy of the Daily Job Records for each week shall be delivered to the Engineer on the last Working Day of each week (fax/email copies acceptable). Payment will not be made for work on days for which the Engineer has not received copies of the Daily Job Records.

The Daily Job Record form shall include the following information as a minimum:

- Day and date
- Weather conditions
- Start and finish times on site
- A brief description of the activities on site, including any length of pipe laid
- Details of the plant and number of Contractor's personnel on site
- Details of any extraordinary incidents (health and safety, visitors to site etc)
- Notes on which, if any, parts of the works have been delayed due to inclement weather
- Name and signature of person filling out the form.

1.5.5. Monthly Reports

The Contractor shall prepare a Monthly Report for submission to the Engineer by 4.00pm on the fifth Working Day of the following month, this being at least five Working Days in advance of the Monthly Progress Meeting and in conjunction with the Contractor's monthly claim.

The Monthly Report shall address the following at a minimum:

- Health and Safety monitoring report and trends (including incidents/accidents, and remedial actions, and any deficiencies identified with compliance with the Safety Plan) and an outline of corrective actions initiated
- Quality including non-conformance events and mitigation measures
- Environment including near misses, incidents and response
- Activity Report including:
 - Contract overview of month's operations and any key issues
 - Progress against programme
 - Work programmed over the next month
 - Planned improvements/changes to Services
 - Changes to the planned programme
- Matters in dispute under the Contract
- Customer Service and complaint records and trends
- Relationship management
- Updated Risk Register
- Successes worthy of wider reporting.

1.6. Programme

The Contractor shall produce a prioritised programme, updated, and revised in consultation with the Principal. The Programme will be developed and submitted in both hard copy and soft copy using MS Project software.

The programme shall show all deliverables as milestones with HOLD points clearly marked. The programme shall clearly show the critical path of activities to completion of the Contract Works.

The Contractor's programme shall make reasonable allowance for review and approval of the Contractor's documentation by the Engineer.

Refer also to the General Conditions clause 5.10.

1.7. Monthly Progress Meetings

Formal monthly meetings shall be held to review overall progress and performance on the Contract Works and to identify issues needing to be addressed by the Contractor or the Engineer.

During periods of significant change in the delivery of the Contract Works, such as the mobilisation of the Contractor, progress meetings may be held more frequently at the request of the Engineer and subject to the Contractor's approval, not to be unreasonably withheld.

1.8. Project Communications

1.8.1. Contractor's Communications

The Contractor shall maintain the following means of communication for the duration of the contract for communication with the Engineer or his representative(s):

- a manned telephone or cellular phone during working hours,
- email facilities, and

- **Emergency Contacts**

The Contractor's project manager or nominated representative must be contactable by mobile phone at all times (24hrs).

1.8.2. Person in charge

The Contractor shall notify the Engineer in writing, the name and 24 hour contact phone number, not being an answer phone, of the person responsible for the supervision of all Contract Works. Any instructions given to this person shall be deemed to have been given to the Contractor.

1.8.3. Instructions in Writing

All instructions will be given to the Contractor in writing and similarly any requests or complaints by the Contractor except those of a minor nature shall be made in writing to the Engineer.

1.9. Public statements

The Contractor or any of its representatives shall not make public comments or provide information to the media concerning the Principal's business or operations including policy matters, road conditions, project status, programme schedule and contractual matters. This includes publication on social media in any form.

The Contractor shall refer all enquiries to the Engineer or their representative.

Under no circumstances shall the Contractor admit any Council liability for any loss or damage suffered by a third party.

1.10. Community and Cultural Impact Considerations

A Cultural Impact Assessment has been undertaken by RLC as part of this project and has been included as Appendix A. The Contractor shall comply with the requirements of the cultural impact assessments and respect the "mana whenua" and "tikanga" cultural values of the landowners affected by this contract.

The Contractor's monthly report shall contain a section covering cultural issues raised during the month.

1.10.1. Iwi & Community Liaison Manager

The Contractor shall appoint an Iwi & Community Liaison Manager to ensure a strategic and managed approach to engaging with residents and home owners throughout the Contract Works.

The Contractor shall allow in their pricing for the Iwi & Community Liaison Manager to attend the Monthly Progress Meetings.

1.10.2. Cultural Liaison Manager

Council may elect to appoint a Cultural Liaison Manager.

If appointed, the Contractor shall allow for the Cultural Liaison Manager and their advisors to attend:

- Weekly and monthly health and safety meetings for the duration of the contract;
- Meetings between the Engineer and the Contractor on a monthly basis.

If appointed, the Cultural Liaison Manager will, from time to time, visit the site to observe the work, in particular, those areas which are of cultural significance. Owing to the multiple locations of active work sites the Cultural Liaison Manager may appoint other team members to undertake site observations on their behalf.

Contact details for the Cultural Liaison Manager will be supplied to the Contractor by the Engineer if one is appointed.

The Cultural Liaison Manager will report back all communications and concerns to the Engineer’s Representative. The Engineer’s Representative will then take up any matters of concern with the Contractor.

Records are to be kept of discussions between the Contractor and the Cultural Liaison Manager.

1.10.3. Contractors Cultural Induction

If instructed by the Engineer, all of the Contractor’s staff and subcontractors working on the site of the Contract Works shall attend a cultural induction prior to any construction works and comply with the requirements of the cultural protocols identified during the cultural induction process.

This cultural induction shall be arranged by the Cultural Liaison Manager and the Contractor.

1.10.4. Accidental Discovery

The requirements and protocols following an accidental discovery are described in section 1.38.

1.11. Risk

1.11.1. Risk - General

The Contractor shall be responsible for the creation and maintenance of a Risk Register for the Contract Works. The Risk Register shall consider both programme risks and construction risks, be updated monthly and provided to the Engineer with the Monthly Report.

1.11.2. Risk Register

The following table provides a high-level description of certain risks to the relationship and to fulfilment of expectations and a summary of how these risks will in part be managed:

Type of Risk	Mitigation/minimisation method
Cost Risk Situations which have the potential to result in costs being above budget.	The works undertaken can be adjusted if costs are tracking above budget. Measures will provide early warning if there is an issue between estimated cost, actual cost, backlog of work, and work yet to be undertaken.
Time Risks Situations which have the potential to result in time delays and undesirable construction seasons or completion dates.	Monthly Programmes will be specified for the completion of Contract Works and there is a contractual obligation to comply with these programmes.
Quality Risks Situations which have the potential to result in a completed goods or service which does not meet the principal’s requirements and/or the requirements of the Principal’s customers.	The Principal’s involvement in the work will provide understanding of situations where repeat work is occurring. The Principal will in consultation with the Contractor decide if work will be deferred if conditions are not appropriate to undertake the work.
Technical Risks Risks associated with the activity that cannot be carried by the Contractor or the Principal.	Specialist expertise will be brought in whenever required, as peer review.

1.12. Hours of work

No work shall start before 0700 hours or continue later than 1900 hours from Monday to Saturday. Work outside these hours and on Sundays and Public Holidays may be possible subject to specific approval of the Engineer, providing a minimum of seven (7) days’ notice is given. Saturdays, Sundays

and public holidays shall not be regarded as normal working days for programming purposes unless specifically required by the Contractor and approval given by the Engineer prior to implementation of the applicable portion of the Contract Works.

Work in the roadway will cease at midday on Fridays between 25th December 2022 and 28th January 2023.

1.13. Setting out

The Contractor will be responsible for all construction setting out and shall, before construction, check and verify all drawing dimensions on site and notify the Engineer if any ambiguities exist.

The Contractor shall be responsible for the correct setting out of all works which includes any offset pegs, from the survey control points which are indicated on the contract drawings. The Contractor shall be responsible for locating these or establishing any other control point necessary to enable the correct setting out of the contract works.

The Contract Works shall be set out by a Registered Surveyor engaged by the Contractor, based on the reference/benchmarks or other relevant criteria indicated on the Drawings. The surveyor shall attend the site as many times as may be necessary during the Contract period, to ensure the works are correctly set out.

The Contractor will also confirm the final set-out of all works onsite (on-property works) with the Engineer prior to the commencement of any works.

Refer also to General Conditions clause 5.8.

1.14. Method Statements

Prior to carrying out the Contract Works, the Contractor shall submit detailed Method Statements to the Engineer for approval.

The Contractor shall ensure that all construction activities are properly planned, documented and communicated in advance and, to that end, shall prepare Method Statements for guidance of the workforce.

Method Statements shall be subject to approval by the Engineer, whose approval will not be unreasonably withheld, and a draft of each shall be submitted to the Engineer a minimum of five working days prior to proposed commencement of the subject work. The Engineer will review and provide comment on each draft within three working days of receiving same.

As a minimum, the Contractor shall provide method statements for the following work:

- Construction of pipelines for reticulation network and transfer rising main, including the Contractor's proposed locations for all drill and receival pits.
- Construction of pipelines at 'special' areas including but not limited to culvert crossing, and any shallow excavations
- Construction of pump stations, including excavation works.
- Construction of Air Valve and Wash Out fittings along pipelines
- Preparation of electrical MCC shop drawings/fabrication drawings
- Testing of all water retaining infrastructure
- Testing of all pipelines
- Commissioning of each portion of work.

The Method Statements shall include the following information:

- Sequencing of operations
- Environmental impact mitigation measures
- Major items of plant (includes order date/delivery), equipment and/or materials to be employed

- Proposals for dewatering plant or excavations (if required) and
- Coordination of works at the site.

The Contractor shall not commission the system until the Commissioning Plan is approved by the Engineer. For the avoidance of doubt, commissioning does not include testing of welds or leak testing of pipe / fixtures. Commissioning does include all activities where energy (electrical or dynamic hydraulic) is introduced into the system to prove functionality of the network.

1.15. Permits and Consents

If permits and/or consents are required for Stage 1, the Contractor shall maintain such records and carry out such tests and other activities as are required to prove such compliance, to the satisfaction of the Consent Authority or its nominee.

1.15.1. Resource Consent

If Resource Consents are required for Stage 1, the Contractor is responsible for obtaining all required Resource Consents for the Contract Works and for complying with the Resource Consents once granted. The costs associated with obtaining a Resource Consent are claimable as a Variation if required.

1.15.2. HAIL Sites

Where sites have been identified as potential Hazardous Activities and Industries List (HAIL) sites, soil sampling shall be undertaken during the Contract Period to confirm HAIL status of these sites. If confirmed as HAIL sites, then all excavated material from these sites shall be required to be disposed of to an approved site.

1.16. Quality

1.16.1. Quality – General

For the Principal, the objective of quality assurance is to engage all parties in the most reliable method to achieve good quality, compliant work. This effectively designs quality into the work and results in cost effective, value work that is done once and right. Work should also meet expected Quality Assurance systems specified in ISO 9001.

The Contractor shall prepare a Quality Management Plan specific to the construction phase of the works detailing at a minimum:

- a) Project Management
- b) Survey and Setting Out
- c) Management of Subcontractors
- d) Rectification of non-complying work
- e) Compliance with Acts and Regulations (Resource Management Act 1991)
- f) Compliance with the materials and testing requirements of section 1.23
- g) The items listed in clause 5.18.2 of the General Conditions.
- h) Management and Operation of Quality Plan

Once approved by the Engineer, the Contractor shall deliver the Contract Works in compliance with the Quality Plan.

1.16.2. Contractor's Key Personnel

The Contractor's Key Personnel are as outlined in the table below:

Role	Responsibility	Key Personnel
Contractor's Representative	Contractor's representative for all contract-related matters	Ken McLeod
Site Representative	Main contact for the Engineer on site and responsible for direction of staff on site.	Nadia Whyte
Commissioning Manager	Responsible for setting out and commissioning of the works	Daniel Snow
Contract Manager	Main contact for the Engineer and responsible for overall management of the contract.	Daniel Snow
Iwi & Community Liaison	Responsible for the communication with homeowners, occupants and local Iwi and responsible for ensuring compliance with any Cultural requirements placed on Council.	Kauri Thornton
Quality Manager	Responsible for certifying acceptability of the Contractor's materials and workmanship and completion of the Daily Job Records.	Becky Cox
Safety Officer	Responsible for all safety issues on site, including inductions, site specific safety requirements and any other safety issues.	Kate Perrott

1.16.3. Continuous improvement

All staff will be encouraged to identify improvements to processes, where these will reduce waste in the end to end delivery of work. The Contractor will consider the following as part of continuous improvement:

- Are we identifying and reducing waste of resources?
- Is the work being carried out enhancing the customer experience and the Principal's assets, while meeting other requirements such as staying within budget?
- What are we doing, what can we be doing, and what can we be doing better, to improve our performance, to minimise cost, and to improve the experience of the customer and the asset?

1.16.4. RITS Assessments

There are a range of checklists and testing documents supporting the Regional Infrastructure Technical Specification, certifying the works carried out meet the RITS requirements. Where relevant, these checklists and tests shall be incorporated into the Contractor's Quality Plan and supplied to the Engineer along with the Monthly Report.

The checklists and tests are available at the following website:

<https://www.waikatolass.co.nz/shared-services/rits/documents>

1.16.5. Contractor's Records

The Contractor shall produce and maintain records which clearly demonstrate that the materials, work methods and completed work meet the requirements of the Contract Documents.

Copies of all sheets to be used for this purpose and an explanation of their use shall be included in the Quality Plan.

The Contractor's Quality Control records shall be available for inspection by the Engineer at all times. In particular all Quality Control records shall be submitted to the Engineer prior to commencing any Inspection of Works, and all contract site meetings.

1.16.6. Photographic Records

The Contractor shall keep an annotated photographic record of all sections of the works at all phases of the works, including at least one photograph per 50 m of pipe laid. The record shall include photographs both prior to and after construction of the contract works. Annotations shall include a description of the subject matter, station and the date the photograph was taken. The record shall be made available to the Engineer at all times.

A copy of the photographs pertaining to each month's progress shall be supplied to the Engineer with the monthly progress claim, and a complete copy set of all photographs shall be delivered to the Engineer within 5 Working Days after the date of Practical Completion.

1.16.7. Additional Quality Requirements

If the Contractor supplies any material or carries out any Contract Works which is not in accordance with the Contract, the Engineer may, at the Engineer's discretion, order further inspections and tests to be carried out with all costs incurred by the Contractor.

The Principal reserves the right to audit the Contractor's quality assurance procedures and quality control at any time. Where activities are undertaken not in conformity with the Contractor's Quality Plan the Contractor shall notify the Engineer for the reasons and what is being done to rectify the non-conformance. Such non-conformances will be considered a serious breach of contract.

The Contractor shall provide for observation of the construction by a Chartered Engineer experienced in wastewater network construction.

Upon completion of the Contract Works the Contractor shall provide to the Engineer executed Producer Statements as required in the form provided by Engineering New Zealand.

Refer also to General Conditions clause 5.18.

1.17. Environmental

1.17.1. Environmental - General

The Contractor shall be responsible for ensuring that all work and work practices are in accordance with the Resource Management Act, the relevant sections of the Regional Water and Soil Plan for Bay of Plenty Regional Council and the Rotorua Lakes Council's District Plan.

As described in section 1.15, the Contractor is responsible for obtaining all required Resource Consents for the Contract Works and for complying with the Resource Consents once granted.

The Contractor shall prepare a project-specific Environmental Management Plan. The Environmental Management Plan shall identify all resource consents requirements and address the management of dust, noise, spills, sediment, water and silt, and work in the vicinity of trees as a minimum.

Contract Works undertaken under this Contract have the potential to impact on the local environment. The Principal and the Contractor will work together to ensure the Contractor's personnel staff are aware of:

- Legal and regulatory constraints when undertaking work
- The potential environmental impacts of the work being carried out
- Methods of mitigating or minimising environmental impacts.

The Contractor shall ensure that no polluting substance shall be discharged onto the land, into the air (as is practicable), or any waterway.

1.17.2. Dust nuisance

The Contractor shall be responsible for ensuring that adjacent residents, or other members of the public, suffer no inconvenience or hardship from dust or mud arising by any means whatsoever from the Contract Works. The Contractor will endeavour to ensure each Site and adjoining public services are kept clean.

1.17.3. Noise nuisance

The Contractor shall carry out work in accordance with Section 16 of the Resource Management Act 1991 and the District Plan. The Contractor shall also cooperate with the local authority's Noise Control Officers where required.

1.17.4. Spills

The Contractor shall ensure that no toxic or contaminating substances can spill on the site or into any waterway. Any such spill and resulting pollution shall be reported promptly to the Engineer and notified to BoPRC. Remediation of any pollution shall be at the Contractor's expense.

1.17.5. Maximum Exposed Trench Length for Pipe Laying

For each pipe laying section by Open Trenching Method, no more than 100 m of excavated earth trench shall remain open at any one time, with a total of no more than 500 m excavated trench exposed at any time. Each section of trench shall be filled and re-compacted progressively. Once a section of trench is filled, grass will be sown to re-establish ground cover in weekly blocks as the pipe construction progresses.

1.17.6. Working in the vicinity of trees

If any work requires the removal of trees Council will liaise with the landowner directly. If any filling/excavation works are to be undertaken within the drip line of any established or significant trees, the Engineer is to be notified prior to these specific works commencing. All works undertaken within these areas are to be as directed by the Engineer or appropriate Rotorua Lakes Council representative. Care is also to be taken to avoid damage to the trunks, roots, branches of any trees by hand tools and machinery.

The Contractor shall observe the following when working in the vicinity of trees:

- Do not put soil debris or builder's materials against a tree trunk or within the branch spread as this can cause serious injury to the tree.
- Do not light fires below or near the canopy of the tree.
- Keep generators and static machinery away from the tree.
- Do not spread, store or dump any chemicals below a tree.
- Do not drive mechanical diggers or vehicles over the root system, compaction of the soil prevents vital air and water from reaching the roots and can cause the tree to die.
- Any construction or excavation should be kept clear of the branch spread by at least 1 metre. This shall be achieved by implementing a temporary fence around the tree branch spread area.
- Retain natural soil level. A change in the grade will damage tree root zones. Removing or adding soil can cause serious harm and eventual death of the tree. Lowering the soil level will remove fragile 'feeder' roots and can expose root zones to the damaging effects of the sun, frost and wind. Adding soil will deprive tree roots of air and cause a carbon dioxide build up. This will result in root death and the overall death of the tree.
- Avoid any excavation within the branch spread of the tree. Tunnelling beneath the root systems with thrusting equipment should be considered.

- Avoid impervious surfacing or the placement of weed control membrane over the roots of a mature tree.
- Do not attach or install foreign objects to the tree, such as signs, cables, wires etc.

1.17.7. Disposal of waste or spoil

The Contractor shall arrange for the disposal of all waste material at suitable sites or facilities. The Contractor shall be responsible for payment of any charges in the use of such sites or facilities, and such charges shall be incorporated with scheduled rates. The Contractor shall obtain written permission from the landowner and ensure that any necessary resource consents or similar approvals are in place prior to using any site.

The Contractor shall indemnify the Principal for any costs or actions if an action is directed against the Principal or the Contractor for the use of a dumpsite.

Any fees/charges associated with the use of any dump site/ sites shall be included in the appropriate rates in the Schedule of Prices.

1.17.8. Control of Water and Silt

The Contractor shall control all water reaching the site of the work, to prevent damage to the excavations, pipes or structures. The Contractor shall not permit any flooding of property, footpaths or roadways to result from their operation or through the use of any pumping equipment. The Contractor shall provide flumes, pipes or other approved means for effectively conveying the water to the nearest adequate and approved outlet.

The Contractor is responsible for any damage to persons or public or private property as a result of their operations and shall repair any damage at the Contractor's expense.

The Contractor shall provide all such pumping plant and drainage pipes and other material as may be required to keep the excavations free from water at all times.

Under no circumstances will any water be allowed to drain into any sanitary sewer or potable water main. The Contractor shall take all necessary precautions to prevent any adjacent ground from being adversely affected by loss of fines through any de-watering process. Any sand, silt or other material deposited by pumping operations shall be removed from side channels at least once per day, and from drains and pipes when directed by the Engineer, and on the completion of the contract.

The Contractor shall take all necessary precautions to prevent silt from being washed from the site. This includes the prevention of silt from being washed down the stormwater reticulation. This may necessitate the erection of structures to contain any silt. The Contractor shall make allowance in the scheduled rates for any such silt control measures.

1.17.9. Natural Water and Pollution of Waterways

The Contractor shall not pollute any waterway at any time. The Contractor is reminded that any use of natural water is subject to the provisions of the Resource Management Act (1991) and the Contractor should ensure that any use of natural water has been authorised by the Regional Council. In this context, "natural water" means all forms of water other than water in any reservoir used for the water supply purposes of any public authority, or in any pipe, tank or cistern.

1.18. Traffic control

The Contractor shall as a minimum comply with the requirements of the NZTA Code of Practice for Temporary Traffic Management, as it applies to the specific sites. A Traffic Management Plan shall be submitted by the Contractor to the Engineer prior to works commencing on any site.

Should the Police (Traffic Safety Branch), WorkSafe, or the Engineer consider at any time there is a risk to traffic, the general public, or the Contractor's employees, the Contractor shall immediately provide such other traffic control, etc. necessary to achieve the required standards. All such costs shall be the

Contractor's responsibility. This may include the erection of additional barricades, scaffolding, lights, warning notices or traffic control signs including, where necessary, the provision of staff to control traffic.

Failure by the Contractor to provide adequate safety measures may result in a work suspension notice being issued by the Engineer, until such time as adequate control is provided. Contract extensions for time lost or additional costs due to work suspension notices under this clause shall not be approved.

Any disruption to property access shall be kept to a minimum. The occupiers of any property which will have its access blocked off for anything exceeding one hour shall be notified in writing and insufficient time to enable them to remove any vehicles etc from their property.

The Contractor shall also ensure parked cars, etc. are moved off the site. All residents in the areas affected by the Contract Works shall be given prior written notice of the works (48 hours) by the Contractor.

The Contractor shall be responsible for obtaining all Corridor Access Requests required to complete the Contract Works.

1.19. Damage to existing features and infrastructure

The Contractor shall, in the carrying out of the Contract Works, take all reasonable care to avoid damage to existing features and infrastructure not related to the Contract Works.

Should any existing features or infrastructure be damaged by the Contractor's operations either directly or indirectly, then such damage shall be repaired by the Contractor at the Contractor's expense and to the standard laid down in the relevant standard specification issued by the Engineer.

For the avoidance of doubt, this includes but is not limited to existing services, roadside furniture and survey marks.

Responsibility for any mark disturbed or destroyed rests with the agency carrying out the works pursuant to section 68 of the survey Act 1986. The Act requires that any affected mark is to be protected or the Chief Surveyor's approval obtained before the marks are destroyed and disturbed.

All survey marks in danger of being disturbed or destroyed by the Contractor's operations shall be accurately offset in a manner approved by the Engineer.

If any boundary peg, survey control, or offset mark is disturbed or destroyed the Contractor shall immediately reinstate it. Should the Contractor fail to do so the Engineer may arrange for the marks to be re-established by a Registered Surveyor at the Contractor's expense.

The Contractor shall liaise with Land Information New Zealand (LINZ) with regard to the preservation of their Benchmarks, or any other permanent survey reference marks, that may be within the construction area.

1.20. Removal of Existing Structures

Any structures that need to be moved for the works shall be reinstated in the same or better condition than original. Photos shall be taken of any structures to be removed before removal occurs to allow the original condition to be recorded.

1.21. Coordination with other contractors and authorities

The Contractor shall cooperate and comply with all reasonable requests made by other contractors and third parties authorised by the Engineer to work on or in the vicinity of the site(s).

1.22. Ownership of information

Ownership of all information and records relating to the Contract Works shall vest in the Principal. This includes, but is not limited to, specific designs and as built drawings.

The Contractor shall supply in a form acceptable to the Engineer, all information that the Engineer requires to keep the above information up to date.

1.23. Materials and workmanship

1.23.1. Materials and workmanship - General

All materials used shall be new, suitable for their proposed use and comply with the relevant NZ Standard or other standards called for in the design and technical specification. Where a particular New Zealand standard specification does not exist, the relevant Australian or British Standard Specification may be used.

All materials shall be adequately stored and protected and where necessary, stacked in accordance with the manufacturer's recommendations.

In all cases where materials and workmanship are required to be approved, the Engineer shall have the sole and final discretion with respect to these approvals.

All test results shall be IANZ certified for both sampling and testing.

1.23.2. Manufacturer's Recommendations

All materials and equipment shall be manufactured and supplied, prepared for, installed, erected, applied, fitted or otherwise used in strict accordance with the respective manufacturer's recommendations. The Contractor shall liaise with the relevant manufacturer's or manufacturer's agents and shall be responsible for ascertaining all such recommendations relevant to the particular applications in this Contract.

The Contractor shall ensure all parts of a construction or finish are compatible and their individual use approved by the manufacturers and suppliers of other parts of the system. Source all parts of a system from a single manufacturer or supplier.

The Contractor shall take delivery of and store products, materials and components in accordance with codes of practice and the product manufacturer's or supplier's stated requirements and shall maintain the proper condition of any protective packaging, wrappings or supports during delivery, unloading and storage.

The Contractor shall handle products, materials and components in accordance with codes of practice and the manufacturer's or suppliers stated guidelines. Distortion and any contact with potentially damaging surfaces or conditions shall be avoided.

In addition all substrate conditions are to be within the manufacturers or supplier's stated guidelines both before and during the installation of any material, product or system. Obtain written instructions on the necessary action to rectify unsatisfactory conditions.

The Contractor shall install the materials in accordance with the manufacturers or suppliers technical literature. Ensure that all installers are familiar with the required substrate conditions and the manufacturers or supplier's specified preparation, fixing and finishing techniques.

A copy of all manufacturer's literature shall be provided to the Engineer as part of the as-built documentation.

1.23.3. Water Tightness

All water retaining structures subject to hydrostatic pressure from contained liquid shall be made watertight by the Contractor. The Contractor shall also undertake pressure testing of all pressure pipework in accordance with section 11, of this specification. All leaks, seeps or lack of water tightness revealed by the test shall be repaired by the Contractor, to the Engineer's satisfaction. The Engineer may direct the Contractor to re-test any such structures or pipelines that have been repaired at the Contractors cost, to check the adequacy of repairs. Reasonable notice shall be provided by the Contractor to the Engineer prior to the commencement of any hydrostatic testing.

1.23.4. Handling of Pipes and Fittings

Pipes and fittings shall be handled in such a manner that prevents damage or breakage of any kind and conforms to the manufacturer’s recommendations.

If any pipe or fitting is damaged after delivery to site, it shall not be used and shall either be repaired or replaced at the Contractor's expense and to the satisfaction of the Engineer.

Stored pipes, manholes, fittings and other materials shall be kept clear of pedestrian traffic at all times and storage facilities shall be prepared to protect pipes from the environment.

Suitable slings or straps shall be used in moving pipes.

1.23.5. Documentation

Supporting documentation for all materials and manufactured products incorporated into the Contract Works shall be supplied by the Contractor to the Engineer.

The documentation shall cover all sampling, testing, inspection, and proving of compliance with relevant standards.

The testing documentation shall include the following minimum information:

- a) Specification clause (and or sub clause)
- b) Quality Control Testing required.
- c) Frequency of Quality Control Testing
- d) Sampling and testing carried out by: (name of testing laboratory)
- e) Measuring devices and the method and frequency of calibration.
- f) Date, drawing/line reference, location of test

1.23.6. Approved Material Specifications and Standards

All materials and installations shall comply with the table below, Approved Material Specifications and Standards, unless otherwise specified by the Engineer.

APPROVED MATERIAL SPECIFICATIONS AND STANDARDS		
ITEM	MATERIAL SPECIFICATIONS	STANDARDS
Boundary Kits	<ul style="list-style-type: none"> • Same or similar to Boundary Kits supplied by Ecoflow and compatible with Eone LPGP systems. • Unit shall comprise of 1/4” BSP (32mm) check valve, flushing tee and isolating valve. Both ends shall have 300mm of DN40 PE100 SDR11 PN16 bar pipe with Male Transition Couplers fitted. • Final product requires Engineer’s approval prior to purchase. 	
Valve Chambers	<ul style="list-style-type: none"> • As per detailed design and designer-supplied specification. All shop drawings and PS1 require approval by the Engineer. 	
Pumps	<ul style="list-style-type: none"> • As per detailed design and designer-supplied specification 	

APPROVED MATERIAL SPECIFICATIONS AND STANDARDS		
ITEM	MATERIAL SPECIFICATIONS	STANDARDS
Bedding Material for pressure pipes.	<ul style="list-style-type: none"> Engineer approved excavated onsite material or imported AP7, GAP 20 or SAP 20. 	AS/NZS 2033 AS/NZS 2566
High Density Polyethylene Pipes for Sanitary Sewer	<ul style="list-style-type: none"> HDPE – size and rating as per Design Specification. Pipes to have a black exterior. 	<p>All pipes shall have a manufacturer's licence mark.</p> <p>AS/NZS 2630:2001 AS/NZS 2631:2001</p>
Pipe fittings (tees, crosses, tapers, blank caps, plugs, saddles and bends of various degrees) for pressure pipes.	<ul style="list-style-type: none"> Shall have a constructed rating of at least that of the pipe. Corrosion-protected cast iron or steel and be lined with epoxy-resin or rilsan. PE fittings are also acceptable on PE pipe. Solvent cement fittings may not be used for fittings on pipes over 50mm nominated internal diameter. Prefabricated PE fittings are to be rated two pressure classes higher than specified rating for the main in which they are located. 	AS/NZS 4130:2001 AS/NZS 4131:2001
Electrofusion Couplers.	<ul style="list-style-type: none"> Shall have a constructed rating of at least that of the pipe. 	<p>All pipes shall have a manufactures licence mark.</p> <p>AS/NZS 4129:2000 AS/NZS 4130:2001 AS/NZS 4131:2000</p>
Flanges	<ul style="list-style-type: none"> Shall have a constructed rating of at least that of the pipe. Stub flanges shall be long stub flanges. Flanges shall be Table E of BS 10/AS2129 or matching the adjacent fitting. 	Table E of BS 10/AS2129
Gaskets for flanged joints	<ul style="list-style-type: none"> Shall have a constructed rating of at least that of the pipe. Gaskets between PE flanges may be glued on one face. 	BS 5292:1980
Air Valves	<ul style="list-style-type: none"> RGX Vent-O-Mat 	
Sluice Valves	<ul style="list-style-type: none"> Resilient-seat type, anticlockwise closing, with a non-rising spindle. All surfaces of the body of the valve shall be epoxy-resin or rilsan-coated. PN16 	Class 1 conforming to BS 5163. AS 4158
Activated Carbon Filters	<ul style="list-style-type: none"> McBerns carbon filters 	
Paint for marking valves	<ul style="list-style-type: none"> Road marking paint. Valve Colour: RED 	TNZ M/7 1993
Manholes	<ul style="list-style-type: none"> Precast, centrifugally spun, reinforced concrete walls to specified diameters. Shall have flush type joints. Designed to withstand HN-HO-72 Transit Loading 250 kN unless otherwise stated. 	NZS 3107
Concrete Manhole Lids	<ul style="list-style-type: none"> Precast reinforced concrete. Preformed butyl mastic sealing strip between the lid and the riser. 	NZS 3107

APPROVED MATERIAL SPECIFICATIONS AND STANDARDS		
ITEM	MATERIAL SPECIFICATIONS	STANDARDS
	<ul style="list-style-type: none"> Designed to withstand HN-HO-72 Transit Loading 250 kN unless otherwise stated. 	
Manhole Access Lids	<ul style="list-style-type: none"> Cast Iron frame and cover. Residential Areas – light duty. Road and Industrial areas – heavy duty. Sewer lid to be painted red 	
Backfill material under asphalt and chip seal carriageways	<ul style="list-style-type: none"> All trenches constructed within the carriageway shall be completely backfilled with suitable granular material as defined in TNZ HM/12. 	TNZ HM/12
Backfill material in driveways and footpaths.	<ul style="list-style-type: none"> GAP 40. 	COP for Working in the Road NZS 4402
Backfill material in grass areas.	<ul style="list-style-type: none"> Back berm – selected excavated material in accordance with specification; 100mm top soil. Front berm – GAP 65; 100mm top soil. 	COP for Working in the Road NZS 4402
Concrete (Ordinary)- for use at locations where concrete will not come into contact with sewage or sewage gasses (e.g. thrust blocks)	<ul style="list-style-type: none"> Ordinary Grade in accordance with NZS 3108 and have a minimum 28 day crushing strength of 17.5 MPa unless otherwise shown on the drawings. Curing to comply with NZS 3109. Not to be placed underwater. 	NZS 3108 NZS 3109
Concrete (Special)- for use at any location where concrete may come into contact with sewage or sewage gasses.	<ul style="list-style-type: none"> To comply with the “Specification for Concrete for Use in a Sewage Environment” 	
Concrete Driveways	<ul style="list-style-type: none"> Concrete shall be a minimum 150mm thick. 28 day strength of 25 MPa. Reinforcing SE62 centrally placed 	NZS 3104 NZS 3109 NZS 3108 COP for Working in the Road.
Reinstatement materials for footpaths and vehicle crossings.	<ul style="list-style-type: none"> All materials used for reinstatement works shall comply with the drawings. 	
Topsoil	<ul style="list-style-type: none"> Good quality loam texture with a pH of 5.0 – 6.5. Be of a workable consistency, friable and porous, stripped from its original location to a maximum depth of 200mm, free of pernicious weeds, straw, stones, sticks, clay lumps and any foreign matter exceeding 25mm dimension. 	
Grass seed	<ul style="list-style-type: none"> Mixture of 50% Perennial Ryegrass, 25% Chewing Fescue, 12.5% Brown Top, 12.5% Crested Dogs Tail; all percentages by weight. 	
Bark	<ul style="list-style-type: none"> Minimum grade 4 and to match existing grade. 	
Weed Mat	<ul style="list-style-type: none"> Shall be UV Stabilised. Heavy duty. Colour: Black 	
Fence Wire and Steel	<ul style="list-style-type: none"> All wire and steel is to be galvanised. 	NZS 3471

APPROVED MATERIAL SPECIFICATIONS AND STANDARDS		
ITEM	MATERIAL SPECIFICATIONS	STANDARDS
	<ul style="list-style-type: none"> • 4mm galvanised wire to be used in locations susceptible to salt laden air conditions. 	

1.23.7. Rejection of Defective Materials

No approval or acceptance of the materials and equipment used shall relieve the Contractor of any of his obligations under the contract, or shall prevent the rejection of said materials and equipment, in whole or in part, at any time thereafter, should said materials and equipment be subsequently found by the Engineer to be defective or not in accordance with the requirements of the contract documents.

All materials not conforming to the requirements of the Contract Documents shall be considered as defective and all such materials, whether in place or not, shall be rejected and shall be removed immediately from the site of the work, unless otherwise permitted by the Engineer.

Pipes that have scoring or damage to a depth greater than 1 mm or have been distorted because of improper handling and/or storage shall be rejected. Notwithstanding any test or inspection made, the Engineer may condemn any materials at any time if they are found not to comply with this specification or if they are not the best of their respective kinds, or if they are damaged.

No rejected material, the defects of which having been subsequently corrected, shall be used until approval has been given by the Engineer. Upon failure on the part of the Contractor to comply with any order of the Engineer made under the provisions of this article, the Engineer shall have authority to remove and replace defective materials and to deduct the cost of removal and replacement from any monies due the Contractor.

Should the Contractor fail or refuse to remove any defective materials used within the time indicated in writing, the Engineer shall have authority to cause the unacceptable or defective materials to be removed and renewed or such repairs to be made or defects corrected at the Contractor's expense.

1.23.8. Ordering of Materials

The Contractor shall notify supply times of all materials to site. Materials which may have long delivery times shall be ordered as soon as possible following the awarding of the contract to avoid delays to the completion of the works.

1.24. Land for Contractor's use

The Contractor shall make their own arrangements for the use of such land as may be required for the satisfactory completion of the Contract Works. This shall include provision for any temporary sheds, storage facilities or dumpsites required for the purposes of the Contract works. All costs of such arrangements shall be incorporated into the Pricing Schedule, as the Contractor deems most appropriate.

Where reserve land, street berms or other public place is to be used, prior approval of the Engineer shall be gained and any conditions imposed shall be maintained during the course of the Contract.

All fuel storage and plant that can potentially cause spills of oil or fuels shall be parked within suitably bunded areas to prevent contamination of soil and waterways. No refuelling or servicing of equipment shall be carried out within 50m of a natural watercourse or stormwater drain, on or adjacent to a road carriageway.

The Contractor's site establishment shall minimise interference with:

- private property access
- property owner's operations

- the work of any Service Authority.

Liaison with the Rotorua Lakes Council (RLC) and Bay of Plenty Regional Council (BOPRC) will be required with regard to the location of proposed sites and how they are to be controlled and the condition in which they will be left. If proposed sites are on private land the Contractor shall submit a signed letter from the owner of the land giving approval to them to use the land for the intended purpose.

1.25. Contractor's amenities

The Contractor shall provide, at their own expense, all temporary buildings, sheds, mess rooms, toilet facilities and stores, including attendance, cleaning and lighting as necessary at each Site.

The Contractor shall make their own arrangements with the appropriate authorities for the supply of electricity, water and telecommunications on the site, and shall pay all expenses incurred.

As soon as any part of the Contractor's temporary facilities become no longer required for the carrying out of the Contract Works, the Contractor shall disconnect and/or remove that redundant part and restore the area to the Engineer's satisfaction.

1.26. Stockpile areas

Temporary Stockpiles of Materials on site to be incorporated in the Contract Works shall be located only in areas that have been approved for this purpose by the Engineer.

All Resource Consent Condition requirements regarding the location and maintenance of stockpile sites shall be observed.

No stockpile areas shall be established on RLC road reserve without the written approval of the Engineer and the road controlling authority. It is expected that the Contractor will identify and use temporary dump sites remote from the actual construction site.

Any stockpile area created or used within the road reserve shall be reinstated to a condition acceptable to the Engineer. No plant parked during the hours of darkness or material stockpiled in such areas shall be closer than three metres to the edge of seal.

Any excess materials stockpiled for use within the road reserve in this contract shall be removed from site on completion of the work.

Further to Clause 11.3 of the General Conditions of Contract a Final Completion Certificate will not be issued until all excess material stockpiled within the road reserve has been removed and the area reinstated to the satisfaction of the Engineer.

1.27. Disposal of Unsuitable or Surplus Material

Material to be removed from the Site shall be disposed of as follows:

- a) Cleanfill unsuitable foundation material, rock and unsuitable or surplus backfill (excluding tarseal/bitumen) may be disposed of at the Contractor's dump site.
- b) Tarseal – this to be either:
 - Broken down or crushed to AP65mm size and used in the top part of the backfill, along with any other basecourse strippings. Under no circumstances can it be placed until there is a minimum of 150mm of specified bedding material over the top of the pipes; or
 - Disposed in an appropriate Sanitary Landfill.
- c) Unclean fill must be disposed of at an approved Landfill site. This category includes stumps, trees, etc.

The Contractor shall allow for all costs in disposal of unclean fill.

1.28. Disposal Areas

Resource consents for dump areas shall be arranged by the Contractor. The Contractor shall notify the Engineer of the location of any dump sites proposed and prior to their use shall submit copies of any Land Use Consents required for these areas in accordance with the Resource Management Act 1991.

Dumping shall be permitted only at the sole discretion of the Council, and it should generally be assumed that approval will not be permitted to dump on Council land. No dump areas shall be established on road reserve.

The disposal of surplus spoil from the excavation of the site that is not used in any other construction works on site shall be the responsibility of the Contractor. The material shall be loaded directly on to trucks and carted off site.

The Contractor shall be responsible for locating and managing suitable dump and borrow areas, and shall make all the necessary arrangements for access, fencing, clearing and tidy up, payment of any royalties and the like. Resource consents for dump areas shall also be arranged by the Contractor. The Engineer shall be informed of the location of all sites before work commences.

1.29. Cleaning Up

The Contractor shall maintain the site in a neat and orderly condition throughout the construction period and shall not allow any area to become littered with rubbish and waste material. The Contractor shall remove temporary facilities as soon as they become redundant and, on completion of the work, shall carefully clean out all pits, chambers and conduits and take down and remove all remaining temporary structures, shed, mess huts and site offices. The Contractor shall also remove rubbish of all kinds from any of the grounds which have been occupied and leave them in a neat, clean, evenly graded condition.

1.30. Adverse Weather

The Contractor shall take all precautions to protect the work against damage from adverse weather. The Contractor will be responsible for damage caused by storms, flood etc and to all private or public property affected by any works carried out under this contract. The Contractor must repair the damage immediately following instruction from the Engineer. If work is not commenced within sixteen (16) working hours, the Engineer may arrange for the necessary restoration work to be carried out and charged to the Contractor.

1.31. Water Supply

In the event the Contractor uses water from the Principal's water mains, water shall only be taken at hydrants nominated by the RLC Water Supply Operations Engineer. The Contractor shall notify the Operations Engineer in advance of the intended use, identifying the location and duration of water use. The Contractor shall comply with any directions given regarding the operation of standpipes and allowable flow rates.

The Contractor shall ensure that when using water from a standpipe and hose, a minimum 150mm air gap at the discharge point is to be maintained.

Water is available for construction purposes from nominated fire hydrants by arrangement with the RLC, at current charge rates. **No hydrant is to be used without prior notification and approval from RLC.** Any non-notified hydrant use will be subject to the Non-Notification fee and RLC staff are obligated to report any such misuse.

If hydrants are not available in the Works vicinity, the Contractor will be responsible for tankering-in the required water for use in construction and commissioning, and (if required) safe disposal of the used water.

1.32. Potholing

Potholing, as indicated in the Drawing or as ordered by the Engineer, shall be conducted as soon as practicable after the issuance of site possession, and shall be backfilled and restored within 48 hours from excavation or as otherwise ordered by the Engineer.

Potholes subject to future re-excitation shall be restored with asphalt, whereas potholes, which will not be subjected to re-excitation, shall be restored with the same type as the existing pavement.

Failure of the Contractor to backfill and/or temporarily restore the said test pits will compel the Engineer undertake the remaining works and charge the costs to the Contractor.

1.33. Access to sites

The Contractor shall make provision for any access required to additional land where required to carry out the Contract Works.

The Contractor shall obtain all approvals, and construct and maintain such other temporary roads, tracks, crossings and hard standing areas as may be required for the efficient execution of the Contract Works. Unless otherwise instructed, all such temporary access shall be removed on completion.

The Contractor must seek the consent of the relevant property owners before using private property for construction access, temporary works or storing materials. If the property owner does not give consent and this has a material impact on the construction methodology, the Contractor shall raise the issue to the Engineer's Representative. The Contractor is required to contact the landowner before entering the property.

The rights or customs of adjacent property owners and occupiers for access shall not be infringed by the Contractor, except with the consent of the Engineer which may require alternative arrangements to be made.

The Contractor shall not restrict access for the Principal's staff.

Existing road seal shall be maintained to the Engineer's satisfaction. It shall be kept clean by picking up material that is spilled and, if necessary, by washing down.

1.34. Access to Works by Engineer

The Contract Works shall be open to inspection by the Engineer or the Engineer's Representative, at all reasonable times and in this connection the Contractor shall provide all facilities necessary to enable such inspections.

In addition to the requirements for inspection contained in 6.4 of the General Conditions of Contract, the Contractor shall give the Engineer at least two (2) Working Days' notice of expected project events:

- a) Commencement of Work
- b) Completion of any excavation to subgrade of pavements, footings and foundations
- c) Reinforcement inspections prior to placing of any concrete
- d) Placing of any concrete
- e) Completion of any underground chamber prior to backfilling
- f) Completion of any pipe installation
- g) Pressure testing of pipelines
- h) Commissioning
- i) Electrical/MCC shop drawings
- j) Completion of electrical works
- k) Achievement of Practical Completion.

The Contractor shall not proceed with the above stages of Contract Works until the Engineer or his Representative has inspected, approved and where necessary measured the Contract Works at each stage.

1.35. Public Relations and Access to Private Property

1.35.1. General

The Contractor shall carry out construction activities in such a manner as to avoid unnecessary encroachment on the rights of other persons and shall ensure that its employees and Subcontractors treat all members of the public and the Principal's employees and agents with courtesy and respect. Any complaints received by the Contractor about work being carried out under the Contract shall be reported to the Engineer's Representative, together with details of the Contractor's proposed response.

The Contractor shall maintain quality systems to address and respond to any complaint in a way that meets the reasonable requirements of the complainant and does not expose the Principal to bad publicity and/or liability.

The Contractor shall take all necessary care to prevent damage to public and private properties. Any such damage that might be done shall be made good by the Contractor, to the Engineer's satisfaction, at the Contractor's expense.

Any material and rubbish dropped on public or private property shall be immediately removed. No plant, buildings, rocks, earth, slurry, vegetation or other materials shall be placed or allowed to roll, wash, slide or blow across adjacent boundaries.

1.35.2. RLC's Property Plans

A Property Plan for each future connected property in Tarawera has been prepared by the Design Consultant during the Design Phase (Phases 1 and 2).

Works carried out on each property shall be consistent with the Property Plans up to the location of the proposed connection to the boundary kit.

1.35.3. Private Landowner Permission

Where any works are required for construction of permanent assets on private land, permission for this work shall be obtained by the Principal in accordance with Section 181 of the Local Government Act 2002. For the avoidance of doubt, this includes:

- Any pump stations located on private land and the connecting pipework
- Any properties where the boundary kit installation must be located inside the property boundary, and
- Any locations where the reticulation or trunk sewer pressure mains pass through private land.

Approval for land entry into the private property through which part of the new sewer lines run and the creation of easements through private property will be processed by Rotorua Lakes Council. It is anticipated that these matters will be resolved prior to commencement of physical works.

1.35.4. Private Landowner/Occupier Liaison

As required under the Road Corridor Access Request (RCAR), the Contractor shall notify the residents in writing of the proposed works, at least two days prior to the start of the works, notifying the property owners/ occupiers of their intentions to start work on site and identifying any foreseeable disruption the contract works will have on them.

The letter shall detail:

- Brief Description of Works

- Start date and proposed finish date of the contract works
- The hours and days of the week that the Contractor will be working on site
- Any nuisance that may be caused to homeowner/leaseholder.
- Name and contact phone number of Contractor's Representative and the Engineer's Representative.

A copy of the Contractor's standard letter to the owners/occupiers must be forwarded to the Engineer for their approval prior to the drop.

The Contractor shall identify and locate all the services that could interfere with the construction of the pipelines within the properties before excavation. The Contractor shall also arrange for the temporary connections of any house services that have to be temporarily disconnected to enable the contract works to be carried out.

Where possible, the temporary connections are to be made prior to disconnection. If this is not possible then the temporary connection shall be made within one hour. In either case, the house occupier is to be informed of the proposed disconnection prior to the work commencing.

Temporary fences are also to be constructed prior to fence removal where the original fence is used to restrict entry to an area (such as swimming pool fences), or contain animals or children in the area.

All areas on properties where work has been done shall be reinstated after the Works to as close a condition as existed prior to the work, or as agreed with property owner, whichever is appropriate. In each case, the property owner is to be satisfied with the reinstatement.

1.35.5. Initial Condition of Private Property

Prior to the commencement of construction on private property, the Contractor shall record the condition of all buildings, structures and ground surfaces and trees on the site and on neighbouring properties, which might potentially be affected by the Contract Works. This shall include all private properties and all areas of public road reserve (where applicable).

This survey shall be documented in writing with explanations, illustrated with date stamped photographs. Copies of this documentation shall be provided to the Engineer prior to construction on the affected property.

1.35.6. Issues with Private Landowners

The Contractor shall attempt to resolve any problems with landowners in the first instance. If the Contractor is unsuccessful in obtaining resolution of the problem, then the matter shall be referred to the Engineer. In any case the Engineer shall be informed of any complaints or comments from the landowners within 24 hours.

1.36. Services

Prior to the commencement of Contract Works, the Contractor shall be responsible for verifying the existence and location of above ground and underground services including survey standard marks with each appropriate authority, regardless of whether they are shown on the contract drawings. Where the Contractor is required to pothole, the Contractor shall submit to the Engineer a diagram clearly showing the locations of these potholes.

It shall be the Contractor's responsibility to reinstate any services which are not redundant, and which are damaged while undertaking the Contract Works. This work shall be by an approved suitably qualified person and at the Contractor's own cost.

Relocation of services is covered by a provisional sum in the Schedule of Prices.

Service repairs invoiced to Council will be deducted from Contract Price payments where the services in question were either marked on site or on the drawings or known by the Contractor.

1.37. Emergency Works

The Engineer is to be informed without delay if, during the course of construction works, any situation arises whereby the security of public or private property or the operation of any public facility is endangered. The Engineer may instruct the Contractor's representative to carry out such remedial measures as the Engineer thinks fit to remove the danger. Any work so ordered is to be done at the Contractor's expense. If the work is not commenced within five (5) hours of the instruction, the Engineer may arrange for the required work to be carried out at the Contractor's expense. Should any emergency arise requiring immediate attention, the Engineer may call out whatever forces seen fit and recover the charges from the Contractor.

1.38. Archaeological sites

Special care shall be taken when working in the vicinity of archaeological sites. Should any archaeological artefact, burial ground, Taonga or culturally sensitive items be exposed/disturbed during the works (either previously identified or unidentified), the protocol described in Waka Kotahi's P45 Accidental Discovery Protocol shall be followed, with the Principal taking the role of the Transport Agency.

1.39. As-built Drawings and Records

The Contractor shall maintain a record set of paper construction drawings (A1 or supplementary sketches) neatly marked up to comply with the requirements of the Rotorua Lakes Council.

An electronic copy of the As-built drawings shall be supplied by the Contractor to the Engineer upon completion of the Contract Works before Practical Completion will be certified, in accordance with RLC's As-built standards. This shall be in standard digital exchange format (.DXF), with the origin of co-ordinates related to New Zealand Transverse Mercator (NZTM), or as agreed with the Engineer.

All As-built information shall be supplied with reference to legal survey pegs or data (e.g.: survey co-ordinates) and not merely boundary fences or walls. Survey pegs are not always reliable and in cases of doubt, advice from a Licensed Cadastral Surveyor (LCS) is to be obtained.

The following as-built information shall be supplied by the Contractor:

- a) Title boundaries, road names and north point
- b) Main offset distances from the lot boundaries to enable location of all sections of the pipe
- c) Location and invert levels of all house connections relative to the closest boundary peg
- d) Contract name and number
- e) The month and year of installation
- f) The name and address of the company that carried out the construction works and the name of the Contract Supervisor
- g) Clearly state the LINZ datum
- h) Any underground services not previously marked on services plans. The Contractor shall note any locations where an existing utility service differed in diameter, location and/or material from the Principal's utility services plans
- i) Pipe outside pipe diameter in millimetres
- j) Pipe material, length of pipe laid, grade, direction of flow and class/pressure rating
- k) The invert level of the pipe invert at 20 metre intervals and at all bends and fittings. 20 metre intervals to correspond with those shown on the construction drawings
- l) Manufacturer of pipes, manholes, and all other drainage fittings (with any literature supplied by any of the manufacturers to be supplied separately as part of the As-built records).
- m) Where mains are constructed through private property, the as-built shall show all existing building footprints relative to site boundaries.

- n) Manholes, cesspits, outfall structures, wet well, valve chamber, the lid levels and invert levels
- o) Co-ordinates of manholes, cesspits and outfall structures
- p) Location of the end of an extended connection
- q) Pipes and manholes removed or abandoned (clearly marked)
- r) Schedules of co-ordinates at 20 metre intervals and at all bends and fittings
- s) Schedules of service connections
- t) If the arrangement of multiple fittings is not clearly legible, the Contractor shall provide an enlarged detail of the fitting configuration
- u) Stormwater and Sewer fittings are to be marked as new or existing
- v) Certification by a Chartered Professional Engineer or Licensed Surveyor that the information supplied on the As-Built is accurate within normal acceptable engineering and surveying tolerances
- w) Any other information clearly required to locate or describe the works
- x) Operations and maintenance manuals
- y) All warranties and guarantees.

All as-built drawings shall include a table for the following assets that are indicated on the drawing describing all attributes that have a tick against them. Brochures etc. indicating technical specifications, spare parts manuals and operating manuals shall be included separately. Each individual asset indicated on the drawing should have the required attributes described.

Asset Description	Type	Make	Model	Size	Serial No	Operating Details	Tech Spec's	Spare Parts Manual	Operating Manual
Isolating valves	✓	✓	✓	✓					
Non return valves	✓	✓	✓	✓					
Ultrasonic Sensor	✓	✓	✓	✓	✓		✓	✓	
Asset Description	Type	Make	Model	Size	Serial No	Operating Details	Tech Spec's	Spare Parts Manual	Operating Manual
Air Valves	✓	✓	✓	✓	✓	✓	✓	✓	✓
Backflow Preventors	✓	✓	✓	✓					
Flow restrictors	✓	✓	✓	✓					
Flow meters	✓	✓	✓	✓	✓		✓	✓	
Control Valves (i.e. Pressure reducing, reservoir,	✓	✓	✓	✓	✓	✓	✓	✓	✓

Asset Description	Type	Make	Model	Size	Serial No	Operating Details	Tech Spec's	Spare Parts Manual	Operating Manual
pump or flow control)									
Pumping units	✓	✓	✓	✓	✓	✓	✓	✓	✓

The information shall be provided to the Engineer at any stage upon request.

The cost associated with this shall be paid by the Contractor and be included in the appropriate rates in the Schedule of Prices.

2. Health and safety

2.1. Health and Safety - General

Rotorua Lakes Council is committed to a high standard of Health and Safety practice and compliance with the Health and Safety at Work Act 2015. The Principal requires all contracted entities to have a high standard of health and safety.

Council has joined the joint Waikato/BOP local authority Health & Safety Pre-qualification Scheme which requires independent 3rd party health and safety assessment by SHE Software NZ Ltd. The successful Participant will be required to be pre-qualified under this scheme.

To find out more about Council's Pre-Qualifying Health and Safety System visit the website <https://www.shesoftware.com/>.

The Contractor shall:

- Provide a safe working environment at all times
- Comply with relevant obligations under the Health and Safety at Work Act 2015
- Be responsible for the health & safety of all their employees, subcontractors, and visitors to the site
- Submit to the Principal the Contractor's Health and Safety plan for approval before any work proceeds on site
- Ensure all suppliers and subcontractors have health & safety policies and plans for the work being undertaken
- Be responsible for reviewing and approving the acceptable health & safety documentation of the separate contractors
- Ensure all separate contractors coordinate their safety management plan with that of the contractor
- Ensure subcontractors comply with all Acts, regulations, and codes of practice (approved or voluntary) applying to the trade or profession within which they operate
- Ensure Council as the Principal is advised of any and all hazardous plant, equipment, machinery or substances which are brought into the workplace
- Ensure any accident or incident which harms or may have harmed any person in the workplace, in addition to being recorded and notified, are to be reported to Council, as the Principal.

Before commencing work on site, all contractors must ensure that any employees of the Contractor and subcontractors are conversant with:

- Emergency procedures (to be followed in the event of an emergency)
- Hazards which have been identified, and the hazard controls.

The Principal retains the right to inspect the contract operation at any time, to ensure all safety procedures and rules are being followed. Failure to follow such rules and procedures may result in the contract being terminated immediately. This list is provided to assist the Contractor with their Health and Safety management and in producing and implementing the Health and Safety Plan. It is not intended to diminish the responsibility of any of the parties with regard to their obligations under the Health and Safety at Work Act (2015) or the Contract Documents.

Nothing in the project brief or project documentation shall be taken to limit the obligation of the Contractor, suppliers, subcontractor or the Principal under the Health and Safety at Work Act 2015.

Any failure by the Contractor to comply with the requirements specified in the article above shall be regarded as a breach of this contract, and without prejudice to other remedies, the provisions in these conditions as to remedy in the event of default, suspension or discontinuance of the work shall fully apply to such failures. In particular, the Principal shall be entitled to immediate suspension of the work at the Contractor's expense until any such failure has been remedied.

Refer also to General Conditions clauses 5.7 and 5.17.

2.2. Health and Safety Plan

The Contractor's Health and Safety Plan (HSP) shall include, but not be limited to:

- a) The identification and recognition of all hazards to be encountered within the contract that may cause harm, serious harm, injury or illness.
- b) The provision of clear instructions in writing on work practices for those hazards that have been identified.
- c) The description in detail of steps to eliminate, isolate or minimise those hazards.
- d) The giving of advice to employees of the existence of hazards and ensure that they know and carry out correct work practices to avoid the influence of these hazards.
- e) The provision of appropriate signage, barriers, notices, covers, protective clothing, and equipment as required and to ensure that these items are in good order or repair.
- f) Ensuring that all employees are trained to undertake the tasks required of them. Where they are not fully proficient, adequate supervision should be provided under the direction of the designated safety supervisor.
- g) The monitoring of work activities and ensuring that procedures that maintain safety are followed.
- h) The review of all procedures regularly and the undertaking of revisions to increase health and safety as appropriate. These procedures should specifically include those dealing with emergencies that may arise in the place of work, including the recording and reporting of accidents.

The Principal has identified the following risks and hazards which the Contractor shall address within their HSP:

- Service strike (overhead power cables at both sites, underground services)
- Confined space
- Moving vehicles/traffic
- Flooding/Weather
- Manual lifting

- Asbestos
- Suspended loads
- Working at heights
- Public/landowner interface
- Animal interference
- Infections and biological contaminants
- Unstable infrastructure
- Working over waterways
- Unstable ground
- Specialist tool and plant use
- Construction noise and dust

The HSP specific to the contract shall be forwarded to the Engineer within seven working days of the acceptance of tender and shall be implemented immediately prior to the commencement of any contract works.

The Contractor shall undertake any modifications to the Plan as required within five working days of a notice of amendment from the Engineer.

2.3. Documentation and Reporting

The Contractor shall conduct and minute regular site meetings or internal audits of safety measures. Accompanying each Monthly Report the Contractor shall provide to the Engineer:

- Copies of the minutes of site safety meetings.
- The results of the Contractor's appointed certifiers audit of working practices and compliance with the HSP if so required.
- Alterations to the Plan to take into account newly identified hazards or recommendations from the Contractor's safety supervisor or consultant.
- Details of all incidents and/or accidents.

2.4. Incidents/Accidents

The Contractor as an employer under the HSWA is required to keep a register of all accidents where someone has been or might have been harmed and also a register of incidents of serious harm.

The Contractor shall immediately notify the Engineer by phone of his actions in dealing with all accidents resulting in:

- Fatalities and other lost time injuries to staff or the Subcontractor.
- Non employee injuries (public).
- Damage to plant or equipment.
- All actual or potential damage to the environment (spills, emissions or discharges).
- Fire.

Immediate notification shall be followed by a full written report within 48 hours.

2.5. Safety Audits

The Contractor shall allow the Engineer or his representative or employee of the Principal access to the work to inspect or audit any aspect of the Contractor's operations relevant to safety and the work environment. The Contractor shall carry out any instructions given by the Engineer regarding Safety and Health as a result of this access.

2.6. Safety in Design

The Principal will indicate, when known, to the Contractor elements of the design of the contract works where hazards or specific hazards may exist or be encountered. This could include a description of anticipated ground conditions, the handling and installation of specialised chemical compounds required for jointing, surface coatings or fillers or similar circumstances where the Principal or his designer have obtained prior knowledge of such elements.

Similarly if the Contractor is responsible for any design associated with the works they shall obtain similar information from their Subcontractors or advisers and this advice shall be incorporated into the HSP.

3. Earthworks

3.1. Scope

The work to be done under this Section comprises clearing, stripping of any topsoil required for the placement of construction equipment, stockpiling, removal of existing weak subgrade, directional drilling, excavation and subsequent backfilling and compaction around all structures and pipe trenches as drawn, specified and scheduled or as necessary to construct the works.

The components of works requiring earthworks include but are not limited to excavations for all on-property equipment, pipes and pump stations.

3.2. Reference Standards

This specification section shall be read in conjunction with the following:

- NZS 4402 - Methods of testing soils for civil engineering purposes (latest edition)
- NZS 4431 - Code of Practice for Earth Fill for Residential Development
- Regional and Local Authority Resource Management Act requirements and consents
- Worksafe New Zealand's Excavation Safety Guidelines
- Regional Infrastructure Technical Standards

3.3. Not Used

3.4. General Requirements

Excavations for trenches shall be taken out in open cuts to a depth sufficient to give the specified cover after due allowance for hand trimming of irregularities left on the trench floor and the pipe bedding.

Open trenches will not be permitted overnight without the prior authority of the Engineer.

Where there is inadequate room adjacent to the trench, the Contractor shall allow to temporarily stockpile excavated material elsewhere.

No spoil, plant or materials shall be stacked against any fence or building without the previous consent in writing of the owner thereof.

The Contractor shall excavate only such ground as is necessary for the proper execution of the work.

If any excavation is made deeper than required, the Contractor shall replace it at their own cost and to the satisfaction of the Engineer.

3.5. Clearing of Site

The Contractor shall discuss and agree with the Engineer as to the required level of site clearance. As the land the construction works are being undertaken on can encroach on private land, consultation

with the Engineer and the landowner shall be done to confirm the level of clearance allowed prior to any clearance works on private land.

The Contractor shall remove all trees, vines, stumps, fences, fallow logs, tree roots, brush, scrub and similar vegetation from all agreed areas as required. All removed material shall be disposed of at an approved location away from the site, and none shall be included in or under any filling on the site.

The Contractor shall also remove all rock, stones, debris and all obstructions of whatever kind of character, whether natural or artificial, encountered in the construction of the work.

Farm fences and gates shall be replaced in the same or better condition than they were found if removed for construction.

3.6. Stripping Topsoil, Removal of Weak Subgrade and Backfilling

After clearing as described above has been completed all topsoil shall be excavated and removed (stripped) from within the areas to be worked. The depth of topsoil stripping shall be sufficient to remove all organic material, turf and significant plant roots. The Contractor shall liaise with the Engineer ahead of and during stripping operations to determine the stripping depth and avoid unnecessary over-excavation.

Topsoil excavated during the installation of pipelines and electrical cables may be stockpiled in heaps to be re-spread later. Topsoil shall not be stockpiled on private property without the permission of the property owner. No topsoil shall be removed from site without the authorisation of the Engineer.

The areas to be worked (and therefore stripped of topsoil) shall be as defined on the Drawings or as directed by the Engineer.

Except where limited by boundaries, existing works or other limiting features, or where otherwise directed by the Engineer, the stripping of topsoil shall extend out to 1 m beyond the limits of areas that will be subject to earthworks and/or construction shown on the drawings.

3.7. Unsuitable Material

‘Unsuitable Material’ shall be defined as any material which, because of its organic content, or poor inherent strength is unsuitable to be incorporated into the Contract Works or have works constructed upon it. After excavation to levels specified on the Drawings and in this Specification, the Contractor shall draw the Engineer’s attention to any suspected unsuitable material. The Engineer shall determine if any ‘Unsuitable Material’ is present in the material below the finished level of any excavation. All confirmed unsuitable material shall be excavated down to suitable materials, or as may be otherwise directed by the Engineer. All excess excavated material shall be disposed of off-site unless otherwise directed by the Engineer.

High moisture content, of itself, shall not necessarily render material unsuitable. Suitability will depend on the character of the soil material, not the water content.

Subsequent backfilling and compaction of all areas shall be undertaken as per Section 3.13 and 3.14.

3.8. Excavation

The Contractor shall carry out all excavations to the dimensions, lines and levels shown on the drawings. They shall be accurately cut and trimmed and shall extend to an approved foundation.

Where, in the opinion of the Engineer, this requires excavation to a greater depth than or beyond excavation lines shown on the drawings, the additional work agreed to by the Engineer will be paid for as an extra at schedule rates. If the excavations are carried beyond or below the lines and levels shown on the drawings without the prior written consent of the Engineer, then the Contractor shall backfill and compact the over-excavated volume to the approval of the Engineer, all at no cost to the Principal.

Excavations for all pipeline work shall be open trenches unless directional drilling or other construction methodology is specified or allowed in writing by the Engineer.

Once excavation for the wet well chambers is completed to the depths / level stated, the Contractor shall undertake at least 4 No. penetrometer tests of the subgrade in the presence of the Engineer. Any reading that correlates to less than 80 kPa will require further excavation or otherwise in-situ compaction subject to direction from the Engineer. In excavating trenches, any surfacing materials shall be preserved as far as practical, for re-use in surface reinstatement on completion of backfilling. Any surfacing materials lost shall be replaced by the Contractor at no extra cost to the Principal.

Suitable excavated materials, as determined by the Engineer, may be stockpiled on the site near the structures and used for backfilling.

All spoil from any trench shall be kept at least the trench depth horizontally from the edge at the top.

The Contractor shall provide and maintain sufficient shoring and supports for all cuttings and equipment which are necessary for the completion of this Contract. All shoring and support work shall be in full compliance with the relevant Acts, regulations and by-laws.

Wherever necessary for safety or wherever instructed by the Engineer, trenches shall be properly shielded by the Contractor and at the expense of the Contractor. The Contractor shall, however, not wait for instructions to shield if the condition of the ground demands support and shall take full responsibility. As an alternative to shielding, the Contractor may batter the sides of trenches to safe slopes. No extra payment will be made for extra material excavated to form batters.

If, when a trench is excavated and the foundation proves to be unstable then, subject to the Engineer's direction, the foundation material shall be further excavated and removed from the site and replaced with run-of-pit quarry aggregate. Such work and materials will be paid for only if in the opinion of the Engineer the ground was unstable in its natural state. If due to negligence or use of improper methods by the Contractor, unstable wet or soft foundations occur, then the Contractor shall bear the entire expense of the removal and replacement of unsatisfactory materials.

3.9. Trench Widths

- The minimum width of the excavated trench shall be the pipe diameter plus 100mm each side of the pipe.
- At no time shall the width of any trench, measured at the original ground surface exceed 2.0 metres, except where the prior approval of the Engineer is given in writing.
- The bottom shall conform to grade with the side walls cut vertically to provide sufficient width to enable compaction of side fill at each side of the pipeline at the horizontal diameter of the pipe.
- The overwidth excavation for the pipe trenches above the crown of the pipe shall only be permitted if approved by the Engineer.
- In general battered trenches will not be possible due to the presence of other services or permanent features on parallel or close alignment.
- Where pipes are laid on curves of large radius, the trench shall be widened so that no point of the pipe shall be nearer than 100mm to the side of the trench wall.
- Trench width of the surface (for surface reinstatement) shall be agreed with the Engineer prior to excavation. Generally the trench width will be determined by the surface material, pipe diameter, depth of trench and plant and methodology required for excavation.

3.10. Classification of Excavated Materials

3.10.1. Common Excavation

Common Excavation shall be excavation of all material except rock as defined below.

3.10.2. Rock Excavation

Rock shall be defined as massive hard conglomerate material that cannot be penetrated using a hand spade but can be ripped using a single ripper mounted on a 20 tonne excavator, or that can be broken up by rock hammers or other percussive methods.

Boulders of volume less than one-eighth of a cubic metre will not be classified as rock nor will materials removed from paved or concreted surfaces.

The Contractor shall advise the Engineer when rock is struck and before excavation of that rock proceeds. The Engineer and Contractor shall inspect the rock and agree on which classification applies. The Contractor shall survey the surface of the rock before and after the excavation work and submit the survey results to the Engineer. Failure to obtain prior approval will render subsequent claims invalid. This work shall be included in the rock excavation rate.

Rock excavation shall be carried out by appropriate power, pneumatically or hydraulically operated impact tools (e.g. Rock breakers). **The use of explosives is not permitted unless agreed by the Engineer in writing.**

In the event of such approval being given, the selection, placement and detonation of the explosives shall be undertaken only by a Certified Construction blaster strictly in accordance with all requirements of the Construction Act 1959 and the Construction Regulations 1961.

The Contractor shall be solely responsible for any damage or claims attributed to the use of explosives.

The approval to use explosives shall not constitute authorisation for additional payment.

3.11. Hydrogen Sulphide Gas

The Contractor is to note that there is a possibility of hydrogen sulphide gas accumulation in trenches due to the geothermal activity in the greater Rotorua area. The Contractor is to ensure that all necessary Health and Safety precautions are taken should this arise.

3.12. Temporary Works

In carrying out the excavations, the Contractor shall ensure that adequate temporary support is provided and that no existing foundations or services in the vicinity are undermined or adversely affected in any way.

This shall include adequate temporary support to ensure that no impact to the proposed retaining wall occurs.

3.13. Backfilling of Excavated Areas

Pipes in trenches shall be backfilled as soon as is practicable after they have been laid, bedded and jointed as specified, subject to the timing constraints imposed by pressure testing requirements as described in section 11.

No backfilling shall be placed against any new structure until concrete in that structure has reached its specified compressive strength.

Excavated material that is suitable for backfill shall be used for that purpose provided the specified compaction as per cent of maximum soil density is attained.

The Contractor shall be responsible for any backfill subsidence occurring after the work has been completed up to the end of Defects Liability Period.

3.14. Compaction Requirements

3.14.1. Earthworks Machinery

Compaction equipment for both the pumping station sites and access layby shall comprise self-propelled vibrating roller(s), or other approved machinery. Such equipment shall be independent of any excavation equipment, and the use of loaded scrapers or carryalls as a means of compaction will not be acceptable except as a means of sealing the surface of the fill at the end of a day's work or prior to rain, if required.

All equipment shall be maintained in good condition fully capable of performing the task for which it is required.

The rate of work of earthmoving machinery shall not be allowed to exceed the rate at which the specified compaction is able to be achieved.

3.14.2. Water Content

Before compacting any layer of placed hardfill material, the Contractor shall ensure that its' water content is within ± 4 per cent of its optimum moisture content, as determined by Test 14 of NZS 4402 Part 2P 1981 for cohesive soils (i.e. silts and clays) or Test 16 of NZS 4402 Part 2P for 1981 cohesionless soils (i.e. sands).

If the water content of the material is more than 4 percent above optimum, then the Contractor shall dry it before compacting it in the fill, passively or by discing, turning or blading.

If the water content of intended fill material is more than 4 percent lower than optimum, then the Contractor shall not use it until it has risen to within the prescribed range, either passively or with the assistance of the Contractor by watering and discing and/or blading. This latter discing and/or blading shall be done sufficiently for the raising of the water content to be achieved uniformly throughout the full volume of the soil to be compacted.

The upper tolerance on optimum water content may be relaxed at the discretion of the Engineer provided the Contractor can show that the specified standard of compaction is being achieved.

The Contractor shall allow in the tendered schedule rates for all costs involved in adjusting the moisture content as specified above; no extra payment will be made for such work.

3.14.3. Compaction of Fill

Before the placement and compaction of any earth fill is started the Contractor shall, at the Engineer's discretion, demonstrate to the Engineer the adequacy of the machinery to be used to the Engineer, by spreading and compacting each layer of a minimum of three **200mm loose thickness** superimposed layers of fill in which tests of the standard of compaction prescribed below shall be conducted.

The Engineer may carry out check tests of compaction at any time. The Contractor shall stop or divert his machines as required by the Engineer to allow the tests to be carried out. The Contractor shall assist as needed by the Engineer in preparing a pad for testing at no additional cost.

Where field tests indicate that the specified standard of compaction has not been achieved, the Engineer may, at his discretion and subject to the nature and purpose of the fill concerned, order cessation of work and/or removal of the fill. All costs associated with the re-testing of any fill areas which fail to meet the specified standards shall be met by the Contractor, and may be deducted from Progress Payments. Such costs shall include those of all related supervision and administration incurred by the Engineer and his staff in determining the extent of the non-compliant fill, its subsequent re-testing, and the advising all parties concerned.

At any time either prior to or during the course of construction, the Engineer may direct modifications to the following compaction criteria, with the objective of ensuring that the optimum compaction criteria for the particular materials and conditions being encountered or likely to be encountered are achieved.

3.14.4. Compaction Standards

The Contractor shall include in the Schedule of Quantities for undertaking NZ Standard Compaction testing of the hardfill material, at least one test per source. The Contractor shall be responsible for testing the works to the prescribed standards either by providing an onsite accredited equipment, ensuring it meets minimum requirements for testing, or by using a registered third party laboratory.

All fill comprising sandy material shall be compacted to a min of 97% (unless otherwise stated) NZ Std Compaction test as measured by nuclear density meter. That Contractor may use a Scala Penetrometer to test interim compaction provided that the Scala used has been calibrated against a set of known density results.

3.15. Dewatering and Drainage

The Contractor shall keep excavations drained of water at all times, by means of gravity drains and/or pumping and/or well-pointing. This shall apply to direct rainfall, to runoff, to groundwater seepage, and to any other water entering the earthworks.

The Contractor's attention is drawn to the fact that pipes will be liable to float if they should be submerged before the backfilling is in place, and that such submergence could occur due to groundwater infiltration or to stormwater runoff from land adjacent to the trench.

The Contractor shall maintain all trench bottoms free from flowing or accumulated water, so that all pipes can be bedded, laid and jointed in dry working conditions. The Contractor shall provide sufficient labour and plant, and maintain all drains, pipes, pumps and sumps to keep the works clear of water to the entire satisfaction of the Engineer. All water shall be disposed of to the approval of the Engineer and in accordance with the consent conditions and any damage caused shall be made good by the Contractor at its own expense.

The Contractor shall ensure that all pipes are sufficiently weighted down to overcome their inherent buoyancy and prevent them from floating in the event of water entering the trench after they have been jointed.

The drainage/dewatering system provided by the Contractor shall be sufficient to ensure that no water is able to accumulate on any areas of the ground surface.

3.16. Subgrade Foundation Approvals

Before the placing of geogrid, hardfill, drainage course, or site concrete on the excavated foundation, the Contractor shall obtain the Engineer's approval of that subgrade. Such foundation shall achieve at least 100 kPa and be tested by the Contractor to the Engineer's satisfaction. The Contractor shall advise the Engineer at least two full working days in advance of any intended placement of such materials on the sub-base, so that an inspection can be arranged without delaying progress.

3.17. Installation by Horizontal Directional Drilling

Prior to commencing any directional drilling work, the Contractor shall satisfy the Engineer of their methodology and site management for pipeline assembly and jointing, directional drilling, back-reaming, slurry containment, pipeline insertion, and connections for the pipe ends to adjacent structures. The Contractor shall also demonstrate that they have a suitable quality assurance system for recording details of each pipe joint.

Electrofusion couplers shall not be used to join pipe strings for directional drilling.

The contractor shall demonstrate that the pull-back loads and back-reaming pressures likely to be encountered during pipeline installation will not exceed the safe loads for the pipe and pipe joints and will not disturb the surrounding ground structure or existing pipelines.

3.17.1. Drilling Equipment and Materials

The equipment used on this work shall be capable of installing a pipeline to within the agreed tolerances.

Boreholes out of line or level will not be accepted and, where these cannot be satisfactorily rectified by re-drilling, the Contractor shall use such other means of excavation as are necessary to construct the pipeline without disturbance to pavement structures or other property which the horizontal drilling was designed to preserve intact. All costs to rectify re-working shall be met by the Contractor.

All connections and fittings are to be constructed or assembled so as to comply with the manufacturers' specifications.

3.17.2. Drill Position

Unless specifically stated elsewhere in the Contract Documents the Contractor shall advise the Engineer of the position of the drill pits a minimum of 10 working days prior to starting physical works.

The hole for the pipe is to be cleanly drilled. Any drilled material (tailings, slurry, lubricant etc.) shall be contained at the drilling site and receiving pit and shall be disposed of in a suitable manner by the Contractor at his expense.

The Contractor shall provide, operate, and maintain location equipment that allows the position of the pipeline to be tracked accurately and to within the tolerances required for pipeline position. The drill head position shall be logged throughout drilling operations, and the log shall include sufficient information to indicate deviations from the design alignment and to provide for the as built information required. A copy of the logs shall be provided to the Engineer in electronic form.

3.18. Final Site Trimming

Finished earthen surfaces shall be uniformly graded so as to be reasonably smooth, dense, free from any abrupt irregularities and without any depressions from which water would not totally drain away by natural gravity runoff. The standard of finish shall be that which is ordinarily attainable with a motor grader, with finished levels and contours not varying by more than ± 20 mm from those shown on the drawings.

The Contractor shall maintain all exposed surfaces of soil. The Contractor shall maintain the said surfaces until such time as a stable sward of grass has been established and shall promptly reinstate any erosion, scouring or other damage which occurs. The Contractor shall also remove any silt accumulations resulting from erosion, and shall re-trim and reinstate original surfaces after removal of the offending material.

3.19. Re-spreading of Topsoil and Grassing

Once any earthworking has been completed, the previously stripped topsoil shall be respread. It shall be respread 150 mm deep, over exposed excavation areas. Maintenance of respread topsoil shall be the responsibility of the Contractor. Any rolling of topsoil before the establishment of grass cover shall be remedied by the Contractor at no cost to the Principal.

Before topsoil is removed from any stockpile for respreading, the stockpile shall be cleared of any coarse vegetation which may have become established.

The Contractor shall remove all foreign material from areas to be respread, before topsoil is placed thereon. Respread topsoil shall be trimmed and then scarified to a depth of 40mm and all stones, foreign matter and debris thrown up shall be removed.

Rye grass, clover mix in the proportions of 85% rye to 15% clover at a minimum rate of 1 kg to 44 square metres. The grassing shall be such that an even sward is provided and if necessary over-sowing

shall be carried out at the Contractor's expense. The grass shall be resown as necessary to achieve a grass strike rate of 80% or higher at the end of the Defects Liability Period.

Surplus topsoil shall be spread on-site as directed by the Engineer and grass sown.

Refer to section 14 for other Surface Reinstatement requirements.

3.20. Protection of Pipes beneath Earthworks Area

The Contractor shall not allow earthworks machinery to travel across any underground pipeline unless that pipeline is protected against damage by virtue of its depth and class of pipe and standards of bedding, and/or by its being protected by substantial temporary pads laid on the surface to spread the loads from the machinery. Any damage that is caused to such pipes shall be made good by the Contractor, to the satisfaction of the Engineer, at no cost to the Principal.

3.21. Sediment and Erosion Control

The Contractor shall be responsible for constructing sediment and erosion protection works. The works shall be proposed by the Contractor in a Sediment and Erosion Control Management Plan which shall be submitted to the Engineer for approval prior to construction.

Prior to commencing earthworks the Contractor shall ensure that erosion and sediment control measures are implemented as detailed in the approved Sediment and Erosion Control Management Plan to prevent erosion and the runoff of sediment from the site. The Contractor shall also install any other additional sediment control measures required by any resource/building consent compliance conditions.

The Contractor's operations shall be staged so as to minimise the area of bare earth exposed at any onetime.

The Contractor shall protect all drainage and under-drainage systems from the ingress of sediment carried by runoff from bare earth exposed during the course of the Contract Works.

The erosion and sediment control measures shall be installed in the following sequence:

- Install silt fences and super silt fences as appropriate;
- Strip topsoil and stockpile, as required, minimising exposed surface area and commence earthworks;
- Reinststate grass on cut/fill and any bare earth/re-topsoiled areas progressively as soon as those earthworks are completed;
- Reinststate grass on the entire bare earth/re-topsoiled area on completion, and
- Check and maintain re-grassed areas during the Defects Liability Period.

All of the sediment and erosion control works, existing stream courses and drains adjacent to the Site, shall be maintained free from sediment and debris by the Contractor.

The Contractor shall provide and maintain such facilities as are required for the control of stormwater runoff from the Contract Works and those parts of the Site affected by construction, so as to minimise any erosion or sedimentation on the Site, to ensure that downstream land and water is not damaged by the construction activity and to comply with any statutory requirement and consents.

The Contractor shall comply with any general rules for the control of stormwater on construction sites that are published by the relevant Consent Authority pursuant to the Resource Management Act, and shall ensure that the workforce is properly briefed on the implications of non-compliance.

4. Concrete Work

4.1. Scope and General Requirements

The work to be done under this section comprises the supply of concrete materials and plant, the supply, bending and fixing of reinforcement, the supply and construction of formwork and the casting, finishing and curing of all in-situ reinforced concrete work in this contract, as shown in the documents.

4.2. Standard Specifications

The following Standards form part of this Specification unless qualified otherwise by the Contract Documents and are to include the latest revision and any amendments.

When there is variance between any provision of the Standards and this Specification, this Specification shall take precedence.

All materials and workmanship shall comply with these Standards unless noted otherwise.

- NZS 3103 Concrete Structure Standards
- NZS 3103:1991 Specification for Sands for Mortars & Plasters
- NZS 3104:2003 Specification for Concrete Production
- NZS 3109:1997 Concrete Construction
- NZS 3111:1986 Methods of Test for Water and Aggregate for Concrete
- AS 3972:2010 General purpose and blended cements
- NZS 3112:1986 Part 1 Tests relating to fresh concrete
Part 2 Tests relating to determination of strength of concrete
Part 4 Tests relating to grout
- NZS 3114:1987 Specification for Concrete surface finishes
- NZS 3121:1986 Specification for Water and Aggregate for Concrete
- NZS 3122:2009 Specification for Portland and Blended Cements (General and Special Purpose)
- AS/NZS 4671:2001 Steel Reinforcing Materials
- AS/NZS 1554.3: 2014 Welding of Reinforcing Steel

The Contractor shall keep a copy of NZS 3109 on site at all times.

4.3. Materials

4.3.1. Cement

Cement shall be sulphate resisting Portland Cement complying with AS 3972. Aggregates and water and coarse aggregate shall comply with NZS 3121. Aggregate shall have a maximum nominal particle size of 19mm.

4.3.2. Reinforcement

Reinforcing bars shall be grade 300E (D and R on the drawings, indicating deformed and round bars) and 500E (HD and HR on the drawings, indicating high tensile deformed and round bars) complying with AS/NZS 4671, as designated by the drawings. All bends, hooks, splices, ties shall be made in accordance with NZS 3109. Unless specifically detailed on the drawings all reinforcing bars shall be deformed.

Welded wire mesh reinforcement shall comply with AS/NZS 4671.

4.4. Concrete Supply

4.4.1. All to be Ready-Mixed

All concrete shall be produced by a ready mix concrete plant, having a 'Valid' certificate from and be an 'Audited Plant' under the auspices of NZ Ready Mixed Concrete Association. The concrete production plant shall be graded as 'High Grade with Production Record' in accordance with NZS3104.

All structural concrete in contact with contained or flowing water to the tops of the walls and columns of structural concrete shall have a minimum cement content of 375 kg/m³ of concrete, and a maximum water-to-cement ratio of 0.45 unless specified otherwise.

All concrete shall have a slump of between 75 and 100mm.

4.4.2. Mixing and Delivery Records

Records shall be kept by the Contractor for concrete mixing at the site for each batch of ready mix concrete including the following:

- a) Cement content in kg per cubic metre
- b) Specified strength
- c) Date and Time of mixing
- d) Quantity per mix

4.5. Concrete Placement

4.5.1. General

All formwork, placing, curing and finishing shall comply with NZS3109 unless modified by this section. The Contractor shall be responsible for employing effective methods of placing, protecting and curing concrete and for the adequacy of the formwork.

Concrete shall not be placed until all excavation, sub-base, formwork, services, reinforcement and embedded parts and preparation of surfaces involved in the placing have been approved by the Engineer. Concrete shall be placed as soon as possible after the Engineer's inspection and approval.

The minimum cover to reinforcement shall be as noted on the drawings and tolerances on all cover shall comply with NZS3109.

Any slab surface slope shall nowhere exceed 1 in 200 from level unless indicated on the drawings.

Immersion type vibrators shall be used in compaction of all reinforced concrete and vibration shall be concentrated on obtaining vertical compaction and not for movement of concrete along the formwork.

Concrete shall be placed so as to avoid segregation or displacement of reinforcement and formwork.

Floating shall not commence until all surplus water is removed or evaporated from the surface of the concrete, and the surface is sufficiently hard to resist displacement under the action of the float.

4.5.2. Ground Preparation

Ground is to be cleared to the sub base level for all concrete structures. This shall remove all topsoil and other organic matter.

The cleared ground shall be capable of 100 kPa allowable bearing pressure. This is to be confirmed on site, and if 100 kPa is not achieved, then the ground is to be undercut and backfilled with appropriately compacted hardfill in layers not exceeding 200 mm. Any undercutting and backfilling is to be at the direction of the Engineer.

4.5.3. Surface Finishes

Surface finishes shall be of the following classes defined in NZS3114:

- Formed surfaces to be backfilled shall be class f1
- Exposed formed surfaces shall be Class F3
- Unformed surfaces to be backfilled shall be Class U1
- Unformed surfaces exposed to weathering shall be Class U3

4.5.4. Construction Joints

All joints shall be constructed in the locations shown in the drawings.

Construction joints shall be provided in accordance with NZS 3109, type B. Hardened joint faces shall be prepared as described by NZS3109 clause 5.6.

4.5.5. Formwork

Formwork for precast and in situ construction shall have sufficient strength, stability and stiffness to safely support all loads during construction and to maintain the tolerances specified in NZS3109 for each type of member.

Joints and linings shall be sufficiently tight to prevent significant loss of water from the concrete.

4.5.6. Curing

From immediately after placement, concrete shall be protected against premature drying by one of the methods specified in NZS3109 for a period of at least 7 days, or 3 days for concrete using rapid hardening cement. A longer period of curing may be required by the Engineer if the temperature falls below 10 degrees Celsius or a retarding agent is added to the concrete.

4.5.7. Removal of Formwork

Formwork shall be removed without shock or damage to the concrete at not less than the times set out in NZS 3109, or as otherwise specified.

4.5.8. Tolerances

The Contractor shall advise the Engineer at least 24 hours before the proposed time for concreting that the areas to receive the concrete are ready for inspection. Concreting shall not commence until the inspection has been satisfactorily completed.

Except where expressly specified otherwise tolerances not exceeding those in Table 4 of NZS3109 will be accepted and shall apply to the hardened concrete when still supported by the forms. Any work exceeding a specified tolerance shall be cut out and replaced as directed by the Engineer at no extra cost for the remedial work.

4.6. Inspections

Each stage shall not proceed until after the Engineer's inspection and written approval of the previous stage.

The following inspections are required by the Engineer:

- After setting out and prior to commencement of work;
- Inspection of foundation;
- After completion of reinforcing;
- Inspection of completed concrete after completion of formwork and installation of construction joints.

4.7. Testing

All testing shall be carried out as per NZS3109.

The Contractor shall make control tests at the frequencies of one sample per 25 cubic metre of concrete. Tests shall be made at the site. Results of these tests shall be made available to the Engineer.

Delivery dockets and other certified records of concrete quality and quantity together with the results of all tests shall be kept on site for inspection by the Engineer. An on-site slump value shall be recorded for every truckload of concrete supplied to site.

4.8. Reinforcing Steel

Reinforcing steel shall be deformed, new billet steel bars conforming to AS/NZS 4671, substantially free from mill scale, rust, dirt, grease or other foreign matter. The bar sizes shall be as specified in the Drawings.

Where shown in the Drawings, wire mesh from an approved manufacturer shall be used to the size specified.

5. Sewer System Materials and Installation

5.1. Scope

This section includes the requirements to provide a permanent grinder pump pressure sewer system, complete with piping and appurtenances.

5.2. Reference standards and codes of practice

Except as otherwise indicated, the current editions of the following Standards apply to this specification:

- EOne Low Pressure Sewer System Design Manual
- AS/NZS 4130:2003 Polyethylene Pipes for Pressure Applications.
- AS/NZS 4129:2000 Fittings for Polyethylene Pipes for Pressure Applications.
- AS/NZS 4131:2003 Polyethylene Compounds for Pressure Pipes and Fittings.
- AS/NZS 2032 Installation of PVC Pipe Systems
- AS/NZ 2033 Installation of Polyethylene Pipe Systems
- AS/NZS 2566.1:1998 Buried Flexible Pipelines
- AS/NZS 2566.2:2002 Buried Flexible Pipelines - Installation
- AS/NZS 1477 : 1999 PVC Pipe and Fittings for Pressure Applications
- AS/NZS 1260 : 2002 PVC Pipes and Fittings for Drain, Waste and Vent Applications
- Utility Service Provider Specifications and Recommendations
- Manufacturer's Specifications and Recommendations
- NZ Building Code and Approved Documents
- AS/NZS 2280:2004 Ductile Iron Pipes and Fittings
- NZ/BS 2494 Specification for Elastomeric Seals for Joints in Pipework and Pipelines
- NZS 3103 Specification for Sands for Mortars and Plasters
- NZS 3107 Specification for Precast Concrete Drainage and Pressure Pipes
- NZS/AS 3725 Loads on Buried Concrete Pipes
- NZS 7643 Code of practice for the installation of unplasticized PVC Pipe Systems

- BS 2971:1991 Specification for Class II Arc Welding of Carbon Steel Pipework for Carrying Fluids
- AS/NZS 1554.6 Welding Stainless Steel for Structural Purposes
- Water NZ's Pressure Sewer National Guidelines
- WSA07:2007 Pressure Sewerage Code of Australia
- Regional Infrastructure Technical Standards

5.3. General

- a) All pipe of given size and material shall be by the same manufacturer;
- b) Clearly mark each pipe length and fitting as required herein;
- c) Pipes shall be produced by extrusion process and homogenous throughout, free from cracks, holes, foreign inclusions and other defects uniform in colour (black);
- d) Do not use pipe with blisters, bubbles, cuts, or scrapes on inside or outside surfaces, which damage wall thickness, or other imperfections which impair performance or life of pipe.

5.4. Pipes and Fittings Materials and Types

5.4.1. Polyethylene Pipes and Fittings (PE)

Pressure sewer mains, laterals, and property discharge lines shall be High Density Polyethylene Pipe (HDPE) with size and pressure rating according to the design and accompanying specification.

All PE pipe shall be polyethylene pipe complying with AS/NZS 4130 and shall have product certification (ISO Type 5) to AS/NZS 4130.

Unless directed otherwise elsewhere in these documents PE pipe shall:

- a) Be manufactured from new compound of colour(s) appropriate to the pipeline's type of service, as follows:
 - For wastewater reticulation: black
- b) Be legibly and indelibly marked with the following information:
 - A trade mark
 - The type series identification
 - Its pressure class
 - Its PE material type
 - Its place and date of manufacture and
 - The national or international standard to which it has been manufactured.

Polyethylene fittings shall comply with AS/NZS 4129 and shall have product certification (ISO Type 5) to AS/NZS 4129. The fittings shall have the same pressure rating and wall thickness as the pipes being jointed.

PE pipes and fittings shall be jointed using electrofusion fittings or butt fusion welding as indicated in the drawings or approved by the Engineer.

PE pipes and fittings shall be from the same manufacturer.

Polyethylene compounds shall be in accordance with NZS/AS 4131.

All socket and saddle electrofusion fittings shall be based on the international 40 volt system, and shall comply with AS/NZS 4129:200, 200 A1 and 200 A2 Fittings for Polyethylene (PE) Pipes for Pressure Applications.

PE pipes shall be installed in accordance with AS/NZS 2033.

5.4.2. Stainless Steel Pipes and Fittings

For wastewater pipelines, all stainless steel pipe fittings and pipework shall be Schedule 10, both with a minimum grade of 316 and 16 bar rating complying with ASTM A312 as specified on the drawings.

Welding standards shall adhere to BS4677 and ANSI B31.1 and/or B31.3.

Backing rings to match mild steel and cast iron flanges complying with AS 4087:1996 A1 Figure B5.

Backing rings shall be fully polymeric coated steel to AS/NZS 4158:2003.

5.4.3. PVC

Pipes shown on the drawings as “PVC” shall be unplasticised polyvinylchloride drain pipe. All PVC pipes and fittings to be used shall comply with AS/NZS 1260:2002.

All PVC pipe shall be installed in accordance with AS/NZS 2033 and AS/NZS 2566.

5.4.4. Ductile Iron Pipes and Fittings

Ductile Iron (DI) pipes and fittings shall comply with AS/NZS 2280.

DI flanged pipe fittings shall be manufactured in accordance with AS/NZS 2280 and flanges shall be in accordance with AS 4087 and shall be coated as specified therein.

DI puddle flanges shall comply with AS/NZS 2280 except that all nuts, bolts and washers used in the assembly of puddle flanges shall be of Grade 316 stainless steel.

5.5. Pre-Acceptance Materials Testing

All pipe materials shall be required to have passed materials testing as required by RLC requirements to become an approved material. This requires testing for oxidation induction time (OIT) and melt flow rate (MFR) and pre-supply compatibility testing by an International Accreditation New Zealand (IANZ) accredited laboratory or equivalent laboratory approved by the Engineer to ensure the pipes comply with AS/NZS 4130.

5.6. Isolation Valves

5.6.1. Isolation Valves \geq DN 80mm

Isolation valves \geq DN 80mm are to be sluice gate valves made of ductile iron materials complying with AS/NZS 2638.2003 - Gate Valves for Waterworks Purposes—Resilient Seated. Sluice valves shall be resilient seated with double “O” ring stem seals.

The valve body shall be coated internally and externally with “Rilsan” polymeric coating or an approved fusion bonded epoxy coating conforming to the requirements of AS/NZS 4158 - Thermal Bonded Polymeric Coatings on Valves and Fittings for Water Industry Purposes.

Sluice valves \geq DN 80mm shall have flanged ends complying with AS4087. Valves shall be anti-clockwise closing and shall operate with non-rising spindles. Spindles shall be turned out of high tensile brass or stainless steel.

5.6.2. Isolation Valves $<$ DN 80mm

Refer to section 1.23.6. Connections to pipework shall be as specified in the Drawings.

5.6.3. Air Release/Vacuum Valves

Air valves shall be located on pressure pipelines and pump station rising mains at locations indicated on the drawings.

Air valves shall be of the kinetic type with double action and shall be of stainless steel construction. The valve shall have an integral anti-surge mechanism to limit the effect of surge on the rising main pipelines. Air valves shall be Series RGX manufactured by Vent-O-Mat (reinforced nylon body) or approved equivalent by the Engineer.

All air valves shall be fitted to an air valve tee in accordance with the details shown on the drawings and shall be provided with an isolating valve (mitre gear) on the air valve riser.

Air Valve shall be provided with chamber as shown in the standard drawings. Chambers shall be properly vented and the covers shall be permanently identified with plates marked "PRESSURE SEWER AV" in lettering at least 25mm high.

Air release/vacuum valves shall have a BSP threaded fitting connected to brass ball valves and other fittings as detailed in the standard drawings.

Air release/vacuum valves shall be classed to meet minimum pressure rating of PN16.

Refer also to Refer to section 1.23.6.

5.6.4. Cleanouts and Flushing Points

The location and construction detail of cleanout and flushing point assembly shall be as shown in the standard drawings.

Polyethylene fittings shall comply with AS/NZS 4129 and shall have product certification (ISO Type 5) to AS/NZS 4129. The fittings shall have the same pressure rating and wall thickness as the pipes being jointed.

Ductile Iron (DI) pipes and fittings shall comply with AS/NZS 2280. DI flanged pipe fittings shall be manufactured in accordance with AS/NZS 2280 and flanges shall be in accordance with AS 4087 and shall be coated as specified therein.

DI puddle flanges shall comply with AS/NZS 2280 except that all nuts, bolts and washers used in the assembly of puddle flanges shall be of Grade 316 stainless steel.

5.6.5. Saddle Connections

Connections to DN50 PE 100 pressure sewer mains shall be made using Tee 90 degree, equal with Integral Clamp and with Reducer with Integral Clamp as shown in the standard drawings. Both fittings shall be PE 100 SDR 11 PN16 (ISO S5).

Connections to DN63 PE 100 and larger pressure sewer mains shall be made using Spigot Saddle with Cutter with Reducer with Integral Clamp as detailed in the standard drawings. Both fittings shall be PE 100 SDR 11 PN16 (ISO S5).

5.6.6. Scour Valves

Scour valves shall be as detailed and located on pressure pipelines at locations indicated on the Contract drawings. The scour points shall be housed in 1050mm diameter concrete manhole chambers as shown on the drawings.

5.6.7. Flanges

All pipework flanges shall comply with **AS 2129 Table E** and, unless indicated otherwise in these documents or directed otherwise in writing by the Engineer, shall be for a nominal pressure rating of 16 bar.

Flange gaskets shall be full face, of 5 mm thick insertion rubber, to WSA 109.

Flanged joints shall be perfectly clean before jointing. The nuts shall be carefully tightened in opposite pairs until the joint ring is only just sufficiently compressed between the flanges to ensure water tightness at test pressure.

Flange bolts shall be of the diameters prescribed for the particular flange patterns. Bolt lengths shall be such that, after making of the flanged joint has been completed, each bolt protrudes through its respective nut by at least two threads but not more than 12 mm. Threads shall be ISO metric threads to BS 3692.

At each bolt, there shall be a washer under one or other of the nut or the bolt-head, but not both. Before each bolt set is assembled, the bolt shall be liberally coated with “Copper-cote” and its thread shall be oiled.

Bolts, nuts and washers used in submerged conditions, and other such moist environments, shall be of grade 316L stainless steel.

Bolt sets used in other than those submerged or in moist environments shall be 316 stainless steel to AS1111.1 and AS1112.1 or galvanised to BS EN1461.

All underground valves, flanges, bolts and the pipe barrels for 200mm on each side, shall be double wrapped with Denso or other approved petrolatum-impregnated tape, except that **Denso (or other petrolatum tape) shall not directly contact HDPE pipe.**

5.7. Tolerances and Rejection

5.7.1. Transport, Storage and Handling of Materials

All handling of pipes must be undertaken in such a manner as to prevent damage or breakage of any kind. Handling and storage of pipes and fittings must be in conformation with the manufacturer’s recommendations.

All pipes and associated fittings necessary for the construction of the pipeline become the Contractor's responsibility after removal from the points of supply.

If any pipe or fitting is damaged after leaving the point of supply, it will be rejected until the defective part has been replaced or repaired at the Contractor's expense and to the satisfaction of the Engineer.

Stored pipes, fittings and other materials must be kept clear of pedestrian traffic at all times.

Storage facilities must be prepared to protect the pipe from the environment and suitable slings, runners or straps must be used in moving the pipes.

5.7.2. Damaged Products

- Inspect pipe, fittings and other components for damage on delivery, immediately before laying and immediately after laying.
- Identify damaged pipes, fittings and other components with indelible marking which is clearly distinguishable from the marking background.
- Seek advice from the manufacturer and the Superintendent where uncertain whether products are unacceptably damaged.
- Set aside damaged components from undamaged components in a quarantine area.
- Cut through damaged elastomeric seals to prevent inadvertent use.

- Repair products at no cost to the Principal only where permitted by the Engineer.
- Uses only repair methods as recommended by the pipe and/or coating manufacturer.
- Use repaired products only with the permission of the Engineer and only where repair achieves performance equivalent to when the product was undamaged.
- Remove damaged products unable to be repaired from the site without delay.

5.7.3. Site Rejection of Products

PE Pipes and PE Electrofusion Fittings

Reject and remove from site where they:

- have scratches deeper than 10% of the wall thickness
- have damage such as indentations and abrasions

Plastic Fittings for PE Pipe

Reject where they have:

- damaged threads
- damage such as indentations, abrasions and scrapes

Ductile Iron Pipes and Fittings

- Reject and remove from site where they have cement lining cracks wider than 3mm chips or other damage of polymeric coatings or cement linings which are unsuitable for repair.
- Repair cracks in cement lining from 0.8mm to 3mm wide and into which a 0.8mm minimum thickness measuring gauge can be inserted at 75mm intervals.
- Grind out the crack to 5mm wide and 10mm deep over its full length and repair with Hilti CA273 two part epoxy resin.
- Accept pipes and fittings with cement lining cracks less than 0.8mm wide, less than half depth and less than 300mm long.
- Check the paint thickness of painted specials with an approved gauge.

Ductile Iron Epoxy Lined Pipes and Fittings

Reject and remove from site where they:

- are older than 24 months from the date of manufacture
- are stored unprotected from sunlight for more than 6 months
- where epoxy lining has chips, cracking or crazing

Elastomeric Seals

Reject where they:

- are older than 18 months from date of manufacture
- have cracks, splits, crazing, scrapes, abrasions or holes
- have been in contact with chemicals, e.g. solvents such as petrol

- are of natural rubber and have been stored unprotected from sunlight for more than 7 days

Valves

Reject where they have:

- damage of polymeric coatings unsuitable for repair
- damage that would impair operational function

Pipeline System Fasteners

Reject where:

- nuts and bolts have damage to threads or cannot be easily screwed onto each other
- washers do not easily slip over the bolts
- washers are not of sufficient external diameter
- plastic coated nuts and bolts have damaged coatings
- bolts are not of length to allow the nut to fully engage onto the bolt for the application
- bolts are much longer than necessary
- bolts are not of appropriate diameter for the flange holes or have to be forced into the flange holes
- bolt heads or nuts have damage that prevents engagement of wrenches or prevents application of sufficient tightening torque

Surface Boxes for Valves

Reject and remove from the site where:

- they have defective hinging
- the top of the cover when fully seated is not flush with the top of the frame
- the cover will not seat within the frame
- they have identification marking not in conformance with the requirement shown in the drawing
- they have cracks in the castings

Mechanical Couplings

Reject and remove from site where they:

- have damage of polymeric coatings on any components, including fasteners and which are unsuitable for repair
- have fasteners with damaged threads

6. Pipe Laying – Open Trench

6.1. General

Pipelaying shall conform to the procedures given in the applicable AS/NZS standards, the specific procedures provided by the pipe manufacturer, or as modified in the Drawings and these Specifications.

Every facility shall be provided for the Engineer to check grades, alignment and the finish of joints as the work proceeds. Notwithstanding this requirement, it shall be the Contractor's sole responsibility to ensure that the gradients, levels and alignment of the work as constructed shall conform exactly to the requirements of the plans and specification, except where modified by the Engineer.

Any obstructions or irregularities shall be removed before a further length is laid.

Pipes, valves and fittings shall be carefully examined for defects at the time of laying. Any defective material discovered before, during or after being laid shall be permanently marked, removed from the jobsite, and replaced with sound material.

Internal pipe walls shall at all times during the contract be kept clean and free of all dirt, rubbish and water. All pipework ends shall be adequately sealed off to prevent any ingress of vermin, water and/or sediment at any break in work. Failure to do so will be at the Contractors cost to remedy.

Note: All pipework which connects to fittings (such as valves and fire hydrants) that need to be removed for periodic maintenance shall have approved jointing mechanisms installed so that the fittings can be removed and reinserted easily and without excavation or cutting of the main lines. This may require installation of gibaults, flange adapters or the like and the Contractor shall allow for this in his price.

6.2. Inspections

Engineers' inspections of the pipe laying works may be carried out at the following stages of the works:

- After setting out and prior to commencement of excavation work;
- If any unexpected subsoil conditions and obstructions;
- Trench opened and prior to the laying of bedding material;
- Pipe laid and prior to the commencement of backfilling;
- At the completion of backfilling and prior to surface reinstatement;
- At the completion of surface reinstatement.

The Contractor shall give the Engineer 24 hours notice of when the works are ready for inspection. Commencement of stages shall not proceed until after the Engineer's approval of the previous stage.

6.3. Laying

6.3.1. General

Pipes and appurtenances shall be laid and constructed according to the positions, gradients and levels as indicated on the drawings whilst still maintaining the minimum depths and clearances as prescribed herein.

Prior to pipe installation, the Contractor shall excavate sufficient trench in advance and test pit existing underground utilities/structures, whether shown on Drawings or visually identified in field, to: (i) verify actual locations and (ii) make reasonable changes in line and grade to resolve conflicts, as approved by Engineer. Furnish Engineer location and elevation information when previously unknown or different underground utilities/structures are encountered.

The Contractor shall provide and maintain sufficient shoring and supports for all cuttings and equipment which are necessary for the completion of this Contract. All shoring and support work shall be in full compliance with the relevant Acts, regulations and by-laws.

Suitable excavated materials, as determined by the Engineer, may be stockpiled on the site and used for backfilling.

The Contractor shall ensure that the foundation of the trench is suitable for pipelaying (i.e. that it is not too soft) and shall inform the Engineer if there are any concerns.

The Engineer shall make checks on the trench foundation from time to time to assure himself of its suitability for pipe laying.

The pipeline shall have at least 1,000 mm of cover, unless specified on the drawings and approved by the Engineer.

Surplus excavated material (following bedding and backfill) shall be removed and disposed of off-site.

All pipes shall be inspected prior to laying and defective pipes marked and removed from the site.

Only competent workers shall be employed on pipe laying and workmen who are unsuitable in the opinion of the Engineer shall be taken off pipe laying.

Where required, suitable slings or other tackle shall be provided to lower the pipes into the trench.

Spigot and socket jointed pipe shall be laid with the spigot end arranged to enter the socket end of the previously laid pipe.

All pipes shall be clean and free from ground water, dirt or mud on the inside.

Adequate precautions shall be taken while laying pipes to prevent dirt or any other debris entering the pipes and temporary plugs shall be provided in the open ends of pipes if work is interrupted.

Pipes with flexible joints may be laid around horizontal or vertical curves where the deflection angle at each joint does not exceed the manufacturer's specifications.

For any angle greater than the manufacturer's specification, factory built bends of the requisite angle, design rating and constructed of an approved material shall be used.

Where it is necessary to cut any pipes they shall be cut with a cutting tool approved by the pipe manufacturer.

Where pipes have to be turned down after cutting, this shall be done with a turning tool, which meets the pipe manufacturer's specification.

All care shall be taken to ensure that no completed lines are subject to floating. Any pipelines which float are to be relaid. The cost of relaying shall be borne by the Contractor.

6.3.2. Pipe Bedding

During pipe installation by open trenching the Contractor shall test the trench base in 50 m intervals along the trench (or as otherwise directed by the Engineer). **The target minimum trench base soil strength is 50 kPa** for at least 900 mm below the trench base as determined by Scala Penetrometer readings of no more than 70 mm/blow. If the target minimum is not achieved the Contractor shall inform the Engineer as soon as possible. No further pipe laying shall take place until the Engineer has approved a raft foundation detail. Scala testing shall be undertaken at the location of all thrust blocks to confirm 75 kPa soil strength.

The bedding shall be spread and compacted on the bottom of the trench for its full width and for the full length of the barrel of each pipe, to provide uniform support for the pipes.

Pipe bedding and haunching material shall be trench excavated material approved by the Engineer. Unsuitable trench excavated material shall be disposed of offsite and imported backfill material shall be supplied.

6.3.3. Gibault and Flange-adaptor Jointing

Gibault joints and flange adaptors shall be fixed in accordance with the best trade practice and manufacturer's specifications. Rubber rings shall be free from twist when the joint is made.

Unless otherwise called for on the drawings or directed by the Engineer, the ends of the two pipes shall be separated by a gap of 10mm when the joint is completed.

Each gibault shall be centred symmetrically over the ends of the two pipes being jointed.

On completion of the jointing, gibaults and flange adaptors and the pipe barrels for 200mm on each side, shall be double wrapped with Denso or other approved petrolatum-impregnated tape, except that **Denso (or other petrolatum tape) shall not directly contact HDPE pipe.**

6.3.4. Pipelaying Below Water

The Contractor shall keep the excavation free from water at all times and shall provide all such pumping plant and other equipment as may be required for the purpose. Should water appear in excavations, it shall be kept down below the level of the joints and bedding by the appropriate means of either a side channel and pumping or well pointing. All wells or sumps shall be sunk and pumps fixed so as not to interfere with the work of bedding, laying and jointing of the pipe.

Drainage water may be passed to a stormwater drain providing adequate steps are taken by means of settling ponds and screens to prevent matter in suspension from entering such drains.

Should the Contractor fail to take adequate steps to keep the sub-soil water down, or should the Engineer consider the methods adopted by the Contractor are endangering or damaging the bedding or pipe, the Engineer shall advise the Contractor and may require pipes and bedding to be relaid when methods acceptable to the Engineer are in place. All care shall be taken to ensure that no completed lines are subject to floating. Any pipelines which float are to be relaid. The cost of relaying shall be borne by the Contractor.

Where the bedding material is soft, wet or spongy and in the opinion of the Engineer, is not satisfactory for the laying of pipes, the Contractor shall supply approved free draining material (eg basecourse) to stabilise the bedding.

6.3.5. Minor Tunnelling

The Contractor will be expected to undertake minor tunnelling under kerb and channel, footpaths and the like at no additional cost and as part of normal pipe laying.

6.3.6. Pipes Laid with Shallow Depth of Cover

Where shallower depths are necessary, the Engineer may direct the contractor to protect the pipe by concrete slabs. The slab shall be 40mm thick, diameter plus 200mm wide centrally placed 615wire mesh as shown on the drawings. The slab shall be installed min 150mm above the top of the pipe.

6.3.7. Thrust Blocks

- Anchor or thrust blocks shall be provided at all major fabricated changes in direction on pipelines greater than 50mm internal diameter requiring elbows or bends, and at all reducers, tees, crosses, hydrants and valves.

- Anchor or thrust blocks shall be of cast-in-situ concrete between undisturbed ground and the fitting to be anchored.
- They shall be sized to comply with RITS requirements.
- They shall be constructed so that access to bolts and fittings for normal maintenance work is unimpaired.
- Where concrete encases uPVC pipelines, the pipe shall be wrapped in Denso polyethylene outer wrap tape to a thickness of 3 to 4 mm, to provide a flexible barrier between the pipe and the concrete.

6.3.8. Detector Tape

During the backfilling of open trenching the Contractor shall provide and lay metallic 'detector' tape coloured green, stipulating "Danger- Sewer Pressure Main Below (or similar) approximately 500mm above the pipe.

6.3.9. Backfilling of Trenches

Pipes in trenches shall be backfilled as soon as is practicable after they have been laid, bedded and jointed subject to the timing constraints imposed by pressure testing requirements.

The Contractor shall ensure that all pipes are adequately backfilled and restrained to prevent movement or floatation at the end of each day.

The backfill material shall be approved onsite material. It shall be placed and compacted in successive horizontal layers, each not more than 200mm thick to achieve 100 kPa or same density as surrounding ground whichever is lesser. The Contractor shall be responsible for any trench subsidence occurring after the work has been completed up to the end of Defects Liability Period.

6.3.10. Reinstatement

Reinstatement of trenches includes:

- removal of surplus soil, stones and debris;
- trimming of the backfill to line and level;
- topsoiling and where applicable seeding;
- restoration of sealed and concrete surfaces where required;
- temporary surfacing; and
- permanent reinstatement of the surfaces.

6.4. Surface Reinstatement

Reinstatement items include surface reinstatement for all areas including carriageways, vehicle crossings, grassed areas, kerb and channels, fences, letter boxes, signs and anything else damaged as a result of the works.

Reinstatement of carriageways, vehicle crossings and grassed areas shall be undertaken as indicated on the Drawings.

The Contractor shall keep a photographic record of all work areas. The record shall include photographs of all affected areas both before and after the contract works are completed. In the event of a disagreement as to the standard of reinstatement, the photographic record will be utilised. The decision of the Engineer with respect to the standard of reinstatement carried out will be final.

In the event that the Contractor fails to produce the photographic records, the Contractor will be required to comply with the directions of the Engineer with respect to the standard of reinstatement. The finished surface of any reinstatement shall be flush with, and on the same gradient as, the existing surface.

Any damage to surfaces that is a health and safety hazard shall be made safe as soon as possible.

Reinstatement of all structures, hedges, plants, pipes, drains, and anything disturbed or damaged by the works shall be reinstated to its original condition or better at the Contractor expense. In the case of pipes and drains, these shall be restored despite being apparently abandoned or disused.

Further details on surface reinstatement are outlined in Section 14.

7. Pipe Laying – Trenchless

7.1. General

Trenchless techniques for the installation of pipes shall be employed where shown on the Drawings.

The Contractor may also elect to use trenchless techniques in lieu of open excavation. In all cases, the Contractor shall submit a proposal at least 10 days before this work is due to commence, which demonstrates that the proposed technique(s) are capable of installing the pipe to the requirements of the contract.

The Contractor may propose alternative pipe materials from those specified to match the trenchless technology proposed. The use of the alternative pipe materials shall be subject to the approval of the Engineer.

All lines shall be installed so that no ground water can track along the pipes. The Contractor shall submit the proposed methodology with the tender submission.

In the event of a failure to successfully install the pipe, even allowing that the technique was approved for use by the Engineer, the Contractor shall install a suitable casing of sufficient diameter to enable laying and supporting of the pipe in position within the casing by suitable grouting or alternatively use open trench techniques at the Engineer's discretion to remedy the failure of installation. This work (including all associated works) shall be at the Contractor's cost.

7.2. Thrusting

Unless impractical or unsafe, thrusting shall be required under carriageways and vehicle crossings, at intersections where there is a large number of existing services, and in areas with any extra-ordinary high quality paving surface. All process details including location of access pits and exit points shall be documented and shall address:

- Achievement of clearances from services, obstructions and overhead power lines.
- Depth at which the pipeline is to be laid to ensure minimum cover is maintained.
- Pipe support and ground compaction.
- Required alignment tolerances.

Where it is proposed to use trenchless technology to install pressure sewers under or near structures, including roadways, a pre-construction survey shall be carried out to determine the potential for damage to the structure arising from trenchless installation.

Where open trench construction interfaces with trenchless construction, the trench construction shall incorporate adequate drainage to avoid water rising from the trench and leading to drainage issues.

The minimum depths for thrusting are as follows:

Location	Thruster Size	Minimum Depth to Top of Pipe
Private Property Non-Vehicular Loading	All sizes	450mm
Private Property Vehicular Loading Public Property, Footways, Sealed Roads	All sizes	600mm
Major Roadways/ Embankments and Sealed Roads	All sizes	750mm

Water jetting shall not be permitted in Road Reserve area.

Drilling shall be the only permitted method of thrusting under carriageways, unless approved by the Engineer.

7.3. Tracer Wire

For the installation of pressure pipelines by directional drilling, a tracer wire in the form of a continuous 10mm to 16mm 2 multi strand (minimum 4) polythene sleeved copper cable shall be provided and installed with all non-metallic pipes to allow detection. The wire is to be taped along the length of the pipe intervals not exceeding 5 m to ensure that contact is maintained at all times.

The wire shall be attached to the pipe with heavy duty adhesive tape.

For street mains, the tracer wire shall be terminated at valve boxes or cleanout ports in an accessible manner by looping the tracer wire back on itself and securely wrapping with black insulatape.

Terminating a tracer wire above ground (for laterals) shall be undertaken by looping the tracer wire back on itself and securing to the alarm/control cabinet support post or cable duct with black insulatape. Ensure that insulation is not stripped from the end of the wire and the actual wires do not touch any metal.

Every care must be taken during installation to ensure that the insulation on the tracer wire is not damaged. The Contractor shall test the conductivity of the tracer wire on completion of the works and rectify any damage so that a continuous indication of the pipeline is available.

8. Pipe Joints

The Contractor shall make the appropriate selection according to the circumstances between Butt-fusion welding and Electrofusion welding for joining polyethylene pipes, unless either specific type of joint is specified in the design drawings.

8.1. Butt Fusion Jointing

Butt fusion jointing shall only be used to join pipes and fittings that are the same size (DN), have the same wall thickness (PN or SDR) and are composed of the same materials (PE100). Jointing shall be carried out by approved contractors in accordance with AS/NZS 2033 “Installation of polyethylene pipe systems” and the approved methodology. Jointing shall not be carried out until the Engineer has received passing results of pre-construction pipe tests.

8.1.1. Methodology

The contractor shall submit a detailed methodology to the Engineer for approval prior to commencement of site jointing. This methodology shall include:

- a) The make and model of the butt fusion jointing machine(s);
- b) The cylinder area;
- c) The weld method to be used;
- d) The name and qualifications of the approved operator;
- e) Details of the pressure gauge, including the make, dial diameter, pressure range, smallest graduation value and the date of last calibration;
- f) Specific parameters for each nominal pipe diameter, wall thickness and pipe material to be jointed.

8.1.2. Quality Assurance

The contractor shall prepare and maintain a site jointing log sheet which is used to provide a detailed record of all joints carried out during the contract. The log sheet shall include:

- a) Pipeline name/description
- b) Joint location, accurate enough to locate the joint within one pipe length
- c) Weld date and time
- d) Weld machine details
- e) Joint number
- f) Operator name and ID number
- g) Pipe nominal diameter
- h) Pipe SDR or PN
- i) Pipe material (PE100)
- j) Pipe manufacturers name and pipe identification
- k) Wall thickness to the nearest 1 mm
- l) Cooled bead height and width (mm)
- m) Heater plate temperature
- n) Initial bead pressure
- o) Heat soak pressure
- p) Welding and cooling pressure
- q) Bead press time
- r) Heat soak press time
- s) Change over time
- t) Time to reach weld pressure
- u) Welding and cooling time

8.1.3. Operator Qualifications

Jointing shall be carried out by approved contractors in accordance with AS/NZS 2033 “Installation of polyethylene pipe systems” who have been named in the methodology. Approved welders have a

NZWETA butt fusion welding certificate received within the last two years and have proven experience on the pipe diameter range being welded. A copy of the operator's qualifications and proof of their experience relevant to the pipe diameter range being welded (e.g. weld test results) shall be submitted to the Engineer.

8.1.4. Equipment

The welder shall have previous experience on the nominated welding machine. The machine shall not be changed without the Engineer's approval. Only automatic machines may be used for butt fusion jointing of pipes.

The electrically heated plate shall be well maintained and kept in a clean condition at all times. The equipment shall be serviced and calibrated as recommended by the manufacturer. The pressure gauge shall be graduated to be reliably readable to 10 kPa or less and calibrated at least within the last six months.

The heater plate shall be undamaged and temperature controlled to be between 205°C, and 235°C over both sides of the whole plate. A portable surface probe pyrometer capable of measure the plate surface temperature to $\pm 1^\circ\text{C}$ shall be used to confirm this.

The sharpness of the planer or facing tool shall be monitored regularly and appropriate maintenance work carried out whenever the jointing surfaces show visible signs of ridges or grooves. Suitable protection against inclement weather shall be provided, to prevent differential cooling of the pipes and dirt, dust or water contamination.

Ancillary equipment shall include:

- a) The clamping device with one fixed and one movable clamp, supported on a rigid frame
- b) Pipe support rollers or skids
- c) Pipe end plugs or caps
- d) The weld bead measuring gauge
- e) Iso-propyl alcohol and lint-free disposable wipes
- f) A clean ground sheet or baseboard

8.1.5. Joint alignment and Weld Bead Profile

The pipe and fittings shall have a minimum allowable temperature of 5°C prior to jointing (i.e. ambient temperature shall be well in excess of 5°C before any welding is commenced). All jointing surfaces, including the heater plate, shall be clean, dry and free of contamination. The maximum allowable diametric mismatch ("step" in the pipe OD at any proposed butt fusion joint) is 10% of the measured wall thickness.

The bead faces shall be smooth and free from pitting bubbles. There shall be no discolouration of the weld bead material. The joint beads shall be rounded and uniformly sized around the entire pipe circumference. In general, the "V-groove" between the beads should not be deeper than half the bead height about the pipe wall. Provided that each half of the final bead is of a similar size and shape and tensile testing shows that the strength and failure mode meet the requirements of this specification, the overall width and height of the bead should not be a critical factor in the assessment of a butt fusion joint. Typical bead dimensions are:

Minimum Wall Thickness (mm)	Width of Bead (mm)
13 (225 OD PE100 SDR17)	10-14
16	11-15
18	12-16
19	12-18
22	13-18
24	14-19
28	15-20
30	16-22

Neither internal nor external beads shall be removed.

8.1.6. Welding

Each butt fusion joint shall be identified with the operator’s certification number, applied in a legible and durable form. Individual joint details shall be recorded on the log sheet. The welded joint shall be kept immobile for the full cooling times, before removing clamps or moving the joint assembly. No attempts shall be made to accelerate the rate of cooling.

8.1.7. Weld Joint Testing

The Contractor must make a demonstration joint in front of the Engineer prior to pipe laying to demonstrate their ability to conform to the agreed pipe welding methodology.

- **During Construction the Engineer will select random welds for tensile testing. The frequency of weld testing shall be 1 test every 20 welds or 1 No. per 1km for coiled pipe.**

The Contractor shall test these welds. If one or both tensile welds fail during construction, the Engineer will instruct the Contractor to supply another two welds for testing. The Engineer will select these next two welds. If either of the additional two welds fail then the Contractor will be instructed to expose and re-weld every weld constructed up to this point in the Contract to the satisfaction of the Engineer. The Contractor shall also submit a report to the Engineer indicating the reasons why the welds failed. All work carried out on failed welds will be done at the Contractor’s expense.

These joints shall be tested in accordance with ISO 13953 “Polyethylene (PE) Pipe and Fittings – Determination of tensile strength and failure mode of test pieces from a butt-fused joint” in an IANZ registered laboratory.

The test joints shall be completed using the machine and operator named in the methodology and proposed fusion parameters. The sample joints shall have the weld line in the middle and have a minimum of 150 mm from the edge of the weld bead to the end of test piece of pipe. The relevant jointing log sheet and graphical plot of the load versus extension shall be supplied for each test. The Contractor shall also supply a length of unjointed pipe material for tensile testing for comparison purposes.

The joint must not fail at a stress \leq 90% of the virgin pipe strength. The test piece shall rupture in a generally ductile manner. Some brittleness may be accepted provided that it is not significantly more

brittle than the comparable virgin pipe sample and that the graphical plot of the load vs extension is comparable with that of the virgin pipe sample.

8.1.8. Joint Problems

If any joints are found to be unsatisfactory during on-site checks or tensile tests, the Contractor shall inform the Engineer as soon as possible. The Contractor shall provide the Engineer with the failed joint identification number and details of the proposed actions to determine if the failed joint is an isolated incident or if it is a symptom of more widespread problem. No further pipe jointing or installation shall take place until the Engineer is satisfied that the problem has been rectified. If no obvious cause is apparent or if the cause is likely to have affected other joints, either the joints can be cut out and remade or additional testing shall be conducted in consultation with the Engineer to determine the acceptability of the affected joints.

The Contractor shall meet the cost of replacing any problem welds, including the cutting out, testing costs and re-welding of the pipes.

8.2. Electrofusion Jointing

Electrofusion jointing shall only be used to join pipes and fittings that are the same DN as the electrofusion coupling. Electrofusion couplings are to be composed of PE100. Jointing shall be carried out by approved contractors in accordance with AS/NZS 2033 “Installation of polyethylene pipe systems” and the approved methodology. Jointing shall not be carried out until the Engineer has received passing results of pre- construction pipe tests.

8.2.1. Methodology

The contractor shall submit a methodology to the Engineer for approval prior to the commencement of site jointing. Individual methodologies shall be submitted for each diameter range being jointed. The jointed method contained in POP001 “Industry Guidelines for Electrofusion Jointing of PE Pipes and Fittings for Pressure Applications” should form the basis of the methodology.

8.2.2. Quality Assurance

The contractor shall prepare and maintain a site jointing log sheet which is used to provide a detailed record of all joints carried out during the contract. The log sheet shall include

- a) Pipeline name/description
- b) Joint location, accurate enough to locate the joint within one pipe length
- c) Weld date and time
- d) Weld machine details
- e) Fitting details (manufacturer and barcode number)
- f) Joint number
- g) Operator name and ID number
- h) Pipe nominal diameter
- i) Pipe SDR or PN
- j) Pipe material (PE100)
- k) Pipe manufacturers name and pipe identification

- l) Wall thickness to the nearest 1 mm
- m) Ambient temperature
- n) Recommended fusion time
- o) Actual fusion time
- p) Recommended cooling time
- q) Actual cooling time

The Contractor shall create print outs from the fusion jointing machine and attached to provide confirmation of the welding conditions used.

8.2.3. Operator Qualifications

Jointing shall be carried out by approved contractors in accordance with AS/NZS 2033 “Installation of polyethylene pipe systems” who have been named in the methodology. Approved welders hold a NZWETA Electrofusion welding certificate received within the last two years and have proven experience on the pipe diameter range being welded. A copy of the operator’s qualifications and proof of their experience relevant to the pipe diameter range being welded (e.g. weld test results) shall be submitted through the methodology.

8.2.4. Equipment

The welder shall have previous experience on the nominated welding machine. The machine shall not be changed without the Engineer’s approval. Only automatic machinery designed for the pipe size may be used for electrofusion jointing.

Two clamps supported on a frame shall ensure the alignment of the components and mating of the component ends. Re-rounding clamps of the appropriate size shall be used where necessary. All jointing equipment shall be well maintained and kept in a clean and serviceable condition at all times. The equipment shall be serviced and calibrated as regularly. The frequency at which this is carried out will be different for individual items of equipment and will also depend on usage, but should be at least once every 12months.

Particular attention shall be given to the control box, the generator and peeling tools. The sharpness of the cutter head tools shall be monitored regularly and appropriate maintenance work carried out whenever the jointing surfaces show visible signs of ridges or grooves. If they have aluminium facer plates, use a cleaner that will remove aluminium oxide.

Suitable protection against inclement weather shall be provided to prevent water, dirt and dust contamination and differential cooling of the pipes and couples. Adequate working space shall be provided around the pipe in the trench to allow peeling and installation of equipment.

8.2.5. Pipe Preparation

The spigot end of the component shall be cut square and all rough edges and swarf shall be removed from the pipe ends. The maximum “out of roundness” the pipe shall be is 1.5% of the internal diameter. The maximum allowable gap between butted ends within an electrofusion fitting shall comply with the fitting manufacturer’s requirements.

The pipe diameter and wall thickness shall be measured for compliance using the appropriate tools. Sections of the pipe experiencing pipe end reversion shall be removed. After cleaning pipe ends shall be peeled to 0.3mm depth and for a distance equal to half the length of the coupling plus 20mm to

remove dirt and oxidation. This should be peeled to a smooth profile using a sharp rotational mechanical peeler and shall not be hand peeled. The exposed ends of pipe strings shall be covered until cooling is complete, to prevent any air flow which may heat or cool the pipe. Covers on fittings shall be retained until immediately before welding.

All jointing surfaces shall be clean, dry and free of all contamination before being assembled. Iso-propyl alcohol complying with the manufacturer's concentration requirements and a lint-free disposable wipe shall be used to remove any oil or grease films. Mark witness marks with a non-contaminating marker.

The pipe and coupler shall have a minimum allowable temperature of 5°C prior to jointing.

8.2.6. Welding

Each electrofusion joint shall be identified with the operator's certification number, applied in a legible and durable form. Individual joint details shall be recorded on the log sheet. The manufacturer's recommended standard fusion times shall be entered into the control box using the appropriate methods required by the type and model of control box. These may include:

- a) a barcode marked on the fitting or on a card supplied with it,
- b) a magnetic card supplied with the fitting or
- c) the electrical resistance in the terminals.

Manual entry of fusion times is not permitted.

The pipe and fittings shall be pre-heated to the manufacturer's requirements if required. The pipes shall be restrained in position during welding at the centreline height of the coupling, to prevent movement and the application of stress during the fusion process. The pipes shall be horizontal either side of the clamps to prevent both pulling away from the coupling joint and the entry of water or dirt into the pipe which may contaminate the weld zone.

The welded joint shall be kept immobile for the full cooling times, before removing clamps or moving the joint assembly. No attempts shall be made to accelerate the rate of cooling. The pipeline shall be allowed to recover from the effects of thermal expansion and installation stretching. The pipeline shall not be restrained by rigid connections until the pipeline temperature reaches ground or service temperature.

Fittings outside the manufacturer's tolerance range on alignment shall be considered defective and will require replacement. The body of the fitting and any melt visible shall be smooth, even and free from obvious defects such as splits, voids, inclusions and charring.

8.2.7. Joint Testing

The Contractor must make a demonstration joint in front of the Engineer to demonstrate their ability to conform to the agreed welding methodology.

The Engineer shall select the scheduled number of joints to be taken for destructive testing. The Engineer may choose to test additional joints at any time during construction. If these additional samples meet the test requirements, the Principal shall bear the costs of testing and any associated costs. If the additional samples do not meet the test requirements then the Contractor shall bear the cost of testing and associated costs.

The destructive testing of the sample joints shall be carried out by an IANZ registered laboratory in accordance with ISO 13954 Peel decohesion test. The cut-out sample joints shall have at least 125 mm

length of pipe protruding from the fitting to comply with the requirements of ISO 13954 Peel decohesion. The Contractor shall instruct the approved laboratory to immediately forward all weld test results directly to the Engineer. The frequency of testing may be decreased at the Engineers discretion if the Contractor consistently demonstrates success.

For the destructive test to be accepted the test pieces shall rupture in a generally ductile manner. Some brittleness may be accepted in test pieces provided that it is not significant and that the graphical plot of the load vs extension is acceptable.

The results shall include a commentary on and photos of the failure mechanism, including; peel depth and quality, ovality, gaps and insertion into the coupler, joint alignment and melt flow into cavity. Failed joint samples shall be made available to the Engineer if requested and results of the test shall be forwarded to the Engineer for approval.

The relevant jointing log sheet and a graphical plot of the load versus extension shall be supplied for each test. Ductility shall be evident through the plot showing a rounded top and an extended sloping recession leg. The load extension graph may be used by the Engineer in assessing the results of the test.

8.2.8. Joint Problems

If any joints are found to be unsatisfactory during on site checks or destructive tests, the Contractor shall inform the Engineer as soon as possible. The Contractor shall provide the Engineer with the failed joint identification number and details of the proposed actions to determine if the failed joint is an isolated incident or if it is a symptom of more widespread problem.

No further pipe jointing or installation shall take place until the Engineer is satisfied that the problem has been rectified. If no obvious cause is apparent or if the cause is likely to have affected other joints, either the joints can be cut out and remade or additional testing shall be conducted in consultation with the Engineer to determine the acceptability of the affected joints.

If an alternative machine, operator, pipe or welding procedure is required in order to make satisfactory joints, then new pre-construction tests will be required.

9. Appurtenances

9.1. Manholes

9.1.1. General

Manholes will be generally required as discharge manhole, air valve and scour valve housing and shall be constructed where specified in the Drawings.

Manholes shall consist of centrifugally spun 1050 mm internal diameter or larger diameter as described on the drawings and specification for concrete pipes to NZS 3107 Class X standard and an HN-HO-72 loading capability. They shall have holes cast in the side for step irons.

Unless specified otherwise on the contract drawings, all manhole bases shall be precast concrete. Precast bases shall be factory made flanged and constructed to NZS3107. The diameter of the base shall be a minimum of 300 mm greater than the external diameter of the manhole.

9.1.2. Risers

Maximum length precast manhole section shall be used. Avoidance of joints must be considered at all times. Should jointing be necessary all joints will be sealed using 'Fosroc Expandite SeellaStrip B.M. 100' (or equal and approved) compound, except for top risers within 600 mm of the surface and the riser-lid joint, in which case joints shall be sealed with approved rubber bitumen sealing strip laid in

the joint before placing the riser or lid section, ensuring the manhole is watertight in accordance with the manufacturer's recommendations. Before placing each riser section both faces of the joint shall be carefully cleaned.

Any visible infiltration leakage through the manhole walls shall be remedied to the approval of the Engineer.

9.1.3. Step Irons

All manholes having a depth in excess of 1m, measured from the cover level to the soffit of the main pipe shall have standard 20 mm diameter hot dipped galvanised steel step irons in accordance with the Regional Infrastructure Technical Standards. The zinc coating shall not be less than 400g/sq.m.

The step-irons shall be placed at 300 mm centres commencing 600 mm below the cover and the lowest iron or rung shall be not more than 400mm above the benching. These shall be the “dropper” or safety type such that a foot will not slide sideways off them. Precast manhole sections shall be placed and aligned to provide vertical sides and vertical alignment of the step irons over the benching. All joints shall be mortared. The access hole in the lid shall be placed over the step-irons.

The step irons shall be bolted into the manhole wall and the outer end of the holes then filled with mortar flush with the pipe. Under no circumstances shall the Contractor break holes in the pipe wall for step-irons.

9.1.4. Pipe Connections

The wall of the manhole shall be cut out to a maximum of external diameter plus 75 mm of the inside pipe. This cut shall be carried out with a concrete saw. Breaking out the hole using percussive methods is not permitted.

The pipe shall be laid in the wall to the invert level shown on the plan and mortared neatly flush to the inside of the manhole.

Compacted GAP 65 approved by the Engineer shall be under all pipe connections, which do not enter the manhole at invert level. This shall extend to a minimum of (unless otherwise stated) 600 mm back from the outside wall of the manhole or to meet undisturbed ground.

Pipes entering manholes shall be flush with the internal wall of the manhole and on the outside be secured by a 150 mm fillet around the circumference of the pipe with 17.5 MPa concrete mortar.

9.1.5. Roof Slab

The roof slab shall be installed with the pre-formed butylmastic sealing strip on the top of the standard precast riser.

9.1.6. Manhole Lids

Manhole lids shall be in reinforced concrete and shall have a minimum slab thickness of 150mm. The lid shall have a standard access opening of 530mm.

The maximum throat thickness (from the bottom of the cast iron frame to the bottom of the precast roof slab) shall be 300 mm unless otherwise stated; therefore the precast riser shall be installed to suit. The throat shall be constructed of a fillet of ordinary grade concrete with a steel float finish. The fillet shall extend from a width of 150 mm around the base of the frame on the concrete roof slab to match the top of the frame.

9.1.7. Cast Iron Frame and Cover

Manhole frames shall lie flush with and have the same crossfall as the final ground levels or as directed.

All manholes shall have a standard prefabricated Lockable heavy duty cast iron lid and frame as shown on RCEIS standard drawing SS 09.

9.2. Valves

9.2.1. General

Valves shall include all sluice and butterfly valves and air valves to be installed under the contract. The locations where these valves shall be installed shall be as shown in the Drawings or as instructed by the Engineer.

All valves shall be supported by an anchor block of 17 Mpa concrete cast against a solid earth base. Anchor blocks shall be inspected by the Engineer or his representative before backfilling.

All valves shall be checked for ease of operation and installed to provide easy access for operation, removal, and maintenance. Unless shown otherwise on the Drawings, all sluice and butterfly valves shall be installed so that the operator turns about a vertical axis.

Immediately before installation, each valve shall be operated and examined for physical defects. The visual inspection shall determine if the valves are furnished in accordance with the specifications and that they are in good operating condition. All parts shall be thoroughly cleaned before installation. Any valve found to be defective during and after installation should be removed and replaced with a new valve.

9.2.2. Air Valve Housing

Air valve housing shall be as specified in the Standard Drawings.

9.2.3. Scour Point

Scour points to allow draining of the pipe shall be provided at locations shown in the Drawings or as instructed by the Engineer.

Construction of scour points including housing shall be in accordance with the details provided in the Standard Drawings.

9.2.4. Bolts and Bolted Connections

All bolts, nuts and washers shall be new Grade 316 stainless steel with molybond anti-galling coating. Graphite greases, graphite packing and graphite compounds shall not be used in contact with stainless steel.

Where dissimilar metals are used purpose made delrin thermoplastic inserts shall be installed in the flanges to prevent electrolytic action.

All flanged or bolted connections buried below ground shall be protected with “Denso” a petrolatum anti-corrosion system, as follows:

- Clean all metal work thoroughly and dry
- Apply Denso Paste or Denso Priming Solution
- Apply Denso Mastic to smooth all irregularities
- Wrap with Denso Tape with 25mm overlap
- Outer wrap of Denso MP/HD multipurpose PVC overwrap with 55% overlap.

All bolts shall be of the appropriate diameter as given in the respective flange standards.

10. Pressure Sewer Laterals

10.1. Scope of work

The work includes but is not necessarily limited to:

- Supply and install pressure sewer lateral including connection to pressure mains;
- Supply and install the Boundary Kit Assemblies, comprising of 1/4" BSP (32mm) check valve, flushing tee and isolating valve. Boundary kits are delivered as assembled single units, both ends shall have 300mm of DN40 PE100 SDR11 PN16 bar pipe with Male Transition Couplers fitted. Cap at end with sufficient protection to prevent damage pending Stage 2 on-property work.

10.2. Pressure Sewer Lateral

Materials and execution of works shall be as specified this specification. Provisions of quantities for open trench installation and directional drilling installation have been quantified in the Schedule. The specific applications for directional drilling and open trenching shall be agreed with the Engineer or Engineer's Representative on site.

The alignment of the lateral shall be in accordance with the Detailed Design and confirmed first with the Engineer before commencing with the installation. Work includes installation of the pressure sewer lateral and the boundary kit.

The Contractor's method of installation (e.g. open trenching, directional drilling or thrusting) shall be approved by the Engineer prior to commencing with the installation.

All on-property pressure sewer pipework shall be laid with a **depth of cover of 500 mm** unless otherwise approved by the Engineer.

Completed pressure sewer lateral shall be measured horizontally along the centerline of the pipe from centerline of the pressure main to the Boundary Kit.

10.3. Testing

Gravity connecting lines shall be tested in accordance with the procedures set out in the RITS.

Pressure sewer components shall be tested in accordance with the applicable clauses of this specification and the manufacturer's documentation.

10.4. Reinstatement

The Contractor shall restore all areas affected by the work to the satisfaction and approval of individual property owners and the Engineer. Where required, the reinstatement works shall include reinstatement of the following surfaces:

- Grassed lawn area
- Landscaped area
- Concrete paving
- Concrete/brick pavers
- On asphalt
- On chip seal.

Requirements for surface reinstatement are outlined in Section 14.

11. Sewer Line Testing

11.1. General

A successful pressure test of the pressure mains is required prior to being allowed to commission the reticulation system. The Contractor shall provide 24 hours notice to the Engineer prior to commencing any pressure testing.

The Contractor shall be responsible for testing all lines and fittings and for providing all the necessary equipment, water and materials for such testing. The Contractor shall identify the optimal source of the water for carrying out the tests described in this section, noting that the Area of Benefit does not contain a reticulated water network, and provide for the safe disposal of test water on completion of testing.

The Contractor will not be paid for any installed pipe until it has passed pressure testing. The Contractor is expected to test sections of pipe as they are completed. All pipelines shall be fully backfilled prior to testing and shall pass the pressure test prior to being certified as suitable for payment by the Engineer.

All pipes and fittings shall be subject to a pressure test after laying, jointing and are covered with backfill. The section to be tested shall be capped or flanged off at either end. The blanked off ends and all bends, tees, etc shall be securely strutted or otherwise prevented from movement before applying any pressure.

The Contractor shall include in their rate for testing, any plugs or stoppers necessary to overcome leakage at gate valves, if this occurs.

Any faulty pipes, joints or fittings shall be replaced by the Contractor and the line retested. All pipes are to be tested so that the specified test pressures are achieved but not exceeded in such lengths of pipe as may be approved by the Engineer. All pipes shall be pre-tested by the Contractor before testing in the presence of the Engineer. Should any section of pipe fail this latter test, the cost of attendance by the Engineer at the subsequent test or tests shall be charged at cost.

Test sections shall not be longer than 1000 meters.

Flush/swab/vent all air from the line. The pipeline should be charged with water slowly; the rate being governed by the facilities available for the air to discharge at an equal rate.

Select a pump of adequate size to raise and maintain the test pressure.

Fill the pipeline from the lowest point making sure all air is removed at high point appurtenances e.g. air release valve.

Once service lines are installed, all new pipe work shall be slowly filled with water to remove all air and allowed to stand for twenty-four (24) hours under a static head of up to the intended working pressure. Any leaks found by visual inspection shall be repaired and the process repeated before testing commences. Allow between 3 and 24 hours for the test water temperature to stabilise and dissolved air to vent from the system.

Adopt a maximum system test pressure (STP) of at least 1.25 times the maximum operating pressure of the pipeline but do not exceed 1.25 times maximum allowable operating pressure of lowest rated pipe/fitting in line.

The contractor shall have contingency plans and sufficient equipment on site to deal with any bursts or other foreseeable emergency that may arise during testing.

11.2. Testing of Pressure Sewer Reticulation and Rising Mains

11.2.1. Testing Methodology

Pipelines to be tested as per NZS 2566.2:2002 Appendix M Test M5 “Constant Pressure Test (**Water Loss Method**) for Visco-elastic Pressure Pipelines”.

The system test pressures shall be as follows:

- **[To be populated following Detailed Design].**

The pressure shall be measured at the lowest point of the test system. If the lowest point is inaccessible, the pressure shall be applied at a conveniently accessible low point and the system test pressure calculated so as to take account of the difference in level.

- **The maximum allowable length of pipeline to be tested at one time is 1,000 m.**

The Contractor shall supply a data logger and pressure transducer of suitable range to record the pressure for the entire duration of the filling and test procedure. This shall be supplemented by a suitable pressure gauge for measuring the system test pressure and the pressure drop.

The data logger and transducer used shall have:

- An accuracy of $\pm 0.5\%$ or better
 - Resolution of 0.1% or better
 - A pressure range so that the system test pressure falls within 30 to 95% of the range
 - Recording interval of 10 seconds with date/time stamp to the nearest second
 - The data logger clock time set correctly
- The pressure gauge used shall have:
- An accuracy of $\pm 1\%$ or better
 - 100 mm dial (minimum)
 - Readability of 10 kPa (1m head) or better
 - A pressure range so that the system test pressure falls within 50 to 90% of the range.

The data logger and gauge shall read within 5% of each other. If they do not agree within this limitation, the cause shall be determined and the faulty unit replaced or recalibrated and the test redone at the Contractors cost.

The Contractor shall provide the Engineer with an electronic copy of each data log in .csv or .xls format.

The test method shall be the reference pressure test. The pipeline pressure shall be raised to the system test pressure. The pipe shall be closed off and left for a minimum of 12 hours. The pressure will decay naturally with expansion of the pipe, and the pipe and water temperatures will stabilise.

To conduct the main test the pressure shall be raised to the system test pressure (using water of the same temperature as that in the pipeline $\pm 5^\circ\text{C}$) and maintained for 5 hours, recording the total volume of water added in each hour to maintain that pressure.

The water volume added to keep the pressure constant between 2 hours and 3 hours after the test start shall be measured and recorded, as well as the water volume added between 4 hours and 5 hours.

11.2.2. Satisfactory Pressure Test

The pressure test is considered acceptable if there are no visible leaks, no components break, no thrust blocks move and the following equation is satisfied:

$$\Delta V(5h-4h) \leq 0.550 \times \Delta V(3h-2h) + V_{Leak 1}$$

Where:

$\Delta V(5h-4h)$	=	Water volume added between hours 4 and 5 after start of test
$\Delta V(3h-2h)$	=	Water volume added between hours 2 and 3 after start of test
$V_{Leak 1}$	=	$0.14 \times L \times D \times H$
D	=	Pipe internal diameter in metres
L	=	Test pipe length in metres
H	=	Average test head in metres

Any section of pipeline that fails any of the specified tests shall be deemed unsatisfactory and the Contractor shall carry out such remedial work as may be necessary for it to pass.

11.3. Charges for Failed Tests

The Contractor is responsible to see that their main is ready for testing. Time spent testing mains which fail will be charged for at a rate of \$75.00/hr, with a minimum charge of one hour. No charge will be made for testing mains when they pass.

Rotorua Lakes Council require 24 hours notice for any pressure test.

12. Structural Steelwork and Miscellaneous Metalwork

12.1. Scope

The work to be done under this Section comprises the supply, fabrication, delivery and erection of all new structural and miscellaneous steelwork items shown on the Drawings. It also includes the supply of all fastenings, bolts, nuts and washers to the above items.

12.2. Standard Specifications

The following Standards form part of this Specification unless qualified otherwise by the Contract Documents and are to include the latest revision and any amendments.

When there is variance between any provision of the Standards and this Specification, this Specification shall take precedence.

All materials and workmanship shall comply with these Standards unless noted otherwise.

NZS 3404 Parts 1&2; 1997	Steel Structures
AS/NZS 1554.1: 2011	Structural Steel Part 1- Welding of Steel Structures
AS/NZS 1163: 2009	Cold formed Structural Steel Hollow Sections
AS/NZS 3679.1: 2010	Structural Steel Part 1- Hot Rolled Bars and Sections
AS 1111.1: 2000	ISO metric hexagon bolts & screws Part 1- Bolts
AS 1112.1: 2000	ISO metric hexagon nuts Part 1
AS/NZS 1252: 1996	High Strength Steel Bolts with Associated Nuts and Washers for Structural Engineering
BS EN ISO 1461: 2009	Hot Dip Galvanising Coatings on Fabricated Iron, Steel Articles
SIS 05-5900:1962	Rust Grades for Steel Surfaces and Preparation Grades Prior to Protective Coating

12.3. Structural and Miscellaneous Mild Steel Work

12.3.1. Materials

Structural Steel shall comply with NZS 3404. Grade shall be as noted on the drawings. All structural steel hot rolled bars and sections shall comply with AS/NZS 3679.1.

All structural steel cold formed hollow sections shall comply with AS/NZS1163.

Bolts, nuts and washers shall comply with AS 1111.1 & 1112.1 for Commercial Bolts and AS/NZS 1252 for High Strength Bolts. All bolts, washers and nuts shall be hot dipped galvanised where connecting galvanised materials. If they are not hot dip galvanised they shall be 316 stainless steel unless otherwise specified on the drawings. Holding down bolts shall be as specified on the drawings.

The steel shall be of first quality, completely free from defects such as laminations, rust or pitting, dents, twists or kinks which in the opinion of the Engineer affects its structural soundness or appearance.

Any Material found to be defective will be rejected before or after fabrication and must be removed from the site and replaced with approved materials by the Contractor at his own expense.

12.3.2. Fabrication

All structural steel work shall comply with NZS 3404.

Structural steelwork shall be of the sections and dimensions shown on the drawings, be fabricated at an approved workshop and be assembled on the job in accordance with the drawings. Before ordering and fabricating any steel the Contractor shall check and verify all dimensions shown on the drawings and shall check the positions of holding down bolts.

Gas cutting is not permitted, except by written consent of the Engineer.

No permanent bolting or welding shall be done until proper alignment has been obtained and all finished members shall be true to line and free from twists, bends and open joints. Where site connections or splices have not been specifically shown on the drawings, the position and design of these connections will be subject to the Engineer's approval. No splicing of individual members shall be made without the Engineer's approval.

Workmanship throughout shall be up to the standard required for first-class structural work and metalwork, and to the approval of the Engineer. Care shall be taken to ensure that all parts fit together accurately and properly without straining.

12.3.3. Welding

Welding shall conform to the requirements of AS/NZS 1554.1 and NZS3404. Welding operator and supervisor qualifications shall comply with AS/NZS1554.1 Section 4.

Welding procedures shall be based on prequalified joints listed in AS/NZS1554.1 All butt welds shall develop the full strength of the connected members.

All fillet welds shall be Class A throughout.

Testing, inspection and cause for repair and the method of repair shall be in accordance with AS/NZS1554.1. Weld quality shall meet the requirements of the permissible levels of weld imperfection in tables 6.2.1 and 6.2.2.

12.3.4. Handling

Delivery, storage and handling shall comply with NZS3404. Padded slings shall be used to handle all corrosion protected steelwork.

12.3.5. Erection

Erection shall comply with NZS3404. The Contractor is responsible for the execution and safety of all erection operations and procedures.

Tolerances for steelwork erection shall comply with NZS 3404 Section 15.3.

The Contractor is responsible for accurately and correctly fixing the steelwork. All seating for steelwork shall be checked to ensure that it is at the correct level, truly flat and in a condition to receive the steelwork.

Steelwork requiring support, including pipe work mountings and similar steelwork shall not be erected until the supporting concrete has been fully cured.

12.3.6. Bolting

Bolting procedures shall comply with NZS3404.

Bolts shall have one washer and one nut and shall be snug tightened. Washers need not be hardened. All bolts shall be tightened by the 'part turn' method of tensioning as in NZS3404 Section 15.2.

Where Chemset Anchor Bolts are specified in the drawings, these shall be 316 Stainless Steel. All other bolts to be Galvanised High Grade 8.8 Steel.

12.3.7. Grouting

Grouting shall be in accordance with NZS3404. Grout shall be a proprietary non-shrink high-strength grout system.

Grouting shall be carried out after holding down bolts and steelwork have been aligned. Holding down or anchor bolts shall be tightened after the grout has cured.

12.3.8. Coatings

All non-galvanised mild steel surfaces shall be prepared for painting by sand-blasting or other approved methods to at least Preparation Grade Sa 2.5 complying with SIS 05-5900.

All fabrication, welding and drilling shall be undertaken prior to applying coatings.

12.3.9. Galvanising

All structural steel work shall be hot dip galvanised and comply with BS EN ISO 1461 to achieve a zinc retention of 600 g/m² after sandblasting to Sa 2.5 unless noted otherwise.

Any surfaces of galvanised steelwork damaged during construction shall have two coats of an approved zinc-rich organic primer applied, to the satisfaction of the Engineer.

All fabrication, welding and drilling shall be undertaken prior to applying coatings.

12.3.10. Fasteners

Anchor bolts cast into concrete shall be as shown on the drawings and/or as required by the equipment manufacturer's, and unless shown otherwise shall be of 316 stainless steel. Chemset anchors can be used and shall be 316 stainless steel.

Expanding fasteners for securing in concrete such as Dynabolts, Trubolts and similar devices, shall in general not be used and shall be used only in such locations and for such purposes as either shown on the drawings or authorised in writing by the Engineer.

Power driven fasteners such as Ramset pins in concrete structures below ground shall be used only in situations as are specifically authorised in writing by the Engineer.

13. PUMP STATION WORKS

13.1. Scope

[Detailed design of the three Tarawera Scheme pump stations is in progress. The following requirements are generally applicable, but will require amendment once specific design elements of the pump stations are known.]

The requirements in this section are in addition to the requirements of the RITS and take precedence over the RITS requirements.

13.2. Set-Out

The Contractor shall undertake cadastral survey to locate the site boundary and set out the works. Engineer approval of the set-out is required prior to any construction works.

13.3. Earthworks

Earthworks for the pump stations shall comply with the relevant sections of this specification.

13.4. Pumps

The Contractor shall supply and install Flygt N –Type submersible pumps (preferred) inside the wetwells and shown on the drawings.

All pumps shall be supplied complete with:

- Cable;
- Grade 316 stainless steel lifting chains;
- Duckfoot discharge elbows;
- Grade 316 stainless guiderails;
- Fixing to the GRP wetwell as per supplier design.

13.5. Wetwells

The Contractor shall supply and install Glass Reinforced Plastic (GRP) wetwells, approved by the Engineer, to the dimensions shown on the drawings. The scope of supply shall include the following:

- Structural design of the wetwell and valve chambers, allowing for all soil, traffic, hydrostatic, flotation, seismic and other design actions in accordance with AS/NZS 1170.2:2011 and AS/NZS 3571, including design of anti-flotation ring and mass concrete connection. The Importance Level (IL) used for structural design of the wetwell is IL3 and a design life shall be 50 years minimum. The structural design for both PS1 and PS3 shall assume worst case of the groundwater level at the ground surface.
- Supply of a producer statements (PS1 and PS4) to the approval of the Engineer;
- Supply a warrantee for the structure of 20 years minimum.
- Moulded flange penetrations for the pipework, air ducts and electrical conduits;
- Access hatch for access to the ultrasonic level transducers (2 No.);
- Fastenings for support of the pumps, pipeworks and ancillary equipment;
- Individual access covers to provide access to the ultrasonic level transducers;
- McBerns hinged sealed aluminium hatch with safety gill (non –trafficable);

Manufacture is to be by the contact moulded method for maximum chemical resistance, and in accordance with international standards using premium corrosion resistant isophthalic resins (sewers) or vinyl ester resins (trade wastes).

All site joints are to be butt and strap, and are to be done by a suitably trained and experienced person.

All bolted connections for the pump supports, pipe supports and other equipment supports shall be able to be unbolted from the inside of the GRP chambers.

Fabrication drawings showing the proposed penetrations, location of access covers and all other details are to be supplied to the Engineer together with the PS1 certificate for approval before placing an order with the supplier.

13.6. Valve Chamber

The Contractor shall supply and install GRP valve chambers, approved by the Engineer, to the dimensions shown on the drawings. The scope of supply shall include the following:

- Structural design of the wetwell and valve chambers, allowing for all soil, traffic, hydrostatic, flotation, seismic and other design actions in accordance with AS/NZS 1170.2:2011 and AS/NZS 3571, including design of anti-flotation ring and mass concrete connection. The Importance Level (IL) used for structural design of the wetwell is IL3 and a design life shall be 50 years minimum. The structural design shall assume worst case of the groundwater level at the ground surface.
- Supply of a producer statements (PS1 and PS4) certificates to the approval of the Engineer;
- Supply a warrantee for the structure of 20 years minimum.
- Moulded flange penetrations for the pipework, valves and air ducts;
- Fastenings and supports for internal pipeworks and ancillary equipment;
- McBerns hinged sealed aluminium hatch with safety gill (non –trafficable);

All bolted connections for the pump supports, pipe supports and other equipment supports shall be able to be unbolted from the inside of the GRP chambers.

Fabrication drawings showing the proposed penetrations, location of access covers and all other details are to be supplied to the Engineer for approval before placing an order with the supplier.

13.7. Flowmeter Chamber

The Contractor shall supply and install 1.2m dia MH complete with concrete cover and McBerns hinged sealed aluminium hatch with safety gill (non –trafficable);

13.8. Emergency Storage Tank

The Contractor shall supply and install 10 m³ GRP emergency storage tanks, approved by the Engineer, at each pump station as shown on the drawings. The tanks shall be installed at a 2% grade directed to the inlet/outlet pipe towards the wetwell. The scope of supply shall include the following:

- Structural design of the tanks for 250kN (Class D)Traffic Loading in accordance with AS/NZS 3571, including design of anti-flotation ring and mass concrete connection;
- Moulded flange penetrations for all pipework penetrations;
- Spray Sparge system including 316SS pipe with 3 No. xBETE ¼” TF8 120 degree nozzles or approved equivalent;
- Hynds Mastro 600mm dia hinged DI Manhole Cover (**Class D Trafficable**);

Fabrication drawings showing the proposed penetrations, location of access covers and all other details are to be supplied to the Engineer for approval before placing an order with the supplier.

13.9. Internal Pipework

All internal pipework to the pump stations shall be either GRP pipework to PN16 pressure rating or Schedule 10 Grade 316L stainless steel. All flanges and bolts shall be Grade 316 stainless steel. All stainless steel pipe work that is to be buried shall be wrapped with Denso Tape.

13.10. Interconnecting Pipework between Chambers

The Contractor shall supply and install the following pipework when connecting the onsite chambers at each pump station:

- All interconnecting pipeworks shall be PE100 SDR11.
- 2 No. AVK Supa Plus Flange Adaptor shall be provide between each chamber
- The anti-floatation / anti-liquefaction concrete is to be formed with a mini separation of 150 mm below the pipework so that they are not encased in mass concrete.

13.11. Electromagnetic Flowmeter

The Contractor shall supply, install and connect ABB reduced bore Process Master flow meters, including all necessary electrical and mechanical connection, with flanges to AS2129 Table E and a PN16 rating.

13.12. Odour Filter

The Contractor shall supply and install McBerns activated carbon filters if required.

The odour filters shall include:

- Concrete plinth 300mm high 20 MPa reinforced with SE92 mesh centrally placed to extend 300mm beyond the footprint of each Greendome unit;
- Carbon filter 100W fan (variable speed) and 300W heater element;
- 100/150 NB SN8 uPVC pipework from the wetwell and air valve chamber;
- 300mm high concrete plinth to support the Greendome unit above the wet well lid level with 316stainless steel hold down bolts.
- Electricity supply, ducting and connection to the MCC;

13.13. Level Transducers and Back-Up Float Switches

The Contractor shall supply and install a 316SS Vegason 61 ultrasonic level transducers fitted complete to the roof of the wetwell chamber.

The ultrasonic level transducers shall be accessible through specifically designed hatches to allow for removal of the units without needing to access via the main hatch.

13.14. Electricity Supply

The Principal will arrange with Unison to provide power electrical supplies to the site.

The Contractor shall provide local power reticulation from the transformer to the MCC cabinet.

13.15. Crash Barrier

The Contract shall design, supply and install a crash barrier around the pump station to NZTA M23 specification.

The crash barrier is to consist of 2 No. bull nose end terminals at either end orientated away from the road and with radii of 5m at corners.

13.16. Vehicle Access

The Contract shall construct a vehicle access for maintenance and lifting the pumps via Hiab. Bollards shall be provided to prevent accidental vehicle access on top of the pump stations. A concrete kerb shall be provided to the perimeter as shown on the drawings.

The surface of the vehicle access shall be either compacted GAP40 aggregate or hot-mix asphalt concrete. The Contractor shall supply and install 100mm thick DG20 hot mix asphalt in accordance with RCEIS 2004.

The Emergency Storage Tanks at the site shall be located beneath the vehicle access.

13.17. Site Security and Fencing

Fencing to the perimeter shall be:

- 1.8m high (0.45m for barbed wire) 50mm heavy duty galvanised steel mesh;
- 3 strands of 12 gauge heavy duty galvanised barbed wire at 150mm spacing above mesh
- 40nb galvanised tube posts at 3m centres 2250mm high embedded 750mm in 17.5MPa concrete 300mm diameter
- Diagonal bracing at all corners and ends.
- 2 No. 2m wide double lockable gates.

13.18. Fibre Optic Cable Duct Between Pump stations

Full in pits shall be provided at 100 m intervals. The pull in pits shall be Humes MODULAR PP CHAMBER PACKAGE 600X750X775 or approved equivalent

13.19. Site Levels and Finishes

The Construct shall set-out to the levels shown on the drawings to the 1953 Moturiki Datum. The Contractor shall supply and install the following:

- The site shall be graded at 1% towards SH30 along the finished surfaces.
- A reinforced concrete ground bearing slab is to be cast in-situ over the wetwells, valve chambers and flowmeter chambers as shown on the drawings.
- The concrete shall be 25MPa 150mm thick with edge thickening SE62 reinforcing centrally placed.

13.20. Commissioning

The Contractor is required to supply a detailed Commissioning Plan, covering all aspects of the methodology.

The Contractor shall be responsible for the correct commissioning of all equipment and for liaising closely with the equipment suppliers.

The following items shall be investigated and fully tested during the final commissioning after the completion of all construction works in this Contract and the construction of the new rising mains.

- Water testing the new pump stations wet wells and the emergency storage tank using a water test.
 - Fill the wetwell with clean water, to be brought to the site by the Contractor. The test level is to be 50mm from the lid level.

- o The water level is to be left for a period of 24 hours and checked to ensure no drop in level has occurred.
- o The test will be successful if there is no drop in water level within the unit and no visible leaks are detected.
- All tests and checks required for provision of a certificate of completion and fitness for use of the electrical installation by a registered electrician.
- Testing of equipment duty and performance.
- All Testing required in the electrical section of this specification.
- Pre-commissioning inspections shall be completed to confirm to the satisfaction of the Engineer that individual items of plant and equipment incorporated in the works are safe to proceed to the next phase of the commissioning process. The Contractor shall take all steps to prevent personal injury, damage to plant, equipment and property during all testing.
- The Contractor shall test and demonstrate to the Engineer that all equipment and systems within the Specification operate reliably in accordance with the design and/or Specification. If the testing and/or demonstration fails, the Contractor shall perform repairs and repeat the test/demonstration. The tests shall include installation inspections and tests recommended by equipment suppliers. Equipment suppliers' inspection check sheets shall be submitted with the Contractor's inspection test plan.
- Installation of all rotating mechanical and electrical equipment shall have been completed and tested for correct rotation prior to the pre-commissioning phase.
- Checking signals from all level control equipment to ensure safe operation and to ensure pumps will not run dry.
- Power failure simulation and power restart.
- Check pumps and maintain required wet well levels on variable speed drives;
- Check larger pumps start/stop when flow exceeds/reduces to the range covered by the small pump;
- Set up and tune Variable Speed Drives including failure modes;
- Prove functional operation of pump station controls and interaction between pump stations in accordance with the Functional Description;
- Where any of the above fail to satisfy the requirements of the specification or the Engineer, correct the defect and retest.
- Oversee initial operation and carry out adjustments until such times as hand over is accepted by Rotorua Lakes Council/s appointed maintenance contractor.

13.21. Operation and Maintenance Manuals

The Contractor shall supply and Operation and Maintenance (O&M) Manual for each pump station which shall include all equipment manuals, installation and/or operation and maintenance manuals and other documentation packed with any item of equipment whether free issue or supplied by the Contractor.

14. Reinstatement

14.1. General

The construction methodologies adopted by the Contractor shall utilise trenchless technologies where possible for the installation of pipework where it passes underneath pavements. However, some reinstatement of pavements may be required and these areas.

The Contractor is responsible for restoration work over the full area affected by their operations, including the restoration to their former condition of all concrete carriageways, vehicle crossings, footpaths, kerbs and channels, fences, public and private properties damaged as a result of their operations. This will be taken to include damage caused by the temporary diversion of traffic, pumping, etc as a result of the Contractor's operations.

Reinstatement of carriageways, vehicle crossings, footpaths and grassed areas shall be undertaken to the standards specified in RCEIS 2004.

The Contractor shall keep a photographic record of all work areas. The record shall include photographs of all affected areas both before and after the contract works are completed. In the event of a disagreement as to the standard of reinstatement, the photographic record will be utilised. The decision of the Engineer with respect to the standard of reinstatement carried out will be final.

In the event that the Contractor fails to produce the photographic records, the Contractor will be required to comply with the directions of the Engineer with respect to the standard of reinstatement.

The finished surface of any reinstatement shall be flush with, and on the same gradient as, the existing surface.

Any damage to surfaces that is a health and safety hazard shall be made safe as soon as possible.

Reinstatement of all structures, hedges, plants, pipes, drains, and anything disturbed or damaged by the works shall be reinstated to its original condition or better at the Contractor expense. In the case of pipes and drains, these shall be restored despite being apparently abandoned or disused.

14.2. Carriageway Rehabilitation

14.2.1. Aggregate Courses

After compacting and shaping the pavement subgrade in accordance with this specification the Contractor shall supply, spread and compact the graded aggregates in conformity with the lines, grades and typical cross-sections shown on the Drawings.

14.2.2. Basecourse

All basecourse aggregate shall comply with TNZ Specification M/4. The material used will be subject to tests at any time by the Engineer to ensure the material complies with the above specification. Such tests and required results will be in accordance with TNZ Specification M/4.

14.2.3. Construction of Basecourse

The construction of the basecourse shall comply with TNZ Specification B/2. The subgrade shall have been inspected and approved by the Engineer, if so required before any basecourse is spread over the area of the pavement. No basecourse shall be laid on a wet subgrade and loaded trucks shall not be permitted to run over any prepared subgrade before basecourse is spread. The basecourse material shall be placed in layers of uniform thickness not exceeding 150 mm thickness.

14.2.4. Inspection by the Engineer

In addition to any testing or inspection by the Engineer required by this or other sections of the specification, the Contractor must programme his work to allow for and facilitate inspections and testing of the prepared subgrade and completed basecourse, if required, by the Engineer.

14.2.5. Defects to be Made Good

Any weak patches or other localised defects which become apparent in the subgrade or in the basecourse itself during the compaction of the basecourse (except those defects which, in the opinion, of the Engineer do not result from the Contractor's method of laying or compaction, or from the Contractor's construction of the subgrade) shall be excavated and made good with approved material at the Contractor's expense.

14.2.6. Tie into existing Roads

Where the pavement construction ties into an existing road, the joints between subbase and basecourse shall be staggered by 200 mm horizontally to ensure uniform compaction.

Where directed by the engineer, the Contractor shall sawcut the existing pavement seal in a straight line at right angles to the line of the road or as otherwise directed.

14.3. Asphaltic Concrete Reinstatement

In areas where resealing is required, the last 150 mm of the trench depth is to be completed in AP40 basecourse surfaced with:

- i. A tack coat of emulsion and 20 mm AC Mix 5 in sealed footpath.
- ii. An emulsion primer sealer using grade 6 chip followed by 30 mm of AC Mix 10 in the road.

Sawcuts in existing sealed surfaces are to be sealed with a 50 mm strip of emulsion and sand.

14.4. Kerb and Channel

14.4.1. General

All kerb and channel may be either cast in-situ or extruded and shall conform with the Drawing RD15 Kerb and Channel Profiles in the Rotorua District Council Roading Standard Drawings, or to match the existing Kerb and Channel on site.

14.4.2. Cast Insitu Kerb and Channel

For cast in-situ kerb and channel, formwork shall be clean dressed timber or steel sections adequately oiled or otherwise treated to allow ease of striking without staining or damaging of the stripped concrete surface.

No formwork shall be stripped until at least two days have elapsed from the time of placing concrete.

14.4.3. Slip Formed Kerb and Channel

Slip formed kerb and channel shall be laid in one operation. Concrete shall be of such a consistency that after extrusion it will maintain the kerb shape without support. The cement content of the mix shall be between 260 and 280 kgs per cubic metre. The extrusion machine shall be operated to produce a well- compacted mass of concrete with a clean and smooth surface free from pitting.

14.4.4. Surface Finish and Tolerances

All curves both horizontal and vertical shall be tangential to straights and the lines and levels of kerbs shall be such as to give the finished kerbs smooth lines free from kinks and angles. Contraction joints 50 mm deep shall be placed in the kerb at 4 m spacings immediately after placing and prior to floating off.

14.4.5. Foundations

Excavation for the concrete works shall be constructed on a layer of compacted basecourse material that shall not be less than 75 mm in depth and that shall be compacted to 95% standard compaction as specified on NZS 4402 Test 4.1.1. Where foundation conditions are unsuitable, the Engineer may require further strengthening of the subgrade to be carried out.

14.4.6. Footpath

All new and replacement footpaths shall be constructed in accordance with the RITS for Roading and Landscaping.

Excavation for the foundation of the footpath shall be brought to the required width, line, grade and crossfall and consist of minimum 100 mm of AP40 material, compacted to 95% standard compaction as specified on NZS 4402 Test 4.1.1. Porous areas shall be blinded with sand and if the foundation is dry then it shall be moistened prior to placing concrete. Should foundation conditions prove unsatisfactory, the Engineer may require further strengthening of the subgrade to be carried out.

The reinstatement of footpaths is to be carried out as soon as practicable. Compacted backfill material is to be placed in excavated areas to allow safe access for pedestrians in the interim.

The concrete paths shall be laid with construction joints at intervals no greater than 3 m centers and have a minimum thickness of 75 mm. Where the footpath is around and adjacent to turning circles in cul-de- sacs, the minimum thickness shall be 100 mm. The paths shall be finished, unless otherwise specified on the plans, with a crossfall of 2%, to shed water and an even non-skid brush surface to finish U5 in terms of NZS 3114. No path shall pond water.

The Concrete strength shall have a minimum 28 day strength of 17.5 MPa.

The surface shall not deviate by more than 5 mm from a 3 m straight edge at any point and no abrupt changes in line or level shall occur.

14.5. Vehicle Crossings

14.5.1. Design

All vehicle and pram crossings shall conform to the appropriate RITS Standard Drawings and shall match the existing surfaces.

14.5.2. Foundations

Excavation for the foundation of the crossing shall be brought to the required width, line, grade and crossfall and consist of a minimum of 100 mm of AP40 material, compacted to 95% standard compaction as specified on NZS 4402 Test 4.1.1. Porous areas shall be blinded with sand and if the foundation is dry moistened prior to placing concrete.

Should foundation conditions prove unsatisfactory, the Engineer may require further strengthening of the subgrade and/or modifications to the concrete works.

14.5.3. Finishing

Crossings shall be finished, to shed water with an even non-skid brush surface to finish U5 in terms of NZS 3114. The concrete crossings shall be laid with construction joints at intervals no greater than 3 m centers.

The surface shall not deviate by more than 5 mm from a 3 m straight edge at any point and no abrupt changes in line or level shall occur. No crossing shall pond water.

All reinforcing used as shown in the drawing shall be clean and free from deleterious substances and rust scale, shall be securely fixed in position on chairs or blocks and prevented from movement during the placing and compaction of concrete.

14.6. Roadway Ancillaries

The Contractor shall reinstate all road markings, cats eyes, fire hydrant markings, signs, posts and street lights that have been removed or altered by that Contractor, within 48 hours of completion of work.

14.7. Service Covers

All service covers and service boxes, manholes, etc. shall be adjusted / reconstructed as necessary to match into finished levels.

The sealed areas around service covers shall be free of saw cuts or joints. Service covers shall be raised and levelled prior to final seal applications.

14.8. Grassed Berm

The grassed berm shall be reinstated and finished with 100mm of approved top soil and grass seeded in accordance with section 3.19.

15. Electrical & Controls

[These are indicative requirements to be finalised during detailed design phase depending on pump station works requirements, if any. Note that these requirements are in addition to requirements in the RITS for pump stations.]

15.1. Scope Of Work

This section of the Specification includes the supply of all labour, materials, cartage, plant and other incidental requirements for the manufacture, supply and testing, installation and commissioning of a reticulation scheme Pump Station, remote outdoor main switchboard motor control centre [MCC] complete with the field remote site new POWERCO incoming 11 kV feeder and transformer assembly.

The contractor to provide, install and connect within the operation of a low tension electrical system connected to the combination of variable speed drives associated with high lift submersible pumps. A direct online starter to be provided for low volume submersible pumps.

Installation of the required controls, instrumentation, communications, and monitoring / run control items complete as located in and about the site as detailed on the Drawings.

Works shall be complete with all minor and incidental items necessary for the proper functioning of the total systems including the low tension electrical reticulation and adjoining communications / data feed installations between the pump station and with the adjoining sites.

Allowance shall be made in the Tender price for duty, exchange, sales, tax, fees, inspection fees and all similar charges.

The work shall include the following:

- a) Co-ordination on site of the new transformer installations by local lines Company.
- b) Supply, installation and terminations of the new incoming service mains cable together with the earth bonding and instrumentation earthing.
- c) Manufacture, production and supply to site outdoor assemblies to not less than IP55. The outdoor assemblies to house internally positioned [MCC] assemblies of typical switchboard cabinetry layouts as detailed (to not less than IP 54) complete with individual doors, closures and sealed high risk required security cabinet enclosures. For example pump motor control, instrumentation – telemetry, HMI panels, indication and main incoming isolators to be located through to and mounted on the front panels from within the internally positioned [MCC] cubicles. All internal (hinged) doors to be fitted off with RONIS coin locking devices. To this end the outdoor enclosure with the main doors closed (to include the full height wire ways) to be locked off with the specified YALE keyed locking system installation. NOTE: When closed and locked off the only switchboard assembly items to be recognised will be to the front [MCC] identification label, to the rear the hinged outdoor antenna structure and the ventilation air inlet and air exhaust hoods.
- d) Provide and install [MCC] complete with the inboard air-conditioning unit. Provide the cubicle complete with an integral outdoor structured envelope enclosure to IP55 together with air gap loop to IP55. The installation of internal type air conditioning unit shall be required to control the internal switchboard temperature and that the air flow pattern to be carefully arranged to avoid short circuiting of the cooling medium.
- e) Provide and install with care electrical distribution systems both 415 / 240 Volts and 24 Volt DC complete with associated local interfacing control systems.
- f) Install and connect within [MSB-1] the required integral VSD assemblies complete with, LC filters and a passive harmonic units Installation, set up (pre-sets) and commissioning to be reviewed by Engineer.
- g) Installation of the specified and detailed siemens (PLC) racks to include for the 24V dc to 24V dc PLC (power supply module), CPU central processor module with the (I/O) digital and analogue input racks. Provide the, Ethernet switch (managed) with and without out the fibre containment and the HMI panel units. Ensure the correct length of ethernet cables with the appropriate RJ45 (industrial) plug fittings installed.
- h) Provide for the concrete mounting pad to accommodate the [MCC] assembly. Ensure to provide structural / seismic certification of restraint systems employed to be issued. Supply and install the required conduit systems and ensure that the primary run conduit cable enclosures run in from the field are to be bushed into the primary gland plate with the incoming cable individually secured through the above cable gland installation. The cable gland area to be created to not less than IP55 on the cable entry side with conduit / cable exit below the cable

gland to be sealed to not less than IP55. The sealed area to become part of the air gap loop (AGL).

- i) [Note: the requirement for a Wet Well at each pump station will be dependent on the detailed design. A dry well solution may be specified.] Pump installations to be co-ordinated with the pump installer complete with the necessary power feed conduit in place including conduit installed to the correct location within the wet well fabrication assembly programme. Entry of all conduits (including pump cables and float sensor cables) typically to be at the highest of the allowable upper reach of the inside of the wet well locations.

- j) All conduits internally to be run and secured and be required to be installed within the wet wells complete with the entry outlet of the conduit in the vertical facing vertically downwards at a final position to be not less than 400 mm above the overflow (HHL) of the wet well. Note that within the 400 mm above the overflow dimension to be complete with the conduit reducer and cable gland installation assembly requirement to be (locked) cemented in to the permanent position.

Permanent position for the cable (pump or float level regulator assemblies) to be fed into location complete with draw wire assistance. The draw wire in all cases to be in place and located at and within the (MCC) cable conduit – conduit bushing / cable gland within the appropriate section and location of the gland plate Note: With the cable (pump or float regulator) in location and drawn through to the correct vertical termination location (MCC) wire way the length of cable run spare should not be less than 1.0 Metre unstressed. Ensure both ends of cable- conduit enclosure / cable gland assembly are tightened to maximum torque as specified by the cable gland supplier without indent damage resulting to the surface of the cable sheath.

- k) Fixtures, fixings, brackets, bolts, nuts and washers together with assemblies to be provided complete in S/S 316. Support structures set into the adjacent concrete pad apron with the associated field conduit / cable enclosure secured to the inside of the vertical structure (angle flat section) with S/S 316 cable saddles, fixtures and fittings.
- l) Install earthing to the locations as indicated on the drawings complete with the ECC and conduit system enclosure provide earth terminations within earth bar enclosure with labels. All outdoor junction boxes and S/S 316 enclosure units to be earthed individually with the scheduled ECC. including braided copper earthing conductor to locations as detailed.
- m) Provide shop drawings for approval to the requirements as detailed including the integration of the air conditioning system within the [MCC] assembly.
- n) As and when the “As built Documentation” as identified As Approved including all drawings, notes relative to the final documentation and details are finalised then the O & M Manuals are then able to be sub-mitted for the final acceptance review.
- o) Commencement of the Maintenance Period to proceed as and when the O & M manuals are received and that the required certified documentation to cover installation items together with the CoC (Certificate of Conformity) as required from the Electrical Contractor.
- p) Provide Shop Drawings for approvals of the new switchboard assembly [MCC] together with the installation of the indoor air conditioning unit and the associated outdoor compressor condensing set.
- q) O & M Manuals to be provided complete with the pre-approved as built documentation and the required certified documentation to cover installation items together with the CoC Certificate of Conformity as required from the Electrical Contractor.
- r) Practical Completion: Commencement of the Maintenance Period (12 Months) to proceed as and when items of documentation and certification have been received. The contractor to provide guarantees and warranties on all electrical equipment and electrical hardware for a

minimum of 2 years. Electrical Certificates of guarantees to be provided by the Electrical Contractor.

15.2. Information to Be Provided By Electrical Contractor

- a) Co-ordinate with the Contractor to ensure that the conduit systems within the floor slab align correctly with the internal gland plate to the base of the wire way sections of [MCC]
- b) The contractor is responsible for providing and installing the appropriate sized conduits to be run underground for the accommodation of the specified circular cable type taking into consideration swept bends, gland plate to conduit bushing with conduit reducers and conduit to cable gland requirements. Conduit dimensions as detailed in the documentation are minimum and the contractor to size the conduits accordingly.
- c) Provide and connect sub-circuits to lighting including the installation of the lighting fittings and power installations as scheduled. Supply, install the new socket outlets and fixed wired outlets to the locations as detailed on the drawings.
- d) Install and connect air-conditioning units to the locations as described on the drawings complete with the designated power supply.
- e) Provide Detail of the cubicle fit-out enclosures within the [MCC-1] outdoor cubicle installation, conduit bushing, cable glanding details, field conduit glanding associated with general / good practice cable glanding requirements.
- f) Practical Completion:

Before the commencement of maintenance period (12 months) final completion items are required as follows:

1. Operational and As built O & M (Operational and Maintenance Manuals (2 only) to include as built drawing documentation completed and approved (in preliminary form) before hand over to RLC. Provide two additional A3 sets of hard copy as built drawings for RLC information and file copies.
 2. Certificate of Compliance (CoC) original copy to Client, copy to Engineer.
 3. Hand Over Notice Of Description for the total electrical and controls operation of the specified and detailed installation in its completed state to be declared as a safe and useable facility in terms of the new plant installation and its intended production operation.
 4. Note: Before the above electrical installation is able to be commenced in construction on site the Electrical Engineer shall provide a signed “Declaration of Conformity” (DoC). For an LV installation for compliance with Regulation 58 of the Electrical (Safety) regulations 2012.
- g) The following information to be provided by the electrical contractor during the tender period:
1. The name of the proposed / selected [MCC-1] outdoor switch board / control cubicle (to IP55) to IP55 manufacturer/ assembler information to be provided to the contractor during the time of tendering. The Electrical Engineer to be notified during the tender period.
 2. Information relating to the electrical tender documentation including the PS-1 and PS-2 wet Well cable glanding system” if the intended electrical / controls format and or system installation design is to be changed in any way the Engineer is to be notified during the tender period.

3. PLC system installation (within the MCC assemblies) including the rack assembly, configuration and loading (integral 24 V.DC supply capacity) approvals confirmed with PLC suppliers technical information.

15.3. Drawings

The Contractor shall submit for approval prior to manufacture, shop drawings of: [MCC-1] outdoor switchboard control cubicle and all other scheduled junction boxes , I/O data loop diagrams as required, cable core numbering sequences and air-conditioning system and ventilation systems installation details.

Control cubicle, switchboard motor control centres, junction box, electrical details as scheduled, conduit bushing and cable glanding typical details shop drawings to be provided for approvals within 10 working days of contract acceptance and shall provide at least the following information:

- a) Layout of equipment, fully dimensioned and the approved location identified.
- b) Brand of all components including catalogues and model numbers.
- c) Single line diagrams / schematics to be provided only if the original single line / control drawings are to be changed.
- d) Labelling throughout as scheduled and as indicated on line diagrams / control schematics of soft starters, PLC, and power supply hardware locations to provide identification to all layouts including installation items to site.
- e) Acceptability of commissioning / programming requirements of the PLC systems and the associated down stream SCADA system to implemented by others to be under the CLIENT control with reference to the information as provided by PDP as the programming documentation.

All submissions shall be made sufficiently in advance of construction requirements to allow a minimum of ten (10) working days for the Engineer's approval. Approval of any submissions shall not in any way relieve the Contractor of the responsibility for any error or omission. Note that the shop drawing approval process is primarily to confirm the dimensional aspects for the site installation process. The contractor to check all dimensioning of the switch board motor control centre: Outdoor assembly [MCC] conduit /cable systems to be as confirmed. Approvals to be obtained prior to commencing manufacturing of [MCC] and all junction box / control cubicle assemblies. All approvals on shop drawing sub-missions to be given in writing.

15.4. Standard Specifications

All work is to comply with the following, which is deemed to form part of this specification.

- a) Electricity Safety Regulations: 2010 together with AS/NZS 3000:2007 wiring rules and all subsequent amendments.
- b) The following New Zealand and Australian Standards:

AS 3947	Low Voltage Contractors/Control Relays
AS/NZS 61009.1:2004	Residual current operated circuit breakers with integral over-current protection for house-hold and similar use.
AS/NZS 60898.1:2004	Circuit Breakers for AC operation $\leq 125A$, $\leq 25kA$
AS/NZS 3439.3:2002	Distribution Boards: Particular requirements for low voltage switchgear

	and control gear assemblies intended to be installed in places where unskilled persons have access to their use
AS/NZS 3137	Light Fittings (all parts)
AS/NZS 2053	Conduits and Fittings for Electrical Installation (HD Grey)
AS/NZS 5000.1	XLPE insulated cables generally OLEX cables where specific motor feed cables are to be employed: single stranded flexible conductors where a high head (water gauge in excess of 150 Metres) the insulation sheath of the cable specification shall read: XLPE. HFS. HO.TP.

c) Instrument Cable Types To Be:

- i) Triple core screened: General Cable Type B51 ES. B5103 ES: (3C)1.5mm². PVC sheathed.
- ii) Two x Twin cored element and collective screen General Cable Type B55 ESCS: 2 (2C)1.5mm². PVC sheathed.

AS/NZS 5000.2	PVC. TPS insulated cables. Circular Black.
AS/NZS 4961	Neutral screen cables. Copper. Cu.
NZS 2265	Earthing Clamps/Bolted Lugs
AS/NZS 1650	Hot Dipped Galvanised Coatings on Ferrous Articles
NZCEP-25	Earthing and Equi-potential Bonding of Low Voltage Electrical Installations
NZCEP-28	Installation of Cables
NZCEP-35	Power System Earthing
AS 4702	“Polymeric Cable Cover Strip”: (mag. slab) Note: to be installed (together with in-ground orange electrical marker tape) within and overall and individual in-ground electrical conduit systems. All in-ground conduit systems to include the Polymeric cable cover strip installed over the electrical conduit / conduits for the compliance of conduit / conduits to provide Class “A” compression requirement of the installed conduit / conduits in situ. The compression requirement to comply in relationship with AS/NZS 2053 “Conduits and Fittings (in-ground) for Electrical Installations” for the inclusion of (HD grey) conduit systems to locations as detailed.

15.5. Corrosion Protection: Main Switchboards / Motor control cubicles:

All metal work to internal (minimum of IP55) cubicle construction to [MCC] shall be in mild steel fabricated complete with etched base primer coat and minimum of three (3) coats HD with final hard waring powder coated panel paint.

The outdoor external enclosure (minimum IP55) envelope of [MCC] to be in minimum of 3.0 mm thick mild steel epoxy etched and painted minimum of three coats colour steel white. Provide the (base) plinth with minimum of 5.0 mm thick steel channel section epoxy etched with three coats of colour steel black.

All bolts, nuts and fixings including brackets and support systems, internal and external field assemblies to be in S/S 316 unless otherwise detailed.

15.6. Electrical Requirements

The following shall be adhered to:

All electrical works shall be in accordance with RLC Specification: Hydrogen Sulphide Protection of Electrical Equipment (Power Solutions Ltd) available from the Principal.

All wiring shall be carried out in strict accordance with the Wiring rules AS/NZS:3000:2007.

All electrical wiring, fittings and supports necessary for the proper functioning of the work, whether or not shown on the drawings or called for in the specification, shall be supplied and installed by the Contractor. The intent of this Clause is that whereas all minor and incidental works are not necessarily specified but are necessary for the completeness of the work, such items shall be provided within the Tender Price.

- a) All cables shall be carefully inspected by the Contractor during installation to ensure that:
 - i. Cable sheath is not damaged.
 - ii. Bending radius is not less than manufacturer's requirements. Confirm on-site that the installed conduits by others are provided with the correct conduit swept bands to accommodate the scheduled cable installation.
 - iii. Mechanical damage will not occur during or after installation.
- b) Where cables enter conduits, provision must be made to prevent the entry of water or other liquids. If it is not possible to make such a provision, a drainage point must be provided at the lowest point of entry. All conduit installations to be positioned complete with long term sealant system applied to all conduit joints and pressure tested with air at 2 bar (Gauge) over 24 hours and provide a certificate of confirmation to ensure and prove the conduit systems are air tight and hence water tight.
- c) Conductors terminating at each wired outlet shall be left not less than 230 mm long at their outlet fitting to facilitate the installation of devices or fixtures.
- d) The Contractor shall finish and install hangers, racks, cable cleats and supports required to make a neat and complete cable installation. Cable bands or clamps as approved by the Engineer shall be used where necessary to bind cable groups together.
- e) All conduits, cable tray and cable ways shall be inspected for defects which may damage the conductors during pulling in; no conductors shall be drawn into the conduits, cable tray or cable ways until all such defects have been rectified.
- f) Where feeds consisting of more than one conductor per phase pass through any aperture, then each conductor of one phase shall be grouped together with one conductor of each of the other two including earthing conductor wherever applicable.
- g) No joints or spaces shall be made in any conductor carrying medium or low voltage except upon approval from the Engineer.
- h) Any joints in cables when specifically approved shall join the conductors securely both mechanically and electrically with heat shrink sleeving over the joint. Joints of conductors 4 mm and smaller may be made by means of compression connectors or approved equal.

All joints and terminations in cables shall be made in accordance with the manufacturer's instructions and the Engineer's approval.

15.6.1. Requirements for Cables and Terminations Requirements for cables and termination include the following:

- a) Cables shall be PVC.CW insulated complying with AS/NZS 5000.1 for 250 volt grade sub-circuits.
- b) In all cases care shall be exercised not to strip the insulation from the conductors farther than the rear of the lug.
- c) In all cases of compression terminals and splices the correct size of all compression lugs and sleeves and correct tools must be used.
- d) All control cables shall be numbered individually with an identification tag number and all control cable conductors shall also be complete with a ferrule and number. The numbering

system and sequence shall be approved by the Engineer before being incorporated. Note that as-built drawings shall be complete with all control cables and conductor numbering system.

- e) Each ferrule shall be so fixed that it can easily be read from within 30 mm of the cable termination.
- f) Note that all cables in this contract shall be of copper conductors to the dimensions as specified and scheduled unless otherwise detailed or agreed upon by the Engineer.
- g) All cabling shall be of stranded conductors. Approval is required from the Engineer for the use of alternative solid conductors.
- h) All cabling in this contract to be concealed unless otherwise detailed.
- i) Minimum cable size to be installed in this contract (on all 240 volt control circuits) unless otherwise specified to be 1.5 mm² copper PVC. MC. Circular black cable: (colour of cores: brown (phase), blue (neutral) and Gn/YI (earth). All control wiring to be Red (phase) and Black (neutral) with general and adjacent earthing in Gn/YI.
- j) Cable size and colour to be installed for all 24 volt DC control circuits shall not be less than 1.5 mm² (colour: Grey, Pink and white).
- k) Cable size and colour to be installed for all 24 Volt AC circuits to be not less than 1.5 mm². (colour: Brown and Orange).
- l) Cable size and colour to be installed for Analogue I/O circuits: (Colour: to be Purple and Pink).
- m) Variable speed drive (3 phase) output cable to be in circular varolex type cable to be terminated in the field with cores red, white and blue as the phase conductors. Earth conductors (3 X 1C) to be ECC for system earth to be connected at each earth / bonded termination point. The screen section of cable to be securely connected at each earthed / bonded termination point.
- n) Earthing installation to be to locations as scheduled and clearly labelled with origin.

15.6.2. Flexible Conduits

- a) Flexible conduit shall be used for the termination of field connected devices as and when detailed and specified. Flexible S/S 304 conduit shall be used for mechanical protection to obviate stresses in wiring due to vibration or to allow adjustment to be made in equipment.
- b) Where a flexible conduit exceeds the length of 450 mm it shall be secured by fixings and brackets of S/S 304.

15.6.3. Conduit and Trunking Requirements

- a) All conduit systems in the electrical contract shall be run and installed by the electrical contractor. The electrical contractor to confirm all conduit dimensions for adequate dimension to accommodate the scheduled cable type / size and dimension on the radiused swept bend type to be employed before installing the conduit system. Conduit and pipe runs shall drain towards hand-holes, having a minimum slope of 1:300.
- b) Data/controls and power conduits and pipes shall be separated by a minimum space of 400 mm.
- c) Underground conduit systems to conform with AS/NZS 2053 (Clause 1.5 Standard Specifications “Part b”) and AS 4702 (Clause 1.5 Standard Specification “Part b”).
- d) Conduit and pipe dimensions shall be measured from the finished floor level of concrete, and all conduits and pipes are to be stubbed with finished floor level of concrete.

- e) All conduit runs which extend through area of different temperatures or atmospheric conditions, or which are installed partially indoors, shall be installed in a manner which will prevent drainage of condensed or entrapped moisture into pull boxes, cabinets or equipment enclosures. Overhead conduits may be provided with conduit fittings drilled with a drain hole and located at suitable points for drainage or shall be provided with seal and drain fittings at the point of entrance to the box, cabinet or enclosure. Underground conduits entering a building shall be arranged to prevent or dispose of drainage or where such drainage cannot be provided, shall be plugged with caulking compound. All conduit/pipe joints underground shall be treated with mastic waterproof seal.
- f) Suitable electrical expandite compound shall be used for the plugging of conduits, ducts and sleeves which will not harden or decompose materially when exposed to air.
- g) Fastening of conduit shall be as follows:
 - To wood by means of screws to S/S 304, to masonry by means of threaded inserts to S/S 304, metal expansion screws or toggle bolts and to steel by means of unistrut conduit clamps or hangers to S/S 304. PVC saddles shall only be used on PVC conduit and where used externally shall be fixed with round headed screws S/S 304.
- h) Conduit clamps shall be installed on each hanger to securely fasten each conduit in the group. Hangers shall have an adjustable feature to keep all conduits in perfect alignment.
- i) Conduit fittings shall be compatible with the heavy duty conduit heavy duty ultraviolet rated and for the environmental conditions where used. Pull boxes, adaptor boxes, Schneider type 56 series to chemical resistant, dust tight, seamless, with knockouts, with gasketed cover joint. Ample space shall be provided for pulling, jointing and cable bends. HD.HP.PVC as detailed conduit to be used below ground level. Note: orange and or grey conduit (HD) to be used below ground level. Grey conduit (HD / UV) to be used above ground as detailed.
 - No cables may be installed until the conduits have been completely cleaned and checked to be free of burrs, grit, abrasive and foreign materials. Conduits for use on site to be appropriately sealed at both ends and stored in a safe, secure and dry environment. A site record to be maintained (daily) to include dates of conduit brought to site, conduits installed on site, conduits checked for useability, conduits installed and cable system installed on site within the conduit assembly together with the cable gland installation requirement completed.
- j) Conduit termination at boxes or equipment shall be by means of a sealed coupling (cable bushing) to provide a dust tight or weather resistant seal to not less than IP55.

15.6.4. Earthing

Provide and install the earthing systems and terminate the ECC cables to the locations as detailed and scheduled complete with labelling.

All metalwork encasing electrical items shall be bonded to earth. The system earthing shall be as scheduled on the Drawings. Provide and install an individual earth terminal adjacent to all outgoing motor feeds, i/o digital and analogue cable loops and control circuits as scheduled with label.

Location of the earthing system for this electrical installation is indicative only; site investigations and tests shall determine the exact location of the earth probes. Driven earth electrodes, where exposed (top last 200 mm), shall be wrapped in two layers of Denso Tape.

The Contractor shall include for earthing and bonding, the installation as detailed and specified in accordance with the wiring Regulations: Electrical Installations; AS/NZS 3000: 2007.

15.6.5. Terminations

On no account will soldered copper conductors terminating in any type of termination be accepted. Crimp pins/conductor terminations are acceptable. Exposed/earthing termination to be connected with crimped lugs (bolted) to the E.C.C. conductor.

15.6.6. Regulations

The electrical Contractor shall obtain, keep up to date and pay for all permits and fees arising from the above requirements, statutes, regulations, in accordance with the wiring rules: covered under the electrical installation standards; AS/NZS 3000:2007 and all amendments, standards specifications, rules and codes particularly applying to this section, shall be adhered to.

15.6.7. Materials of Construction and Workmanship

All workmanship shall be carried out in accordance with the best trade practice with the overall installation of neat and tidy appearance.

All materials shall be provided free from any defect and shall be maintained in as new condition until the end of the contract. Equipment shall be positioned to provide good appearance and easy access for maintenance and shall be installed level, secure and free from moisture. All similar materials shall be of one make as far as it is practicable. All Argon welding (metallic) shall be completely free of slag and splatter, surface welds shall be ground flush whenever possible.

All metalwork in the Contract shall be painted and shall consist of an anticorrosion system/preparation with at least 2 x 1 minimum final coats of the scheduled paint of the scheduled colour applied. Brackets, support systems screwed fixings, washers fittings and bends shall consist of S/S 304 or corrosion resistant system in all cases. Signs of corrosion or rusting on surfaces of (all) work supplied under this contract shall be made good under the warranty period including damage to the surfaces of S/S 304 by the presence of iron filings and/or steel SWARF.

15.7. Supervision

The Contractor shall at all times provide and keep on-site materials, supplies and labour with experienced supervisors to meet the completion requirements. The contractor to confirm and nominate the following personnel in writing the following requirement for the onsite at all stages of the electrical contract: 1) The main supervisor personnel (MSP) together with: 2) A second in command (SIC) for back up and fill in, in the case of ill health or unexplained circumstances of 1). MSP then 2). SIC is able to take over immediately in the same professional role. The registered electrical inspector as required below to follow same format above: 1) MREI and 2) SREI.

To confirm the above operations an onsite electrical log book (hard covered A4 note book / neat hand written notes: photo copied "Engineers copy" only for end of month claim attachment (to remain on site with the main contractors site foreman) with day to day site functions time to be incorporated and entered into on a daily basis (diary) complete with electrical deliveries, personnel and weather bases within the SELB/2013. The SELB/2013 to be available at each and every site meeting and engineering personnel visitations. Note all electrical test procedures and test results as and when required in accordance with the wiring rules: AS/NZS 3000:2007 and as adjusted from time to time by the Electrical Engineer (for scope of work and procedure) to be conducted by a registered electrical inspector and seconded by contractor personnel; 1) or 2). All results site notes and comment to be entered into the SELB/2013. and completed sign off with associated assignees as above.

15.8. External Envelope Enclosure Construction To IP55.

External doors to be to heavy gauge polished aluminium construction provided with keyed locking devices. Doors must be true and square in both the open and shut positions supported by heavy duty hinges.

Note: External doors to be provided with latched securing arms to ensure that the doors (3 only) when opened shall engage and latch to either 50% and 100 % of fully opened (fully opened door to be at 120 degrees [perpendicular +30 degrees] to the external envelope enclosure). Note when doors are opened fully there shall be nil measurable sag. Measurements and door operational performance to be demonstrated to the Main Contractor (that all functions are in good working condition and fully operational) at the 50% or less in completion of the total hardware installation. Basic IP55 rating of the completed external envelop enclosure to be submitted to a trial test of achievability by applying a water spray (Note: Not considered to be a power-full spray) from a standard nozzle against the enclosure from any direction and that water shall not enter the enclosure. Witnessed and proof of the above tests as required to be conducted shall be provided as certified documentation to be received by the Engineer before delivery of the completed [MSB-A / MCC-A] is able to be accepted on site.

15.9. Internals of Enclosure Construction To IP54

Internal doors to individual panels and cubicles within the main switchboard MSB-A / motor control centre MCC-A assembly to be 2.5 mm Thick in mild steel construction.

15.9.1. General

Doors must be true and square in both the open and shut positions, supported by heavy duty hinges. Provide cable entry cable and gland plates for bottom access only throughout. Busbars shall be totally enclosed. After construction, all mild steel work shall be ground smooth, eliminating all weld marks.

All on site MCC cubicle assemblies to provided with as follows: The top coat inside required and the out side paint finish for all other assemblies to be of thermoplastic epoxy powder finished with a baked top coat in light straw to BSS 381.C.No.384 or Colour oxyplast FF833C or light straw.

The busbar system shall be fully enclosed with a minimum certified fault rating of 5.0 kA for two seconds. Bars shall be high conductivity electrical grade copper. Supports shall be non-tracking, high electric insulating material. A half cross sectional area neutral bar shall be provided having adequate termination facilities. The earth bar shall be full length.

Each control wire is to be identified at each end by a ferrule number, the number corresponding to the wire number used on the marked up as-built drawings. All items are to be clearly labelled and outgoing terminals numbered with the same number as the wire connected to it. Outgoing terminals shall be readily accessible, with ample provision made for outgoing cables.

In this instance, internal modular switchboard/motor control cubicle layout is proposed with the internal enclosure rated to not less than IP54. [MCC] layouts are not final and an alternative arrangement would be acceptable if the detailed and specified requirements can be met. However, information relating to alternative arrangements and manufacture shall be provided during tender period with co-ordination of the plinth base with the main contractor prior to obtaining approvals from the Engineer.

15.9.2. Bus Bars

- Busbars shall be of high conductivity copper suitably mounted and supported to AS/NZS 3439.3:2002.

- Making and arrangement of busbars, main connections and small wiring shall comply with AS/NZS 3000:2007.
- Busbars shall be PVC sleeved in colours to denote phases. Joints shall be left bare. Lap taping of bars or connections will not be accepted.
- All bolts used in connection with the busbars shall be cadmium plated high tensile steel.

15.9.3. Circuit Breakers

- Provide and install for the main incoming isolation of the main switchboard a moulded case isolator at the rated capacity.

15.9.4. MCB's / Fuses

- Fuse bases, carries and fuses shall be provided as detailed. All fuses shall be HRC cartridge type with indicators, rated duty 440V AC33 category.
- All fuses shall be of the HRC type and fitting with HRC fuse cartridges. Fuse holders, bases and cartridges shall be GEC English Electric 'Red Spot'. All fuses bases and contacts shall be shrouded so that there is no possibility of electric shock while the fuse carrier is in place, being withdrawn or when fully withdrawn. As detailed, DINRAIL mounted fuse/combination termination unit in the form of SAK manufacture to be used.
- All control circuits shall be protected by MCB's and fuses DINRAIL or HRC type as scheduled, connected to the red phase (including those in packaged equipment) unless otherwise specified.

15.9.5. Tests

- Completed switchgear shall be subjected to a high voltage test applied for one minute as follows:

Between any 2 busbars – two tests

- Phase to phase 1,000 V test
 - Phase to N and or E 500 V test Between each busbar and earth.
- The tests shall be carried with all switches closed, fuse links inserted but with any indicating instruments disconnected. During the test, one pole of the test instruments shall be earthed through the switchboard.
 - Two copies of a Test Certificate supplied and signed by the manufacturer shall be forwarded to the Engineer.

Note: megohm reading shall not be less than 50 megohms.

15.10. Motor Control Centre

Provide, install and connect completely the distribution boards as detailed. The distribution board shall be totally enclosed type with minimum 2.4 mm gauge mild steel construction, mounted with side hinged front doors with quick acting fasteners, phase barriers and wiring ducts where shown. All doors shall be fastened in place by a single spring-loaded fastener. All components shown on the drawings shall be provided.

Insulated neutral bars and earthing continuity bars shall be incorporated with a removable link for testing purposes. These bars shall have enough 'ways' to accommodate all circuits and spares as scheduled. All MCB's to be on time delay with instant trip on heavy fault conditions.

Where relays or contactors are to be mounted, provide a separate area, integral with the distribution board to accommodate them. They shall be mounted behind 2.0 mm clear polycarbonate masking panel, with internal door over. The door over to be provided (fully labelled):

The busbars within the boxes and all connections thereto, shall be designed to carry their fully rated current without a temperature rise of more than 20°C. Provide and install insulated masking covers over all MCCB's and MCB's assemblies. All masking panels over MCCB's and MCB's enclosures to be removable and provided with the required labelling.

Distribution boards to be provided with an engraved black and white designation label. A clearly typed or stencilled chart shall be mounted inside the door, giving full particulars of all circuits controlled including the size of fuse or MCB rating. Cover chart with 1.6 mm perspex sliding into a rigid frame. The chart shall show the circuit numbers and the location of the circuit outlets to correspond with the drawings.

All components within the DB such as relays, extra fuses etc. shall be clearly labelled.

The DB shall have red, white and blue labels to mark the phases. The complete distribution board shall be suitable for withstanding a fault equal to 10 kA intensity without sustaining damage. The incoming side of the MCC shall have provided by the manufacturer all necessary gland plates, gland and holes punched/drilled prior to delivery to site to suit the type of incoming cables. Provide S/S 304 plates for the termination of all cables. Connect gland plates internally to the earth continuity bar with 19 x 3 mm copper (hard annealed) strip.

Control and signalling units to all in Harmony series style 4 / 22 Diameter.

Interior wiring and connections are to be conveniently accessibly. For commissioning allow for 10 only control relay/wiring connections and alterations as and when required and as instructed by the Engineer.

Terminals shall be klippon SAK DINRAIL mounted type for all control connections, minimum rating 10 amps. Wiring and terminals shall be numbered at all terminals including the outgoing cable tails. Number ferrules are to be of the Critchley or plastic tape type and are to be clearly readable after installation. All panel wiring is to be inflexibly PVC insulated 230 volt grade conductor colour identified in accordance with cable schedule type/colour in the specification.

Note: before the MCC is delivered to site, the Switchboard Inspection Schedule 1.25 section (f) shall be completed and given to the Engineer for issuing as the final approval in writing.

15.11. Variable Speed Drives (where applicable)

Variable Speed Drive details and specifications will be supplied following detailed design.

15.12. MCC Internally Mounted Equipment

15.12.1. HRC Fuses

Shall be to BSS 88 Class Q1, less than four hours at 1.5 times rated current.

Miniature Circuit Breakers/Combination MCB/RCD to be two pole double module units (as scheduled and detailed) .

Shall be of approved time delay type with instantaneous tripping on fault conditions and shall comply with AS/NZS 61009.1:2004.

15.12.2. Markings

Switchgear MCB racks and low voltage fuse boards shall be labelled with engraved traffolite or similar approved materials. Labels shall be fixed to panels etc, using an insulated riveted type of system of installation.

15.12.3. Contactors and Control Relays

In all cases contactors supplied and installed in this contract shall conform with an AC rating all to IBC 158-1. Allow to label all contactors and relays as scheduled.

Interfacing control relays and contactors shall be selected for the appropriate duty, but in no case shall be of lower standard than Utilisation Category AC03 (AC3) for class 0.3 duty at 1,000,000 operating cycles unless otherwise specified. Contactors and starters shall be fitted with continuously rated 230 volt $\pm 5\%$ operating coils unless otherwise indicated and with the necessary number of contact and interlocks for the required functions.

15.12.4. Control Relays Type (230 V AC and 24 V DC)

All control relays shall be Omron or similar approved type of relay and rated to not less than 0.5 kW / pole to AC3.CAT. Label all relays as scheduled.

15.12.5. Control Relays 24 Volt / DC Operation

All 24 volt/DC control relays shall be Omron type G2R or other similar approved type of relay suitable for DIN rail mounting only. Label all relays as scheduled.

15.12.6. Control Circuit General Arrangement

Allow for the inclusion of 24 only control cable additional alternations during the testing and commissioning procedures only. The control cable (meaning one conductor 2 x 1 ends) alteration and addition shall be by instruction from the Engineer only.

15.12.7. Additional Control Circuit Requirements

Supply, install and connect the PLC system rack units as specified. The electrical contractor to provide the programmer with the appropriate qualified expertise to programme the installed PLC system. Fully programme all MCC based PLC systems with an allowance for additions as may be required for modifying the programme during commissioning and in the course of the maintenance period. Allow for the likely additional programme modifications within the fixed price of the contract proposal. The programmer to programme the installed PLC installations complete with requirements of the interface at the data system installation included. The programming data operational limits and data system format information for the PLC control is outlined in this Specification. The electrical (controls) sub-contractor shall provide the electronic program file (s), with comments and password as required with hardcopy of the PLC programming details at the hand over of the Rotorua CC Pump stations as and when commissioning is completed.

The PLC shall be programmed to meet the control requirements outlined in section 15.18 of this specification.

15.13. Silent Operation for Contactors and Relays

All contactors and relays shall be mounted in panels as indicated. When relays or contactors are actuated, they shall be free from any discernible noise to the Engineer's approval.

15.14. Installation of Motor Control Centres

Where cables are to be run and entering with in the typical (MCC) to be installed to form not less than IP54 to the underside of the (MCC) gland plate assemblies incorporated at the top of and at the base of the wire ways as individually detailed.

15.15. Commissioning and Testing

CAUTION IS EXPRESSED, to be reviewed as follows: commission and test with respect to the following clauses a). through to and including item h)., to be noted as follows:

Duty and care to apply, however, the voltage differential of 24 Volts DC is safe, however with the unexpected cautionary provision, arc flash can result with fatal consequences . Accidental arc flash and reflex actions can cause severity of damage and expense to adjacent low voltage hardware. (Including the possibility of Lethal physical contact with adjacent 415 / 240 Volt (A/C) Circuits).

Take care with live 24 Volt DC circuits.

- a) Before the (MCC) Control cubicle assembly are certified as ready for despatch from the switchboard manufacturers, the MCC to be subject to tests as detailed in the (New Zealand electrical) Wiring rules AS/NZS 3000:2007 for which the Engineer shall require one week's notice so that he may be in attendance, if desired. (The Engineer will make this decision.) Any items which have failed during testing shall be repaired or replaced and brought up to an as-new condition.
- b) Before any of the electrical services are livened, they shall be subject to tests as detailed in the New Zealand Wiring Regulations.
- c) Before any of the systems in this contract are put into service, they shall be subjected to a commissioning and testing procedure in accordance with NZ ECP-11 – Inspection and Testing of Low Voltage Installation for certification purposes.
- d) Equipment supplied by others and installed by the Contractor shall be commissioned by the Contractor under the instruction of the equipment supplier.
- e) Commissioning and testing procedures shall generally include:
 - i. Visual check of all work for completeness, and check against diagrams of all wiring.
 - ii. Check that all work complies with the Wiring rules AS/NZS 3000:2007.
 - iii. A check that all equipment is safe to operate and that overloads, safety devices and interlocks are all in working order.
 - iv. CoC to be provided on completion of commissioning of MCC,
 - v. Receipt of Certificate of Compliance from nominated electrical auditing inspector.
 - vi. All test results, comments and personnel present dates recorded and logged within the SELB.
- f) Distribution System:
 - i. Insulation tests shall be made with 500 V 'Megger'. No cable will be accepted with an insulation resistance, including termination, or less than 100 megohms. (Any electronic equipment shall be isolated and disconnected from electrical systems under test.)
 - ii. Test continuity and phase identification of all conductors in all cables, phase rotation along will not be accepted.

- iii. Measure resistance of switchboard earth and test all earth continuity connections.
- iv. Check polarity and phase identification of supply and at all outlets. Phase rotation alone will not be accepted.
- v. All connections and terminations of sub-circuits, sub-main and service main cabling rated at 63 amps and above shall be inspected for thermal (temperature) gains progressively as the installation is livened and then commissioned.
- vi. Test and prove all control circuits, control relays, contactors and indication equipment: entered and logged within the SELB.
- g) Level control units to be commissioned and fully programmed by supplier before control circuits are energised for use.
- h) Existing telemetry system alterations and additions together with commissioning completed and operating satisfactorily.

15.16. Socket Outlets

Provide and install socket outlets to the locations on MSB and to the type and ratings as indicated on the drawings.

15.17. Specialist Technical Attendance on Site:

Provide, arrange attendance on specialist suppliers where required for specialist items of equipment, systems and hardware. Specialist technical input on specialist equipment, systems and hardware to cover the scope of work as scheduled section 15.1 items a). through to and including n). together with the Electrical Services drawing documentation.

15.18. Functional Control Description

[To be added as following completion of detailed design]

15.19. Commissioning

Provide attendance on-site to co-ordinate and commission fully the MCC control system including the level controllers and flow metering and monitoring. Commission fully the MCC including all the required setting-up and adjustments required on the level controllers including the digital output contacts and the PLC analogue set points. Note because of the variable nature of incoming flow rates in and out of the wet well, care shall be required in setting-up of the pump set run parameters, especially with the time frame with respect of running a particular drive. An inherent time delay by which the pump set can come up to speed may cause overrunning of the second duty set point.

During the commissioning procedures, allow not less than 7 working days over a time span of at least 30 working days to modify, alter and change at any time any one float or all level controller settings throughout the commissioning part of the contract.

15.20. As-Built Drawings and Operation and Maintenance Manuals

The as-built drawings and maintenance manuals shall be incorporated into the Electrical Controls Manual to be supplied by the Contractor.

- a) Include for the final SCADA operation (If SCADA required) and include for the nominated output alarms and associated connections on the as-built drawings.

Provide two preliminary copies of the Operations and an as-built and maintenance manuals containing electrical circuit drawings, equipment specifications, manufacturers information, as- installed settings, programming details and instructions for the PLC and commissioning results.

Note: All control drawings shall be completed with identified control cables and control conductors as outlined. The Contract shall not be considered complete until these items have been received by the Engineer.

- b) Submit a draft copy for approval and then two professionally made spiral bound copies, together with Auto CAD electronic files of all drawings.
- c) Provide and permanently install inside the cabinet door a laminated copy of the electrical circuit diagrams as and when the as built documentation is approved.

A record shall be kept on-site of all modifications (if and when modifications occur) as the work proceeds, which shall be incorporated on a modified set of drawings to be prepared by the sub-contractor.

After completion and handover of the works, the sub-contractor to provide to the Engineer two sets of 'As-Built' drawings and maintenance/operational instruction manuals. The standard of these drawings shall not be less than the standard of Contract drawings. The standard of maintenance/instruction manuals shall be to the satisfaction of the Engineer. Subject to the checking of preliminary as-built documents by the Engineer, the following prints shall be provided:

1. 2 sets of A3 size prints.
2. Electronic copy of the CAD file.
3. 2 only Maintenance Manuals, each incorporating 1 set of A3 size reduced prints, together with detailed maintenance instruction and operational instructions for inclusion within the maintenance manual when all documents are approved.

Note: All control drawings shall be complete with identified control cables with identified cable core numbers and control conductors in this specification. The contract shall not be considered complete until these items have been received and approved by the Engineer. Note: As and when required, a CAD disc in Auto CAD shall be made available by the Contractor to assist in the generation of the as-built drawing requirements.

15.21. Practical Completion

Before electrical work shall be deemed to be practically complete, the Contractor shall have carried out the commissioning and testing specified in section 15.15 and shall have produced the documentation section 15.2 f) items; 1, 2, 3 and 4.

Copies to indicate that the Certificates and associated compliance information are received including the Operational and Maintenance of the Electrical and Services; Plant and Equipment

All the electrical and services; plant and equipment shall be maintained by the Contractor for the period stated in section 15.1 Clause r. together with the requirements of Special Conditions of Contract.

15.22. Guarantee and Warrantee

The electrical contractor to provide guarantees for the electrical services installation including faulty workmanship for a **minimum period of two years**. The contractor to provide guarantees and warrantees on electrical equipment and electrical hardware for a minimum period of 2 years. Electrical Certificates of guarantees and warrantees to be provided by the electrical contractor.

15.23. Completion

The electrical contractor shall programme work in co-ordination and consultation with the main (civil) contractor and complete the installation according to the main contractor's programme.

It shall be the sub-contractor's sole responsibility to check with the main contractor initially and during the sub-contract installation stages to ensure equipment ordering and work scheduling complies with the main contractor's programme.

The works shall be completed and ready for handover concurrent with the civil work. No overtime shall be chargeable as an addition to the Contract.

At completion, leave all work neat, tidy, clean and otherwise operating correctly. Remove all plant, tools, rubbish and debris from the site.

Appendix A Cultural Impact Assessment

Tarawera Sewerage Scheme Construction - Stage 1

Contract 22/038

Section B - Specification

Appendix A - Cultural Impact Assessment

Part 1 of 2

CULTURAL IMPACTS ASSESSMENT

for Tarawera Waste Water
Treatment Plan



TE ARAWA LAKES TRUST

Table of Contents

Executive Summary

Key Findings and Recommendations

Part 1: Preface

1.0	Objectives	Page 4
1.1	Methods	Page 5
1.2	Acknowledgments	Page 5

Part 2: The Activity

2.0	Background - Tarawera Lakes Restoration Plan	Page 6
2.1	Lake Tarawera Sewerage Steering Committee	Page 6
2.3	LTSSC - Purpose	Page 6
2.4	The Options	Page 7
2.5	Funding, objectives and considerations	Page 11

Part 3: Tangata Whenua Context

3.0	Te Arawa - Whakapapa, Rohe	Page 11
3.1	European Arrival and Impact	Page 15
3.2	Tourism and the economy	Page 16
3.3	Tarawera Eruption	Page 17
3.4	Tuhourangi and Ngāti Rangitahi today	Page 19

Part 4: Environmental Framework

4.0	Te Ao Maori - Maori World View	Page 22
4.1	Core Concepts	Page 22
4.2	Treaty Principles	Page 26
4.3	Local Government Act (LGA) 2002	Page 26
4.4	The Resource Management Act 1991 (RMA)	Page 27
4.5	Regional Policy Statement	Page 27
4.6	Environmental Management Plans	Page 28

Part 5: Engagement with Tangata Whenua

5.0	Background	Page 30
5.1	The engagement process	Page 31
5.2	Key Responses	Page 32
5.3	Conclusions	Page 34

Appendix

- 1 Rotomahana Parekarangi Blocks
- 2 Maori land blocks - Tarawera
3. Tuhourangi Sites of Significance

Glossary

References

List of photos and figures

Executive Summary

The Tarawera Lake Restoration Plan seeks to identify actions to cap the total nitrogen and reduce total phosphorus concentrations in Lake Tarawera to improve water quality.¹

Lake Tarawera's TLI is currently 3.0 and does not meet its target of 2.6 (as confirmed within the Regional Water and Land Plan). The main cause of the declining water quality (indicated by a high TLI) is an increase in nitrogen and phosphorus flowing from the catchment. To resolve the problem, the level of nutrients entering the lake needs to be reduced to a sustainable load.²

The Tarawera Lake Restoration Plan focuses on reducing nutrients to improve lake water quality. The plan has been adopted by the Rotorua/Te Arawa Lakes Strategy Group. Key actions have been identified with the priority recommendation to reticulate houses in the Lake Tarawera urban community.

The Lake Tarawera Sewerage Steering Committee (LTSSC) has been formed to investigate and recommend the most appropriate wastewater disposal option to the community and Rotorua Lakes Council, (RLC). Key stakeholders on the committee include representatives from Rotorua Lakes Council, Bay of Plenty Regional Council, (BOPRC), the Tarawera Ratepayers Association and local iwi Tūhourangi and Ngāti Rangitahi.

To date the steering committee has been presented with evidence that septic tanks contribute to the increased nitrogen (N), phosphorus (P) and e-coli discharged into the lake, contributing to the deterioration of water quality.

In response it has looked at ways to achieve a reticulated wastewater scheme and has identified five possible and viable wastewater options. As part of the engagement process, it has commissioned this cultural impact assessment for the proposed five options.

The scope of this report looked to identify cultural impacts for the proposed wastewater plan through a pre-engagement process with tangata whenua.

This report provides an overview of the historical and current relationship tangata whenua has with this area. Literature review and interviews held with tangata whenua have provided initial feedback accordingly for this kaupapa and clear direction on how to progress forward in such a way to enable a robust and informative process of engagement and consultation.

¹ Tarawera Lakes Restoration Plan page 3

² Tarawera Lakes Restoration Plan page 2

KEY FINDINGS FROM THIS REPORT

The feedback and response provided by ngā uri o Tuhourangi me Ngati Rangitahi have indicated that there are a range of cultural impacts likely as a result of the introduction of the waste water treatment system at Tarawera, however the current issue of the *decline of the māuri of Tarawera* is the most significant impact and there is acknowledgement that this must be dealt with. Each waste water treatment option can broadly be included or eliminated by considering the additional cultural impacts. These can be considered as filters or criteria as the cultural impact assessment is developed further.

1. The highest level cultural impact acknowledged is the current ongoing degradation of the Lake; the diminishing of the mauri of the water. - The option that best addresses the declining mauri of the wai will be considered.
2. Second level impact acknowledges the absence of Tuhourangi and Ngati Rangitahi from Tarawera for 131 years and their desire to return to their ancestral home; the option that best enables the return of Tūhourangi and Ngāti Rangitahi to their lands and resources alongside Tarawera will be considered.
3. Third level impact acknowledges that the presence of Tuhourangi and Ngati Rangitahi at Tarawera pre and post eruption means there are many sites of significance on the landscape, particularly in relation to urupa (places where the deceased lie buried) and that the options that has the least impact on the cultural landscape will be considered.
4. The fourth level acknowledges the tikanga (protocols) associated with waste and its disposal; the option that has the least impact on the values associated with waste water; the travel of paru to other places, specific matters identified in iwi Management Plans will be considered.

It is the full assessment of these cultural impacts and the various mitigation options against the Waste Water treatment systems plan that will provide the best option for investment from a cultural perspective.

RECOMMENDATIONS

1. Landowner representation to be included in the Steering group. Landowners have a specific set of issues as well as their role as tangata whenua.
2. Addition of an alternate to ensure ongoing and consistent representation. This is applied in other similar forums.
3. It is then recommended that a more in-depth engagement process in respect of the options is undertaken to determine the extent of the cultural impact and the mitigation measures to address these. The model developed in respect of the Rotorua WWTP is seen as best practice by Tūhourangi and this is the approach recommended to ensure the cultural impacts identified are able to be mitigated.

Part 1 - Preface

The Tarawera Steering Group is seeking to engage with tangata whenua, via this Cultural Impact Assessment, to provide information and understanding about the proposed options for Waste Water Treatment at Tarawera and to determine whether they are within the boundaries of cultural acceptance.

Tangata whenua as represented by

- Te Arawa Lakes Trust
- Tūhourangi
- Ngāti Rangitīhi
- Rotomahana Parekarangi 6 Block owners
- Ruawahia 2B

1.1 Objectives

The objectives of this CIA are:

- To document the cultural values associated with the proposed waste water treatment options for Tarawera
- To identify the potential effects on cultural values as a result of the proposed treatment options
- to recommend next steps to identify mitigation options

In meeting these objectives, the report will:

- provide all parties with a level of confidence and understanding related to the proposed activity; the engagement to date and the consultation process going forward.
- Assist Rotorua Lakes Council to effectively take into account the iwi management plans
- Provide a foundation for future discussions between iwi affected and Rotorua Lakes Council

1.2 Methods

The preparation of this CIA report involved a review of information and pre consultation process through engagement with Tūhourangi, Ngāti Rangitihī and Māori land owners within the Lake Tarawera Catchment. Specifically, the process included:

- A review of the provisions of the Resource Management Act 1991, the Te Arawa Lakes Settlement Act 2006, Affiliate Te Arawa Iwi and Hapū Claims Settlement Act 2008 (Te Ariki, Te Wairoa) and other relevant statutes and regulations.
- A review of historical cultural information and other written references relevant to this assessment.
- A review of Tūhourangi Tribal Authority Enhanced Iwi Environment Resource Management Plan 2011.
- A review of Ngāti Rangitihī Iwi Environmental Management Plan 2011, specifically policies on sewage disposal, discharge to water, and freshwater management.
- Discussions with tangata whenua with knowledge and experiences of the area and values.
- Discussion with Māori land owners within the proposed site area and catchment.

1.3 Acknowledgements

On behalf of Te Arawa Lakes Trust, we wish to thank our koroua, mātua and whanau who participated in this report, providing valuable input and guidance.

Part 2: The Activity

2.0 Background - Tarawera Lakes Restoration Plan

The Tarawera Lakes Restoration Plan as developed by the Bay of Plenty Regional Council, focuses on addressing lake water quality and has been adopted by the Rotorua/Te Arawa Lakes Strategy Group. The number one priority of the Plan is to reticulate houses in the Lake Tarawera urban community.

2.1 Lake Tarawera Sewerage Steering Committee

The Lake Tarawera Sewerage Steering Committee is made up of representatives from a range of key stakeholders including Rotorua Lakes Council (RLC), Bay Of Plenty Regional Council (BoPRC) and the Tarawera Ratepayers Association; tangata whenua Tūhourangi and Ngāti Rangitīhi.

2.3 LTSSC - Purpose

The LTSSC is tasked to:

- Investigate and recommend the most appropriate wastewater disposal option to the community and Rotorua Lakes Council. The final recommendation must be sustainable and help to improve the health of Lake Tarawera.

To date, the LTSSC has:

- Been presented with evidence that septic tanks contribute to the increased nitrogen (N), phosphorus(P) and e-coli discharged into the lake which causes water quality deterioration.
- Looked at ways to achieve a reticulated wastewater scheme.
- Identified five possible and viable wastewater options.
- Commissioned a cultural impact assessment for the options

2.4 The Options

The proposed service area: (Number of properties: Current - 423; Ultimate - 546)

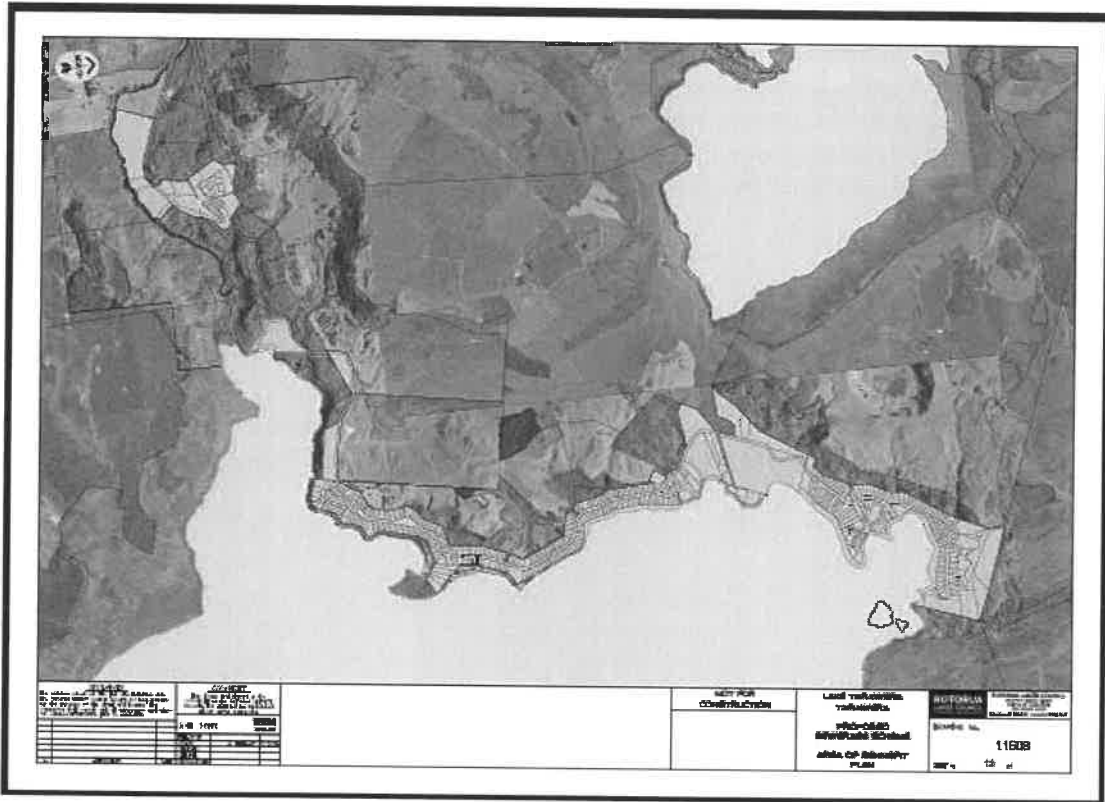


Figure 1. Rotorua Lakes Council Drawing No. 11608. Lake Tarawera, Proposed Sewerage Scheme, Area of Benefit Plan

The proposed options:

1. A Septic Tank Effluent Pump (STEP) system located on individual residents sites. A STEP system is a 3800 litre septic tank with a filter and pump inside the tank. The filtered effluent is pumped through pressure pipes to a local Wastewater Treatment Plant.
2. A STEP system where the filtered effluent is pumped to Ōkāreka and from there to the Rotorua Wastewater Treatment Plant.
3. A Low Pressure Grinder Pump (LPGP) would be located on individual residents sites to pump all the waste to a local Wastewater Treatment Plant.
4. A Low Pressure Grinder Pump would pump the waste to Ōkāreka and from there to the Rotorua Wastewater Treatment Plant.
5. If a decision is made not to reticulate this community, then each individual property owner would need to;

- a. Install an Aerated Wastewater Treatment System with Nutrient Reducing capabilities (AWTS+NR). The effluent from this system would be discharged to near surface soils. This system would be an improvement in performance over septic tanks but would not fully remove the N and P from the catchment.
- b. This option may cost each property owner up to \$20,000 and is not eligible for subsidy.
- c. Not all properties will be able to accommodate one of these systems because of land slope and stability, available space, proximity to ground water and unsuitable soils. A report is currently being prepared on these issues. Property owners in this category would need to apply for a resource consent which would seek to mitigate the effects of the discharge.

Note:

- 1) If the preferred option is to connect to the existing Okareka Wastewater system, resource consents will not be required.
- 2) If the preferred option is to establish a Wastewater Treatment Plant and Land Disposal System within the area, then resource consents will be required for the construction and operation of the plant.

LOW PRESSURE GRINDER PUMP SYSTEM

- Houses at Tarawera connected by low pressure grinder pumps
- About 1500 installed within the district over the last 9 years

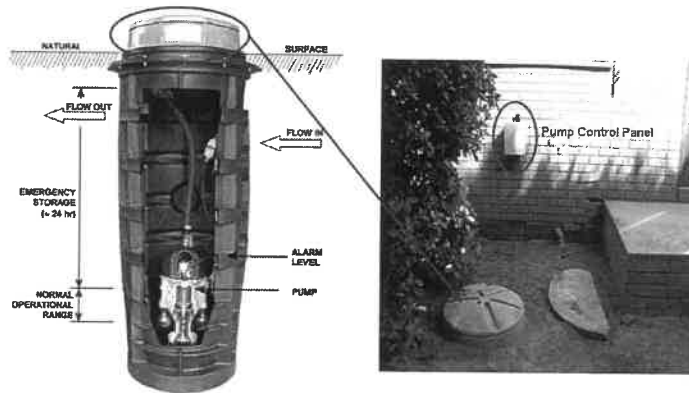


Figure 2. Low Pressure Grinder Pump System, Rotorua Lakes Council, Sewerage Options for Tarawera, Manzano 2017

STEP SYSTEM

- Underground septic tank (about 4000 litres) provides primary treatment (solids settling) so only liquids go to treatment plant.
- The solids remain in tank for years and decompose through anaerobic process. Remaining solids pumped every seven years (approximately.)
- Solids filtered out.
- 25mm line connects property to main sewer in street.

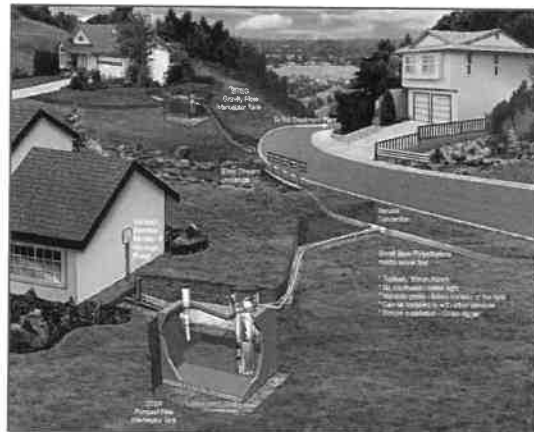


Figure 3. Step System, Rotorua Lakes Council, Sewerage Options for Tarawera, Manzano, 2017

PROPOSED WASTEWATER TREATMENT PLANT AND LAND DISPOSAL SYSTEM CONCEPT

- Wastewater Treatment – Membrane BioReactor Plant (600m³/day approx.)
- Land Disposal System – Trench based Rapid Infiltration
- Approximate area requirement
- 5-6 hectares (depending on soil characteristics and buffer requirements)
- Solids management – Stored on site and transported offsite
- Odour management – Enclose all odour generating processes with foul air extraction and treatment.
- Noise management – Blowers house inside blower room with acoustic silencers
- Indicative cost - \$6.0M to \$6.50M

PROPOSED WASTEWATER TREATMENT PLANT AND LAND DISPOSAL SYSTEM

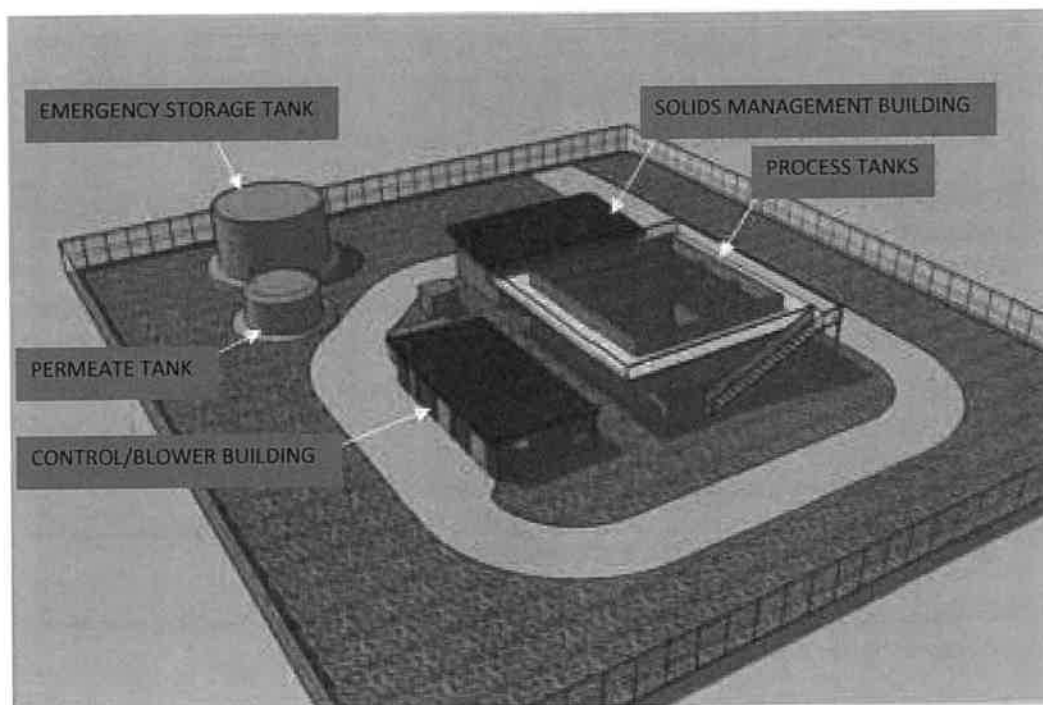


Figure 4. Indicative perspective view of Tarawera Wastewater Treatment Plant Rotorua Lakes Council, Sewerage Options for Tarawera, Manzano, 2017

2.5 Funding

The options have been broadly costed and range from \$15m to \$18m. This translates into a cost per property of approx. \$40k. Subsidies have been received from the Rotorua Lakes Council of \$1,500 per property and \$6.5m from the Freshwater Fund administered by MfE. Payment options will be advised once a preferred treatment options has been settled and grants and subsidies are confirmed.

Timeframe objectives

1. Once the Cultural Impact Assessment (CIA) is completed, the committee will revise property cost estimates.
2. Engage with RLC and BoPRC to ensure the Lake Tarawera scheme is included in their respective Long-Term Plans.
3. Decide on a preferred option and recommend it to the community and to RLC.
4. In a position to construct the preferred option from 2020 onwards.

Considerations

- The proposed options are costly and need to be environmentally friendly, as well as help towards reducing N and P in the lake.
- The committee wants to identify a preferred option, after it has considered a cultural impact assessment (CIA) on the five options.
- This Cultural Impacts Assessment has been carried out by the Te Arawa Lakes Trust.

Part 3: Tangata Whenua Context

3.0 Te Arawa - Whakapapa, Rohe

Te Arawa is one of seven Māori Tribes of New Zealand. The traditional lands of the Te Arawa people are around the Rotorua lakes; extending from named Maketū on the eastern seaboard to Tongariro mountain in the central North Island.

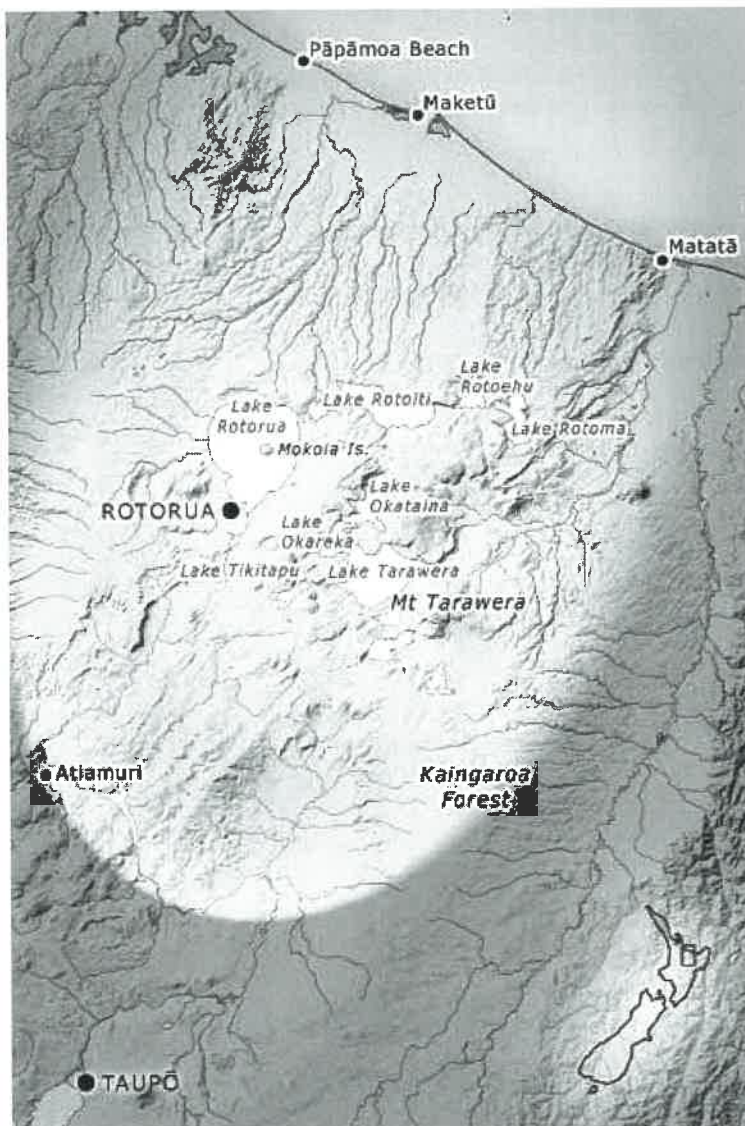


Figure 5. Te Arawa Tribal Area (Tapsell, 2017)

Whakapapa

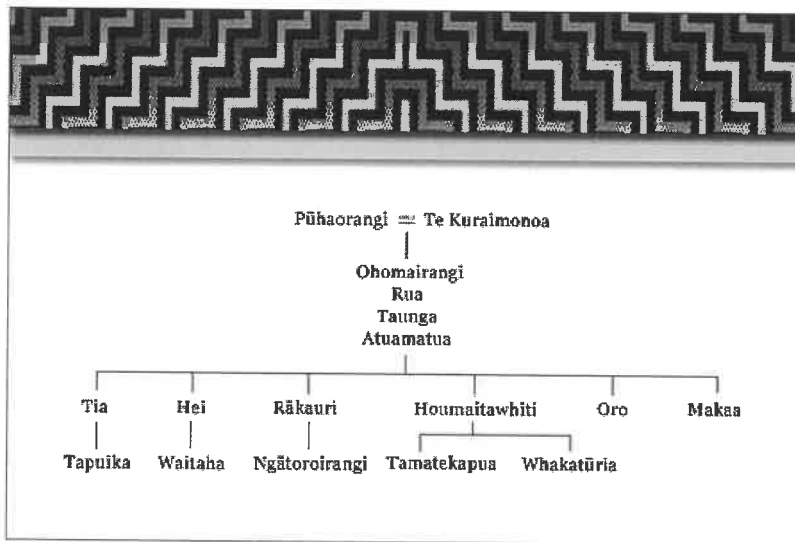


Figure 6. Te Arawa Whakapapa (Tapsell, 2017)

Te Arawa waka | Te Arawa tangata Origins

The Te Arawa people of the Bay of Plenty are the offspring of Pūhaorangi, a celestial being who descended from the heavens to sleep with the beautiful maiden Te Kuraimonoa. From this union came the revered ancestor Ohomairangi. He was responsible for protecting Taputapuātea marae — a place of learning on the island of Raiatea or Rangiātea, in the Polynesian homeland known as Hawaiki. High priests from all over the Pacific came to Rangiātea to share their knowledge of the genealogical origins of the universe and of deep-ocean navigation.

By the time Ohomairangi's revered descendant, Atuamatua, was born the people were known as Ngāti Ohomairangi and lived in the village of Maketū. Atuamatua married the four granddaughters of Ruatapu. A generation later, six of their sons, Tia, Hei, Rakauri, Houmaitawhiti, Oro and Makaa became the leading family group of Ngāti Ohomairangi.

The Migration

The migration to Te Ika-a-Māui over 20 generations ago was instigated by war over scarcity of resources and land. Houmaitawhiti, one of Atuamatua's six sons, had a son, Tamatekapua. Tamatekapua took up the challenge laid down by his father: to seek a peaceful new home in a land far to the south. Over 30 Ngāti Ohomairangi tribe members accompanied Tamatekapua and the tohunga, Ngatoroirangi, in the double-hulled canoe originally named Ngā rākau rua a Atuamatua (the two trunks of Atuamatua) in memory of their father. During the voyage they had a perilous encounter with the great ocean creature, Te Parata, who almost swallowed them. However, one story goes that they were delivered from the jaws of certain death by a mythical great shark, and the people renamed the canoe and themselves Te Arawa in its honour.

Arrival

On entering the Kaituna estuary beside Ōkūrei, the bow of the Te Arawa canoe was tethered to a large rock, Tokaparore, and to an anchor rock called Tūterangiharuru, which held her fast in the current of the Kaituna River. The tohunga Ngātoroirangi was the first to step off, conducting rituals beneath a pōhutukawa tree in full bloom. Today this site is remembered as Ōngātoro, and commemorated by a monument built in 1940. A pā established on the Ōkūrei headland close to the moored canoe was named Maketū, after their home village on Rangiatea, in Hawaiki.

In time Te Arawa was led by Tama's great-great-grandson, Rangitahi. He chose to position the the Pakatore pā inland between Waiariki and Maketū, overlooking the Kaituna River. Through strategic marriages with the children of the Bay of Plenty's most influential leaders, Rangitahi's seven sons and one daughter were born. They became known as Ngā Pūmanawa e Waru (the Eight Beating Hearts).

Rohe

Te Arawa multiplied and spread across the geothermal zone of the central North Island, occupying lands in a continuous line from coast to volcanic mountain interior. This area became identified with Te Arawa, and is affirmed on marae with the proverb:

Mai Maketū ki Tongariro
Ko Te Arawa te waka
Ko Te Arawa māngai-nui ūpoko tū-takitaki
From Maketū to Tongariro
Te Arawa the canoe
Te Arawa the determined people

Rangitahi's sons moved most of the Te Arawa tribe inland to the geothermal lakes. In time, descendants of Rangitahi aligned themselves through intermarriage into three major kin groups:

- Ngāti Pīkiao (at the eastern end of Lake Rotoiti and around lakes Rotoehu and Rotomā)
- Tūhourangi (upper Kaituna, western Lake Rotoiti and the south-east side of Lake Rotorua including Ōhinemutu)
- Te Urī o Uenukukōpako, later known as Ngāti Whakaue (Mokoia and north-west side of Lake Rotorua).³

³ Paul Tapsell, 'Te Arawa - Settlement and migration', Te Ara - the Encyclopedia of New Zealand, <http://www.TeAra.govt.nz/en/te-arawa/page-2> (accessed 29 October 2017)

Story by Paul Tapsell, published 8 Feb 2005, updated 22 Mar 2017

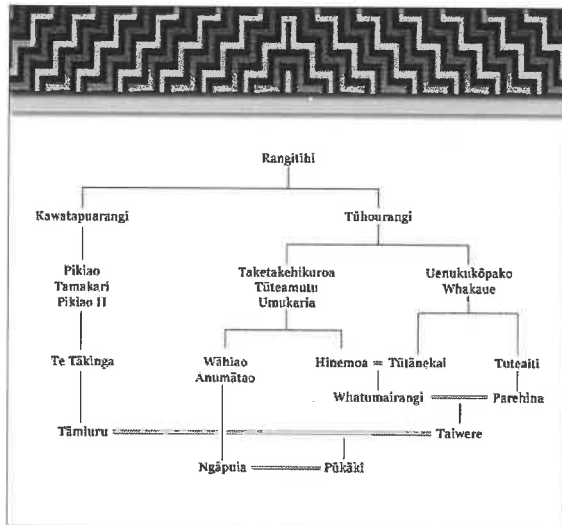


Figure 7. Rangitīhi Tūhourangi Whakapapa (Tapsell, 2017)

3.1 European Arrival and Impact

As European traders, whalers and others arrived, they brought diseases that spread rapidly amongst Māori communities, killing many and wiping out whole villages. They also brought and traded guns. Marauding invaders such as Ngapuhi, came armed with muskets and caused significant losses during skirmishes and battles. Te Arawa regrouped as Nga Pumanawa e Waru and vowed never to fight amongst themselves again.

Te Arawa traded guns to increase security over lands and resources. They engaged with missionaries, who brought Christianity, Western farming methods, technology, education and medicine. By 1860, Te Arawa was developing successful commercial operations, establishing orchards and farms, flax and flour mills and fishing and sailing fleets. Warfare during the 1860s and 1870s hindered commercial development. Te Arawa took up arms to defend its land and resources whilst supporting the Crown. In 1840, they opposed the Treaty of Waitangi initially but eventually conceded, aligning with the Crown in exchange for protection under the treaty. Despite this alliance with the Crown, the introduction of land surveying and the Native Land Court system affected Te Arawa significantly.

By the 1880s Te Arawa became divided at the extended family level. The court pitted brother against brother, forcing families to fight for individual rights to ancestral estates. Even when undivided shares in lands were awarded, these slipped away as payment for surveys, court costs, or store credit, or were sold by relatives.⁴

⁴ Paul Tapsell, 'Te Arawa', Te Ara - the Encyclopedia of New Zealand, <http://www.TeAra.govt.nz/en/te-arawa> (accessed 22 October 2017)

Story by Paul Tapsell, published 8 Feb 2005, updated 22 Mar 2017

3.2 Tourism and the economy



Figure 8. White Terraces (Blomfield, 1882)

Ngāti Rangitīhi and Tūhourangi lived closest to Mount Tarawera for many generations. They fought with each other often over tribal land interests. Ngāti Rangitīhi controlled the north-eastern sides of the maunga, including the central peak, Ruawahia. Tūhourangi controlled the Tarawera lakes district, including the terraces at Rotomahana.

The Pink and White Terraces were situated on the shores of Lake Rotomahana, near Mount Tarawera. Te Tarata (the tattooed rock) or the White Terrace was about 3 hectares in size, tumbling to the lake from 30m, and 240m wide around the base. The terraces of Ō-tū-kapua-rangi (fountain of the clouded sky) or the Pink Terrace, were smaller and lower. Steps ascended gracefully to a crater platform, where three metre-deep basins were filled with clear blue, warm water, ideal for bathing.

During the mid 1800s the terraces became known as the 'Eighth Wonder', with people coming from all over the world to see this spectacular natural phenomenon.

Often visitors would travel from Auckland to Tauranga by steamer, then inland by coach to Ohinemutu, where Ngāti Whakāue resided at Lake Rotorua. From there, they would travel by coach to Te Wairoa. They would be entertained with performances by local Māori at Hinemihi whareniui. The following morning, they would travel by canoe across Lake Tarawera to walk over a narrow isthmus between Lake Rotomahana and Lake Tarawera to reach the stunning terraces.

Tūhourangi became immersed in the tourist trade; with some people earning substantial annual incomes of over £4000. They provided tourists with guides, transport, accommodation, food, entertainment and souvenirs.

Lifestyle changed significantly from subsistence living - hunting, gathering, cultivating to earning substantial money from a growing tourist trade. Unfortunately, with newly

acquired wealth, iwi became exposed to the negative influences of alcohol, tobacco and disease.

3.3 Tarawera Eruption

While ferrying tourists across Lake Tarawera to visit Rotomahana's famous Pink and White Terraces in 1886, guide Sophia Hinerangi saw a mysterious phantom canoe. The high priest Tūhoto Ariki of the Tūhourangi tribe interpreted this as a warning. He feared the terraces were being exploited as a tourist attraction without due regard to ancestral values. In the early hours of 10 June, the domed mountains of Wāhanga, Ruawāhia and Tarawera split apart, spewing forth millions of tonnes of ash and debris. The fissure extended down the mountain and through the terraces, from Rotomahana to Waimangu, some 10 kilometres away. Earthquakes were felt throughout the North Island. Auckland residents mistook the noise for distant cannon fire.

The following day it was pitch black from Rotoiti to Maketū – ash choked the skies. Lake Rotomahana, its terraces and over 150 Tūhourangi–Ngāti Rangitihi residents were buried. Protected by a valley, the village of Te Wairoa was distant enough for most residents to survive. Many sheltered in Guide Sophia's house, which did not collapse. The priest Tūhoto Ariki also survived: he was dug from his buried house four days later.

Te Arawa kin provided shelter, clothing, lands and food for the survivors. Most found refuge at Whakarewarewa (Ngāti Wāhiao), Ngāpuna (Ngāti Hurunga), Waitangi (Tapuika), Matatā (Ngāti Rangitihi) and Coromandel (Ngāti Hei). Descendants of the tribe still live in these places today. Because the government acquired the devastated area soon after the eruption, the people of Tūhourangi could not return to their Tarawera homeland when it recovered in the early 1900s. Today Tūhourangi are seeking redress through the Waitangi Tribunal.⁵

⁵ Paul Tapsell, 'Te Arawa', Te Ara - the Encyclopedia of New Zealand, <http://www.TeAra.govt.nz/en/te-arawa> (accessed 22 October 2017) Story by Paul Tapsell, published 8 Feb 2005, updated 22 Mar 2017

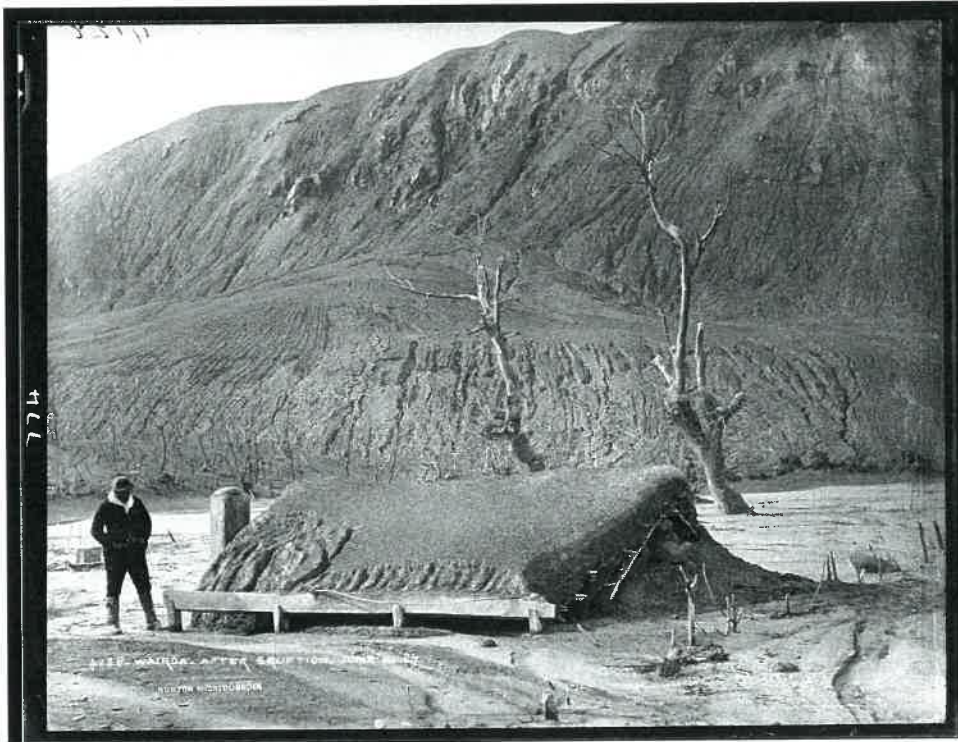


Figure 9. Wairoa after the eruption (Muir, 1886)

The devastation caused by the eruption had severe physical, social and economic impacts on the area. The destruction was immense. Vegetation and villages were flattened, reduced to rubble or buried in mud. The Māori settlements of Moura, Te Ariki, Te Tapahoro, Te Wairoa and Totarariki were destroyed in the eruption and fatalities were significant. The official death toll being 150 people - whānau and hapū were filled with inconsolable grief.

The economic base of Tūhourangi was destroyed. The Terraces were lost and the tourist trade disappeared overnight. Land was uninhabitable, dwellings destroyed and most livestock were killed. The landscape was a wasteland. Ngāti Rangitihī and Ngāti Tarawhai were impacted also.

"We had to learn again. Our tribe was culturally decimated, our Wairua, Mauri, and our heritage was lost from our kuia and kaumatua being killed." Shirley Marr, a descendant of a local who experienced the event.⁶

⁶ Kawerongo Newsletter, Ngāti Rangitihī, Tarawera Eruption

3.4 Tūhourangi and Ngāti Rangitīhi today

Through the treaty settlement process over the past 30 years, both Tūhourangi and Ngāti Rangitīhi are making significant headway in rebuilding the economic, cultural and environmental foundations for their people and respective iwi, through the return of lands, resources and the provision of compensation.

Tūhourangi today is represented by an iwi membership of 2,874



Tūhourangi Tribal Authority

The Tūhourangi Tribal Authority was established in 2006 to manage the settlement benefits received on behalf of Tūhourangi descendants by the various Te Arawa entities who negotiated on their behalf.

Tūhourangi are the iwi comprised of Ngāti Wahiao; Ngāti Apumoana; Ngāti Hinemihi; Ngāti Hinganoa; Ngāti Huarere; Ngāti Kahu Upoko; Ngāti Puta; Ngāti Taoi; Ngāti Te Apiti; Ngāti Tionga; Ngāti Tukiterangi; Ngāti Tumatawera; Ngāti Tuohonoa; and Ngāti Uruhina

Figure 10. Tūhourangi Rohe - Tribal area, (Te Puni Kokiri, 2017)

Tūhourangi's comprehensive treaty settlement is articulated through **Te Pumautanga o Te Arawa**.

Te Pumautanga o Te Arawa (TPT) is a Post Settlement Governance Entity. It was formed on 1 December 2006 to receive, hold and manage the assets negotiated on behalf of the eleven Te Arawa iwi and hapū that it represents (known as the Affiliates). Each Affiliate has their own organisation and trustees to govern their own affairs as respective hapū and iwi. ⁷

⁷ <http://tpota.org.nz/about-tpota/>

Ngāti Rangitihī is represented by 2298 registered members and is currently in negotiations with the Crown for their comprehensive treaty settlement with the Crown.



Figure 11. Rohe of Ngāti Rangitihī - Tribal area, (TPK, 2017)

Te Mana o Ngāti Rangitihī

Te Mana o Ngāti Rangitihī is the PSGE set up in 2008 to manage redress and settlement on behalf of Ngāti Rangitihī from the historic Central North Island (CNI) Iwi Collective Settlement. It is responsible to lead the social, cultural, environmental and economic growth of Ngāti Rangitihī, and ensure the continuation to provide opportunities for generations to come.

Ngāti Rangitihī is currently in the negotiation phase of its comprehensive treaty settlement with the Crown. Te Mana o Ngāti Rangitihī is mandated to negotiate this process.

Both iwi are represented on the Te Arawa Lakes Trust Board as representative of their original owner interests in Lake Tarawera.

Te Arawa Lakes Trust

The Te Arawa Māori Trust Board was established in 1924, pursuant to Section 27 of the Native Land Amendment Act and the Native Land Claims Adjustment Act 1922, and now operates under the Māori Trust Board's Act 1955.

Fifteen hapū were represented on the Board as well as one seat allocated for soldiers, totaling 19 representatives. Initial membership of the Board was based on ownership of the 14 Te Arawa lakes, which surround the Rotorua district, and remained the structure of the Board. On 18 December 2004, the Crown and Te Arawa signed a Deed of Settlement for Te Arawa Historical Claims and Remaining Annuity Issues over 14 lakes. The PSGE set up to manage the settlement redress was Te Arawa Lakes Trust (TALT).⁸

The settlement redress consists of the following:

- the acknowledgements and the apology given by the Crown to Te Arawa,
- the Cultural Redress recognizing Te Arawa traditional, historical, cultural and spiritual association with the lakes covered in the settlement, including the transfer of 13 lakebeds; guaranteed and
- the Financial Redress; and
- the Annuity Redress.

⁸ <http://www.tearawa.iwi.nz/about-trust>

The respective lake beds associated with this proposed activity that Te Arawa Lakes Trust holds a Statutory Acknowledgement over are Lake Tarawera and Lake Okareka.

Aspirations for Tūhourangi and Ngāti Rangitihi are articulated in many forms including treaty settlements that provide cultural redress, iwi management plans, The Lake Tarawera Restoration Plan and the recent development of the Joint Tarawera Accord.

Key partnerships that will support economic development and support the re-connection with the Lake catchment include the development of the Tarawera Trails and the recent joint purchase of the Waimangu Valley Tourist operation.

Additionally both iwi are involved as kaitiaki in partnership with the Department of Conservation in pest management around the shores of the lake and on the maunga.

Other Māori organisations that support their aspirations for development and well being within Te Arawa wide context are:

Te Tatau o Te Arawa

Te Tatau o Te Arawa (Te Tatau) is a partnership agreement between Te Arawa and the Rotorua Lakes Council. Tatau o Te Arawa Charitable Trust ("Te Tatau") is represented under this partnership agreement by the Te Arawa Partnership Board which acts in the interests of Te Arawa whanui and all members of Te Tatau (including, but not limited to, Te Pukenga Koeke o Te Arawa, Te Arawa Marae, Te Arawa hapū and iwi; Pan-Te Arawa entities; Māori Land Trusts and Incorporations and Matawaka groups, and individual members of Te Arawa) within the Rotorua district.⁹

Rotorua Te Arawa Lakes Strategy Group

The Rotorua Te Arawa Lakes Strategy Group co-ordinates management of the Rotorua lakes. It is made up of elected representatives from Bay of Plenty Regional Council, Te Arawa Lakes Trust, and Rotorua District Council. It is a joint committee within the meaning of clause 30(1)(b) of Schedule 7 to the Local Government Act 2002.

Purpose

The strategy group represents the opportunity to provide for Te Arawa's relationship with its ancestral lakes, and express raNgātiratanga, by managing the lakes' catchments through Te Arawa values. The arrangement recognises that Te Arawa owns the lake beds, and "it has got to be more than just nominal ownership". The purpose is expressed in the Treaty settlement legislation as:

... to contribute to the promotion of the sustainable management of the Rotorua Lakes and their catchments, for the use and enjoyment of present and future generations, while recognising and providing for the traditional relationship of Te Arawa with their ancestral lakes.

⁹ <https://www.rotorualakescouncil.nz/our-council/tearawapartnership/Documents/Te-Arawa-Partnership-Agreement-Final-1.pdf>

Part 4: Environmental Framework

4.0 Te Ao Māori - Māori World View

The way in which tangata whenua relate, interact and behave with all things including the environment is based on set of traditional beliefs. This 'Māori Worldview' reflects various values, ethics and knowledge systems built over many generations and enabled Māori to survive sustainably within their environment for generations.

"It's in your whakapapa, in your pepeha, the mountain, the water, the people. The health of the environment is reflected in the health of the people".

4.1 Core Concepts

Ranginui and Papatuanuku

The story of creation for Māori is the beginning of all knowledge, forming the relationship between tangata whenua and the environment.

With Ranginui and Papatuanuku locked in a tight embrace, their children trapped between them..

"After considerable time, the children became restless and were intent on escaping from the confines of their parents into the world of light beyond. They convened a council to discuss a plan for making their escape. Tūmatauenga (the God of war) suggested that they kill their parents, but his brother's would not agree. So Tāne (God of the forests) proposed that they merely separate their parents and thereby escape.

These children included Tāwhirimātea (God of winds), Tāne (God of the forests), Tangaroa (God of the sea and all waterways), Rongomātāne (God of the kūmara and cultivated crops), Haumia (God of the fernroot and wild herbs & berries), Tūmatauenga, (God of war & the precursor of man) and Ruaumoko, (God of earthquakes & volcanoes). It was through the act of separating their parents that these children became tutelary Gods of the divisions of nature and the environment."¹⁰

Papatūānuku became the earth mother and Ranginui became the sky father.

¹⁰ Barlow, C; He Tikanga Whakaaro, P174, 1996

Māori values relating to fresh water environment	
Whakapapa	Whakapapa (genealogy) describes the relationships and connections of all life forms to each other and to the atua.
Te Ao Māori	Holistic view of the environment, consideration of the whole catchment (freshwater) and how it interacts.
Mauri	The life force that exists in everything, life giving capacity. Protection of the mauri and keeping it in balance is fundamental to Māori.
Wairua	Spiritual connection and wellbeing
Kaitiakitanga	Guardianship, stewardship by manawhenua in accordance with tikanga Māori.
Tino Rangitiratanga	The right to make decisions for your own people concerning your own resource.
Mahinga kai	Includes the the resource harvested, ability to access the resource, the site of harvest, the act of gathering and using the resource and the health of the resource.
Manaakitanga	Hospitality, support and care shown to guests.
Matauranga Māori	Māori knowledge - traditional, intergenerational - relating to the environment includes sustainability practises.
Te Reo	Language, containing knowledge, expressing culture and identity included in waiata and stories.
Whānaungatanga	The interrelationship of Māori with whānau, hapū, iwi and tipuna (ancestors)

Figure 12. Table of Māori cultural values relating to freshwater environment

Key external Māori values that can be expressed in the landscape, lakes, rivers etc	
Wāhi tapu	sacred sites, e.g. urupā (burial grounds), sacred shrines (tuahu), wai
whakaika	ritual or ceremonial sites, ana (caves)
Wāhi taonga	treasured sites, e.g. marae, kainga (settlements), pā (old fortified villages), forest
Wāhi tupuna	ancestral sites –waka landing and anchorage sites (e.g. unga waka, tauranga waka), old battlegrounds, ara (tracks), rock outcrops,
wāhi tohu	indicators etc.
Taonga	flora and fauna, taonga species (plants, trees, animals, birds, fish, etc.),
Rongoa	medicines
General classification of water (relationship to tapu and noa)	
Wai ora	Water in its purist form, e.g. rainwater
Wai puna	Spring water
Wai whakaika	Ritual waters, pools, ceremonial
Wai māori	Freshwater water, water for normal consumption
Wai mate	Water that has lost mauri, is degraded, and no longer able to sustain life
Wai kino	Water that is dangerous, such as rapids ¹¹

Figure 13. Table of Māori cultural values and classifications of water (Harmsworth, 2013)

11

https://www.landcareresearch.co.nz/__data/assets/pdf_file/0020/70625/Maori_values_freshwater_notes.pdf

Te Whakapapa o Te Wai

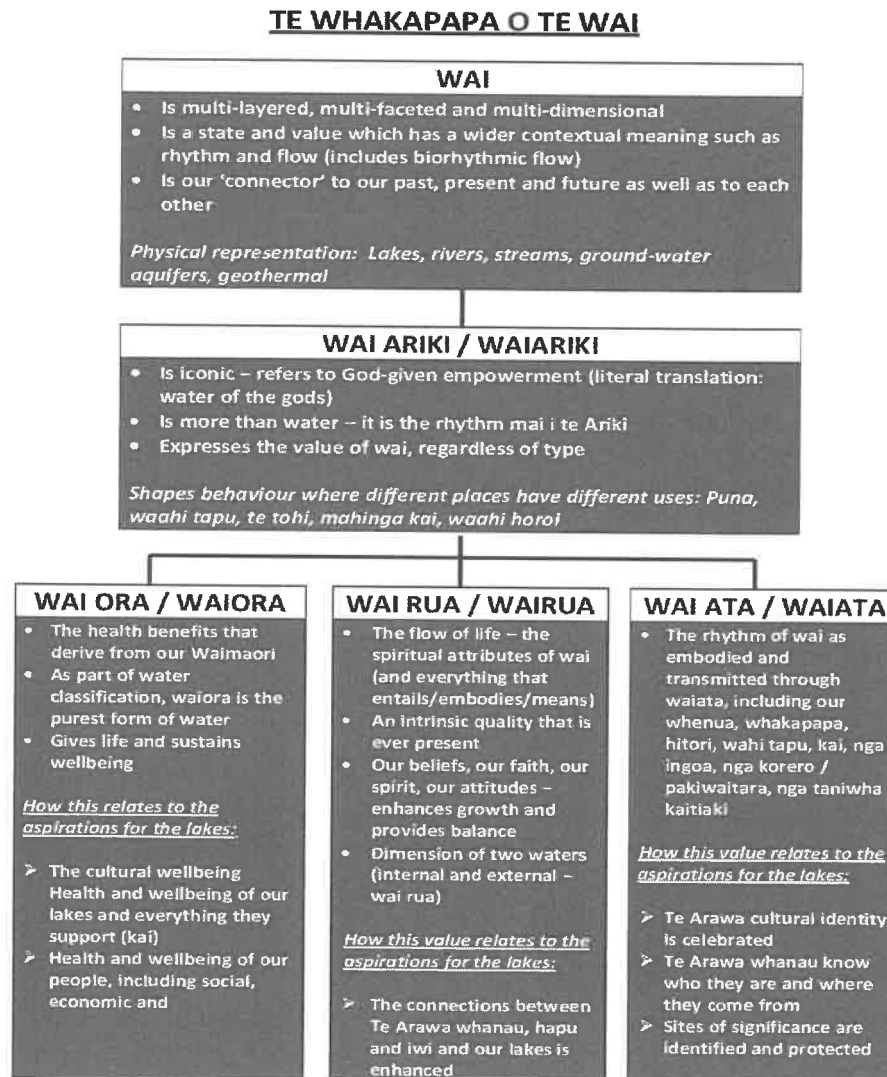


Figure 14. Te Whakapapa o Te Wai (Te Arawa Lakes Trust, 2017)

Te whakapapa o te wai above describes the relationship between Te Arawa and ngā wai o Te Arawa; this case Tarawera and the waters associated with the Lakes. The values associated with this relationship are then outlined and the alignment with the wellbeing of the lakes. This relationship requires that these values are upheld and the mauri of the lakes and people are interconnected.

4.2 Treaty Principles

Tangata whenua interests relating to freshwater management are recognised and provided for within a statutory and planning framework, whereby decisions relating to fresh water management (including discharges to water) are made.

The Treaty of Waitangi

Application of the Treaty is implemented through established Treaty principles. The four following principles are ones most commonly applied through the work of Regional Council:

- **Active Protection**

To actively protect that which is most important to Māori. This may include their rights (including citizenship), property, treasures, special places, culture, language or other.

- **Tribal Authority**

Guarantees Māori the right to manage, control and enjoy their own resources and taonga in accordance with their cultural preferences.

- **Redress for past breaches**

To address past actions or omissions of the Crown that led to harmful effects for Māori.

- **Duty to Consult**

Ensuring Māori are consulted with on matters of importance to them.

4.3 Local Government Act 2002 (LGA)

The Local Government Act 2002 gives local authorities responsibility for taking an informed and long-term approach to how decision making can benefit the economic, social, cultural and environmental well-being of Māori.

Specific provisions relevant to this activity relating to Māori under the LGA are:

Section 4

Treaty of Waitangi

Section 81

Contribution to decision making and capacity building

Section 82 (2)

Principles of consultation - processes for consulting with Māori

Section 14 (1) (D)

Building capacity

4.4 The Resource Management Act 1991 (RMA)

The RMA provisions include recognising and having regard for the relationship Māori have with land, water, sites of cultural significance, kaitiakitanga, iwi management plans etc. Under the RMA, engaging with Māori is required within the Regional Policy Statement (RPS) and Regional Plan development, and through resource consent processes.

Specific provisions with the RMA relevant to this activity are:

Section 2

Defining and having regards for kaitiakitanga.

Section 6 (e)

Recognising and providing for the relationship of Māori and their culture and traditions with their ancestral lands, water, sites, wahi tapu and other taonga.

Section 7 (a)

Having particular regard for kaitiakitanga

4.5 Regional Policy Statement

The Regional Policy Statement (RPS) is prepared under the RMA and contains provisions specifically for Māori.¹²

Policy IW 7D	Cultivating partnerships between iwi and statutory management agencies are "essential if the sustainable management of the region's resources is to be achieved."
Policy IW 1B	Enabling development of multiple-owned Māori land?
Policy IW 2B	Recognising matters of significance to Māori
Policy IW 3B	Recognising the Treaty in the exercise of functions and powers under the Act.
Policy IW 4B	Taking into account iwi management plans.
Policy IW 5B	Avoiding adverse effects on matters of significance to Māori
Policy IW 6B	Encouraging tangata whenua to identify measures to avoid, remedy or mitigate adverse cultural effects.

Figure 15. Table of RPS Iwi Resource Management policies (BOP RC, 2014)

Resource Consent Processes

Engagement with Māori under the resource consent application process includes obligations under Sections 6(e), 6(f), 7(a), and 8 of the RMA.

¹² https://www.boprc.govt.nz/media/566892/operative-rps-1-october-2014_part-three-amended-19-sept-16.pdf

4.6 Environmental Management Plans

There are specific legislative requirements in the RMA that require decision makers to take iwi management plans into account. Hapū and iwi resource planning documents provide for tangata whenua interests to be considered in Council processes, including resource consent processes.

Ngāti Rangitīhi Environmental Management Plan

NGĀ RAWA WHAKAHIRAHIRA	
Resource	Issues
Water bodies	Rivers, streams, lake beds and banks have been dramatically altered to provide for land - use. Water bodies are unable to support living ecosystems including fish and bird habitats.
Objectives	
Preserve or restore and maintain the natural form and character of water bodies including the margins and fauna. The restoration and enhancement of the Tarawera River, Rangitaiki river, Lake Tarawera, Lake Rerewhakaaitu, and Lake Rotomahana. ¹³	

Figure 16. Policies for Environmental Management, Nga Rawa Whakahirahira (Ngāti Rangitīhi, 2011)

¹³ Te Mana o Ngāti Rangitīhi Environmental Management Plan page 28

He Wai - Water		
Resource	Issues	
Wai Kino - Waste Water	<p>Matters of concern to Ngāti Rangitihi include protecting the mauri of water. Ngāti Rangitihi state that mauri is the essence within water that ensures the continuation of life that dwells within it. In order for future generations to gain benefits from both the sea and freshwater, the mauri of water must not be defiled.</p> <p>Contaminants of particular concern are: Sewage and effluent discharges; rural, industrial and urban discharges; stormwater and sediment runoff; ... Mixing of wastewater with waterbodies directly maybe spiritually and culturally offensive.</p>	
Objectives	Policies	Methods
Water is avoided as a medium for transporting treated waste	<p>The appropriate treatment of wastewater (to remove solids, changes in colour, smell, bacteria) and its discharge and penetration to land, avoiding direct discharge to rivers, lakes and the sea</p> <p>The minimisation of use of water to transport waste.</p> <p>The minimum standards for water quality outputs from wastewater treatment increase over time.</p> <p>Encourage and promote new technologies that utilise different mediums for treating waste (rather than water) and minimising the use of water.</p> <p>Preference for treating wastewater at source.</p>	<p>Waste reduction programmes.</p> <p>Trialling composting toilets in appropriate situations including public areas, rural situations remote areas with no infrastructure.</p> <p>Conduct clean -up programmes.</p> <p>Work with consent authorities to ensure consent conditions relating to water quality and quantity of consent holders being adhered to through regular monitoring and response to compliance issues and complaints.</p> <p>Submissions to LTCCP, annual plan, designations and consent applications regarding wastewater treatment systems and plants.</p> <p>Work with joint -agencies to improve lake water quality in Rotorua lakes, Tarawera and Rangitaiki Rivers.¹⁴</p>

Figure 17. Policies for Environmental Management, Hei Wai (Ngāti Rangitihi, 2011)

¹⁴ Te Mana o Ngāti Rangitihi Environmental Management Plan page 30

Part 5: Engagement with tangata whenua

5.0 Background



Figure 18. Lake Tarawera

Te Arawa tribes settled in the Tarawera area in about the 14th century. In 1886, Mt Tarawera erupted; it destroyed settlements, killing at least 120 people and decimated the local thriving tourist economy. Ngāti Rangitihī resettled in Matata and Tūhourangi and Ngāti Hinemihi relocated to Whakarewarewa, Rotorua.

Land alienation by the Crown, post the eruption, impacted the ability for iwi to return to the Tarawera area. Despite this, Lake Tarawera and the surrounding area continues to hold a deep spiritual connection cultural significance to Tūhourangi and Ngāti Rangitihī, in particular. They have managed to retain some land holdings around the lake (Rotomahana Parekarangi 6 Blocks, Ruawahia 2B, Okataina 10, Te Ariki and others). Collectively they are the 3rd largest landowner in this catchment, immediate to Department of Conservation and the Crown.

The Tarawera Lake catchment that encompasses the whenua, the lake itself and the maunga define Tūhourangi and Ngāti Rangitihī as ahi kaa. The people are fully intent on returning to live there in the near future. Commercial investment and opportunities such as the Tarawera Trail, eco tourism, neighbouring Waimangu Valley operation, Kaitiaki tours, the planned Marae project at the Lake confirm intent by both iwi to return and rebuild. Iwi operations in pest control on both the Maunga and far lake side signify the level of engagement and responsibility as kaitiaki.

5.1 The engagement process

Interviews were held during September 2017, with 9 representatives from iwi, Māori land trusts and Māori businesses operating within the area. Executive representatives from Tūhourangi Tribal Authority and Te Mana o Ngāti Rangitihī were interviewed, as were kaumātua who reside at Lake Tarawera.

Māori reservation and land trusts, Ruawahia 2B and the Rotomahana Parekarangi 6 Blocks below, represent some 12,000 shareholder interests within the immediate Tarawera designated area of activity. see Appendix 1. Rotomahana Parekarangi

Ruawahia 2B Ngāti Rangitihī
Rotomahana Parekarangi 6Q 2B
Rotomahana Parekarangi 6O 2B
Rotomahana Parekarangi 6B (or Maungarawhiri)
Rotomahana Parekarangi 6C 2B
Rotomahana Parekarangi 6G 2B Kariri Point
Rotomahana Parekarangi 6G 3B Marae Site, Spencer Road
Rotomahana Parekarangi 6G 3B Urupa
Rotomahana Parekarangi 6K2B
Rotomahana Parekarangi 6J2B4
Rotomahana Parekarangi 6J2B7B4
Okataina 10 Land Trust

Figure 19. Maori reservations and land trusts, Ruawahia 2B and Rotomahana Parekarangi 6 Blocks.

Those interviewed individually were provided with information from Rotorua Lakes Council on the described Waste Water Treatment Options.

They were asked for information and understanding about cultural values directly associated with Lake Tarawera, historically and its current state.

They were then asked about the Waste Water Treatment options and what cultural impacts from these options were likely.

Te Arawa Lakes Trust also presented at a hui alongside Rotorua Lakes Council to iwi member from Tūhourangi at Te Pakira Marae, Whakarewarewa. Feedback was received at this hui also.

5.2 Key responses

Key responses were identified as follows:

- Lake Tarawera is intrinsically connected to tangata whenua. It is in their pepeha (whakapapa - the maunga, the lake..) and key to identity.
- The remediation and clean up of the lake to remove human waste via existing old septic tanks is paramount. Water is a life force and the quality of Tarawera lake (water) is key to the balance of the mauri, and this includes well being people and nature. Healthy maunga, healthy water, healthy people.
- Tangata whenua residing at the lake and using it as drinking water had noticed a decline in water quality - it was no longer providing energy, it's life force, mauri was affected negatively.
- Mahinga kai - kaumatua interviewed spoke of gathering kai from the lake (40 years ago). "Tuna (eel) were the size of dinner plates (girth); kakahi (fresh water mussel) were in abundance. Taonga species also included inanga, koura, kokopu, kouro. Abundant birdlife included water fowl, kereru, pihipihi and tui.
- Economy - the restoration and sustainable management of the water quality at the lake is key for the commercial operations that iwi are both currently involved in and the future opportunities; marketing 'pristine environment'.
- Interviewees understood the lake is fed by 7 waterways and impacted by them, hence the water quality is a complex issue, one that is owned by all - iwi, residents, government, visitors.
- There is concern through the interviews held and the information provided that council understands the breadth of aspirations of the land owners within and close to the areas of proposed routes, to develop and build potentially multiple dwellings including papakainga, marae, tourism etc.
- With regards to the proposed Okareka route - interviewees were concerned about the following:
 - potential risks during flooding
 - the planned route appeared to be too close to the water body and there were potential risks of contamination should there be equipment malfunction.
- There was mixed opinion from those interviewed about the preferred option to treat at proposed WWTP on site or to remove completely. Some did not want the paru mixed and removed completely, holding a cultural preference to treat on site.

- Some felt there was a breach in cultural practice through the proposed transfer of paru from one location (rohe) to another.
- There was interest by some of the interviewees, in the opportunity to partner with Council through leasing land for the WWTP infrastructure. This could provide opportunity to offset costs for proposed iwi housing, some return on investment, added value through utilisation of bio solid etc.
- Tangata whenua indicated strongly that this proposed activity allows for, and does not impede, iwi aspirations to return to the area, and develop housing and infrastructure within the foreseeable future. "It has always been the intention of the people to return home".
- Through the individual interview process, tangata whenua requested this kaupapa be presented at hui-a-iwi; this was considered tikanga and sought for a collective sharing of information and consequent consideration.
- Further to this, Te Arawa Lakes Trust presented an overview of the Waste Water Treatment plan to a recent hui held be Tūhourangi. Feedback from this hui was as follows:
- Tangata whenua are pleased to be involved. Having participated significantly in the current reticulation plan for the Rotorua Lakes catchment, including co-design of a culturally appropriate waste water treatment plant; they would expect to be part of a robust consultation and engagement process going forward for the Tarawera plan. It was noted that such a process has now been developed and could be followed accordingly. This would include access to and engagement with expert Mātauranga Māori knowledge.

5.3 Conclusions

The feedback and response provided by ngā uri o Tuhourangi me Ngati Rangitahi have indicated that there are a range of cultural impacts likely as a result of the introduction of the wastewater treatment system at Tarawera, however the current issue of the *decline of the māuri of Tarawera* is the most significant impact and there is acknowledgement that this must be dealt with. Each wastewater treatment option can broadly be included or eliminated by considering the additional cultural impacts. These can be considered as filters or criteria in the initial assessment.

It is then recommended that a more in-depth engagement process in respect of the options is undertaken to determine the extent of the cultural impact and the mitigation measures to address these. The model developed in respect of the Rotorua WWTP is seen as best practice by Tūhourangi and this is the approach recommended to ensure the cultural impacts identified are able to be mitigated. Cultural impacts are expressed in levels to illustrate how the cultural impacts have been expressed by hāpu and iwi.

1 The highest level cultural impact is the ongoing degradation of the Lake. Tuhourangi and Ngati Rangitahi acknowledge Te Mana o te Wai and consider that wai was given to us through our whakapapa (genealogy). All living things have mauri (the life force) and water is considered essential to life; ;The option that best addresses the declining mauri of the wai will prevail.

2. The Second level impact considers that Tuhourangi and Ngati Rangitahi have been absent from Tarawera for 131 years and the option must support the return of Tuhourangi and Ngati Rangitahi to their lands;the option that best enables the return of Tūhourangi and Ngāti Rangitahi to their lands and resources alongside Tarawera will be a suitable option.

3. The third level of impact is associated with the destruction and the loss of life that was experienced at Tarawera, and that the wider landscape is considered an urupa. It must also be noted that Tuhourangi and Ngati Rangitahi, occupied this area for hundreds of years prior to the eruption and therefore there are many sites of cultural significance that exist on this landscape; the option that has the least impact on the cultural landscape and values associated with this place.

4. The fourth level of impact is in relation to the tikanga (protocols) associated with waste and wastewater. For example waste goes to land, concerns regarding the travel of parū to other catchments and other specific matters identified in Iwi Management Plan; the option will need to address and/or mitigate these matters.

The aspirations of Tangata whenua Tūhourangi and Ngāti Rangitihi are significant - to further develop their assets and natural resources through sustainable practices. This includes the desire and plan for their people to return home to the Lake Tarawera area and to rebuild an economic foundation to support future generations.

With regards this kaupapa, it is clear that the mitigation options need further engagement and development and that a **Mātauranga Māori approach is required.**

Whilst the overarching impacts have been identified, specific details such as sites of significance along proposed routes need to be mapped in detail (requiring expert knowledge). See Appendix 2 - Tūhourangi Sites of significance.

Tangata whenua commented that **'the entire landscape is an urupa, and there are sites of significance also that were prior to the eruption'**. This would indicate a level of sensitivity to this activity is required.

With regards the proposed Waste Water Treatment options, **tangata whenua are seeking more detail and information to enable input into the most appropriate assessment of impact and mitigations.**

There is a model already developed - WWTP and this is now the standard and best practice approach. **This is the engagement model we recommend for further engagement going forward.**

Appendix 1

Lake Tarawera: Rotomahana Parekarangi and Ruawahia Blocks

The area around Lake Tarawera sits within two blocks, part within the Rotomahana Parekarangi blocks and the other part in the Ruawahia block.

The Rotomahana Parekarangi block surrounding Tarawera on the Rotomahana side was known as Rotomahana Parekarangi No.6 and was awarded to Tūhourangi. When the block was sub-divided amongst hapū of Tūhourangi, the blocks surrounding Tarawera were awarded as follows:

Rotomahana Parekarangi 6C	Ngāti Uruhina
Rotomahana Parekarangi 6B	Ngāti Uruhina
Rotomahana Parekarangi 6F	Ngāti Te Amo and Ngāti Tukiterangi
Rotomahana Parekarangi 6G	Ngāti Te Apiti, Ngāti Tuohonoa and Ngāti Hinemihi
Rotomahana Parekarangi 6H	Ngāti Hinemihi, Ngāti Tawake, Ngāti Umukaoria, Ngāti Tuohonoa, Ngāti Te Amo, Ngāti Puta, Ngāti Wahiao
Rotomahana Parekarangi 6J	Ngāti Hinemihi and Ngāti Tawaka of Tūhourangi
Rotomahana Parekarangi 6O	Ngāti Apiti, Ngāti Tuhono, Ngāti Huare, Ngāti Tukiterangi and Ngāti Te Amo of Tūhourangi
Rotomahana Parekarangi 6P	Ngāti Puta, Ngāti Tawake, Ngāti Tukiterangi, Ngāti Wahiao of Tūhourangi
Rotomahana Parekarangi 6Q	Ngāti Uruhina, Ngāti Te Apiti, Ngāti Wahiao and Ngāti Umukaria of Tūhourangi

Figure 20. Rotomahana Parekarangi Blocks - Hapū, Iwi

A small part of Rotomahana Parekarangi No.5B also borders the Lake, which was awarded to Ngāti Rangitihī at 14 Rotorua MB 38, 43-50 dated 2 March 1888.

The Ruawahia block was awarded to Ngāti Rangitihī solely at 4 Whakatane MB 302-303 dated 12 February 1891.

Name of Māori Land Block	Type of Trust	Area in hectares	No. of Shareholders
Ruawahia 2B Ngāti Rangitīhi	Māori Reservation Trust	1897.4	802
Rotomahana Parekarangi 6Q 2B	Ahu Whenua Trust	237.6	2676
Rotomahana Parekarangi 6O 2B	Ahu Whenua Trust	253	1694
Rotomahana Parekarangi 6B (or Maungarawhiri)	Ahu Whenua Trust	129.5	1194
Rotomahana Parekarangi 6C 2B	Ahu Whenua Trust	13.8	595
Rotomahana Parekarangi 6G 2B Kariri Point	Māori Reservation	4.2	315
Rotomahana Parekarangi 6G 3B Marae Site, Spencer Road	Ahu Whenua Trust	68.7	1774
Rotomahana Parekarangi 6G 3B Urupa	Ahu Whenua Trust	.7 5 ha	1756
Rotomahana Parekarangi 6K2B	Ahu Whenua Trust	32.4	524
Rotomahana Parekarangi 6J2B4	Ahu Whenua Trust	19.4	539
Rotomahana Parekarangi 6J2B7B4	Ahu Whenua Trust	33.6	534
Okataina 10 Land Trust	Ahu Whenua Trust	513.5	5191

Figure 21. Rotomahana Parekarangi Blocks - area, shareholders

Ahu Whenua Trust

An Ahu Whenua trust is a common land trust. It is designed to promote the use and administration of one or more Māori land blocks or general land owned by Māori on behalf of its owners¹⁵

Māori Reservation

A Māori reservation is a very specific type of trust which sets aside (reserves) Māori land or general land for a very specific community purpose, which can include Marae, Urupa, Wahi Tapu and other entities or areas of cultural significance.¹⁶

¹⁵ <https://www.Māorilandcourt.govt.nz/your-Māori-land/trusts-and-incorporations/>

¹⁶ <https://www.Māorilandcourt.govt.nz/your-Māori-land/trusts-and-incorporations/#Māori-reservation>

Appendix 2

Māori Land Blocks around Lake Tarawera, Lake Okareka, Buried Village

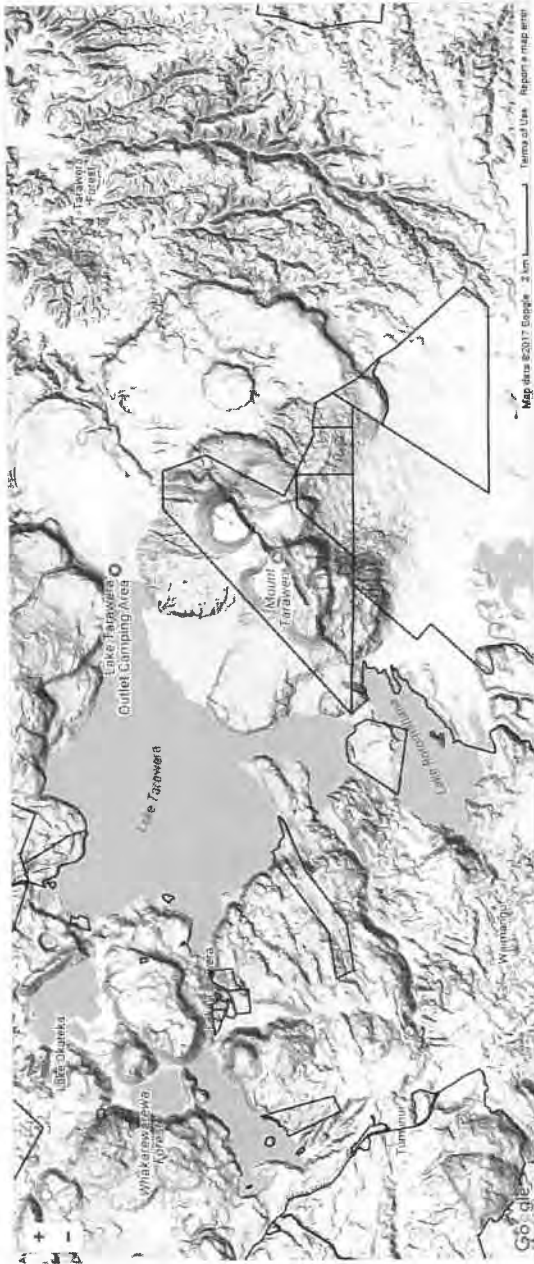


Figure 22 Map - Land Blocks around Lake Tarawera, Lake Okareka, Buried Village

Appendix 3

Tūhourangi - Area of Interest, Sites of Significance

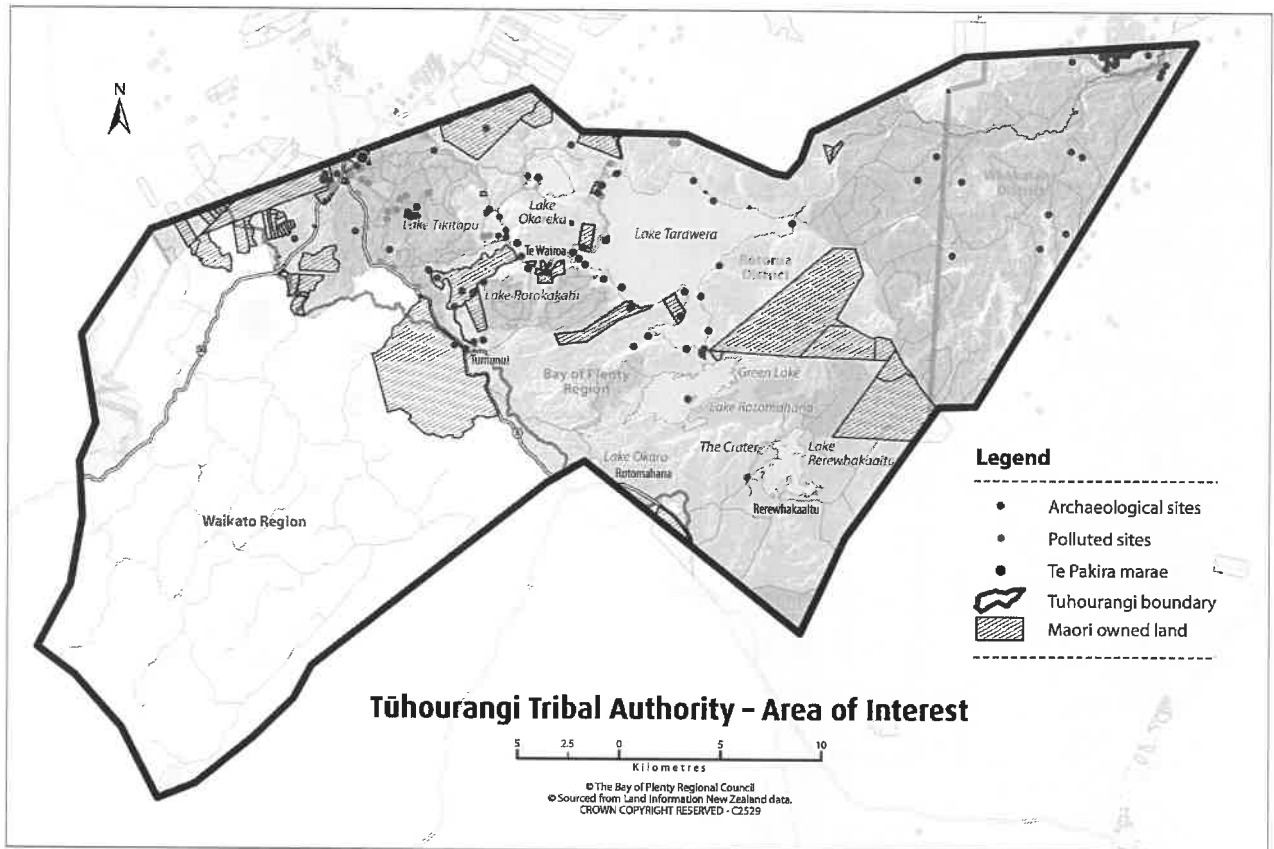


Figure 23 Map of Tūhourangi area of interest

Glossary

Hapū	sub-tribe
Hui	gathering, meeting
Inanga	whitebait
Iwi	tribe
Kaitiaki	trustee, minder, guardian
Kaitiakitanga	guardianship, stewardship
Kakahi	freshwater mussel
Karakia	prayer, to recite ritual chants
Kaumatua	elderly, old, aged
Koura	freshwater crayfish
Mana	prestige, authority, control, power
Mana Whenua	territorial rights, power from the land, authority over land
Marae	open area in front of the wharenuī
Mauri	life principle
Pa	fortified village, fort, stockade
Para	refuse, rubbish, waste, sewage, dirt, mud
Rangatiratanga	right to exercise authority
Rohe	area of interest
Tangata Whenua	people of the land
Tāonga	property, possessions, treasure
Tapu	sacred
Tikanga	protocol, practice –customary system of values and practices
Tino Rangatiratanga	self-determination, autonomy
Wāhi Tapu	sacred place
Wai	water
Wai kaukau	to swim, bathe
Wairua	spirit, soul
Whānau	family group

References

Barlow, C; He Tikanga Whakaaro, P174, 1996

Bay of Plenty Regional Council (2014) Operative Regional Policy Statement. Retrieved from <https://www.boprc.govt.nz/plans-policies-and-resources/policies/operative-regional-policy-statement/>

Bay of Plenty Regional Council (2015) Tarawera Lakes Restoration Plan

Harmsworth GR, 2013, Māori values for freshwater planning.
https://www.landcareresearch.co.nz/__data/assets/pdf_file/0020/70625/Maori_values_freshwater_notes.pdf

Local Government Act, (2002) Retrieved from
<http://www.legislation.govt.nz/act/public/2002/0084/latest/whole.html>

Ngāti Rangitīhi, 2011, Environmental Management Plan

Paul Tapsell, 'Te Arawa', Te Ara - the Encyclopedia of New Zealand,
<http://www.TeAra.govt.nz/en/te-arawa> (accessed 22 October 2017)
Story by Paul Tapsell, published 8 Feb 2005, updated 22 Mar 2017

Resource Management Act, No. 69. (1991). Retrieved from
<http://www.legislation.govt.nz/act/public/1991/0069/latest/whole.html>

1. Rotorua Lakes Strategy Group Agreement
2. Te Tatou o Te Arawa
3. Tuhourangi Protocol

Retrieved from: <http://www.rotorualakescouncil.nz/our-council/about-council/Kaupapamaori/Documents/MaoriCommitteesAdvisoryGroupsandForums2010.pdf>

Tuhourangi Tribal Authority, 2011, Enhanced Iwi Environment Resource Management Plan

Websites

Te Kahui Mangai
<http://www.tkm.govt.nz/>

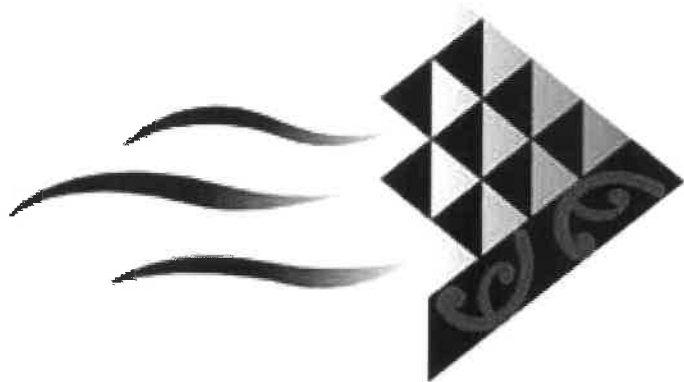
Te Pumautanga o Te Arawa Lakes Trust
<http://tpota.org.nz/about-tpota/>

Te arawa lakes trust
<http://www.tearawa.iwi.nz/>

Māori Land Online
<http://www.maorilandonline.govt.nz>

Figures

- Figure 1. Rotorua Lakes Council Drawing No. 11608. Lake Tarawera, Proposed Sewerage Scheme, Area of Benefit Plan
- Figure 2 Low Pressure Grinder Pump System, Rotorua Lakes Council, Sewerage Options for Tarawera, Manzano 2017
- Figure 3. Step System, Rotorua Lakes Council, Sewerage Options for Tarawera, Manzano, 2017
- Figure 4. Indicative perspective view of Tarawera Wastewater Treatment Plant Rotorua Lakes Council, Sewerage Options for Tarawera, Manzano, 2017
- Figure 5. Paul Tapsell, 'Te Arawa - Origins', Te Ara - the Encyclopedia of New Zealand
- Figure 6. Te Arawa Whakapapa (Tapsell, 2017) Paul Tapsell, 'Te Arawa - Origins', Te Ara - the Encyclopedia of New Zealand,
- Figure 7 Rangitīhi Tūhourangi Whakapapa Paul Tapsell, 'Te Arawa', Te Ara - the Encyclopedia of New Zealand
- Figure 8. White Terraces, 1882, Auckland, by Charles Blomfield. Gift of Sir Guy Berry, South Africa, 1960. Te Papa (1960-0003-2)
- Figure 9. Wairoa, after eruption June 10 1886, 1886, New Zealand, by Burton Brothers studio, Frederick Muir. Te Papa (C.010774)
- Figure 10. Rohe of Tūhourangi (Tribal area), Te Puni Kōkiri, Te Kāhui Māngai <http://www.tkm.govt.nz/iwi/tuhourangi/>
- Figure 11. Rohe of Ngāti Rangitīhi (Tribal area), Te Puni Kōkiri, Te Kāhui Māngai <http://www.tkm.govt.nz/iwi/tuhourangi/>
- Figure 12. Table of Māori cultural values relating to freshwater environment
- Figure 13. Table of Māori cultural values and classifications of water (Harmsworth, 2013)
- Figure 14. Te Whakapapa o Te Wai (Te Arawa Lakes Trust, 2017)
- Figure 15. Table of RPS Iwi Resource Management policies (BOP RC, 2014) https://www.boprc.govt.nz/media/566892/operative-rps-1-october-2014_part-three-amended-19-sept-16.pdf
- Figure 16. Policies for Environmental Management, Nga Rawa Whakahirahira (Ngāti Rangitīhi, 2011, Te Mana o Ngāti Rangitīhi Environmental Management Plan page 28
- Figure 17. Policies for Environmental Management, Hei Wai (Ngāti Rangitīhi, 2011) Te Mana o Ngāti Rangitīhi Environmental Management Plan page 30
- Figure 18. Lake Tarawera (photo)
- Figure 19. Ruawahia 2B and Rotomahana Parekarangi 6 Blocks.
- Figure 20. Rotomahana Parekarangi Blocks - Hapū, Iwi
- Figure 21. Rotomahana Parekarangi Blocks - area, shareholders.
- Figure 22 Map - Land Blocks around Lake Tarawera, Lake Okareka, Buried Village <https://www.landcareresearch.co.nz/resources/maps-satellites/maori-land-visualisation-tool>
- Figure 23 Tūhourangi Tribal Authority – Enhanced Iwi Environment Resource Management Plan July 2011 page 35



TE ARAWA LAKES TRUST

Tarawera Sewerage Scheme Construction - Stage 1

Contract 22/038

Section B - Specification

Appendix A - Cultural Impact Assessment

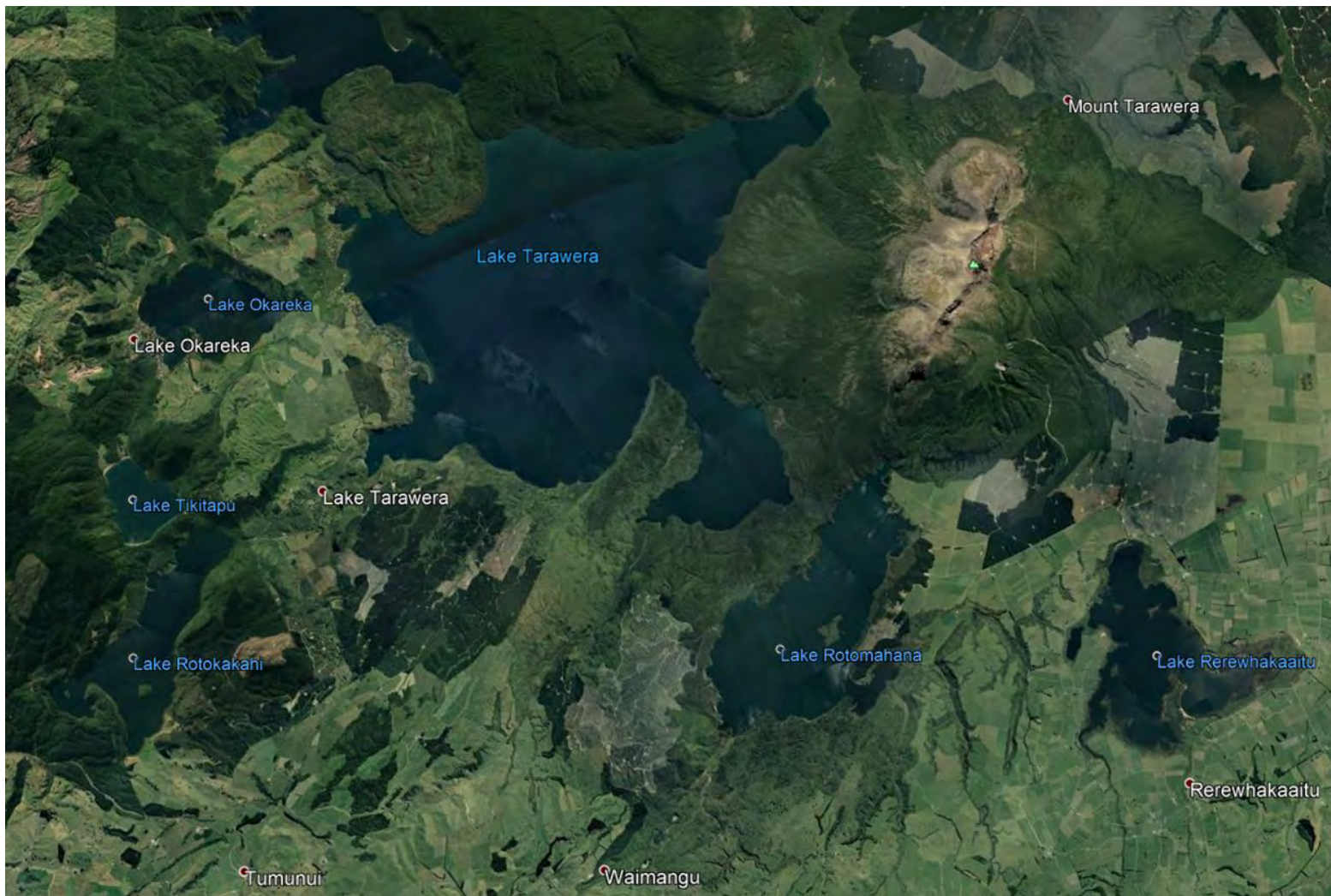
Part 2 of 2



TE ARAWA LAKES TRUST

**CULTURAL
IMPACTS
ASSESSMENT 2**

for Tarawera Wastewater
Reticulation Scheme



CULTURAL IMPACT ASSESSMENT REGARDING THE PROPOSED LAKE TARAWERA WASTEWATER RETICULATION SCHEME

Prepared by Lee Warbrick and Wally Lee

on behalf of

Te Arawa Lakes Trust, Nga hapū o Tūhourangi, Ngāti Hinemihi, Ngāti Rangitihi

for the

Rotorua Lakes Council

Contents

Contents	3
Preamble	5
Statements of association	7
EXECUTIVE SUMMARY	9
1.0 INTRODUCTION	12
1.1. Purpose	12
1.2 Ko Wai matou	12
1.3 Context	13
1.4 Methodology	14
1.5 Engagement Process	14
2.0 BACKGROUND	16
2.1 Declining Water Quality and the drivers for reticulation	19
2.2 The proposed options for a resolution	20
2.3 Preferred Option – Tarawera Sewerage Steering Group and community	24
2.4 Funding	27
2.5 The role of the Cultural Impact Assessment	28
3.0 MANA WHENUA OF TARAWERA CULTURAL VALUES	29
3.1 Historic Context for Mana Whenua	29
3.2 Te Tūāpapa o ngā Wai	38
3.3 Tarawera framework	43
3.4 Statement of Key Values	45
3.5 Impact of Wastewater Discharge on Mana Whenua	49
4.0 STATUTORY AND POLICY CONTEXT	50
4.1 The Treaty of Waitangi	50
4.2 Resource Management Act 1991	50
4.3 Other legislation	52
4.4 Iwi Management Plans	52
5.0 FINDINGS and RECOMMENDATIONS	55
5.1 Summary	55
5.2 Findings	57
5.3 Recommendations	59
APPENDICES	60
1. CIA 2 Assessment Matrix	60

2. Visit to Haumingi 9B3B.....	76
3. Lake Tarawera: Rotomahana Parekarangi and Ruawahia Blocks	77
3. Māori Land Blocks around Lake Tarawera, Lake Ōkāreka, Buried Village	80
5. Tūhourangi - Area of Interest, Sites of Significance.....	81
6. Technical Information	82
7. Record of attendees at meeting held 15 October 2019, Millenium Hotel, Rotorua	91
GLOSSARY	92
REFERENCES.....	93
FIGURES	94

Preamble

Tohi ki te wai, e Para, Hei āhua te tāngaengae ko te wai

i tēnei tangaengae Ki te mātāpuna o te wai

Kai te mahi kotahi o te wai

Kai te whatu whakapiri Ki te hauora me te toiora o te wai

Tarawera, Ōkāreka, Tikitapu, Rotomahana, Rotokakahi nga roto e homai, whakairi ora,

Tūturu, whakamaua kia tina! Haumi e, hui e, taiki e!

Te wehi ki te atua te timatanga o te whakaaro nui, heoi ano, he honore he kororia kit e atua he maungarongo ki runga kit e mata o te whenua, he whakaaro pai ki a tatau katoa.

Kai te mihi ki ratau kua hinga atu ki tua o te aria, koutou kua wheturangitia, moe mai ra. Ki nga tini aitua o te wa kei tena, kei tena wa tatau iwi, kei poroporoakihia, kei tangihia atu ano ki a ratau, haere, haere, e oki, kati ake ki a ratau

Ka mihi kau ana ki a koutou katoa e whakapapa mai nei ki enei whenua, ki enei roto o Tarawera. Otira me mihi ki nga whānau, nga hapū me nga iwi honohono o te whenua nei, ka tika. Na wera kawai whakapapa ka tuku mai enei whenua ki a tatau. No reira Ngāti Umukaria, Ngāti Tutea, Ngāti Taoi, Ngāti Tama, Ngāti Wahiao, Ngāti Apiti, Ngāti Puta, Ngāti Te Amo, Ngāti Uruhina, Ngāti Te Ipu, Ngāti Huarere, Ngāti Tuohonoa, Ngāti Tawake, Ngāti Rangitahi, Ngāti Hinemihi nei ko tenei te mihi atu. No reira nga te mahi kotahi tatau ka ora ai te wai. Tena kautou, tena kautou, tena tatau katoa.

This report has been compiled by a collective of Mana Whenua groups who have an intergenerational connection to the waters and lands associated with the Tarawera catchment. The role of Mana whenua is significant as it is the hapū associated with the land that has the right to the expression of tino rangatiratanga and mana whakahaere. The tribal and ancestral lands and waters of Tūhourangi, Ngāti Rangitahi and Ngāti Hinemihi also require expression of our rangatiratanga where we exercise our responsibilities as kaitiaki.

Mana Whenua continue to be active throughout Lake Tarawera and the surrounding catchments, practicing cultural values with a deep spiritual connection through mahinga kai, wānanga, and kaitiakitanga. The burial places of ancestors are known to Mana Whenua and to this day they remain of the utmost sacredness. The stories of the past have been handed down from generation to generation, from family to family, never to be forgotten. Mana Whenua continue to administer lands and waterways with a solemn vow to return home.

To understand the current situation within the Tarawera catchment and the genuine need to reticulate wastewater for the community living on the shores thereof, the reader first must understand the tribal history of the land. This Cultural Impact Assessment is undertaken on of the Mana Whenua who continue to be active kaitiaki within the Tarawera catchment and is essentially a story of the impacts upon the Mana Whenua of Tarawera, Rotokākahi and Tikitapu.

Disclaimer:

While care has been taken in the preparation of this document, no responsibility is accepted for the accuracy of the content (whole or any part of).

Front Cover: Lakes Tarawera, Ōkāreka, Rotokakahi, and Tikitapu with hapū and iwi land boundaries.

Statements of association

Te Arawa Lakes Trust

'All the freshwater within the Te Arawa boundary – belongs to Te Arawa emphatically. Te Arawa owns it but we all need it. Pakeha ownership of a natural resource is to turn it into a saleable commodity. Māori take care of it and pass it on to the younger generation.'

*Ta Toby Curtis
Chairman, Te Arawa Lakes Trust*

Piki mai rā, kake mai rā
Hōmai te waiora kia tū tākiwai tākiwai tākiwaiora e

For generations Te Arawa have lived in the embrace of the land surrounded by water, be it thermal, natural or for bathing. The question must be, how can we reciprocate? We must be cognisant of the origins and the significance of water, we must allow the water to flow and contribute to the environment as a whole, we must build a pathway that ensures that the relationship we have with water and that water has with us endures.

Water is central to life. It symbolises the lifeblood of Papatūānuku (earth mother) and the tears of Ranginui (sky father). It is the element that binds the physical and spiritual realms together. Whakapapa encapsulates the Māori world view and acknowledges our connection with the gods, the natural world and with each other. All things whether animate or inanimate are connected through whakapapa and have mauri (life force). It is the foundation for mātauranga Māori that binds whānau, hapū and iwi together. This is reflected in our guiding Te Arawa values – Te Whakapapa o te Wai are: Wai, Waiariki, Waiora, Wairua, Waiata

The lakes are part of us. Every nook and cranny we have a name for, they are named after prominent ancestors and those names are still used today as though they are still living,

*Ta Toby Curtis
Chairman, Te Arawa Lakes Trust*

Ngāti Rangitihī

Our objective is the restoration and enhancement of Lake Tarawera - to restore, maintain and protect the mauri of this taonga and resource. We advocate sustainable management of freshwater to meet the basic health and safety needs of people.

“Our natural resources embody wairua and mauri, they are living and interconnected. It is imperative to stop paru leaking into the lake. Our people connect to the whenua and the awa – healthy maunga, healthy waterways, healthy people and it is currently out of balance. As kaitiaki we have a duty of care for the protection and sustainable use of our natural resources.”

Ken Raureti

Te Mana o Ngāti Rangitihī

Tūhourangi

*Tera te auahi
Tera te auahi
Tera te auahi
ka patua i Tarawera
kai raro iti iho
Ko Ngāti Taoi i moe ra i te whenua
Haere ra e te iwi
Ki te po uriuri ki te po tangotango
Ki te iwi ki te po
Arohirohi ana taku nei titiro ki te puke i te
kumete
Kai raro iti iho ko te tini a te kura i a
Tūhourangi
Whakapukepuke ai nga ngaru o Tarawera ko
te rite i aku kamo
Ka whati mai te ngaru ka oho ra te marino ko
te rite i te iwi
Ehara noa mai ra te rae ki mōura haere ra e
te iw
Ki wiwi ki wawa ki raro ki te reinga ko wai au
ka kite
Kai kinikini ai te mamae i taku kiri ki te iwi ka
wehe
whakarehurehu ana taku nei titiro ki
whakapoukorero
Kai raro iti iho ko Ngāti Rangitihī toku hoa
moenga
Na Ngatoroirangi i taki mai te mana o te atua
Ka hau kai te whenua
Hurahia e nga tohunga ka maranga kai runga
ka ru ko te whenua
Te riri o te atua i whiua ki te tangata i whiua ki
te whenua
E hora noa mai ra i te po uriuri i te po
tangotango
Waiho nei te aroha waiho nei te mamae
Ka kai kino i taku kiri
I maringi a wai te roimata i aku kamo
ki te iwi ka wehe.*

EXECUTIVE SUMMARY

People from all over the world are drawn to Lake Tarawera for its iconic landscape and its recreational features. The cultural significance of this landscape necessitates the careful consideration of development activities that may adversely impact on cultural values.

Before colonisation, the Rotorua Lakes including Tarawera provided food, shelter, economic resources and primary transport routes for the many hapū and iwi who settled following the arrival of the Te Arawa waka. The shores and surrounding areas of Lake Tarawera were occupied by hapū of Tūhourangi and Ngāti Rangitihi. There were areas for mahinga kai (food gathering), urupa (burial grounds), pa sites (settlements), trade and transport routes, bathing areas, and wāhi tapu (ceremonial and sacred areas).

After colonisation, the “Hot Lakes” district attracted tourists from all over the world as stories of the boiling mud, geysers and other geothermal wonders spread. In particular, the Pink and White Terraces (Otukapuarangi and Te Tarata) on the shores of Lake Rotomahana were becoming known as one of the natural wonders of the world. Te Arawa played a major role in developing tourism in Rotorua and acted as guides for visitors. They kept a significant degree of control over access and transport to the attractions of the area.

Developments in the late nineteenth century led to an increase in nutrients flowing into the lakes from clearing forestry, farming and septic tanks. The environmental degradation of the lakes has affected their mana and wairua⁴.

Over the years, Te Arawa negotiated with the Crown for ownership of the Lakes, customary fishing rights, trout fishing licences and a co-management approach to the restoration of the Te Arawa Lakes.

Lakes Ōkāreka, Ōkātina, Rotokakahi, Rotomahana and Tikitapu all drain into Lake Tarawera, either via surface water or groundwater flows. Lake Ōkaro and Lake Rerewhakaaitu drain first to Lake Rotomahana, then to Lake Tarawera. Because of this interaction between lakes, the catchment of Lake Tarawera (the Tarawera System) is made up of an inner catchment and an outer catchment:

- Inner catchment – includes the land, surface water and groundwater that drain directly to Lake Tarawera.
- Outer catchment – includes the land, surface water and groundwater that drain to the seven other lakes in the Tarawera System before draining to Lake Tarawera.

The approach up until now has been to address each lake in isolation, without consideration of the interaction between lakes¹ Lake Tarawera as the destination of the nutrients and work is underway to build a groundwater model of the area, which will provide more information on the interactions between lakes. With so little known about the outer catchment and its contribution to the nutrient load to Lake Tarawera, the best approach is to reduce nutrients from known sources while the groundwater model is finalised.

The Tarawera Lakes Restoration Plan as developed by the Bay of Plenty Regional Council for the Rotorua Te Arawa Lakes Strategy Group, focuses on addressing lake water quality and the number one priority of the Plan is to reticulate houses in the Lake Tarawera urban community.

The Rotorua Lakes Council (RLC) is seeking to install a reticulated wastewater scheme in the Lake Tarawera communities. Lake Tarawera Ratepayers Association (LTRA) together with Mana Whenua and Iwi Authorities, (henceforth known as the Collective), have been reviewing several options to protect the environment for future generations.

There is agreement that the reticulation of the wastewater from the urban community at Tarawera must happen to mitigate the current effects of the leaching of nutrients and e-coli to Lake Tarawera. These effects impact on the mauri of the Lake and the relationship of mana whenua with the Lake and the surrounding area.

Mana whenua have expressed deep concern and regret that the current situation of allowing the ongoing use of defunct and sub-standard systems in the Tarawera urban area has continued for so long; there is a commitment to ensuring that solutions are found. There is however the need to ensure that any solution will be both environmentally and culturally appropriate for the catchment.

This document will examine actual and potential effects of the proposed activities on physical sites of significance, cultural values and tangata whenua relationships with its natural resources. It will guide RLC on key cultural issues and act as a tool for activities relating to planning, implementation, operation and management over the full lifecycle of the preferred option to be assessed.

It is not possible to foresee and understand all potential impacts of the preferred option. It is equally challenging to convey adequate measures to address identified impacts, especially over the full life of any preferred scheme, where both information and cultural perspectives are certain to evolve. Additionally, some information critical to future decision making is not yet available.

However, what is essential is Mana Whenua are embedded in the process and adequately resourced to engage with decision makers in order to avoid or mitigate potential negative impacts. Some of the essential factors are;

- To be informed of planned activity well ahead of schedule and have time to consider potential impacts.
- When necessary, have access to enough technical support and expertise, undertake research where there are potential unknowns and contribute to ensure activity is well understood, impacts are considered adequately, and decisions are shared with iwi stakeholders.
- The principles of Kaitiakitanga be adopted by Council and applied to the process henceforth with emphasis on:
 1. Working with mana whenua – obviously this is the best way to understand kaitiaki principles and put these into practice
 2. Promoting kaitiaki values, objectives and principles to the wider public

The benefits for all stakeholders will be a seamless and unified approach which will enable all to move forward into the future with confidence and understanding to ensure the long-term protection of the environment and lake for generations to come.

1.0 INTRODUCTION

1.1. Purpose

The purpose of this Cultural Impact Assessment is to inform, guide and provide recommendations based on the cultural position of Tūhourangi, Ngāti Hinemihi, Ngāti Rangitihī and all affected Mana Whenua within the Tarawera catchment with respect to the proposed options for the reticulation of wastewater from the Tarawera community. For the purposes of this report, the group is identified as 'the Collective'.

The primary objectives of this document are to:

- Outline the history; describe cultural values and traditional relationships with ancestral lands, water, sites of cultural significance and other taonga.
- Reflect the Collective's cultural position in relation to the scheme.
- Highlight Mana Whenua concerns relating to wastewater and the scheme and its potential impact on cultural assets, land and geological features.
- Recommend processes, methods and solution options to ensure outcomes align with the cultural position of affected hapū and iwi.
- It will recommend methods and solution options to avoid, or at least mitigate foreseeable negative comments and cultural offence.

1.2 Ko Wai matou

Tangata whenua and Mana Whenua as represented by:

- Te Arawa Lakes Trust
- Tūhourangi
- Ngāti Rangitihī
- Ngāti Hinemihi
- Rotomahana Parekarangi 6 Block owners
- Ruawahia 2B

1.3 Context

The Rotorua Lakes Council (RLC) are proposing to install a reticulated wastewater treatment scheme in the Lake Tarawera community starting at the end of Spencer Road to the north, then in a south easterly direction linking with Tarawera Road. The proposed pipeline will then link to the established pumping station at Lake Ōkāreka for a transfer to the Rotorua Wastewater Treatment plant (WWTP) at Te Arikiroa.

The Cultural Impact Assessment aims to guide decision making by the Rotorua Lakes Council for a reticulated wastewater scheme in the Lake Tarawera catchment. If consents are required, the report will contribute to the consent authority's decision-making process whether to grant or decline consents.

Overall this document looks at foreseeable, potential and probable impacts and how these may be avoided or mitigated in ways acceptable to Mana Whenua. Mana Whenua make up most landowners over the scope of the Scheme and are obligated to preserve and protect their areas of interest as kaitiaki

The objectives of this CIA are to:

- Document the cultural values /effects associated with the proposed wastewater treatment options for Tarawera,
- Identify the potential effects on cultural values/ effects as a result of the proposed treatment options,
- Recommend next steps to ensure the cultural values, views and issues identified can be addressed.

In meeting these objectives, the report will:

- Provide all parties with an understanding of cultural matters related to the proposed activity,
- Outline engagement to date and recommendations for the process going forward,
- Provide a foundation for future discussions between Iwi and Mana Whenua affected and the Rotorua Lakes Council.

1.4 Methodology

- A review of the provisions of the Resource Management Act 1991, the Te Arawa Lakes Settlement Act 2006, Affiliate Te Arawa Iwi and Hapū Claims Settlement Act 2008 (Te Ariki, Te Wairoa) and other relevant statutes and regulations.
- A review of historical cultural information and other written references relevant to this assessment.
- A review of Tūhourangi Tribal Authority Enhanced Iwi Environment Resource Management Plan 2011.
- A review of Ngāti Rangitihī Iwi Environmental Management Plan 2011, specifically policies on sewage disposal, discharge to water, and freshwater management.
- Cultural Advisory Panel set up, representative of tangata whenua and iwi organisations to consider cultural impacts of proposed options
- Discussions with tangata whenua with knowledge and experiences of the area and values.
- Discussion with Māori landowners within the proposed site area and catchment.
- Analysis of information gathered, and report developed.

1.5 Engagement Process

- **Cultural Advisory Committee**
A cultural advisory panel was set up, as recommended in the first Cultural Impact Assessment. Representatives from tangata whenua, iwi organisations and Te Arawa Lakes Trust attended the Tarawera Steering Committee meetings and held workshops to discuss and evaluate the cultural and associated impacts of the proposed wastewater options.
- **Interview Survey**
Mana Whenua representatives from land blocks within the Tarawera catchment and iwi authorities representing Tūhourangi, Ngāti Hinemihi and Ngāti Rangitihī were invited to participate in an interview survey to gather information and greater understandings about the cultural impacts of the proposed options. Participants were provided with background information on the options and the process to date. They were then interviewed kanohi ki te kanohi or by phone conference. Data was gathered and formed part of the analysis shown in the CIA matrix.
- **Hui-a-Hapū Tuesday 26 March 2019**
Hui-a-hapū was held at the Millenium Hotel and was attended by 25 people from various hapū of Te Arawa including Tūhourangi and Ngāti Whakaue. A technical overview of the options to be considered under this Cultural Impact Assessment was highlighted to hapū representatives in attendance. Taira Wichman attended and provided independent technical advice upon request. The hui was recorded, and the responses have been analysed and included within the CIA matrix

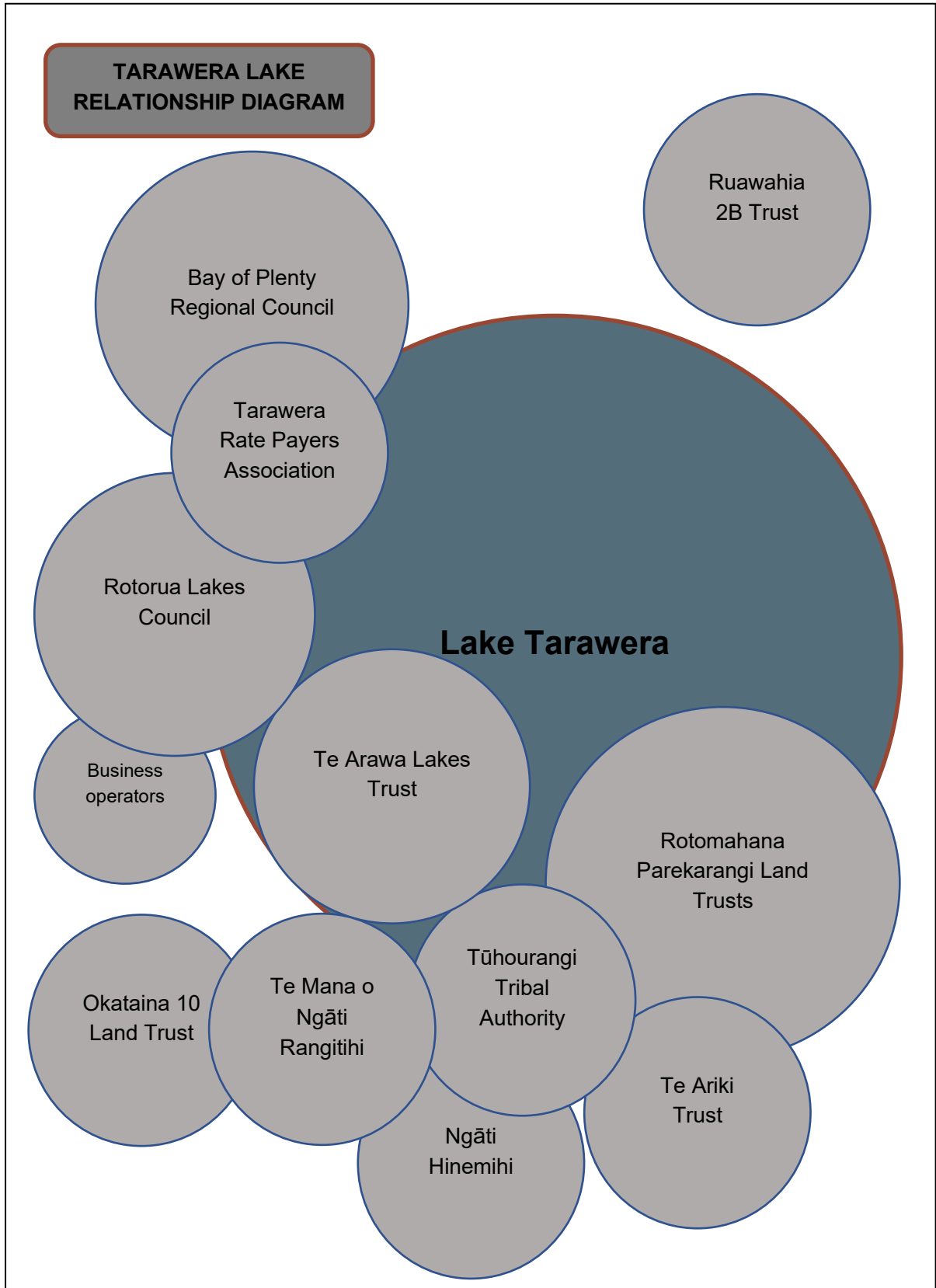


Figure 1 Tarawera Lake Relationship Diagram

2.0 BACKGROUND

Lake Tarawera

Lake Tarawera is the second largest lake of the fourteen Te Arawa/Rotorua Lakes included in the Te Arawa Lakes Settlement 2006. It is part of the Lakes Restoration Programme managed by the Bay of Plenty Regional Council in Partnership with Te Arawa Lakes Trust and Rotorua Lakes Council.

At a glance:

- Lake size: 4,138 ha
- Catchment area: 14,472 ha
- Elevation: 298 m
- Average depth: 50 m
- Deepest point: 87.5 m
- Formed: 5,000 years ago
- Outflow: Surface via the Tarawera River

About 391 houses are located at the lake with about 25% occupied all year round by 290 residents. The remaining 75% of houses are used as holiday accommodation. There are anecdotal reports of an emerging trend of bach owners that have been holidaying at the lake for the past few decades, retiring and living at the lake permanently.

Lake Tarawera is a popular lake, providing a variety of recreational uses for residents and visitors:

- Water activities – kayaking, sailing, water-skiing, ski-biscuiting, jet-skiing, swimming.
- Fishing – Lake Tarawera has a well-stocked trout fishery.
- Walking, tramping and camping – there are several walking and tramping tracks around Lake Tarawera with camping grounds located at The Outlet, Humphries Bay and Hot Water Beach.
- Tourist attractions – the Buried Village of Te Wairoa, Hot Water Beach, trout fishing and an ascent of Mount Tarawera attract visitors to the lake.
- General activities – parks and reserves adjacent to the lake provide public facilities such as boat ramps, playgrounds and public toilets. The inner catchment includes the land, streams, and groundwater that run directly into Lake Tarawera. Land cover in the inner catchment is mostly native and exotic forest with some pasture.

Lakes Ōkāreka, Ōkātina, Rotokakahi, Rotomahana and Tikitapu all drain into Lake Tarawera, either via surface water or groundwater flows. Lake Ōkaro and Lake Rerewhakaaitu drain first to Lake Rotomahana, then to Lake Tarawera. Because of this

interaction between lakes, the catchment of Lake Tarawera (the Tarawera System) is made up of an inner catchment and an outer catchment:

- Inner catchment – includes the land, surface water and groundwater that drain directly to Lake Tarawera.
- Outer catchment – includes the land, surface water and groundwater that drain to the seven other lakes in the Tarawera System before draining to Lake Tarawera.

The approach up until now has been to address each lake in isolation, without consideration of the interaction between lakes¹. This approach is effective, as a reduction in nutrients in the catchment of any of the outer lakes will benefit both the immediate lake and Lake Tarawera. However, it doesn't consider the interactions between lakes or Lake Tarawera as the destination of the nutrients.

Work is underway to build a groundwater model of the area, which will provide more information on the interactions between lakes. This work is expected to be completed in about twelve months; at which time a more accurate nutrient budget can be prepared with updated reduction targets.

With so little known about the outer catchment and its contribution to the phosphorus load to Lake Tarawera, the best approach is to reduce phosphorus from known sources while the groundwater model is finalised. In the meantime, discussions with landowners in both the inner and outer catchments will improve our knowledge of the current phosphorus load to the lake from this source, and lead to voluntary reductions.¹

Unless otherwise referenced, the information in this section following has been sourced from *Tarawera: The Volcanic Eruption of 10 June 1886*.

Before colonisation, the Rotorua lakes provided food, shelter, economic resources and primary transport routes for Te Arawa. The iwi used Mount Tarawera as a burial ground for chiefs and other persons of importance and the mountain is considered tapu.

Te Arawa is made up of iwi and hapū, based predominantly in Rotorua, tracing their ancestry back to the Arawa waka. Presently, Te Arawa has a population of about 35,1273. After colonisation, the "Hot Lakes" district attracted tourists from all over the world as stories of the boiling mud, geysers and other geothermal wonders spread. In particular, the Pink and White Terraces (Otukapuarangi and Te Tarata) on the shores of Lake Rotomahana were becoming known as one of the natural wonders of the world.

¹ [Lake Tarawera Restoration Plan](#)

Te Arawa played a major role in developing tourism in Rotorua and acted as guides for visitors. They kept a significant degree of control over access and transport to the attractions of the area. Settlers introduced trout and other exotic species into the Rotorua lakes, which depleted indigenous fish stocks and forced a reliance on the introduced species. The introduction of fishing licences led to further hardship for some members of Te Arawa already affected by the reduction of indigenous species.

Over the years, Te Arawa negotiated with the Crown for customary fishing rights, trout fishing licences and burial reserves in the lakes. Developments in the late nineteenth century led to an increase in nutrients flowing into the lakes from clearing forestry, farming and septic tanks. The environmental degradation of the lakes has affected their mana and wairua.

The degradation of Lake Tarawera and its surrounding catchments, is of concern to all tangata whenua who are connected to the lake by whakapapa (genealogy) within their rohe (tribal boundaries). The extent to which the land-use changes and declining water quality has impacted on tangata whenua values is currently unknown.

The Rotorua Lakes Council (RLC) is seeking to install a reticulated wastewater scheme in the Lake Tarawera communities. The current effluent disposal system is via onsite effluent tanks and disposal trenches with a total of 169 properties non-compliant. Evidence suggests septic tanks contribute to increased nitrogen (N), phosphorus (P) and e-coli which in turn contributes to water quality deterioration. To reduce the risk to public health and protect the water quality of Lake Tarawera, the RLC, Bay of Plenty Regional Council (BOPRC), Lake Tarawera Ratepayers Association (LTRA) together with Mana Whenua and Iwi Authorities, (henceforth known as the Collective), are reviewing a number of options to protect the environment for future generations.

2.1 Declining Water Quality and the drivers for reticulation

Tarawera Lakes Restoration Plan

The Tarawera Lakes Restoration Plan was developed by the Bay of Plenty Regional Council as part of the wider Lakes Restoration Partnership programme and focuses on addressing lake water quality. It has been adopted by the Rotorua/Te Arawa Lakes Strategy Group. The number one priority of the Plan is to reticulate wastewater in the Lake Tarawera urban community.

Importance to tangata whenua

For Māori, water is a taonga, a treasure, and is very highly regarded. Māori identify themselves in terms of their ancestors and their rivers and mountains.

Māori consider water bodies to be their ancestor, a part of their family and a part of them. When a freshwater body is mismanaged, it hurts not only the water body itself, but the tangata whenua who identify with it.

In Māori environmental management, all resources have mauri (an energy which binds and supports life). The mauri of each water body is a separate entity and cannot be mixed with the mauri of another. This conflicts with the traditional western view that water can be diverted, dammed and used to take away waste. The pollution and alteration of a water body diminishes its mauri and affects its ability to provide food from this source.

Practices, or tikanga, are used to maintain the mauri of resources. The ongoing observation of these tikanga has led to the development of the ethic of kaitiakitanga. Kaitiakitanga is most simply translated as guardianship, but it also includes care, wise management and the use of resource indicators (where resources themselves indicate the state of their own mauri).

The degradation of Lake Tarawera and its surrounding catchments, is of concern to all tangata whenua who are connected to the lake by whakapapa (genealogy) within their rohe. The extent to which the land-use changes and declining water quality has impacted on tangata whenua values is currently unknown.

Lake Tarawera Sewerage Steering Committee

The Lake Tarawera Sewerage Steering Committee is made up of representatives from a range of key stakeholders including Rotorua Lakes Council (RLC), Bay of Plenty Regional Council (BOPRC) and the Tarawera Ratepayers Association; representatives from iwi authorities Tūhourangi Tribal Authority, Te Mana o Ngāti Rangitihī, Te Arawa Lakes Trust, Māori land trusts.

LTSSC - Purpose

The LTSSC is tasked to:

- Investigate and recommend the most appropriate wastewater disposal option to the community and Rotorua Lakes Council. The final recommendation must be sustainable and help to improve the health of Lake Tarawera.

To date, the LTSSC has:

- Been presented with evidence that septic tanks contribute to the increased nitrogen (N), phosphorus(P) and e-coli discharged into the lake which causes water quality deterioration.
- Looked at ways to achieve a reticulated wastewater scheme.
- Identified five possible and viable wastewater options.
- Commissioned a cultural impact assessment for the options

2.2 The proposed options for a resolution

The proposed service area: (Number of properties: Current - 423; Ultimate - 546)

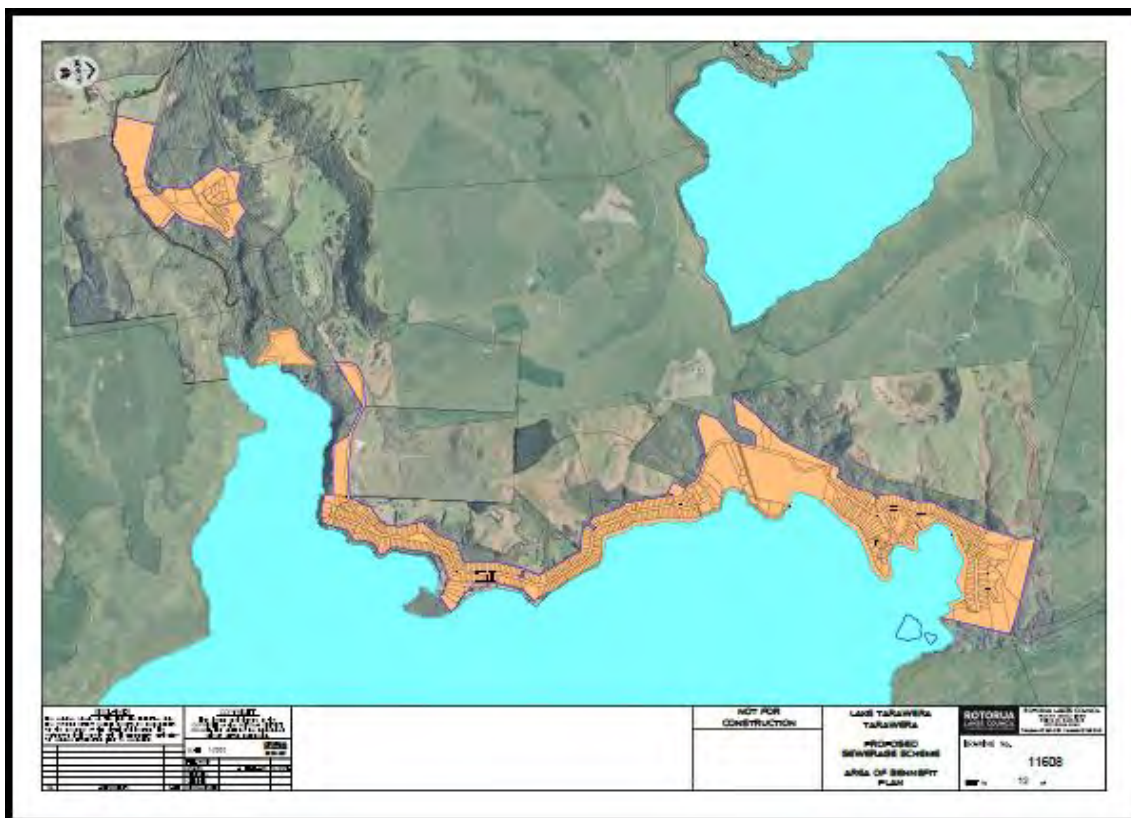


Figure 2. Rotorua Lakes Council Drawing No. 11608. Lake Tarawera, Proposed Sewerage Scheme, Area of Benefit Plan

The proposed options:

1. A Septic Tank Effluent Pump (STEP) system located on each property. A STEP system is a 3800 litre septic tank with a filter and pump inside the tank. The effluent is pumped through pressure pipes to a local Wastewater Treatment Plant.
2. A STEP system where the effluent is pumped to Ōkāreka and from there to the Rotorua Wastewater Treatment Plant.
3. A Low-Pressure Grinder Pump (LPGP) located on individual properties connected to a local pipeline and Wastewater Treatment Plant.
4. A Low-Pressure Grinder Pump located on individual properties with a pipeline connected to Ōkāreka for transfer to the Rotorua Wastewater Treatment Plant.
5. If a decision is made not to reticulate this community, then each individual property owner would need to;
 - a. Install an Aerated Wastewater Treatment System with Nutrient Reducing capabilities (AWTS+NR). The effluent from this system would be discharged to near surface soils. This system would be an improvement in performance over septic tanks but would not fully remove the N and P from the catchment.
 - b. This option may cost each property owner up to \$20,000 and is not eligible for subsidy.
 - c. Not all properties will be able to accommodate one of these systems because of land slope and stability, available space, proximity to ground water and unsuitable soils. A report is currently being prepared on these issues. Property owners in this category would need to apply for a resource consent which would seek to mitigate the effects of the discharge.

Note:

- 1) If the preferred option is to connect to the existing Ōkāreka scheme, then resource consents will not be required.
- 2) If the preferred option is to establish a Wastewater Treatment Plant and Land Disposal System within the area, then resource consents will be required for the construction and operation of the plant - discharge to air (odour) and land (land disposal field).

LOW PRESSURE GRINDER PUMP SYSTEM

- Houses at Tarawera connected by low pressure grinder pumps
- About 1500 installed within the district over the last 9 years

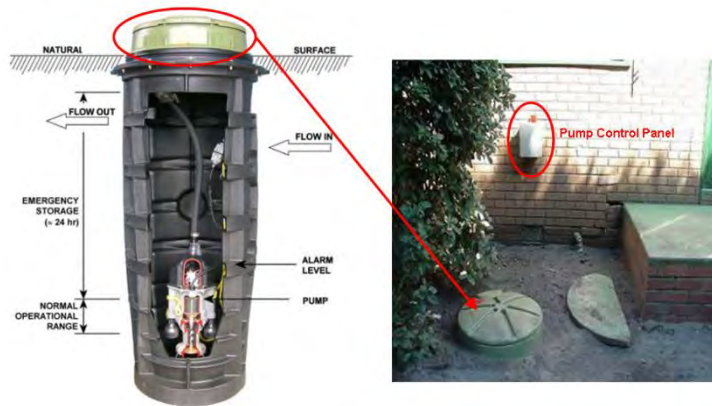


Figure 3. Low Pressure Grinder Pump System, Rotorua Lakes Council, Sewerage Options for Tarawera, Manzano 2017

STEP SYSTEM

- Underground septic tank (about 4000 litres) provides primary treatment (solids settling) so only liquids go to treatment plant.
- Most of the solids settle and remain in tank for years decomposing under anaerobic process. Remaining solids pumped every seven years (approximately.)
- Solids filtered out.
- 25mm line connects property to main sewer in street.



Figure 4. Step System, Rotorua Lakes Council, Sewerage Options for Tarawera, Manzano, 2017

PROPOSED WASTEWATER TREATMENT PLANT AND LAND DISPOSAL SYSTEM CONCEPT

- Wastewater Treatment – Membrane Bio-Reactor Plant (600m³/day approx.)
- Land Disposal System – Trench based Rapid Infiltration and/or reuse
- Approximate area requirement
- 5-6 hectares (depending on soil characteristics and buffer requirements)
- Solids management – Stored on site and transported offsite
- Odour management – Enclose all odour generating processes with foul air extraction and treatment.
- Noise management – Blowers house inside blower room with acoustic silencers
- Indicative cost - \$6.0M to \$6.50M

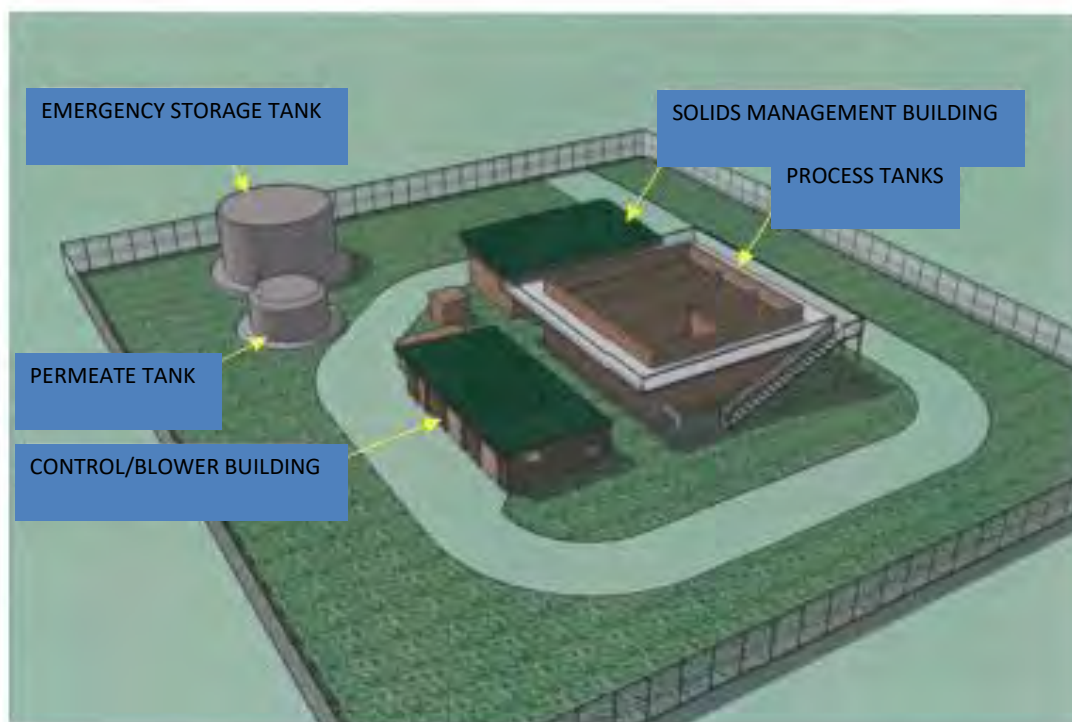


Figure 5. Indicative perspective view of Tarawera Wastewater Treatment Plant Rotorua Lakes Council, Sewerage Options for Tarawera, Manzano, 2017

2.3 Preferred Option – Tarawera Sewerage Steering Group and community

At the meeting of the Tarawera Sewerage Steering Group on 15 October 2018, the group reviewed and discussed the cultural, environmental, financial and social issues related to the options.

Consideration of on-site options	
<p>STEPS</p> <ul style="list-style-type: none"> - More culturally acceptable - Tank large size – 4 cub. Meters, 4000 litres - Ground stability compromised - Rotomahana mud - Section sizes - Terrain too steep - Ground water limiting depth - More cost 	<p>LPGP</p> <ul style="list-style-type: none"> - Not so culturally acceptable - Smaller footprint - Cheaper cost - Better ground stability – less disturbance - Already in use at Ōkāreka - Easier access machinery - Only 1000 litres - Community acceptable
Consideration of Disposal – Local Treatment Plant	
<ul style="list-style-type: none"> - Culturally more acceptable - Does not remove effluent out of the catchment - Cost is prohibitive, nearly twice - Would require local Maintenance Contract to operate - Requires a local site and disposal are - Required resource consent - Add considerable time to proceed – 2-3 years 	
Consideration of pipeline route – Playnes Farm	Consideration of Pipeline Route – Tarawera Road
<ul style="list-style-type: none"> - Culturally less preferred – significant sites - Cost difference \$2.2M - less expensive but many costs not included - Costs of legal and access agreements unknown - Cost of infrastructure not known – roading - Geotech investigation and cost unknown - Access agreement or lease of land unknown 	<ul style="list-style-type: none"> - Culturally acceptable -road already there - owned by Council - Known alignment - Easier to work for machinery - Better long-term security - No cost of access or land agreements

The preferred option subsequent to discussion and careful consideration being as follows:

- (i) That the Tarawera Sewerage Steering Group strongly supports the onsite LPGP systems for each property at Lake Tarawera based on the cultural, physical, technical aspects. (Unanimous decision)
- (ii) that the Tarawera Sewerage Steering Group agreed that the best practicable option on balanced deals with Iwi issues and affordability for the connection to lake Ōkāreka is via Tarawera Road. (Unanimous decision)
- (iii) The Tarawera Sewerage Steering Group does not believe that OSET is a viable option for the community given that 170 properties will not be able to comply, there is considerable on-going cost and there will be limitations to several sections on the operation of an onsite scheme.

A public meeting was held at Tarawera on 20 October 2018 with over 100 people attending. The community resolved unanimously to support grinder pump and the road connection back to Ōkāreka.

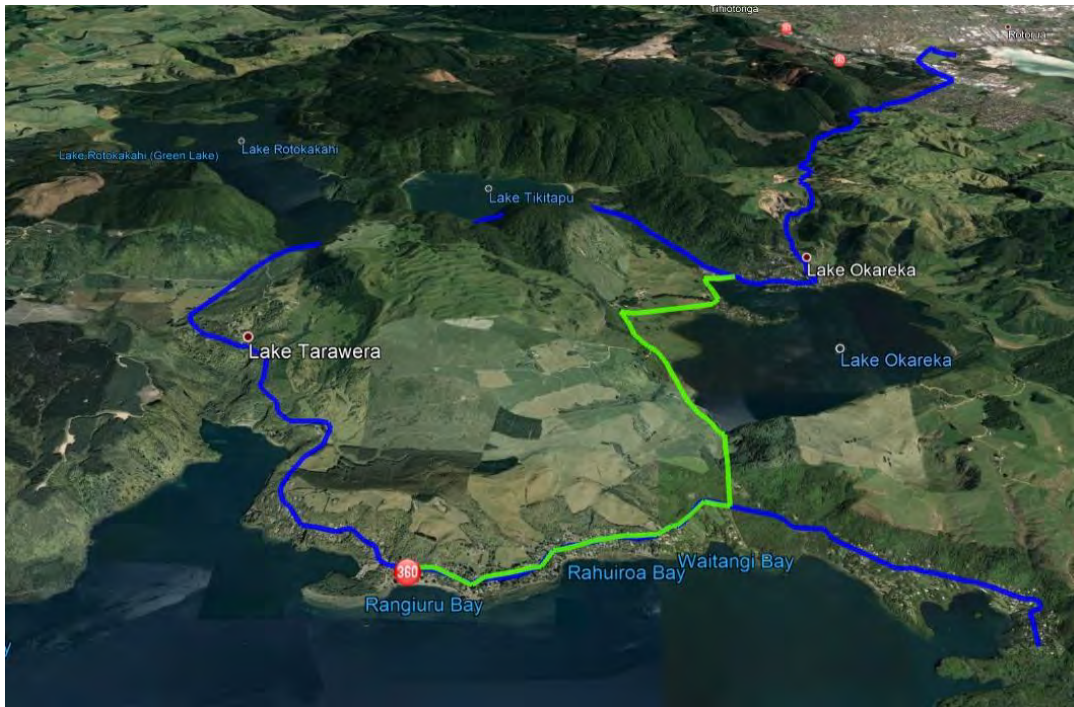


Figure 6. Indicative pipeline routes

Note:

- 1) If the preferred option is to connect to the existing Ōkāreka Wastewater system, resource consents will not be required.
- 2) If the preferred option is to establish a Wastewater Treatment Plant and Land Disposal System within the area, then resource consents will be required for the construction and operation of the plant.

Regardless of the system to be implemented, there will be considerable earthworks in areas of cultural significance to the Collective. It is presumed these works will involve site evaluation, geotechnical testing, excavation, directional drilling, and pipeline installation with the construction of pump stations. There is potential for the discovery of sites of cultural and historical significance, tāonga tuturu (ancient/ traditional artefacts of value) or koiwi (bones/human remains) around all areas of the proposed earthworks. If mana whenua and iwi are adequately resourced and embedded in the key areas of the project, there is the utmost confidence that all aspects of the scheme can be implemented without significant cultural offence and/or cultural harm.

At the forefront of our minds must always be to improve and protect the water quality of Lake Tarawera. The system eventually assessed as appropriate by the Committee, will enable Mana Whenua aspirations to return to and potentially develop their traditional and ancestral lands. In time this will be reflected in housing growth and the development within the community.

2.4 Funding

The options have been broadly costed and range from \$15m to \$18m. This translates into a cost per property of approx. \$40k. Subsidies have been received from the Rotorua Lakes Council of \$1,500 per property and \$6.5m from the Freshwater Fund administered by Ministry for Environment. Payment options will be advised once a preferred treatment options has been settled and grants and subsidies are confirmed.

Timeframe objectives

1. Once the Cultural Impact Assessment (CIA) is completed, the committee will revise property cost estimates.
2. Engage with RLC and BOPRC to ensure the Lake Tarawera scheme is included in their respective Long-Term Plans.
3. Decide on a preferred option and recommend it to the community and to RLC.
4. In a position to construct the preferred option from 2020 onwards.

Considerations

- The proposed options are costly and need to be environmentally sustainable well as help towards reducing N and P in the lake.
- The committee wants to identify a preferred option, after it has considered a cultural impact assessment (CIA) on the five options.
- This Cultural Impacts Assessment has been carried out by the Te Arawa Lakes Trust.

2.5 The role of the Cultural Impact Assessment

The role of the CIA is to inform, guide and provide recommendations to the RLC based on the cultural position of the Collective regarding the preferred Lake Tarawera Sewerage Reticulation Scheme.

Consequently, this second CIA aims to guide all activity within the limits of the Resource Management Act 1991 having particular regard for Part 2 Sections 6, 7, 8 and is applicable over the full lifecycle of the option or options that may eventually be agreed upon.

In this context its objectives are:

- To convey Mana Whenua expectations.
- To ensure where practicable solutions are aligned with Mana Whenua expectations.
- To highlight cultural sensitivities and potential issues.
- To ensure cultural aspects are adequately considered with all activity.
- To provide guidelines that ensures works are carried out in a culturally acceptable manner.
- To avoid unnecessary cultural impacts in relation to affected Mana Whenua and Iwi.
- Where impacts are unavoidable, provide an agreed means to ensure activity is carried out in a way that minimises cultural impact.
- To minimise potential for cultural offence.

The document will examine actual and potential effects of the proposed activities on physical sites of significance, cultural values and tangata whenua relationships with its natural resources. It will guide RLC on key cultural issues and act as a tool for activities relating to planning, implementation, operation and management over all aspects and stages of development and within the full lifecycle of the scheme.

Mana Whenua aim to ensure its cultural position, as represented within the TSSC forum, is not undervalued, misinterpreted or unduly compromised in its implementation relating to the preferred scheme.

3.0 MANA WHENUA OF TARAWERA CULTURAL VALUES

3.1 Historic Context for Mana Whenua

Mana Whenua and Settlement Entities

This Cultural Impact Assessment is to be read in conjunction with the first Cultural Impact Assessment for Tarawera Wastewater Treatment Plant October 2017. Under Part 1 Preface of the preceding document, Tangata Whenua are named as being represented by:

- Te Arawa Lakes Trust
- Tūhourangi
- Ngāti Rāngitihī
- Rotomahana Parekarangi No. 6 Block owners
- Ruawahia 2B

It is acknowledged and recognised that the above-named entities excluding the Rotomahana Parekarangi 6 Block owners have interests and Statutory Acknowledgements associated with the Lake Tarawera Catchment and are named as Tangata Whenua. The Roto-Pare 6 Block owners will herein be regarded as Mana Whenua.

The residential developments built since the early 1900's and the associated problems with wastewater reticulation has occurred primarily on land previously known as Rotomahana Parekarangi No. 6 from the Native Land Court hearings of 1882 and the re-hearing of 1887.

Ngāti Rangitihī has significant interests in the Tarawera area.

Ngāti Rangitihī is currently completing its Treaty Settlement with the Crown. It has signed an Agreement in Principle with the Crown and will soon initial a Deed of Settlement. Should the Deed be ratified by our Iwi we will be able to describe the many sites of cultural significance that will be awarded to Ngāti Rangitihī around lakes Tarawera and Rotomahana.

These sites will define our interests and responsibilities for restoring and sustaining the Mauri of this special part of our rohe." - Leith Comer Chairman Te Mana o Ngāti Rangitihī Trust.

Kaitiakitanga of our natural environment

The significant waterways of importance to Mana Whenua lakes, rivers, streams and wetlands are important cultural taonga for the Hapū of Mana Whenua. Our responsibilities as 'kaitiaki' are inter-woven with the natural environment including our sacred rivers and

maunga (mountains); this is the expression of the Treaty of Waitangi principle of Tino Rangatiratanga. The right of tangata whenua to take part in managing freshwater resources is formally recognised and legislated in the Resource Management Act (1991), in Sections 5, 6(e), 7(a), and 8.

Customary Land Use

In the traditional Māori world view, everything in the natural world possessed a mauri or life force. A kinship existed between all elements of the natural world of which people, land and fisheries were part of a holistic order. This view of the world was reflected in the way Māori managed all their natural resources. The early settlers of Roto-Pare land maintained their rights to the land by way of continuous occupation (Ahi Kaa)² The most visible signs of their mana were their settlements and cultivation sites and their activities ranged from hunting and gathering to extensive horticulture.³

Māori used land to uphold customary obligations within and between whānau, hapū and iwi, the fulfilment of these duties depending on them safeguarding the land and its resources by means of a system of practical rules, checks and balances to manage these vital assets.

Tūhourangi Tribal Area of Interest

The Tūhourangi tribal boundaries and sites of cultural significance are vast and to get an idea of the scale of the area, mountain landmarks will be used in this instance, for immediate identification.

They are Moerangi, forming the northern boundary and encompassing the Whakarewarewa forest. Haparangi and the Horohoro bluffs and further west to the Waikato River, the northern flanks of the Paeroa ranges then south to Kakaramea or Rainbow Mountain and the eastern identity of Ruawāhia, more commonly referred to as Mount Tarawera. It must also be noted that the Tūhourangi boundaries are not exclusively within these identifiable landmarks as Hapū of Tūhourangi also reside in the Te Puke area.

The history of the Tūhourangi people and where they lived throughout the Rohe of Te Arawa is rich and varied and more often than not involves times of significant warfare but also of alliances, marriages and peace. Tūhourangi hapū can trace their occupation of Tarawera and the surrounding lakes to a specific moment of history. That being the murder of Umukaria, the father of our famous ancestress Hinemoa.

During the 1700s the Tūhourangi Tribe settled the shores of Lake Tarawera sharing their occupation with Ngāti Rangitihī. Two chiefs of this period were Tionga of Ngāti Rangitihī and Te Rangikatukua of Tūhourangi. The normal fighting formation adopted by Tūhourangi during battle was the wedge or arrow formation at the point of which could always be found either or both of these warriors.⁴

² Smith 1942 : 54

³ Kawharu 1977 : 37

⁴ Waaka K. 1996 Pers. Comm.

(Tūhourangi)

Ngaurumotu

|

Rangikatukua

|

Te Hurinui

|

Te Kohika

(Ngāti Rangitihi)

Mahora

|

Tionga

|

Mokonuiarangi

|

Paerau

Towards the end of the 1700s these two joined forces on a number of occasions in warfare against the Tuhoe tribe living in the Urewera ranges

Te Rangipuawhe and Rangiheuea held authority over lakes Rotomahana and Tarawera controlling numerous cultivations, ngawha and duck snaring locations.⁵ Te Rangipuawhe owned a house called Rangaapawa situated on Te Puai island in the middle of Lake Rotomahana. Both Te Puai and Te Pukura islands were blown out of Lake Rotomahana during the Tarawera eruption of 1886 killing all the inhabitants.⁶

Ngaurumotu

|

Hinepapa

|

Te Rangikaingahuhu

|

Nawaina

|

Te Rangipuawhe

Ngaurumotu

|

Hinepapa

|

Rauotehuia

|

Rangiheuea

Tūhourangi and Ngāti Rangitihi continued to live in close proximity on the shores of Lakes Tarawera and Rotomahana, but the close camaraderie shared by their forebears was not to last. During the early 1800s, both tribes clashed in battle at Kauaehapa at the foot of the Tarawera mountain.⁷

⁵ RMB 31 1894 : 213

⁶ RMB 31 1894 : 233

⁷ RMB 31 1894 : 218

The hapū of Tūhourangi spread themselves over the whole of the Roto-Pare area with major pa sites in all of the strategic locations. Fortified pa were the scene of many battles that raged between Tūhourangi and their neighbours Ngāti Rangitihi. Once they secured mana over this block Tūhourangi faced minor intrusions and challenges from their traditional rivals Ngāti Whakaue. These battles had significant cultural value relating to the concept of 'whenua toto'. (When blood was spilt on the land it imbued it with the mana and memory of those who had been killed there).⁸ Thus pa and other sites were often regarded as wāhi tapu (places of spiritual/cultural value). Other wāhi tapu included traditional urupa and burial caves, tuahu (altars) and historic places (e.g., landing places and boundary markers of the original explorers).

Tūhourangi set up Motutawa Island as their principal pa in memory of their previous homeland at Mourea called Motutawa. It was here, according to Taupopoki,⁹ that Tūhourangi enacted their laws, conducted their political meetings and defended their occupancy rights and mana. On a domestic level Motutawa was surrounded by the food rich Rotokakahi lake while the nearby lakes and forests were also abundant with food and raw materials.

European Contact

Prior to the arrival of the first European at Tarawera in the 1840s the main activities here had been kumara cultivation, the gathering of aruhe (fern root), fishing and duck snaring.¹⁰ Christianity arrived in 1844 with the reverend Seymore Spencer setting up an Anglican mission at Whareroa. He encouraged Tūhourangi to familiarise themselves with the agricultural and horticultural techniques of the Pakeha. The 1850s saw an outbreak of an influenza epidemic in the central Bay of Plenty causing widespread suffering and loss of life especially among children.

At this time Ngāti Rangitihi set up flax trading industries to take advantage of the growing demand for flax by European traders. One such trader, Abraham Warbrick, arrived at Rotomahana in the early 1850s and was given a piece of land at Rotomahana by the Ngāti Rangitihi chief, Paerau, on which to set up a trading station. The Tūhourangi Chief Rangiheuea disputed Ngāti Rangitihi's rights to this land. Warbrick was assaulted, his house destroyed and he was evicted.¹¹ Paerau was incensed at this action and challenged Rangiheuea to a battle over the rights to Rotomahana. Warfare continued between these two former allies until 1855 and during this time no one lived outside the main fighting pas. Peace was finally sealed between the two tribes in 1855 and two years later, a lockspit was made in the ground near the mouth of the Tarawera river. This was a small trench dug along a survey line and was a sign that peace had been made over the land.¹²

⁸ Kawharu 1977 : 47

⁹ RMB 13 1887 : 96

¹⁰ RMB 13 1887 : 100

¹¹ RMB 31 1894 : 212-24

¹² RMB 13 1887 : 123-25

Pink and White Terraces

For many generations the people of Tarawera and Rotomahana enjoyed sole occupation and use of the waters issuing forth from the pink and white terraces. With the arrival of Europeans word started to spread to the outside world of the unsurpassed geothermal spectacle on the shores of Lake Rotomahana and was regarded at the time as the eighth wonder of the world. Almost overnight they inherited a commercial enterprise so lucrative that less than a decade later, they were being hailed as the most affluent tribe in the country.¹³

On one side of the lake lay seven and a half acres of white silicate terrace formed by the cascading waters of the Te Tarata geyser. On the other side lay a five-and-a-half-acre expanse of indescribable beauty known as the Pink Terraces, the smooth steps of which had been formed over the years by the waters of the Otukapuarangi geyser.¹⁴

Tūhourangi, under their chiefs Rangiheuea and Rangipuawhe, held complete authority over Tarawera, Rotomahana and the terraces controlling both the tourist traffic and the accompanying recompense.¹⁵ The young men of Tūhourangi were rostered on the whale boats used to ferry tourists across Lake Tarawera while guiding duties were carried out by certain women of the tribe. From guiding and boat fees alone, it is estimated that the tribe had an annual income of 6000 pounds.¹⁶ The Te Wairoa village was developing as the main Tarawera settlement to service the tourist industry. By the 1880s there were two hotels, a schoolhouse, a flour mill and a bakery operating here. So affluent were the people of Te Wairoa during this period that the eyes of the carved figures on the meeting house Hinemihi were made of gold sovereigns.¹⁷

On 9 November 1887 Tūhourangi asked the court to divide No. 6 into 18 separate sections (6A to 6S with no 6I to be distributed among 18 already defined groups. The Court agreed and on 11 November 1887, a schedule of subdivisions was issued to Tūhourangi.

These No. 6 blocks are named in alphabetical order along with their traditional names and the Mana Whenua hapū who lived on the shores of Ōkāreka, Tikitapu, Rotokakahi, Tarawera and Rotomahana prior to the eruption of Wahanga, Ruawahia, Tarawera and Rotomahana:

- 6B - Maungarawhiri, Ngāti Uruhina

¹³ Kuru Waaka 1996 Pers. Comms.

¹⁴ Denman 1968 : 16

¹⁵ RMB 13 1887 : 100

¹⁶ Denman 1968 : 16

¹⁷ Ibid

- 6C - Ohorongo, Nga Hapū o Tūhourangi
- 6D - Ōkāreka, Ngāti Uruhina, Umararoa, Te Anumatao
- 6E - Te Marua/Opawhero/Ōkāreka, Nga Hapū o Tūhourangi
- 6F - Waitangi, Nga Hapū o Tūhourangi
- 6G - Tokiniho, Nga Hapū o Tūhourangi
- 6H - Tokiniho/Tikitapu, Ngāti Umukaria
- 6J - Te Wairoa/Karikaria, Hinemihi, Ngai Tawake
- 6K - Te Wairoa/Otupoto, Hinemihi, Ngai Tuohonoa
- 6L – Moerangi, Nga Hapū o Tūhourangi
- 6N - Te Kumete, Ngāti Umukaria, Taoi, Wahiao, Tuohonoa
- 6O - Matakana, Nga Hapū o Tūhourangi
- 6P - Wairua, Ngāti Huarere, Tukiterangi
- 6Q - Te Ariki, Nga Hapū o Tūhourangi, Ngāti Rangitihī

The history on the alienation of Tūhourangi land will not be included in this report. However, residents of Tarawera now enjoy their idyllic setting as a result of dubious Crown purchasing of individualised shareholdings, survey liens and other Māori land alienations practices including but not limited to the Public Works Act.

Hinemihi

By the middle of the 19th century Anglican, Roman Catholic and Wesleyan missionaries from Europe and North America had begun turning the Māori into God-fearing Christians. In 1852 the Revd. Seymour Mills Spencer, an American-born Anglican minister, established a mission station in Te Wairoa. His wooden Te Mu Mission church was built next to his parsonage on the brow of a hill overlooking the settlement.¹⁸

Spencer also began changing the outward appearance of things at Te Wairoa. He encouraged local Māori to construct fences around their homes, creating English-style gardens with vegetable plots, flowers and trees. They built narrow roads and pathways connecting properties to each other and to the church.¹⁹

Eventually the settlement began to resemble a conventional English village, with local children attending a native school, a mill producing flour from locally grown grain and the first foreign visitors arriving asking to be taken on boat rides to see coloured formations they had

¹⁸ Gallop, A. (1998); *The House with The Golden Eyes*: Pg 19

¹⁹ Ibid

heard about from others passing this way. Few knew it then, but the tourism boom had begun.²⁰

Te Wairoa

With the establishment of a village at Te Wairoa so too were the many European entrepreneurs who came to Te Wairoa to take advantage of the close proximity to the Pink and White Terraces building hotels (Rotomahana Hotel, Terrace Hotel, Temperance Hall, a school, 3 shops, houses, a flour mill, Te Mu Mission Church and a Hall. “And by 1880 Te Wairoa was home to over 100 members of the Ngāti Hinemihi/Tūhourangi whānau.”²¹

Aporo Te Wharekaniwha: Pink and White Terraces

Everyone from Mark Twain, Anthony Trollop and other eminent Victorian commentators fell over themselves to describe these lost marvels of natural architecture.²²

The white terrace Te Tarata (tattooed rock) was located at the north east corner of the lake covering some 3 hectares, crowning it was a large boiling geyser with emptying and refilling action. The pink Terrace known as Otukapuarangi (cloudy atmosphere) appeared as about 50 large stairs, tinted in tons of rose, pink and salmon. Rising to a height of 40 metres, 120 feet, above the lake, they covered an area of 2.2 hectares, 5 1/2 acres. The unusual colours were believed to have been caused by ferric ion oxides contained in the water. The warm, clear blue waters running down the terraces invited visitors to take a dip or simply relax and gaze across to the majestic of Mount Tarawera rising out of the water on the far side.

Aporo Te Wharekaniwha was the chief of his people Ngāti Hinemihi a sub tribe of Tūhourangi. It was his idea to create a special place at Te Wairoa allowing tourist to get a first-hand view of Māori culture that had been permitted before, at the same time providing his people with a hall for private events and a place where community matters could be debated.

What Aporo had in mind was something on a more grander scale designed to make a visit to Te Wairoa every bit as memorable as a trip to the pink and white terraces a place where Māori and for “a price’ pakeha could visit which would stand for generations as a carved memorial to his family and himself and an ancient and respected ancestor from long ago called Hinemihi, and in the spring of 1880 he set about constructing the whare.

A wharenuī is a meeting house. It is a spiritual symbol of nobility, a living link with the past and a reminder that life goes on after death and usually bears the name of the heroic tribal ancestral chief.

²⁰ Ibid

²¹ Ibid; Pgs. 20/21

²² Ibid; Pg. 12

A meeting house is also architectural, artistic and cultural expression of the people who built it and a powerful statement about their identity.

Part of the problem, at least during 1880, lay in the division of the Te Wairoa people; the Tūhourangi occupying the western half of Te Wairoa village, running back towards Lake Rotokakahi, and the Ngāti Hinemihi holding the major and eastern portion, which included the land running down to Lake Tarawera, and thus the embarkation point for the terraces.²³

At the beginning of September, 1880 Ngāti Hinemihi erected a toll-gate leading from the village to Lake Tarawera charging a fee of 2 pounds per head. Dissention between Ngāti Hinemihi and Tūhourangi ensued thereby causing upheaval within the community. With the aide of Robert Graham and Wi Maihi Te Rangikaheke a deal was brokered with the two tribes coming to an agreement that the toll-gate be demolished and a set charge be placed on all tourists.

Hinemihi Te Ao Tawhito: The Great Ancestress

Te Wairoa was where New Zealand's Tourism began in the middle years of the 19th century, so becoming NZ number 1 tourism resort, and in the centre of this busy hub would stand a magnificent single story carved native building in which visitors would pay to watch performances of traditional Māori songs and dances. It would be the most photographed building in town, the oldest and most famous. Aporo Te Wharekaniwha named her after a famous ancestress Hinemihi o Te Ao Tawhito - Hinemihi of the old world. Hinemihi was a noted female chief who lived in the Hot Lakes area in pre-European times, some 250 years before the tourism invasion. She was a descendant of Ngatoroirangi, priest of the Te Arawa canoe which brought the original members of the tribe to Aotearoa during the great migration over 1000 years previously.²⁴

Few meeting houses bear female names, but Hinemihi was obviously an exceptional woman of high rank, famous for having at least three husbands and keeping a giant lizard, or taniwha, named Kataore, as a domestic pet. Stories about Kataore, sometimes described as half man-half fish and with an appetite for human beings, frequently appear in Māori legends.²⁵

Carvers

Aporo hired two of the area's best known and respected artisans, Wero Toroi and Tene Waitere.

²³ Stafford, D.M. 1986; *The Founding Years in Rotorua*: pg. 242

²⁴ Gallop, A. 1998; *The House With the Golden Eyes*. Pg. 27

²⁵ Ibid, pg. 36

By the time Aporo was planning Hinemihi, Wero was nearly 80 years old. He was born in Okataina and grew up among canoe builders and carvers from the famed Ngāti Tararawai hapū, a subtribe of the Te Arawa people. Assisting the old master carver with the carving of Hinemihi was a young former pupil of the carving school, 23-year-old pupil Tene Waitere. Aporo paid Wero and Tene for their work 'by the square foot' - an agreed sum of money for every twelve inches of carving produced by the old craftsman and his young protégé. Each carving was crafted from a single block of wood. At no time was any piece joined with another to form a single carved unit. The carvings were a visual way for Aporo's tribal history to be passed on to future generations and for people with no written skills to understand their origins.²⁶

Work on Hinemihi was completed in March 1881. On the morning of 10 June 1886, Hinemihi was to play a pivotal role in the survival of 62 people. Due primarily to the traditional methods of construction, Hinemihi stood fast and it was here that Māori and Pakeha survived that most dreadful night.

²⁶ Ibid, pg. 28/9

3.2 Te Tūāpapa o ngā Wai

Te whakapapa o te wai describes the relationship between Te Arawa and ngā wai o Te Arawa; in this case Tarawera and the waters associated with the Lakes. The values associated with this relationship are then outlined and the alignment with the wellbeing of the lakes. This relationship requires that these values are upheld, and the mauri of the lakes and people are interconnected.

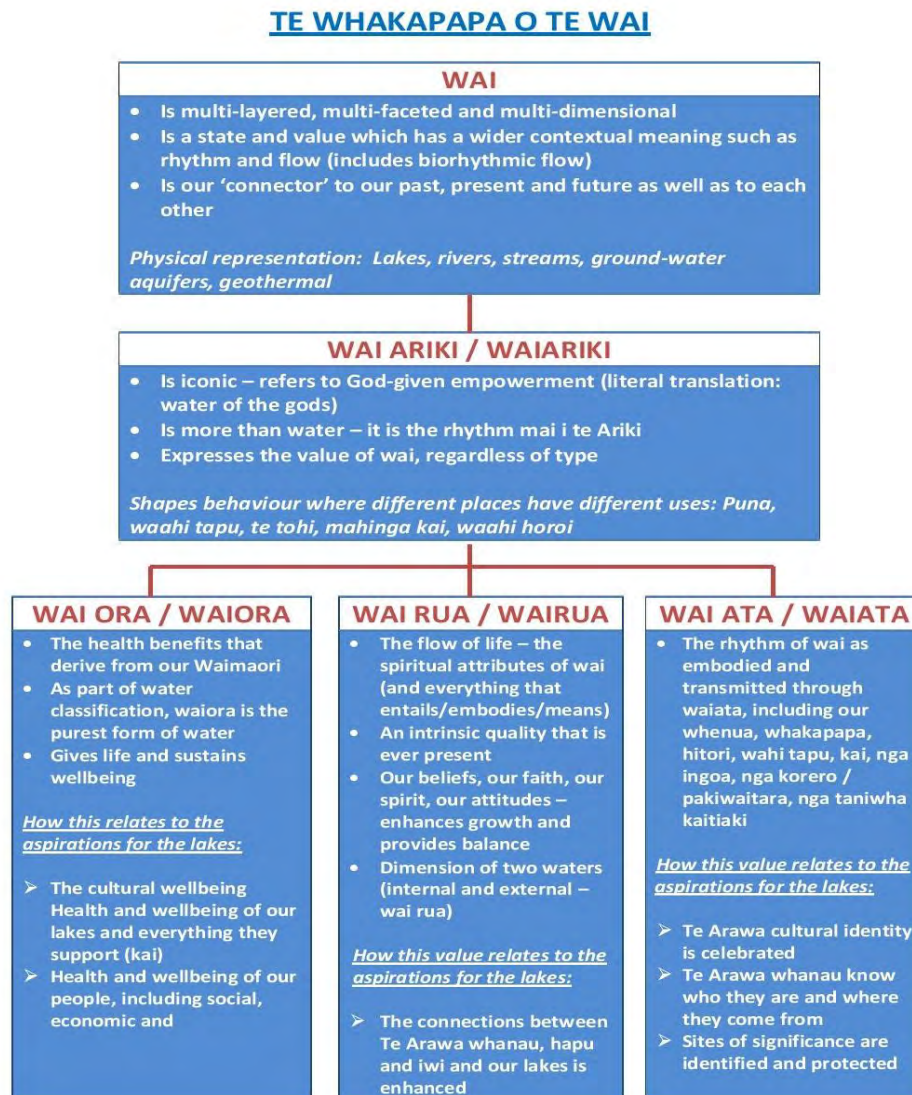


Figure 7. Te Whakapapa o Te Wai (Te Arawa Lakes Trust, 2017)

TE ARAWA LAKES TRUST - PRINCIPLES

Te Tūāpapa o ngā Wai o Te Arawa sets the Principles which decision makers will need to be aligning to with regard to the Te Arawa/Rotorua Lakes.

1. Value the role that Te Arawa has to play - Te Arawa has a long standing physical and spiritual connection to the Te Arawa lakes since settling in the rohe. Example of this Principle in Action – Projects incorporating Mātauranga Māori.
2. Value Te Ao Māori - The Māori world view, culture and values are a core element of what it means to be Te Arawa. An example of this Principle in Action is the use of Mātauranga-based tools to measure and monitor the health of the lakes.

These Principles can be specifically articulated as a core set of values as outlined below. They are **are multi-dimensional in meaning and application and are interrelated and affect each other.**

<p>Kaitiakitanga (sustainable protection of taonga- resources)</p>	<p>Ensures the current and future care, conservation, protection and maintenance of relationships with the taonga as well as the use of resources through responsible actions, behaviour, conduct and practices. An active approach ensures the ability to interact with the resources in a manner that is beneficial to both the resources and the welfare of the people. Example: Participating at all levels of resource management; technical, management, governance, application, education.</p> <p>Is the collation and transfer of knowledge (Mātauranga) between generations and across hapū and whānau. Focuses on specific area of interest and traditional practice(s).</p>
<p>Mana Whenua/Mana Whakahaere</p>	<p>Whānau/hapū/iwi determination of resources. Recognition through ancestral right by lands and waters occupied (includes seasonal use). Influential and primary principle in terms of where you belong, where you count, where you are important, and where you can contribute. They are essential for Te Arawa well-being.</p>
<p>Manaakitanga</p>	<p>Contribution, hospitality, mutual respect, support, encourage, generosity, enhancement and maintenance of integrity). The ability to care and provide support is integral to working together to achieve aspirations while maintaining the integrity and upholding the mana of others. Example: Hakari: a celebratory dinner of banquet proportions</p>

	after a significant event recognizes and acknowledges the importance of the event and those who participated.
Mauri	Essence, life giving - encapsulates vitality and liveliness and has the ability to attract and deter, as well as be maintained, enhanced and diminished, purely through one's actions, behaviour and conduct. Example: original state of wellbeing for the lakes is diminishing, therefore what ability and added value can we give for it to continue to exist and revitalize.
Orangatanga	State of Wellbeing, health - to be in good health and vigour is to essentially have balance and sustenance to perform the correct functions for livelihood and continued existence. Example: continued lack of nutrients or too much nutrients can cause imbalance and subsequent changes in original state.
RaNgātiratanga	Leadership, guidance, direction, integrity, honesty. Recognition and implementation of values and attributes that build long lasting foundations and can be exercised in a way that has mutual benefit, respect and purpose for all people, now and in the future.
Tikanga	Being responsible for the safety and wellbeing of ourselves and others. Provides for a process and guidelines of what is deemed appropriate for that particular occasion.
Wairuatanga	Spiritual- recognition, acknowledgement and belief that spiritual links exist between people, places and purpose. It is an acknowledgement of the relationship with people to their maunga, awa, moana, marae, tūpuna and atua. Example: Karakia (prayer) conducted and received for gratitude, knowledge, thanks and good intentions.
Whakapapa	Genealogy - maintaining ancestral links between Te Arawa, whenua/moana, atua and acknowledges and defines the relationships and connectedness with the physical and spiritual elements when analysing and synthesising information and knowledge. Example: Te Arawa Lakes Settlement Act 2006- acknowledges the traditional, spiritual, cultural and economic importance and of the Te Arawa lakes and its resources (taonga) to Te Arawa.
Whānaungatanga	Relationships, Inter-relationships. Underlying principle that binds whānau, hapū and iwi and affirms the values of the collective. Examples: formal protocols, integrated management committees, which may be established, maintained, encouraged, enhanced and sustained for the betterment of people, places and purpose.

Figure 8 Te Arawa Lakes Trust – Lakes Structure Policy 2017

CULTURAL ACTIVITIES UNDERTAKEN ON THE ROTORUA TE ARAWA LAKES

Pa sites	<p>Pa are fortified villages. Many pa sites still exist around the shores of the Rotorua Te Arawa lakes and all are archaeological sites identified by the NZ Archaeological Association (NZAA) on their Archsite website. All archaeological sites recorded or unrecorded are protected by the Historic Places Act.</p>
Wāhi tapu	<p>Wāhi tapu are scared sites. Not all wāhi tapu are archaeological sites. Some natural features around the lake shores, such as kohatu (rocks), repo (swamps), ana (caves), puna (springs), ngawha (hot pools), motu (islands) are regarded as wāhi tapu by various hapū for many different reasons, for example, Iriirikapua, Te Kuri a Te Roi, Motutara, Te Rua o Umukaria, Te Ana o Tunohopū. Most of the above natural features have, at some time in local Māori history, been associated with death, burials, or battles, taniwha, or blood spillage.</p> <p>Over centuries and fluctuating lake levels, many of these wāhi tapu may now be above or below a lake surface or margin.</p> <p>The Historic Places Act defines wāhi tapu as "places sacred to Māori in the traditional, spiritual, religious, ritual or mythological sense": a very broad definition that encompasses all sites significant to Māori. There are very few sites in the Te Arawa region that are registered with the NZ Historic Places Trust as wāhi tapu. Many, however, are listed on the ROC's District Plan</p>
Mahinga kai	<p>Mahinga kai are traditional food gathering or collection areas. Te Arawa Lakes (Fisheries) Regulations 2006 sees the return of management of customary non-commercial fishing to Te Arawa. The fisheries regulations provide for kaitiakitanga, establishment of Komiti</p> <p>Whakahaere (Fisheries Committee) and the development of the Mahere Whakahaere (fisheries plans) for Te Arawa's five taonga species, koura, koaro, kākahi (freshwater mussel), tuna (eel), and inānga, including morihana (carp). Traditional species of fish and shellfish are still gathered at certain times of the year from most lakes.</p> <p>Some lakes were more renowned than others for their abundance of koura, inānga, kākahi, morihana, toitoi (bully), or tuna. Other native species have disappeared since the introduction of trout. Traditional methods of gathering these native species are still used. The materials used to make the traditional snare or net device may have changed but the methods used to make the catch are the same.</p> <p>Koura is probably the most desired of all the traditional food sources. Koura is often referred to as a "kinaki"; a delicacy to add relish to a</p>

	<p>feast. Most of the lakes and streams in the Te Arawa district have koura. The traditional tau or koura trap is still used as well as the "rama koura" method. Rama koura is where a gatherer will use a lamp/torch and walk along shallow lake edges at night when the koura come into the shallow waters to feed during the late spring and summer months. The gatherers catch them either in their hands or with a korapa (long handled scoop net). In areas where there is a high density of lakes structures, this practise is almost impossible</p>
<p>Mahinga raranga/whatu</p>	<p>Mahinga raranga/whatu are traditional plant gathering places. Harvesting of traditional resource plant materials from many lakes is still practised, but not as often as it once was.</p> <p>Harvest is mainly for weavers of traditional Māori garments, artefacts and art works, who gather harakeke, raupo, toetoe, paopao, and paru from traditional harvesting places around the lake edges. Weavers of traditional garments, mats, and kits will gather plant materials from their own lake resource areas first. If there are none they will go to the lake of a related iwi/hapū. Lists are provided of the tribes which belonged to each lake. This custom also relates to traditional foods. The two plants that grow best in the lakes are paopao (also known as kuta) and raupo. The deeper the water where these plants grow, the longer the whenu (weft and warp strips) that weavers can work with. Both raupo and kuta once grew prolifically around all the lakes in the district and would have helped to filter nutrients out of the water.</p>

Figure 9 Te Arawa Lakes Trust – Lakes Structure Policy 2017

3.3 Tarawera framework

The purpose of the development and presentation of the CIA phase 2 has been to allow mana whenua who maybe potentially affected by the establishment of a Tarawera wastewater treatment system to:

1. Establish a relationship with the Bay of Plenty Regional Council, Rotorua Lakes Council, the Tarawera Ratepayers Association and the TSSC.
2. Understand the activity and the proposed options.
3. Identify and articulate the relationships with taonga.
4. Identify the effects of the proposed activity and options on mana whenua through a values-based framework.
5. Assess the impact of the effects identified and any associated risks.
6. Assess where possible whether and how these can be avoided, remedied or mitigated.
7. Frame recommendations on the preferred measures mana whenua would like local authorities to consider mitigating the adverse effects.
8. Report back to mana whenua on the results of the cultural impacts assessment.
9. Present findings to the local authority

Note – through this process the maintenance of an ongoing relationship should be continued as good practice and valuable to all parties.

The CIA Analysis Framework

Information was gathered through the workshops held with a cultural advisory panel (representing mana whenua and iwi organisations), individual interviews with Māori landowners and hui-a-iwi. Technical information was provided by an independent engineer.

From the first Cultural Impacts Assessment Phase 1, four priority areas were considered:

- The quality of the water at Lake Tarawera
- Te hokinga mai ki Tarawera - The Return Home
- Tikanga
- Sites of Significance

In addition to the above, through the engagement process in the development of this Cultural Impacts Assessment Phase 2, the following key areas were also considered:

- Protecting Papatuanuku
- Working with Council

Participants were asked to consider the cultural impacts including issues and opportunities with regards to the above key areas of the proposed options, the status quo and provide mitigations or remedies.

The Cultural Assessment matrix (appendix 1) was constructed to

1. Address key issues as above
2. Identify potential impacts against key cultural variables
3. Provide a summary of recommendations

3.4 Statement of Key Values

Through the journey of the development of this Cultural Impacts Assessment (Phase 2), we have collected the dialogue of Mana Whenua through historical information and an interview process and identified these as the Key Values:

Kaitiakitanga

Ensures the current and future care, conservation, protection and maintenance of relationships with the taonga as well as the use of resources through responsible actions, behaviour, conduct and practices. An active approach ensures the ability to interact with the resources in a manner that is beneficial to both the resources and the welfare of the people. Example: Participating at all levels of resource management; technical, management, governance, application, education.

Is the collation and transfer of knowledge (Mātauranga) between generations and across hapū and whānau. Focuses on specific area of interest and traditional practice(s).

Tūhourangi have never relinquished their mana or sense of kaitiakitanga in the Tarawera rohe. Mana Whenua have always maintained their relationship with ancestral lands, waterways and taonga fish species. Hapū members were aggrieved upon learning of the poor wastewater disposal methods that have been allowed to continue to pollute Lake Tarawera. This has a negative impact on the ability of Mana Whenua to exercise their cultural value of kaitiaki.

Ngāti Whakaue hapū members have also expressed their sense of kaitiakitanga as it pertains to their ancestral land. Ngāpuna already receives the wastewater from the Rotorua community. The Ngāpuna lands and community is already suffering as a result and further inputs from outside of the Rotorua catchment will not be accepted by the Ngāti Whakaue hapū of Ngāpuna.

The Rotorua community has its own, current issues to deal with. The consensus is, this is an issue for the Tarawera community to resolve and pay for.

Manaakitanga

Contribution, hospitality, mutual respect, support, encourage, generosity, enhancement and maintenance of integrity). The ability to care and provide support is integral to working together to achieve aspirations while maintaining the integrity and upholding the mana of others. Example: Hakari: a celebratory dinner of banquet proportions after a significant event recognizes and acknowledges the importance of the event and those who participated.

Our ability to manaaki our visitors is being brought into question. Our families, children and visitors from all over the world are unaware the water they swim in has excessive levels of e-coli. This is a matter of national importance.

Visitors who rent book-a-batch or holiday homes must be made aware if the water they drink whilst residing at Tarawera, comes from the lake or from reticulated and appropriately treated water sources. Our manaakitanga dictates that our guests should not be unknowingly drinking water contaminated with fecal coliform and e-coli.

Mana Whenua hold proud traditions of being able to supply food for our guests. Taonga species such as Koura and tuna (including trout) are still caught and prepared for special occasions. The protection of the habitat and ecosystem in which our taonga species live and reproduce must be protected to ensure future generations are able to continue with their cultural tradition of manaakitanga.

Rangatiratanga

Leadership, guidance, direction, integrity, honesty. Recognition and implementation of values and attributes that build long lasting foundations and can be exercised in a way that has mutual benefit, respect and purpose for all people, now and in the future.

As an expression of rangatiratanga during the hui a iwi on 26 March 2019, motions were passed from attendees to emphasise Mana Whenua distaste at having to deal with degradation of their taonga. The relationship of Māori and their culture and traditions with their ancestral lands, water, sites, wāhi tapu, and other taonga:

- 1 No effluent from Tarawera be traversed back to the Rotorua catchment. It is culturally and naturally wrong to run it against the natural flow of the land/water which is out through the Tarawera river. Annie Balle, Betty Hona
- 2 Treatment plant at spot x with tangible benefits to mana whenua. Jim Schuster, Gail Lee
- 3 Papakainga development according to our tikanga out at Tarawera. Peter Mohi, Michelle Hawe

A lengthy discussion and discourse also occurred around the approximately 177 properties that require immediate attention. Abatement notices must be served on properties with a limit on the number of people who can reside in the property at any one time

The customary rights of Mana Whenua must be protected through the key value of and expression of Rangatiratanga.

Wairuatanga

Spiritual- recognition, acknowledgement and belief that spiritual links exist between people, places and purpose. It is an acknowledgement of the relationship with people to their maunga, awa, moana, marae, tūpuna and atua. Example: Karakia (prayer) conducted and received for gratitude, knowledge, thanks and good intentions.

Wai meaning water and rua meaning two. In a simple sense this means the physical and spiritual awareness of living. Spirituality is a sense of connection and knowing there is something greater than ourselves. A moral compass to guide the living and to have regard for other people and the environment in which we live.

To Māori, the physical and spiritual world are intertwined, which leads back to wai, water. Mana Whenua continue to return to their lakes within the Tarawera catchment due to a spiritual connection with the land and water, which can never be extinguished.

It is known that residents in Tarawera take their water directly from lake Tarawera. The flow of poorly treated wastewater into lake Tarawera, then taking that water again for human consumption to sustain the physical then contaminates the spiritual. All who enjoy the waters, especially throughout the summer are also unknowingly affected. The responsibility for this situation rest within the Tarawera community. The cultural value of Wairuatanga must guide the ethical stewardship and moral compass of future development.

Tau utuutu

Utu and Muru set the context for the consequences of decisions and/or actions outside of the prescribed laws. Utu is the compensation, consequence or a reciprocal exchange for some wrong-doing or non-compliance with tika and pono or tikanga and kawa.

Balance is provided for and can be restored through the practice of utu and muru. The law (tika and pono or tikanga and kawa) is known and there is transparency in the system of asserting compliance and retrieving compensation. We are all part of the same system of tikanga and kawa although our circumstances may be different.

There is also the side of reciprocity which instils a reward or positive acknowledgement for generosity, maintaining what is tika and pono or upholding tikanga and kawa. There is an expectation that everyone is required to do their part, and all will thrive when this happens.

The care for the land and for each other will mean all will be rewarded with a greater outcome.

Used in this regard, tauutuutu helps to complete the circle of mauri. Tauutuutu is the restoration of balance to the environment through the reciprocal actions of the community. The privilege of living in the shadow of Ruawahia comes with the responsibility of giving back to the land and water in a much more sustainable manner.

Our Rangatiratanga determines this journey will not be completed in isolation of each other.

3.5 Impact of Wastewater Discharge on Mana Whenua

There is consensus that the current situation, whereby the ongoing discharge of untreated wastewater from most of the properties in the Lake Tarawera catchment is unacceptable.

The negative impacts are felt by Mana Whenua and are expressed in the following ways:

- It is detrimental and harmful to the natural resources associated with the Lake. This then extends to being harmful and offensive to our people and culture.
- The mauri of the lake and the life within it is negatively impacted – the life force of the lake and environment is not in balance and therefore the mauri of the people is impacted,
- The mana of the Lake and the people who are regarded as kaitiaki is negatively impacted
- The tapu/noa relationship is negatively impacted - the ability for the Lake and environment to flourish is significantly diminished. The ability of kaitiaki to restore the balance is impacted.
- Kaitiakitanga is negatively impacted – the role of kaitiaki is diminished by the control of the discharge by others and the Lake and environment are not protected

Consequently, there is a detrimental effect on the well-being of mana whenua that is reflected alongside the diminishing well-being of the Lake.

4.0 STATUTORY AND POLICY CONTEXT

4.1 The Treaty of Waitangi

Tangata whenua interests relating to freshwater management are recognised and provided for within a statutory and planning framework, whereby decisions relating to freshwater management (including discharges to water) are made.

Application of the Treaty is implemented through established Treaty principles. The four following principles are ones most commonly applied through the work of Regional Council:

- **Active Protection**

To actively protect that which is most important to Māori. This may include their rights (including citizenship), property, treasures, special places, culture, language, relationships with another iwi and whānau, or other.

- **Tribal Authority**

Guarantees Māori the right to manage, control and enjoy their own resources and taonga in accordance with their cultural preferences.

- **Redress for past breaches**

To address past actions or omissions of the Crown that led to harmful effects for Māori.

- **Duty to Consult**

Ensuring Māori are effectively consulted on matters of importance to them.

4.2 Resource Management Act 1991

The RMA provisions include recognising and having regard for the relationship Māori have with land, water, sites of cultural significance, kaitiakitanga, iwi management plans etc. Under the RMA, engaging with Māori is required within the Regional Policy Statement (RPS) and Regional Plan development, and through resource consent processes.

Specific provisions with the RMA relevant to this activity are:

Section 2

Defining and having regards for kaitiakitanga.

Section 6 (e)

Recognising and providing for the relationship of Māori and their culture and traditions with their ancestral lands, water, sites, wāhi tapu and other taonga.

Section 7 (a)

Having particular regard for kaitiakitanga

Regional Policy Statement

The Regional Policy Statement (RPS) is prepared under the RMA and contains provisions specifically for Māori. ²⁷

Policy IW 7D	Cultivating partnerships between iwi and statutory management agencies are "essential if the sustainable management of the region's resources is to be achieved."
Policy IW 1B	Enabling development of multiple-owned Māori land?
Policy IW 2B	Recognising matters of significance to Māori
Policy IW 3B	Recognising the Treaty in the exercise of functions and powers under the Act.
Policy IW 4B	Taking into account iwi management plans.
Policy IW 5B	Avoiding adverse effects on matters of significance to Māori
Policy IW 6B	Encouraging tangata whenua to identify measures to avoid, remedy or mitigate adverse cultural effects.

Figure 10. Table of RPS Iwi Resource Management policies (BOP RC, 2014)

Resource Consent Processes

Engagement with Māori under the resource consent application process includes obligations under Sections 6(e), 6(f), 7(a), and 8 of the RMA.

²⁷ https://www.boprc.govt.nz/media/566892/operative-rps-1-october-2014_part-three-amended-19-sept-16.pdf

4.3 Other legislation

Local Government Act 2002 (LGA)

The Local Government Act 2002 gives local authorities responsibility for taking an informed and long-term approach to how decision making can benefit the economic, social, cultural and environmental well-being of Māori.

Specific provisions relevant to this activity relating to Māori under the LGA are:

Section 4

Treaty of Waitangi

Section 81

Contribution to decision making and capacity building

Section 82 (2)

Principles of consultation - processes for consulting with Māori

Section 14 (1) (D)

Building capacity

4.4 Iwi Management Plans

There are specific legislative requirements in the RMA that require decision makers to take iwi management plans into account. Hapū and iwi resource planning documents provide for tangata whenua interests to be considered in Council processes, including resource consent processes.

Ngāti Rangitahi Environmental Management Plan

NGĀ RAWA WHAKAHIRAHIRA	
Resource	Issues
Water bodies	Rivers, streams, lake beds and banks have been dramatically altered to provide for land - use.

	Water bodies are unable to support living ecosystems including fish and bird habitats.
Objectives	
<p>Preserve or restore and maintain the natural form and character of water bodies including the margins and fauna.</p> <p>The restoration and enhancement of the Tarawera River, Rangitaiki river, Lake Tarawera, Lake Rerewhakaaitu, and Lake Rotomahana. ²⁸</p>	

Figure 11. Policies for Environmental Management, Nga Rawa Whakahirahira (Ngāti Rangitihī, 2011)

He Wai - Water		
Resource	Issues	
Wai Kino - Wastewater	<p>Matters of concern to Ngāti Rangitihī include protecting the mauri of water. Ngāti Rangitihī state that mauri is the essence within water that ensures the continuation of life that dwells within it. In order for future generations to gain benefits from both the sea and freshwater, the mauri of water must not be defiled.</p> <p>Contaminants of particular concern are: Sewage and effluent discharges; rural, industrial and urban discharges; stormwater and sediment runoff; ... Mixing of wastewater with waterbodies directly maybe spiritually and culturally offensive.</p>	
Objectives	Policies	Methods
Water is avoided as a medium for transporting treated waste	The appropriate treatment of wastewater (to remove solids, changes in colour, smell, bacteria) and its discharge and penetration to land, avoiding direct discharge to rivers, lakes and the sea	<p>Waste reduction programmes.</p> <p>Trialling composting toilets in appropriate situations including public areas, rural situations remote areas with no infrastructure.</p>

²⁸ Te Mana o Ngāti Rangitihī Environmental Management Plan page 28

	<p>The minimisation of use of water to transport waste.</p> <p>The minimum standards for water quality outputs from wastewater treatment increase over time.</p> <p>Encourage and promote new technologies that utilise different mediums for treating waste (rather than water) and minimising the use of water.</p> <p>Preference for treating wastewater at source.</p>	<p>Conduct clean -up programmes.</p> <p>Work with consent authorities to ensure consent conditions relating to water quality and quantity of consent holders being adhered to through regular monitoring and response to compliance issues and complaints.</p> <p>Submissions to LTCCP, annual plan, designations and consent applications regarding wastewater treatment systems and plants.</p> <p>Work with joint -agencies to improve lake water quality in Rotorua lakes, Tarawera and Rangitaiki Rivers.²⁹</p>
--	--	---

Figure 11. Policies for Environmental Management, Hei Wai (Ngāti Rangitahi, 2011)

²⁹ Te Mana o Ngāti Rangitahi Environmental Management Plan page 30

5.0 FINDINGS and RECOMMENDATIONS

5.1 Summary

The Lake Tarawera catchment is significant to not only Mana Whenua, Tangata Whenua and the settlement entities of Te Arawa Lakes Trust, Te Mana o Ngāti Rangitihī and the Tūhourangi Tribal Authority but also to residents of Tarawera, our local community and the wider public of New Zealand and international visitors.

International tourism in Aotearoa New Zealand was first established at Te Wairoa with Tūhourangi show casing the pink and white terraces prior to the eruption of the Rotomahana lakebed. The stories of our ancestors continue to be the backbone of the wider tourism industry in Rotorua.

There are seven lakes with natural flows into Lake Tarawera and subsequently the Tarawera River. The options for consideration in this cultural impact assessment are for reticulated wastewater to flow in an unnatural direction. Our tikanga compels mana/tangata whenua to hold to the natural flows, avoiding lengthy pipelines and the possibility of infrastructure failure.

The Taupo District Council are currently experiencing an environmental disaster due to poor monitoring and placement of their sewerage reticulation infrastructure. The cost of this failure is yet to be determined in both financial and cultural terms.

Local Councils around the country are also experiencing environmental disasters due to establishing waste dumps on the banks of rivers and coastal margins. Rising sea levels and severe weather events due to global warming are highlighting decisions from previous generations that have now become a burden for current generations. It is incumbent on this generation to get our infrastructure right for future generations. This will require different thinking. The privilege of residing on the shores of Lake Tarawera also comes with the responsibility of looking after the environment.

The residents of Tarawera are not solely responsible for the current seepage and effluent discharges into Lake Tarawera. The Rotorua Lakes Council and the Bay of Plenty Regional Council must also shoulder responsibility which leads back to Central Government's powers of delegation to their local authorities.

The Onsite Effluent Treatment Regional Plan 2006 has assessed Lake Tarawera as a 'Maintenance Zone,' pending Plan Change 14. Septic tanks must be pumped out every three years. If the tank size is a good size, the pump out frequency can be reduced to four, five or six-yearly. An outlet filter must be installed. Soak holes must be replaced by a trench system. 43% of properties within the current Lake Tarawera maintenance zone are illegal with no room for an OSET upgrade. 56% of properties require significant upgrades.

This management regime is not sufficient to stop the nutrient discharge to Lake Tarawera. The Bay of Plenty Regional Council must enforce legal action immediately and both Councils must act to manage this issue until the reticulation is in place.

There is general agreement and acceptance that reticulation of wastewater is needed to mitigate the issues of nutrient discharge and e-coli to the Lake. There is concern however that the preferred option does not reflect the views and values of the mana whenua of

Tarawera. This CIA outlines those views and values and offers some insight into the matters to be addressed moving forward.

It is important that Tangata whenua maintain and exercise the right to have their say in a manner and form that is relevant to them. The history provided in this report is first and foremost to provide a more balanced outlook to the resource consenting process. The adverse environmental effects caused to their land from the past, present and into the future must be acknowledged in order to eliminate, isolate or minimize further potential environmental degradation.

At a meeting of Landowners, tribal representatives, hapū and whānau members of Tūhourangi, Ngāti Rangitahi, Ngāti Hinemihi, Ngāti Whakaue at the Millennium Hotel on Tuesday 15th October there was unanimous support for a rejection of the Steering Group preferred proposal (denoted by the Blue Line) presented on pg 27 in Fig 6. The Findings and Recommendations presented here were also supported and the report was approved by the meeting to be presented to the Project Working Group.

5.2 Findings

The following actions will support and uphold the cultural values as outlined in this CIA;

Value	Action
Kaitiakitanga	Identify and implement ways to recognise our relationships with agencies, allowing mana whenua and hapū to be represented and engaged in ongoing processes.
	Ensure we are involved in strategic decision making.
	Develop meaningful ways in how we in how we connect, articulate, monitor and report on behaviors, activities and impacts in the environment.
	Construct and utilise a conceptual framework that encompasses cultural values to understand the issues, identify appropriate tools and support responses, allowing tikanga to be addressed.
Manaakitanga	Ensure manaaki is written into council processes.
	Share this value and understanding of mutual respect with our Tarawera neighbours and demonstrate how we respect and honour their mana and this can be reciprocated
	Grow understanding about our values that protect our shared environment so that we can grow as a people and a community.
Wairuatanga	Host wananga and learning opportunities to grow understanding about our values such as wairuatanga and the connection between the spiritual and physical world, the people and the environment and their respective well-being that is contingent on maintaining in balance.
	Install relevant signage and/or symbols to increase knowledge and understanding of wairuatanga, mauri and mana of the environment.
Rangitiratanga	Include mana whenua in decision making at all levels associated with the wastewater treatment scheme; the role must be defined.
	Develop and implement a tikanga based process for consultation, communication and representation, to enable whānau and hapū to be engaged, invited and informed.
	Ensure Māori knowledge and values are incorporated in process, solution, design and implementation
	Uphold rangatiratanga and associated rights so that we can demonstrate leadership and decision making for the greatest good and highest value – that is the restoration of lake water quality for future generations.

Tau utuutu	Develop and practice better communication between mana whenua, rate payers and council, leading to better understanding about the current situation to identify shared values about the protection of the lake and the privilege and responsibilities of living there.
	Recommend local councils under the RMA consider putting a consents process in place for rate payers to ensure such effects on the environment are managed more sustainably.

5.3 Recommendations

The feedback and response provided by ngā uri o Tūhourangi me Ngāti Rangitahi have recommended:

1. Avoidance, mitigation and remedial options are assessed and implemented immediately for those properties that are currently non-compliant and are discharging to Lake Tarawera. The allowance of ongoing discharge with no action is considered a failure by Councils to uphold their role and a failure of the community to act in good faith. This could be options such as limiting the number of people living in a dwelling, if a dwelling is not used as the primary abode then the dwelling cannot be utilised, restricting access to holiday rentals and accommodation in homes not occupied by the owner. Houses cannot be sold or rented until the remediation action has taken place.
2. Rotorua Lakes Council assesses the viability of an in-catchment treatment plant in partnership with Mana Whenua. Alternative options for in-catchment treatment can be implemented in the interim.
3. Rotorua Lakes Council acknowledge the roles and responsibility of tangata whenua as kaitiaki and engage in a direct conversation with Tūhourangi, Ngāti Hinemihi and Ngāti Rangitahi on the way that this role and these responsibilities can be enabled in the ongoing management of Lake Tarawera and the surrounding lands.
4. The start-up cost of the reticulation is shared amongst the parties that have contributed to the issue. All new development in the catchment will be required to connect to the scheme; Where Marae developments and Papakainga have an alternative option that meets the same standard this will be considered.

APPENDICES

1. CIA 2 Assessment Matrix

Quality of Water at Lake Tarawera <i>'Water is paramount. It is sacred and life giving.'</i>			
Issues/opportunities	<p>Through whakapapa, waiata, karakia, cultural practices we continue the relationship with Tarawera.</p> <p>The lake is included in our whakapapa – it has mana as our ancestor.</p> <p>Wastewater and human waste diminish the mauri (life force and well-being) of our lake.</p>	<p>'Water is life, everything revolves around water, our bodies are 70% water. Without water nothing can survive. Water quality is reflective of the people that live around it. If our water degrades or becomes toxic, then it's a reflection of us, of people in society.'</p> <p>'We agree with that objective, to actually making sure that our wai is healthy, but not that the cost of our own health and well-being'</p> <p>Water quality – 'it has to be high enough to enable us to continue our cultural practices, our traditional methods of harvesting kai, and also our own sense of kaitiakitanga.'</p> <p>'From my personal experience, that lake {Tarawera} was one of the key foods suppliers. Even as a very young person I recall we used to fish for the koura and the tuna... some of the biggest tuna ever came out of Tarawera.'</p>	<p>Kaitiakitanga</p> <p>Mauri</p> <p>Tikanga</p> <p>Orangatanga</p> <p>Wairuatanga</p> <p>Mana whenua</p> <p>Whakapapa</p>

<p>Status quo</p>	<p>Concern was raised that pollution is occurring and that local/regional authorities are allowing that to continue without consequence or accountability</p> <p>Mana whenua asked why residences that were red stickered were allowed to continue to discharge and why had abatement notices not been issued.</p>	<p>‘Lake water quality is most important, so too is holding those to account that have allowed these practises to continue – residents, ratepayers, RLC, BOPRC.’</p> <p>‘If you put together as one, all the output sites that are being discharged and it was being discharged into any other lake, they would have to cease and desist immediately.’</p> <p>‘The residents have been red-stickered – why can’t they be closed down?’</p>	<p>Whānaungatanga</p>
<p>LPGP via Tarawera Road</p>	<p>Agreed this option will improve, protect water quality at Lake Tarawera</p> <p>Mana whenua confirm support for the objective to improve the health of the wai, but not at the expense of the health and well-being of the people.</p>	<p>‘This will likely affect other lakes. Where is DoC in this process? DoC has to empty and manage their toilets. Why can’t these 177 out there sort it out instead of piping? We have Tarawera river on the other side that has already been polluted.’</p> <p>‘Which is more important, getting the water clean, or the process? So long as the process doesn’t lead to getting para back into the lake’</p>	
<p>STEP via Tarawera Road</p>	<p>Agreed this option will improve, protect water quality at Lake Tarawera</p>	<p>Not all properties will be able to accommodate a STEP system due to the slope of the land and stability, available space, proximity to ground water and unsuitable soils.</p>	

<p>Local Treatment Plant</p>	<p>Agreed this option will improve, protect water quality at Lake Tarawera</p> <p>Whilst traditional Māori did not have to deal with modern, urban issues of wastewater management, current belief is that wastewater disposal directly onto land is the accepted practice. This because of Papatuanuku (earth Mother) has the power to cleanse these waters and utilise effluent nutrients to increase land fertility</p>	<p>‘Adding Tarawera discharge to the town wastewater adds to the problem, we wanted our own.’</p> <p>‘If the hapū at Tarawera make the mess it’s our fault. We make the mess we look after it’</p> <p>‘We are not talking about money, we are talking about what’s best for the whenua and our Roto’</p>	
<p>Summary</p> <p>Within the natural environment, all things of the earth have a Mauri, a life force connected to the survival of our planet/Papatuanuku. The continued discharge of water contaminated with human waste affects not only the physical part of a human being, but also the spiritual being. Residents of Tarawera currently draw their drinking water directly from Lake Tarawera which leads us back to an ethical responsibility in dealing with the discharge of poorly treated human waste directly to water. The general public are relatively unaware that during the summer months, they are enjoying recreational activities within a heightened e-coli contamination zone. All agree Tarawera must be reticulated. However, the problem was created by the residents of Tarawera and should be dealt with by the residents of Tarawera through a land treatment system based in Tarawera.</p>			

Te hokinga mai ki Tarawera - The Return Home

Mana whenua have not been home for 140 years. Colonialism and the eruption whilst having a devastating effect, has not diminished the determination to return home to Tarawera.

Issues/opportunities	<p>Tūhourangi, Ngāti Hinemihi whānau/hapū/iwi are progressing plans (at concept drawing stage) to re-establish residence and presence at Lake Tarawera, through the development of up to 3 marae (of various capacity/size).</p> <p>Up to 300 people per day onsite for events such as hui, tangi</p> <p>Papakainga built alongside proposed marae</p>	<p>‘Te Ariki was seen as a place where we could relocate some of our people. If they are going to be hunter gatherers all the time then why not have them close to that area then around by the hot water beach and those areas, where you’ve got natural environmental systems.’</p> <p>‘It’s where we belong, it’s our land. It’s a collective instinct, belonging and personal. It would be great for our people to be able to go back there, but it is expensive. We have to find a way to enable our return.’</p>	<p>Mana whenua</p> <p>Whakapapa</p> <p>Rangitiratanga</p>
Status quo	<p>Concern/interest raised about the councils plans for future development (including Playnes Farm and other pastoral land) and what impact that will have on any treatment system for Tarawera and the lake ecological environment.</p>		<p>Kaitiakitanga</p>
LPGP via Tarawera Road	<p>This is considered most practicable by the iwi organisations. Tūhourangi Tribal Authority, Te Mana o Ngāti Rangitihī and TALT, also some of the landowners not in the immediate vicinity.</p>		

	Affordability was signalled as important to some mana whenua, but not all. However, at hui-a-iwi, many shareholders from land blocks near Te Wairoa were unanimous in voting against this option.		
STEP via Tarawera Road	Reticulation is unanimously agreed	The Ōkāreka reticulation scheme is based on an LPGP system. ‘Can a STEP system be connected to an LPGP system at Ōkāreka’? No.	
Local Treatment Plant	Mana whenua have plans for the repatriation of Hinemihi (meeting house), the development of papakainga and kaumatua flats, as well as tourism and business opportunities associated with the trail and the Buried Village.	‘Having those utilities in place can only be good for Ngāti Hinemihi development. There are plans for 3 marae to go out there.’	
Summary			
<p>Tūhourangi have never forgotten their history and long association with Tarawera. It is encapsulated in the waiata we sing during family occasions and tangihanga. Waiata when sung remind us all of our history and continues to fire mana whenua ambitions to return to Tarawera and resettle their lands. This is known in cultural terms as ahi kaa or home fires.</p> <p>Mana Whenua have maintained an ongoing association with Lake Tarawera and other surrounding lakes long before the Treaty of Waitangi and land alienation for European settlement. The potential additional cost of a wastewater reticulation scheme, according to Tūhourangi is not based on cost as Tūhourangi and other hapū and Iwi connected with Lake Tarawera did not create the current dilemma.</p> <p>However, any future development or subdivision of land must have provision to enable Mana Whenua to return home unencumbered.</p>			

Tikanga

‘From Māori point of view, perspective, really trying to safeguard, protect and look after Papatuanuku

... we go for the best system’

<p>Issues/opportunities</p>	<p>The current leaking, seepage and uncontrolled discharge is offensive and unacceptable.</p> <p>Taking responsibility for the breach is not apparent. The Government must take responsibility</p>	<p><i>‘So long as we do our best to hold to the notions of tapu and noa, the best we can... It’s to keep things in balance, so that life can be sustained.’</i></p> <p><i>‘It comes back to Papatuanuku, mother earth, the way we were raised, the way we were born, the way we will die, the way we will return. Otherwise without these values, it’s a licence to pollute and destroy. If we practise these values, we are practising kaitiakitanga.’</i></p>	<p>Tikanga</p> <p>Wairuatanga</p> <p>Orangatanga</p> <p>Kaitiakitanga</p>
<p>Status quo</p>	<p>It is abhorrent for Māori that human waste is entering waterways from which drinking water is sourced, where natural resources (mahinga kai, raupo, harakeke) are traditionally gathered, and people swim.</p>	<p><i>We knew well from a very young age that you did not mix para with the needs of the living’.</i></p> <p><i>‘If you mixed para with things that went into your mouth you were attacking the wairua in the person’.</i></p>	<p>Whānaungatanga</p> <p>Kaitiakitanga</p> <p>Rangitiratanga</p>
<p>LPGP via Tarawera Road</p>	<p>Mana whenua is aware the proposed Rotorua Lakes Council treatment plan is not well supported by affected iwi, hapū</p>	<p><i>‘The transfer of human waste from ‘our’ rohe to another rohe is not acceptable.’</i></p>	

	<p>in Rotorua. There is cultural concern that we do not add to their problem.</p> <p>Concern that there are risks of infrastructure pipe failure along a significant distance that could impact on two other taonga lakes – Rotokakahi, Tikitapu.</p>		
STEP via Tarawera Road	The transfer of wastewater from one tribal rohe to another.	It is preferred that each catchment deals with its own waste, rather than constructing a 20km pipe which traverses a number of tribal lakes and boundaries	
Local Treatment Plant	<p>The development of the Rotoiti Haumingi 9B3B treatment plant was discussed at length.</p> <p>The cultural advisory committee visited the council site to see and learn about the STEP and LPGP technology; this was followed by a visit to the Rotoiti plant under development.</p> <p>Risk – An onsite treatment plant may not be appropriate due to topography and other constraints at Lake Tarawera. Risk being that contaminants end up back in the lake.</p>	<p><i>‘Preferred treatment would be land based dispersal on our site.’</i></p> <p><i>‘We would prefer to deal with it ourselves.’</i></p> <p><i>‘We do not ‘flush and forget’.</i></p> <p><i>‘Traditionally, everything went back to the land, it certainly didn’t go back to the water.’</i></p>	

Summary

Tikanga is based on ethical responsibilities and how we treat not only one another but also our natural environment. Our tikanga sets rules to prevent contamination of our physical and spiritual being that might compromise generations to come. The enjoyment of our natural resource should not be compromised by limited and virtually non-existent wastewater disposal practices.

Tarawera is a natural resource that has been and continues to be enjoyed by people from all over New Zealand and the world. Our manaakitanga therefore dictates how we should treat our guests. They should not be unwittingly and unknowingly exposed to contamination from their hosts.

The proposal to transfer waste from one tribal rohe to another does not satisfy tikanga. It is fraught with concerns over the length of the pipeline, and the potential for infrastructure failure and contamination of other pristine water bodies within the Tarawera catchment. The burden of responsibility and cost should not rest within the Rotorua catchment but must remain in the Tarawera catchment.

Sites of significance			
Issues/opportunities	<p>Wahi tapu are sites of significance that are of cultural importance. They can be areas of land, water, space that hold significance for cultural and spiritual purposes and activities. They can include: old pa sites, excavations and middens (pa tawhito) • old burial grounds and caves (ana tupapaku) • current cemeteries (urupa) • battlefields (wahi pakanga) • sacred rocks, trees or springs (nga toka, rakau tapu) • water courses, swamps, lakes and their edges (waipuna, awa, roto)</p> <p>They can be sites of archaeological importance where taonga tuku iho (e.g. whakairo, toki, hiinaki) are found.</p> <p>They can be both tangible objects and intangible (spiritual), connected by whakapapa.</p>	<p><i>'In a broad sense the whole of the Lake area and surrounding whenua is considered sacred due to the devastation and loss endured by the Tarawera eruption.'</i></p> <p><i>'Some sites may remain hidden and not revealed due to sensitivity and importance.'</i></p>	<p>Kaitiakitanga</p> <p>Wairuatanga</p> <p>Mana whenua</p> <p>Tikanga</p>
LPGP via Tarawera Road	<p>Following the existing roadway indicated no outstanding concerns regarding historical sites of significance. Most are off road, e.g. old flour mill, stone wall. Wahi tapu protocol should be developed to identify, record and protect wahi tapu.</p>	<p><i>'You've got a metre and a half, in some places 3 metres deep of mud and ash from the eruption. So, you've got room to move within that ash layer before your strike any archaeology below it. Any finds would be accidental.'</i></p>	

	<p>The wāhi tapu protocol should also make provision for accidental discovery and working on discrete sites.</p> <p>An Accidental Discovery protocol should be established prior to the commencement of earthworks and include provisions for the discovery of taonga, koiwi and sites of significance.</p>	<i>(regarding the proposed route along the road)</i>	
STEP via Tarawera Road	<p>The option to traverse Tarawera Road is not seen as a significant obstacle in terms of accidental finds of koiwi or taonga as the roadway, which was once a main walking path has been used for many generations.</p>		
Local Treatment Plant	<p>Mana Whenua pa sites are well known. Any accidental disturbances and finds can be mitigated with Mana Whenua input during the whole process.</p>		
<p>Summary</p> <p>It is estimated that 153 people died during the eruption of Mount Tarawera on the 10 June 1886. The true figure may never really be known therefore Mana Whenua regard the whole Tarawera catchment to be wahi tapu.</p> <p>Any disturbances can be mitigated through Mana Whenua practices following our kawa and tikanga through karakia. Kaitiakitanga is binding on Tangata whenua.</p>			

Protecting Papatuanuku			
Issues/opportunities	The natural flow of water is into Lake Tarawera and out through the outlet to Tarawera River to the coast.	<p><i>“Our cultural values – flow of water, ki uta ki tai – from the mountains to the sea.”</i></p> <p><i>‘We are going against the natural flow of water, the natural flow is through Te Awa o te Atua, out through Matata.’</i></p>	Tikanga Wairuatanga Orangatanga Kaitiakitanga
Status quo		<p><i>Papatuanuku doesn’t need us, we need her. If we don’t take care, look after her then we will suffer. Our ancestors lived in balance with the land, with our Atua, with Tawhirimatea, Ranginui, with the stars, maramataka, everything was in its place and in its balance, they understood their role in it.</i></p>	Whānaungatanga Kaitiakitanga Rangitiratanga Mauri
LPGP via Tarawera Road	<p>Pumping a high volume of water 26km from Lake Tarawera to Lake Rotorua, against the natural flow of water, to transport human waste goes against natural laws. It has serious impacts on Rotorua lake and upsets the ecological balance and environment.</p> <p>Piping sewage past Rotokakahi is not acceptable (Board), the risks of plant failure and discharge into sacred lakes is of concern.</p>	<p><i>“How much strain would it put on the current capability of the system now.”</i></p> <p><i>‘What is the projected population growth along the full 26km?’</i></p> <p><i>‘What’s the volume of waste going to be ... at every 5km by volume. Real figures for the current population and then the anticipated population, as per 5km stretch all the way to the Ngapuna plant? We are going into danger zones with toxicity and also capacity of proposed new upgraded wastewater treatment plant.’</i></p>	

		<p><i>'I can see huge issues along the pipeline, at the plant – it's going to end up with sub-standard treatment if it's an overloaded situation that affects all the way to the Maketu estuary.'</i></p> <p><i>'The biggest risk I see is with the pipe work – from Tarawera to Ōkāreka to Rotorua, 26km there is potential for busted pipework, fault line, slips, shifts around Rotomahana mud, can create a significant future problem.'</i></p>	
STEP via Tarawera Road	As above		
Local Treatment Plant	<p>Traditional Mātauranga Māori practises of utilising land dispersal for the treatment of effluent have in the past proven sustainable and ecologically sound.</p> <p>Recent treatment systems based on western science, have impacted negatively on local Māori ie saturation of nutrients in the Whakarewarewa forest and toxins in the Puarenga stream, causing ill health and affecting well-being.</p>		

Summary

Papatuanuku does not need malpractice from mankind, we need her. We were born from her and we return to her upon death. She sustains us through the life-giving waters and the food we need from her abundant storehouses. We process that water and food and return to her our paru to be returned to the whenua which she processes for us. This is how it has been since time immemorial.

Water flows have their own direction. It is the nature of water to find its own level and natural flow. Mankind has gone against the natural flow for too long and now we suffer the consequences and must pay for our actions. If growth in the Tarawera arena is anticipated, then the ability to process our waste to aid Papatuanuku in sustaining the environment we have chosen to live in, must be done to the natural flow of the water.

Working with council			
Issues/opportunities	<p>Relationship with council –</p> <p>There is a level of distrust and suspicion based on historical issues/grievances with Rotorua Lakes Council that includes the discharge of effluent into Lake Rotorua, the effect of the discharge into the Whakarewarewa forest and Puarenga stream. Current issues of contention with some affected iwi include the new plant and proposed treatment process that is not acceptable to many whānaunga in Rotorua.</p> <p>Questions the capacity of the proposed upgraded WWTP to carry Tarawera catchment loading</p>	<p><i>‘Local iwi, tangata whenua are quite suspicious. They have seen over many decades the quality of the lake water going down; they raised concerns over the years but nothing substantial has been done.’</i></p> <p><i>‘I can remember the old people when I was about 12 or 15, asking the council ‘why are you letting all effluent back into the lake? – we were assured by council the science was reliable’</i></p> <p><i>‘Our experience historically with council and science has been a failure.’</i></p>	
Status quo	<p>Questions are asked by mana whenua:</p> <ol style="list-style-type: none"> 1. Who is responsible for issuing consents for sub-standard systems and what is the accountability for this? 2. How has it got to the point where 97% are sub-standard? 3. If the current cumulative discharge was from a single source would council treat the breach with more urgency/action? 	<p><i>‘This meeting (hui) is concerned that ongoing pollution now is occurring and it’s only by the grace of those local and regional authorities that it’s allowed to continue.’</i></p>	

<p>LPGP via Tarawera Road</p>		<p><i>‘So, the big winners here are the residents, predominantly European and the big losers are Māori’.</i></p> <p><i>‘How confident are we in terms of a piping system that there won’t be any leaching and/or breakages that then flow into not just Lake Tarawera, but Lake Rotokakahi and Lake Tikitapu because they are all on that route down to the council treatment area. ... With this plan, not just talking about Tarawera but also the impact on the other waterways as part of any proposed route.</i></p>	
<p>Local Treatment Plant</p>	<p>Mana whenua are keen to discuss and investigate the opportunity to co-partner with council to provide land and cultural expertise for the development of an onsite treatment plant.</p>		
<p>Summary</p> <p>The Rotorua Lakes Council and the Bay of Plenty Regional Council must engage with Mana Whenua, Tangata Whenua and the settlement entities of the Te Arawa Lakes Trust, Tūhourangi Tribal Authority and Te Mana o Ngāti Rangitīhi. The days of token consultation with Māori are no longer appropriate. The Treaty of Waitangi settlements provide Statutory Acknowledgments and secondly, Te Arawa whānui are significant land holders and economic contributors to the Rotorua economy.</p> <p>Of all regions throughout Aotearoa, the Central Lakes District is the most progressive and forward thinking of all regions. Our relationships are growing more positively than negatively, learning to move forward together rather than work against each other in a reactionary fashion. Effective and progressive partnerships are required if we are to achieve collaborative goals now and for future generations.</p>			

Additional impacts and risks

Issues/opportunities	
Status quo	<p>Health risks</p> <p>Offence to human waste discharge into water; particularly sacred water</p> <p>Local Māori to consider legal options to stop breaches.</p>
LPGP via Tarawera Road	<p>Lake Rotokakahi Trust Board has signalled grave concern about potential risks piping past their lake front.</p> <p>Mana whenua are adamant they do not want to add to the existing tensions/problems with the proposed Rotorua Lake system</p> <p>Hui – Question to RLC – what is the projected population growth along the proposed 26km pipeline from Tarawera to Rotorua? - taking into account urban development at Lynmore for example. Interested in population growth and the consequent impact on capacity of pipeline, Rotorua plant, toxicity, overload.</p>
Local Treatment Plant	<p>Climate change (increased rain and variable weather patterns) in addition to the topography and scoria, ash soil types may result in effluent contaminants entering the lake.</p>
Mitigation	<p>Consenting body taking responsibility for breaches.</p> <p>Discussion and understanding about immediate remediation.</p>

2. Visit to Haumingi 9B3B

June 16 2018

Visit to Haumingi 9B3B as recorded by Martin Hunia (representing Ruawahia 2B Trust and Tarawera CIA Cultural Advisory Panel).

'As the newly elected Ruawahia 2B representative on the cultural advisory panel to deal with the Lake Tarawera wastewater plan on Thursday we took a visit to see what options would become available to householders in the Lake Tarawera catchment in the future to deal with their sewage and make the lake clean again.

We also got to look at the Rotoiti/Rotoma scheme currently being built and if you have travelled through the area you would have noticed all the road works going on. They are not fixing the road but laying the sewage pipes for their catchment area from the toilets at the bottom of the Rotoma Hills to Curtis road the road to Rakeiao, Tapuaekura Marae or just before you start to climb Tikitere. After an induction at Taurua marae (Ngāti Rangiuuora) we got to visit the site where the sewage tanks would be situated on land administered by Haumingi 9B 3B Ahuwhenua Trust which is on the hill behind the marae and Emerys Store. Just over a month ago where they are building the sewage plant, it was all in pine trees according to Te Ohu Wikingi who is a member of the cultural advisory panel who lifted the tapu for when the works began.'



3. Lake Tarawera: Rotomahana Parekarangi and Ruawahia Blocks

The area around Lake Tarawera sits within two blocks, part within the Rotomahana Parekarangi blocks, and the other part in the Ruawahia block.

The Rotomahana Parekarangi block surrounding Tarawera on the Rotomahana side was known as Rotomahana Parekarangi No.6 and was awarded to Tūhourangi. When the block was sub-divided amongst hapū of Tūhourangi, the blocks surrounding Tarawera were awarded as follows:

Rotomahana Parekarangi 6C	Ngāti Uruhina
Rotomahana Parekarangi 6B	Ngāti Uruhina
Rotomahana Parekarangi 6F	Ngāti Te Amo and Ngāti Tukiterangi
Rotomahana Parekarangi 6G	Ngāti Te Apiti, Ngāti Tuohonoa and Ngāti Hinemihi
Rotomahana Parekarangi 6H	Ngāti Hinemihi, Ngāti Tawake, Ngāti Umukaoria, Ngāti Tuohonoa, Ngāti Te Amo, Ngāti Puta, Ngāti Wahiao
Rotomahana Parekarangi 6J	Ngāti Hinemihi and NgātiTawaka of Tūhourangi
Rotomahana Parekarangi 6O	Ngāti Apiti, Ngāti Tuhono, Ngāti Huare, Ngāti Tukiterangi and Ngāti Te Amo of Tūhourangi
Rotomahana Parekarangi 6P	Ngāti Puta, Ngāti Tawake, Ngāti Tukiterangi, Ngāti Wahiao of Tūhourangi
Rotomahana Parekarangi 6Q	Ngāti Uruhina, Ngāti Te Apiti, Ngāti Wahiao and Ngāti Umukaria of Tūhourangi

Figure 12. Rotomahana Parekarangi Blocks - Hapū, Iwi

A small part of Rotomahana Parekarangi No.5B also borders the Lake, which was awarded to Ngāti Rangitihī at 14 Rotorua MB 38, 43-50 dated 2 March 1888.

The Ruawahia block was awarded to Ngāti Rangitihī solely at 4 Whakatane MB 302-303 dated 12 February 1891.

Name of Māori Land Block	Type of Trust	Area in hectares	No. of Shareholders
Ruawahia 2B Ngāti Rangitīhi	Māori Reservation Trust	1897.4	802
Rotomahana Parekarangi 6Q 2B	Ahu Whenua Trust	237.6	2676
Rotomahana Parekarangi 6O 2B	Ahu Whenua Trust	253	1694
Rotomahana Parekarangi 6B (or Maungarawhiri)	Ahu Whenua Trust	129.5	1194
Rotomahana Parekarangi 6C 2B	Ahu Whenua Trust	13.8	595
Rotomahana Parekarangi 6G 2B Kariri Point	Māori Reservation	4.2	315
Rotomahana Parekarangi 6G 3B Marae Site, Spencer Road	Ahu Whenua Trust	68.7	1774
Rotomahana Parekarangi 6G 3B Urupa	Ahu Whenua Trust	.7 5 ha	1756
Rotomahana Parekarangi 6K2B	Ahu Whenua Trust	32.4	524
Rotomahana Parekarangi 6J2B4	Ahu Whenua Trust	19.4	539
Rotomahana Parekarangi 6J2B7B4	Ahu Whenua Trust	33.6	534
Okataina 10 Land Trust	Ahu Whenua Trust	513.5	5191

Figure 13 Rotomahana Parekarangi Blocks - area, shareholders

Ahu Whenua Trust

An Ahu Whenua trust is a common land trust. It is designed to promote the use and administration of one or more Māori land blocks or general land owned by Māori on behalf of its owners³⁰

Māori Reservation

A Māori reservation is a very specific type of trust which sets aside (reserves) Māori land or general land for a very specific community purpose, which can include Marae, Urupa, Wahi Tapu and other entities or areas of cultural significance.³¹

³⁰ <https://www.Māorilandcourt.govt.nz/your-Māori-land/trusts-and-incorporations/>

³¹ <https://www.Māorilandcourt.govt.nz/your-Māori-land/trusts-and-incorporations/#Māori-reservation>

3. Māori Land Blocks around Lake Tarawera, Lake Ōkāreka, Buried Village



Figure 14 Map - Land Blocks around Lake Tarawera, Lake Ōkāreka, Buried Village

5. Tūhourangi - Area of Interest, Sites of Significance

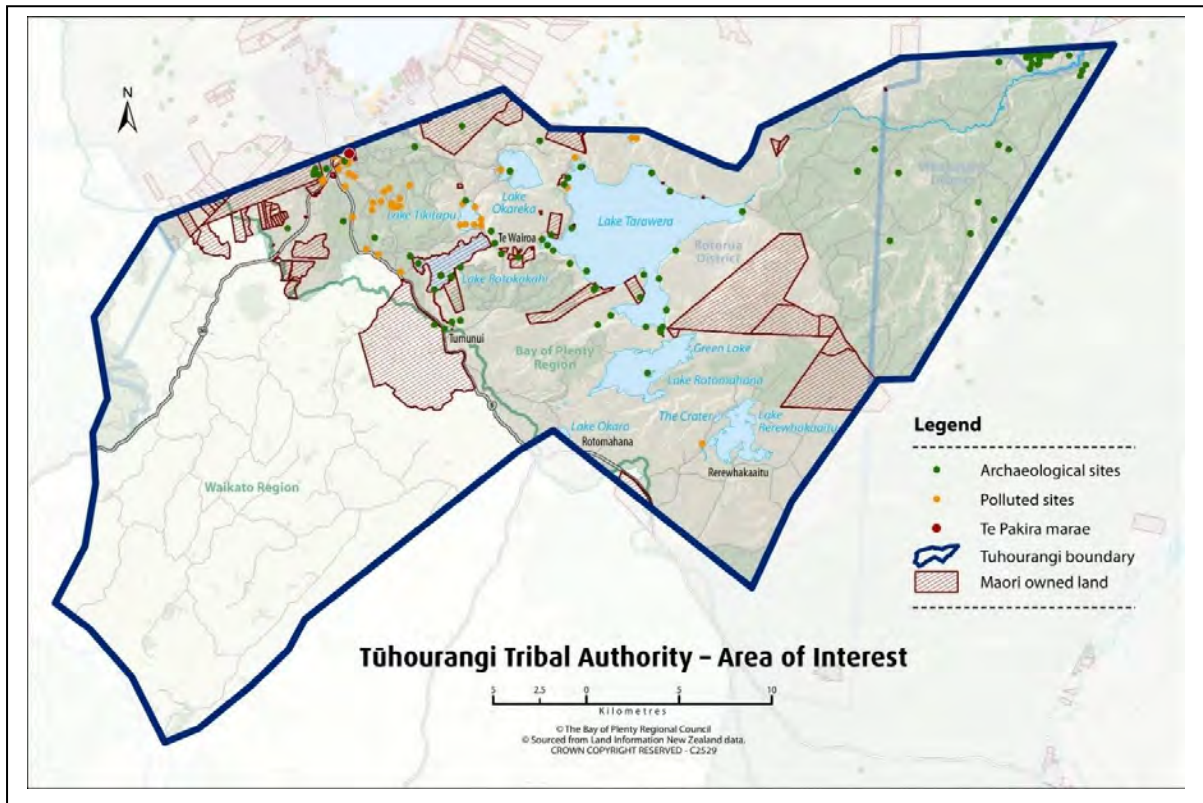


Figure 15 Map of Tūhourangi area of interest

6. Technical Information

As provided by Taira Wichman, Research Engineer, Wera

Key issues and values identified that are impacted and/affected by the wastewater treatment plans at Lake Tarawera

Key issues and values that should be considered in the development and assessment of options for the wastewater treatment scheme

Key issues and values that should be considered in the implementation and management of the wastewater treatment scheme

Critical Concerns Relating to Options

Scheme Elements

- Architecture of the scheme
- Choice of scheme elements
- Fit with current industry practice

Scheme elements include:

- Onsite systems - LPGP/STEP/Other (gravity and pump)/connecting pipework/boundary kits
- Cluster holding tanks
- Cluster pretreatment tanks
- Mainline reticulation pipe
- Lateral connectors
- Pumps stations
- Holding tanks
- Emergency and Holding tanks
- WWTP
- Sludge cartage
- Power supply - household/WWTP (performance/capacity/resilience/etc)
- Etc

failure of scheme Elements

Either individually or as a combination (perhaps as a cause of initial failure event).

Engineered elements and functions possess a non-zero risk of failure

What happens in the event of failure?

Onsite Systems

Desired Attributes

- What are required of these?
- Affordable
- Robust - does not breakdown / can perform design function / earthquake
- Removable and replaceable
- Use in network failure
 - As either onsite holding tank
 - Connection to local onsite holding tank (lower than house drainage)
 - Connection to local cluster holding tank
 - Connection to local pretreatment cluster tank
 - Onsite temporary disposal
 - Local temporary cluster disposal
- No odour

Full Life Costs

Upfront (as charged)

A - \$5,000 - \$6,000

B - \$6,000 - \$8,000

C - \$8,000 - \$10,000

Installation

- Earthworks
- Concrete ballast
- Single visit

- Double visit -

Servicing

Repair and Maintenance

- Earthworks
- Concrete ballast

LPGP

LPGP Benefits

- Currently used by RLC including at Ōkāreka
- Can be serviced by RLC agents
- Small footprint
- Lower upfront and install cost

Cultural Benefits

- What are these?

LPGP Limitations

- 6-year life as per RLC use
- Has a small retention volume
- Expensive pump
- Heavy pump
- Pump cannot process cloth (clogs or damaged by towels - therefore expensive repair for simple failure mode)

Cultural Limitations

- What are these?

STEP

STEP Benefits

- Will be used by RLC including at Rotoma (currently \$12,500 per installed system)
- Can be serviced by RLC agents
- Slightly higher upfront cost and install

- Higher install costs
- Can be used as a holding tank
- Can use STEG system where gravity flushing systems are applicable
- STEG systems do not have a large retention volume unless an outlet valve is installed allowing them to be used as a holding tank

STEP Limitations

- Has a small retention volume
- Large footprint required to ensure gravity separation processes are performed sufficiently
- Pump protected by filters
- Affordable pump
- Units are slightly more expensive than LPGP
- Installation

Home Use - What can be flushed into the onsite receiving unit?

Protection of the Onsite Unit (clogged or damaged pump / die off of pretreatment biology / clogging of filter media)

Protection of environment in relation to failure

Protection of WWTP processes

Anything and everything that can be flushed including - food scraps/pills/chemicals including toxics/household detergent/paint/bodily waste/kitchen waste and wastewater/clothes wash/water bath water/degreasers/phones/towels/non degradable wipes/emerging contaminants

Limited Use preferred - pills/limited chemicals/all household detergent/no paint/bodily waste/kitchen waste/non-toxic chemicals/phones/towels/degradable wipes

Environmentally Sustainable Use preferred- pills/non-toxic chemicals/food scraps/limited detergent/no paint/bodily waste/kitchen waste/phones/towels/wipes/no emerging contaminants of concern

Failure of scheme Elements

Either individually or a combination (perhaps as a cause of initial failure event).

Engineered elements and functions possess a non-zero risk of failure

What happens in the event of failure?

Attributes of Failure

Use - Full and normal use/.../limited use

Type of sewage released - raw ground-up sewage/primary treated/secondary treated/higher level/ all of the above with log retention times (more septic/malodorous than at source)/health hazard

Odour - None/Barely Detectable/ Detectable/.../Strong Stench

Scale of failure - volume of sewage released/time that this is released for

Region of Failure - Individual household/Multiple localised properties/25% of community Barely Detectable/ Detectable/.../Strong Stench

Scale of failure - volume of sewage released/time that this is released for

Odour - None/Barely Detectable/ Detectable/.../Strong Stench

Scale of failure - volume of sewage released/time that this is released for

Odour - None/Barely Detectable/ Detectable/.../Strong Stench

Scale of failure - volume of sewage released/time that this is released for

Failure controls -

Scale

Current

Drivers for Upgrade:

- Recent report concluding that on a community basis there are limited options other than reticulation
- Regulatory requirements under the responsibility of BoP Regional Council - Regional Council OSET rules and not being able to get consent for current systems or even upgrades
- Potential health risks - human contact with effluent-borne disease as result of inadequate effluent management (such as disposed effluent from current soak holes and septic tank systems)
- Modern community values - flush and forget, clean property, general sewage system failure concerns, environmental impacts, impacts on lake, affordability,
- Context - Upgrade is a response to regulatory requirements - 170 properties on soak holes, Homes at Te Mu on modern OSET systems as a response to compliance requirements with Regional Council OSET rules
- Science drivers - problem identified and quantified by scientific assessments relating largely to environmental impacts
- Steering committee decisions
- some homes on modern OSET systems
- Growth and development
- Restricted growth and development - some like it just the way it is
- Iwi values
- Māori land values
- Pakeha land values

Assumptions:

- Cultural issues and values are significantly affected in the context of modern wastewater treatment schemes and therefore become essential parameters in decision making.
- Thorough and effective engagement and co-design at a high-level (concepts and architecture) are essential to identifying and assessing options
- It is possible that the overall architecture and solution elements of a WWT scheme can be designed, constructed and managed (operations, maintenance, future upgrades, replacement and decommissioning activity) to respond to relevant values and issues to minimise cultural impacts and avoid cultural offence

Scope

Full life of the scheme - concept development through to decommissioning/replacement

Quantification

Today's solutions are the foundation for the future

Population

1. Cultural Considerations Relating to the Preferred Option

Concepts

- **Local treatment plant.** Sub issues:
 - **Location** - What are the desired site attributes? - offers network resilience (considering localised failure - damage to part of the network)/reuse of effluent/NIMBY - isolated/noise nuisance/minimises odour impacts (isolated/downwind)/allows for growth (land for a larger facility and higher discharge volumes)
 - **Facility Design** - Visual impact of facility - footprint size/height/colours/aesthetics/potential odour impacts/hazardous chemicals/robustness/growth (duplication or modularity)/emergency storage
 - **Other** - proposed treatment processes and technologies/ energy requirements - power usage/raw materials (ethanol/sugar etc)/treatment quality, performance and robustness/controls and operation/size and capacity/engineering resilience/elasticity/operation - automation/disposal methods/effluent reuse/cost
 - Sludge disposal or reuse
 - Pump stations

- **Connect to Rotorua.** Sub issues:
 - Rotorua treatment plant issues
 - Local iwi concerns/agreement
 - Pipeline Connection to Ōkāreka Pump Station
 - Sewage spills - currently a **zero risk**
 - Will introduce a **non-zero risk**
 - Failure catchment - requires analysis based on worst case
 - Sites of significance (passing through/within proximity/potential for impact in event of failure i.e. downhill of spill), potential for strong objection to installation of a pipe in certain areas/consideration in choice of alignment
 - Mitigating methodologies (preventing failure) - Solution attributes and engineering options in: design, material selection, construction, network management
 - Failure detection
 - Repair/replacement

- **Existing Compliant Systems** - Allowance for continued use of OSET compliant systems (within proximity to pipe, not within proximity of pipe) - compliance managed by RDC

- **Mixed Solution** (where practicable) - isolated properties (OSET for individual/clusters for multiple properties)

- **Failure and Resilience**

- Backup options responding to significant failure in one or more of the critical scheme elements (power/connection to main pipe/main pipe failure/local plant failure)
- Resilience to potential failure events - earthquake/slips and landslides/heavy rain events etc - assessment of individual element and
- Consideration for environment change - heavy rains/flooding/high water table/high lake levels (permanent or intermittent)/ permanent baseline changes (increases)
- Potential impacts on

Architecture

- Pretreatment
 - Why? i.e. cultural offence of sending your waste to or past someone else's whenua
 - to minimise impact of failure
 - What are the pretreatment objectives?
 -
 - What solutions are available?
 - What needs to be done?
- Growth aspects - pipe size
- Resilience
- Risk - including cultural risk considerations
- Redundancy
-
- Physical size - including overall footprint
- Visible footprint
- Robustness and structural integrity
- Odour
- Servicing - simple and affordable, containment of waste products, unobtrusive
- Replacement of mechanical, electrical and control elements (pump, wiring, control systems) - availability and costs of parts, costs
- Replacement (as a result of failure, end of life, new solution) - simple, affordable, unobtrusive
- Resilience - Consideration for Failure (resilience to failure events and continued use in failure events)

Options in a power failure, network failure, other failure (onsite storage, odour, onsite

On Site Solution Options

- Capacity limits - how many people can it take?
- Expected Life - of unit and major components

- Physical size - including overall footprint
- Visible footprint
- Robustness and structural integrity
- Odour
- Servicing - simple and affordable, containment of waste products, unobtrusive
- Replacement of mechanical, electrical and control elements (pump, wiring, control systems) - availability and costs of parts, costs
- Replacement (as a result of failure, end of life, new solution) - simple, affordable, unobtrusive
- Resilience - Consideration for Failure (resilience to failure events and continued use in failure events)
 - Options in a power failure, network failure, other failure (onsite storage, odour, onsite disposal, local disposal, pump out)
 - Resilience of onsite tanks and connections
 - Connection for onsite disposal - yes/no
 - Backup power capability - yes/no
 - Collection from onsite tank / Simple connection to local collection tank (installation of local collection tank in event of significant failure event)

2. Implementation of the Scheme

Placement and connection of onsite equipment

Connection to main pipe or lateral pipe (a secondary pipe connected to the main pipe, that connects to more than one property)

Main pipe connections - resilience of connection at the property boundary

3. Management of the Scheme

Growth

Servicing

Repairs and Maintenance

Replacement

Upgrade

7. Record of attendees at meeting held 15 October 2019, Millenium Hotel, Rotorua

William Roach
Adrian Mathews
Rea Martin
Deliah Balle
Kepa Winiata
Petera Clark
Peter Staite
Kahurangi White-Parsons
Chris Clarke
Warwick Rika
Warena Morgan
Rawiri Daniels
Annie Balle
Vicki Tamati
Te Ohu Wikingi
Tipene Marr

GLOSSARY

Hapū	sub-tribe
Hui	gathering, meeting
Inanga	whitebait
Iwi	tribe
Kaitiaki	trustee, minder, guardian
Kaitiakitanga	guardianship, stewardship
Kakahi	freshwater mussel
Karakia	prayer, to recite ritual chants
Kaumatua	elderly, old, aged
Koura	freshwater crayfish
Mana	prestige, authority, control, power
Mana Whenua	territorial rights, power from the land, authority over land
Marae	open area in front of the wharenuī
Mauri	life principle
Pa	fortified village, fort, stockade
Para	refuse, rubbish, waste, sewage, dirt, mud
RaNgātīratanga	right to exercise authority
Rohe	area of interest
Tangata Whenua	people of the land
Tāonga	property, possessions, treasure
Tapu	sacred
Tikanga	protocol, practice –customary system of values/practices
Tino RaNgātīratanga	self-determination, autonomy
Wāhi Tapu	sacred place
Wai	water
Wai kaukau	to swim, bathe
Wairua	spirit, soul
Whānau	family group

REFERENCES

Bay of Plenty Regional Council (2015) Tarawera Lakes Restoration Plan

Keam, Ron F; *Tarawera: The Volcanic Eruption of 10 June 1886*

Smith (1942)

Kawharu (1977)

Waaka K. 1996 Personal Comments

Denman (1968)

Gallop, A. (1998); *The House with The Golden Eyes*

Stafford, D.M. 1986; *The Founding Years in Rotorua*: pg. 242

https://www.boprc.govt.nz/media/566892/operative-rps-1-october-2014_part-three-amended-19-sept-16.pdf

Te Mana o Ngāti Rangitahi Environmental Management Plan

Websites

Te Kahui Mangai

<http://www.tkm.govt.nz/>

Te Pūmāutanga o Te Arawa Lakes Trust

<http://tpota.org.nz/about-tpota/>

Te arawa lakes trust

<http://www.tearawa.iwi.nz/>

Māori Land Online

<http://www.maorilandonline.govt.nz>

FIGURES

Figure 1. Tarawera Lake Relationship Diagram

Figure 2. Rotorua Lakes Council Drawing No. 11608. Lake Tarawera, Proposed Sewerage Scheme, Area of Benefit Plan

Figure 3. Low Pressure Grinder Pump System, Rotorua Lakes Council, Sewerage Options for Tarawera, Manzano 2017

Figure 4. Step System, Rotorua Lakes Council, Sewerage Options for Tarawera, Manzano, 2017

Figure 5. Indicative perspective view of Tarawera Wastewater Treatment Plant Rotorua Lakes Council, Sewerage Options for Tarawera, Manzano, 2017

Figure 6. Indicative pipeline routes

Figure 7. Te Whakapapa o Te Wai (Te Arawa Lakes Trust, 2017)

Figure 8. Te Arawa Lakes Trust – Lakes Structure Policy 2017

Figure 9. Te Arawa Lakes Trust – Lake Structure Policy 2017

Figure 10. Table of RPS Iwi Resource Management policies (BOP RC, 2014)

Figure 11. Policies for Environmental Management, Nga Rawa Whakahirahira (Ngāti Rangitahi, 2011)

Figure 12. Rotomahana Parekarangi Blocks - Hapū, Iwi

Figure 13. Rotomahana Parekarangi Blocks - area, shareholders

Figure 14. Map - Land Blocks around Lake Tarawera, Lake Ōkāreka, Buried Village

Figure 15. Map of Tūhourangi area of interest



TE ARAWA LAKES TRUST



Contents

A.	GENERAL INFORMATION	3
A.1	Basic Methods of Measurement	3
A.2	General Directions.....	3
A.3	Measurement	4
A.4	Pricing of Items	4
A.5	Payment.....	4
A.6	Provisional Items	4
A.7	Provisional Sums.....	5
A.8	Adequacy of Rates and Sums	5
A.9	Unscheduled Obligations.....	6
A.10	Dayworks	6
A.11	Contingency	7
B.	SCHEDULED ITEMS	8
1.	Preliminary and General.....	8
1.1	Provision of Bonds and Insurances	8
1.2	Establishment.....	8
1.3	Site Security	8
1.4	Construction Methodologies and Project Plans.....	8
1.5	Record Photographs.....	8
1.6	Signage	9
1.7	Demobilisation and Clean-Up	9
1.8	As Builts and O&M Manual.....	9
1.9	Contract Management.....	9
1.10	Health and Safety Management	9
1.11	Environmental Controls	10
1.12	Traffic Management.....	10
1.13	Public Relations and Liaison.....	10
1.14	Cultural Induction Attendance and Liaison.....	10
1.15	Services Location and Setting Out.....	11
1.16	Liaison with RLC staff & Obtain Building Consents.....	11
1.17	Site office and Telecommunications for Site Engineer (Provisional Sum)	11

1.18	Engaging with Archaeologist. Approved by RLC. As required. (Provisional)	11
1.19	Provisional cost associated with standing down during Archaeologist and Cultural Investigation	11
1.20	Other Overheads	11
2.	Pressure Sewer	12
2.1	Pipework	12
2.2	Flush Points	15
2.3	Scour Valves	15
2.4	Air Valves inclusive of odour filter	15
2.5	Isolation Valve	15
2.6	Fittings.....	15
2.7	Miscellaneous.....	17
3.	Pump Station.....	17
3.1	Pump Station TPS1 – Stoney Point.....	17
3.2	Pump Station TPS2 – Refuse Transfer Station – Tarawera Road.....	19
3.3	Booster Pump Station – Cliff Road	20
4.	Testing	21
4.1	Pre-acceptance Testing of PE Pipe Materials.....	21
4.2	Pipe Material Testing (Provisional Item)	21
4.3	Testing of Trench Subgrade	22
4.4	Pre-Construction Weld Testing.....	22
4.5	Destructive Weld Testing.....	22
4.6	Pressure Testing	22
5.	Dayworks	23
5.1	Labour	23
5.2	Materials.....	23
5.3	Major Plant (with operator)	23
5.4	Working Day Rate	23
5.5	Vegetation Clearance	23
5.6	Cut to waste unsuitable material & dispose of offsite.....	23
5.7	Supply and place imported fill.....	23

A. GENERAL INFORMATION

This is a **Measure and Value Contract** and the Contract Price is determined with reference to the Drawings and Specifications in accordance with the provisions of this Contract.

The quantities set out in the Schedule of Prices are only an estimate of how much of each kind of work is included in the Contract. Such quantities shall therefore not be considered as final measurements.

A price or rate shall be entered against each item in the Schedule, whether quantities are stated or not. Items against which no price is entered will be considered to be covered by the other rates and prices in the Schedule.

This Schedule shall be used as a guide only. The quantities herein are approximate and shall not be used as a basis for ordering of materials.

A.1 Basic Methods of Measurement

Except where indicated otherwise in this Schedule and/or the Specification, measurements shall generally be determined in accordance with NZS 4224, "Methods of Measurements of Civil Engineering Quantities".

A.2 General Directions

In the Schedule of Prices the sub-headings and item descriptions identify the work covered by the respective items. They shall be read in conjunction with the relevant passages below and with the relevant drawings and specifications. The nature and extent of the work shall be ascertained by reference to the Drawings, Specification and Conditions of Contract.

The rates and prices entered in the Schedule of Prices shall be deemed to be the full inclusive value of the work covered by the items and, unless expressly stated otherwise, shall include the following:

1. Labour and costs in connection therewith.
2. The supply of materials, goods, storage and costs in connection therewith including delivery to Site. Taking delivery of materials and goods supplied by others, unloading, storage, and costs in connection therewith.
3. Plant and costs in connection therewith.
4. Fixing, erecting and installing of placing of materials and goods in position.
5. The effects on the phasing of the Works or any elements of the Works to the extent set forth or reasonably implied in the documents on which the Tender is based.
6. General obligations, liabilities and risks involved in the execution of the Works set forth or reasonably implied in the documents on which the tender is based.
7. Establishment charges, overheads and profit.
8. Waste.
9. Attendance and transport for any sampling and testing required to be carried out by the Specification, supplying results of tests carried out by the Contractor and providing test certificates.
10. Complying with Quality Assurance schemes and providing certificates of compliance.
11. Provisional Items and provisional sums are only to be expended upon the agreement and explicit written instruction by the Engineer in each and every instance prior to commencement of these works, whether stated or not.

12. All items requiring disposal to an approved offsite dump, shall include all associated costs, including but not limited to disposal fees.
13. No overtime shall be chargeable as an addition to the Contract.

A.3 Measurement

Any Schedule of Prices shall be used as a basis for computing payments and for valuing Variations and for no other purpose.

Where a change in scope of works requires it, measurement of work shall be computed net from the dimensions stated in the Contract and as per NZS 4224: 1983 Code of Practice for Measurement of Civil Engineering Quantities.

The following abbreviations are used to describe “units” in the Schedule of Prices:

cu.m or m ³	-	cubic metre
hr	-	hour
kg	-	kilogram
LS	-	Lump Sum
m	-	linear metre
Ea.	-	each
Prov. Item	-	Provisional Item
Prov. Sum or PS	-	Provisional Sum
sq.m or m ²	-	square metre
wk	-	week

NOTE: unless stated elsewhere, all m³ quantities are “solid measure in place after compaction”.

A.4 Pricing of Items

Each individual item shall have a price entered against it. Prices shall be expressed in New Zealand Dollars (NZD), to two decimal places.

A.5 Payment

Claims for payment shall be in the format of the Schedule of Prices.

Payment for work covered prior to the inspection by the Engineer will be based on the Engineer’s assessment of the value of works.

Payment will only be made for the actual quantity of work completed, up to the quantities contained in the accepted programme, or increased quantities approved by the Engineer. No payment will be made of any work in excess of this.

A.6 Provisional Items

Provisional Items provide for work that may or may not be carried out by the Contractor, but which must still be priced by the Contractor. The work shall only be performed on the

instruction of the Engineer.

The amount payable to the Contractor for work covered by provisional items shall be for the quantity of work directed by the Engineer.

The rate for provisional items shall fully compensate the Contractor for all their costs for that item, including but not limited to: Labour, Plant, Material, On-Site Overheads and Profit.

A.7 Provisional Sums

Provisional sums shall be in accordance with the general conditions.

The Contractor shall, when required by the Engineer, produce all quotations, invoices, vouchers, timesheets and accounts or receipts in connection with the expenditure in respect of provisional sums.

There are two provisional sums shown only on the Summary sheet:

Relocation of Existing Services (Provisional Sum)

The provisional sum includes all costs associated with the Relocation of Services where necessary and provides for the payment of the net invoiced cost of all work undertaken by the appropriate authority to relocate services as required.

Payment shall be per linear metre of service relocation to the approval of the Engineer.
This item shall only be expended on the written approval of the Engineer.

Additional Boundary Kits (Provisional Sum)

The provisional sum includes all costs associated with Additional Boundary Kits where necessary.

Payment shall be per additional boundary kit required to the approval of the Engineer.
This item shall only be expended on the written approval of the Engineer.

A.8 Adequacy of Rates and Sums

The items in the Schedules together with the rates and sums entered against them shall be held to cover everything necessary for the completion and maintenance of the Works to the complete satisfaction of the Engineer. Items have been provided in the Schedule for all major parts of the Contract Works and the rates and sums entered against them shall be held to cover all accessories and minor items together with the cost of complying with all general obligations imposed by the Contract.

All miscellaneous items, supervision, contingencies, conveyance of plant and incidental work, plus general overhead administration, maintenance and profit that are not included in the relevant subsection of the Schedule of Prices, shall be deemed to be incorporated in the Schedule to which they must closely relate.

All Contract Rates and sums entered in the Schedule shall be carefully proportioned, having regard to the special conditions of the work in each case.

All indirect costs, risk and profit shall be deemed to be distributed among the rates and sums in proportion to the direct costs allowed for by the Contractor in each rate and sum.

The exact position of the work shown on the Drawings is an aid to the Contractor to assist in pricing the Contract and may be varied. The Contractor shall allow when pricing the works for each price, rate or sum to cover the scope of work defined in the Tender Documents regardless of where the work is performed onsite.

A.9 Unscheduled Obligations

Every item in the Schedule of Prices shall be priced by the Tenderer.

Tenderers shall set out, fully describe and price as an addendum to the Schedule of Prices, any work obligation not covered elsewhere and for which they consider a separate price is required. If no such allowances are made, it shall be deemed that the cost of any item not specifically referred to in the Schedule of Prices is spread over and included by the Contractor in his price or prices for other items in the Schedule of Prices which are most closely appropriate for the work not referred to.

No claims will be entertained on the basis of omissions of items from the Schedule of Prices which are shown on the Drawings or referred to in the Specification or are an integral part of an item measured or referred to in the Schedule of Prices.

A.10 Dayworks

A.10.1 Labour

The contract rates are the hourly rates at which payment will be made for labour employed on daywork from the direction of the Engineer. Payment will be only made in respect of the actual hours worked by the labourer and agreed to by the Engineer.

The contract rates shall include allowances for taxes, pensions, skill, travelling time, insurances, holiday pay, payment in respect of time loss due to inclement weather, executive superintendence, non-working foremen, the use and maintenance of all non-motorised tools for all establishment charges, profit, overheads, and any other payments which the Contractor may be required to make to the workmen under the relevant employment agreement. Plant operators will be included for under the contract rates for plant.

A.10.2 Plant

Payment for plant shall be the actual hours worked on daywork by a nominated item of plant in accordance with the Engineer's directions, multiplied by the contract rate for that item of plant as outlined in the NZ Contractor's Federation rates (2005 ed.) plus or minus a percentage. The rates will apply whether the plant is already on site or brought to the site on the Engineer's instruction.

Full payments for working plant shall only be for the actual hours worked. In the event that plant is brought to the site on the written instructions of the Engineer and used only for daywork, the cost of haulage to and from site will be paid to the Contractor as daywork. Where such plant brought to the site is retained on standby on the Engineer's instruction, a standby rate equal to 60 per cent of the full tendered rate applicable for up to 8 hours on any Working Day, will be payable. The contract rates for plant are for use of the plant inclusive of all fuel and consumable stores, overhauls, repairs and replacements, and for haulage to and from the site (except as stated above) and inclusive of operator.

The time necessarily spent in moving plant within the site as a result of the Engineer's direction to use it on daywork shall be added to the actual hours worked provided that no time spent in moving for purposes of maintenance, repair or refuelling shall be added.

A.10.3 Materials

Payment for materials will only be certified and paid for on the net cost of the materials and the net quantities and weights of the materials actually used in accordance with the Engineer's instruction.

The percentage additions to the net cost of materials used on daywork shall cover all overhead charges, profit and all incidental costs whatsoever. The percentage addition shall apply to all materials delivered to site and authorised by the Engineer to be used in dayworks. The net quantities and weights actually used in accordance with the Engineer's instructions only, shall be certified and paid for, together with any material necessarily and unavoidably cut to waste with the Engineer's knowledge and consent and any surplus material which the Contractor is unable to use for its own use and which is delivered to the Principal's store on site.

A.11 Contingency

No Contingency has been built into this contract. Any work required that is outside of the construction scope must be discussed with the Engineer and, if required, be treated as a variation to this contract. Where possible, rates agreed for the main contract works will be used to value such variations.

B. SCHEDULED ITEMS

For referencing, the number for the items below is consistent with the numbering in the Schedule of Prices.

1. Preliminary and General

The Preliminary and General costs are deemed to cover all Fixed and Time Related Costs are not identified by other schedules.

1.1 Provision of Bonds and Insurances

This Item covers all costs relating to providing Bonds and Insurances in accordance with the Conditions of the Contract.

Full payment will be upon acceptance of the Bonds and Insurances by RLC.

1.2 Establishment

The establishment item includes for the Contractor's mobilisation and establishment on site of all manpower, equipment, plant, vehicles, accommodation, temporary services and the demobilisation including clean up and removal on completion, temporary drainage and fencing, and all overhead costs such as those arising from mobilising resources and plant, arranging insurances and bond, permit costs, the preparation and supply of the initial programme, and the like.

50% Payment will be made upon establishment on site. The balance will be on a pro-rata basis throughout the duration of the Works.

1.3 Site Security

This item includes supply and installation of temporary security fencing around all work areas, compounds and stockpile as required for the duration of the Contract.

Payment will be on a pro-rata basis throughout the duration of the Works.

1.4 Construction Methodologies and Project Plans

Payment under this item will reimburse the Contractor for the preparation of construction method statements requested during the course of the Works, programme, and updates and associated information.

Payment will be on a pro-rata basis throughout the duration of the Works.

1.5 Record Photographs

This item shall include the supply and recording of digital photographs of all works activities as detailed in the specifications.

Payment will be on a pro-rata basis throughout the duration of the Works.

1.6 Signage

This item covers all works associated with the supply and installation of all temporary, construction works signage and all permanent works signage and labelling.

Payment will be on a pro-rata basis throughout the duration of the Works.

1.7 Demobilisation and Clean-Up

This item is to cover removal of site compounds, Contractor's facilities, temporary accommodation and demobilisation of all plant and equipment on site and satisfactory clean-up of the site on completion of the Contract as described in the project specification.

Payment shall be a Lump Sum made on completion of site clean-up.

1.8 As Builts and O&M Manual

This item includes the provision for as-built and operations and Maintenance manuals handover documentation as described in the project specifications.

Payment shall be a lump sum paid once all the information has been received, reviewed, and accepted by the Engineer.

1.9 Contract Management

This item is to include all cost allowances including management, supervision, obtaining of permits, setting out and associated costs, etc, along with all time-related cost to the contract:

- All costs incurred to comply with ongoing contractual requirements including resource consent conditions once obtained by the Principal;
- Operate and maintain on-site facilities for the duration of construction including any site office, stockpiles, storage sheds and ablution facilities;
- Maintenance of tools, equipment and plant;
- Maintenance of existing site access ways
- Setting out of the work;
- Site meetings; and
- Project reporting
- Updating of programme of works;
- Liaison with the Engineer.

Payment will be on a pro-rata basis throughout the duration of the Works.

1.10 Health and Safety Management

This item will cover the cost of the preparation, implementation and management of the Health & Safety Management Plan and controls. It also covers the provision of all safety measures to ensure the safety of all staff and public for the entirety of the contract duration and as described in the project specifications.

50% payment will be made on approval of the health and safety management plan. The

balance will be paid on a pro-rata basis throughout the duration of the Works.

1.11 Environmental Controls

This item covers the cost to produce and implement the site-specific Environmental Plan. The implementation of the plan shall cover erosion and sediment control measures, including all leaks and spillage of oils and hydrocarbons, disposal of soil, dust control, noise control, vibration control, and disposal of contaminated water.

It also includes maintenance, and monitoring (including completion of all daily, weekly and/or monthly audits), and removal of all environmental controls on completion of the project.

Payment will be assessed against the Contractor's level of compliance with the requirements for the implementation and management of the Construction Plans during the period of the contract, and shall be a Lump sum payable pro-rata in equal instalments as the contract progresses.

The Practical Completion Certificate will not be issued until all the implementation and management requirements.

1.12 Traffic Management

This item will cover the cost of the generation, implementation, and submission of the site-specific traffic management plan (TMP).

It also includes implementation, maintenance, monitoring and removal of all traffic management upon completion.

This item will also cover all associated costs including work carried out by sub-contractors, the supply, install and maintenance of signage, staff and any other required equipment.

5% payment will be made on approval of the TMP(s). The balance will be paid on a pro-rata basis throughout the duration of the Works.

The Engineer may make deductions from this item if audits of the site show that the Contractor is not exercising appropriate traffic control standards.

1.13 Public Relations and Liaison

This item will cover all costs associated with communications, coordination and liaison with private property owners for any on-property works.

Payment will be on a pro-rata basis throughout the duration of the Works.

1.14 Cultural Induction Attendance and Liaison

This item will cover all costs associated with all Contractor's and subcontractor's attendance at a cultural site induction and communications, coordination and liaison with RLC's Cultural Impact Manager for the duration of the contract.

Payment will be on a pro-rata basis throughout the duration of the Works.

1.15 Services Location and Setting Out

This item covers all levelling and surveying required in the setting and marking out of all existing services (including pot holing as required), the construction areas, structures, and works.

It also includes all subsequent survey works required to complete the construction works. Payment shall be in pro-rata instalments over the duration of the contract.

1.16 Liaison with RLC staff & Obtain Building Consents

This item will cover all costs associated with liaising with RLC staff and successfully obtaining building consents (if required).

It is to include costs incurred for:

- All communications, coordination and liaison with RLC staff,
- Preparation of as-built plans and submission to RLC for building consent.

Payment will be a lump sum on granting of consent by RLC.

1.17 Site office and Telecommunications for Site Engineer (Provisional Sum)

This item will cover all costs associated with the provision of a site office and telecommunications facilities for the Site Engineer (if required). Provisional sum, only to be expended with the approval of the Engineer.

Payment shall be lump sum on presentation of evidence of costs incurred.

1.18 Engaging with Archaeologist. Approved by RLC. As required. (Provisional)

This item will cover all costs associated with engaging a suitably qualified archaeologist approved by the Principal (if required). Provisional item, only to be expended with the approval of the Engineer.

Payment shall be on an hourly basis on presentation of evidence of costs incurred.

1.19 Provisional cost associated with standing down during Archaeologist and Cultural Investigation

This item will cover all costs associated with standing down during an investigation by an archaeologist or cultural investigation approved by the Principal (if required).

Provisional item, only to be expended with the approval of the Engineer.

Payment shall be per day that standing down is necessary. This item is mutually exclusive with item 5.4 a) and both shall not be claimed on any one day when standing down is necessary.

1.20 Other Overheads

Any other overhead and administration charges not included as described above shall be deemed to be fully included in all other rates and sums in the Schedule of Quantities including the Day Works Schedule.

2. Pressure Sewer

2.1 Pipework

This item will cover all costs associated with installation of the pipework for the pressure sewer mains.

This item includes supply of:

- all bedding materials, including bedding material as specified in the Specification,
- all materials (including bends, tees and other connections within the pipe)
- all material for laying and compacting ordinary backfill

For open trenching the rate shall include excavation, trench shoring, spoil disposal, backfill and reinstatement. For directional drilling the rate shall include seeking access to private land if so required for the drill rig and all excavation, spoil disposal and backfilling and reinstatement of drilling and acceptance pits, all drilling costs including set-up and drill fluid management.

The pipe rate must include the cost of tracer wire, and any flanges, couplers or welds required. This rate must cover the cost of any flanges, taper pieces, flange adaptors, electrofusion couplers and all butt welds necessary.

This item shall cover liaison with service authorities, and the physical location of all services (including water mains, sewers, stormwater pipes, power cables, telephone cables, fibre optic cables).

The rates submitted by the Contractor in the Contract Schedule are to include for all haulage of plant and materials to site, confirmation of service locations, setting out of alignment, surface preparation, Earthworks as per Section 3 of the Specification, stockpile of excavated material (as required), disposal of excavated material (as required), installation of bedding material, welding of pipeline (including all fittings and beds as required), monitoring the PE welding process and providing the specified data on each weld to the Engineer, storage of pipeline onsite, installation of pipeline in trench, backfilling of trench, reinstatement of trench surface and any other works reasonably required to install PE pipelines.

Payment shall be at the scheduled unit rate per linear metre of pipe per type and size installed and measured horizontally along the centreline of pipe without deductions for lengths of fittings, connections, valves, flushing points/cleanouts, scour valves and air/vacuum air release valves. Payment shall be made upon successful testing and fully reinstatement approved by the Engineer.

2.1.1 Falling Pressure Main

2.1.1.1 Open Trenching – In District Council Road

This item covers all costs described under Item 2.1 associated with the supply and installation of falling pressure mains by open trenching, regardless of location.

Payment shall be as described in Item 2.1.

2.1.1.2 Extra Over for Open Trenching - Rock

This item will cover all costs for excavation of rock for pipe installation as directed by the Engineer. Rock is defined in Section 3.10 of the Specification.

Payment shall be per lineal metre of solid in place trench excavation through rock for pipe installation. This item shall only be expended on the written approval of the Engineer.

2.1.1.3 Directional Drilling – In District Council Road

This item covers all costs described under Item 2.1 associated with the supply and installation of falling pressure mains by directional drilling, regardless of location.

Payment shall be as described in Item 2.1.

2.1.1.4 Extra Over for Directional Drilling – Rock

This item will cover all extra over costs for excavation of rock for pipe installation as directed by the Engineer. Rock is defined in Section 3.10 of the Specification.

Payment shall be per lineal metre of solid in place trench excavation through rock for pipe installation. This item shall only be expended on the written approval of the Engineer.

2.1.2 Pressure Mains

2.1.2.1 Open Trenching – In District Council Road

This item covers all costs described under Item 2.1 associated with the supply and installation of pressure mains by open trenching, regardless of location.

Payment shall be as described in Item 2.1.

Rates supplied for:

2.1.2.1 a) – 2.1.2.1 f) Varying rates by pipe diameter.

2.1.2.2 Extra Over for Open Trenching - Rock

This item will cover all extra over costs for excavation of rock for pipe installation as directed by the Engineer. Rock is defined in Section 3.10 of the Specification.

Payment shall be per lineal metre of solid in place trench excavation through rock for pipe installation. This item shall only be expended on the written approval of the Engineer.

2.1.2.3 Directional Drilling – In District Council Road

This item covers all costs described under Item 2.1 associated with the supply and installation of pressure mains by directional drilling, regardless of location.

Payment shall be as described in Item 2.1.

Rates supplied for:

2.1.2.3 a) – 2.1.2.3 f) Varying rates by pipe diameter.

2.1.2.4 Extra Over for Directional Drilling – Rock

This item will cover all extra over costs for excavation of rock for pipe installation as directed by the Engineer. Rock is defined in Section 3.10 of the Specification.

Payment shall be per lineal metre of solid in place trench excavation through rock for pipe installation. This item shall only be expended on the written approval of the Engineer.

2.1.3 Rising Mains

2.1.3.1 Open Trenching – In District Council Road

This item covers all costs described under Item 2.1 associated with the supply and installation of rising mains by open trenching, regardless of location.

Payment shall be as described in Item 2.1.

Rates supplied for:

2.1.3.1 a) – 2.1.3.1 b) Varying rates by pipe diameter.

2.1.3.2 Extra Over for Open Trenching - Rock

This item will cover all extra over costs for excavation of rock for pipe installation as directed by the Engineer. Rock is defined in Section 3.10 of the Specification.

Payment shall be per lineal metre of solid in place trench excavation through rock for pipe installation. This item shall only be expended on the written approval of the Engineer.

2.1.3.3 Directional Drilling – In District Council Road

This item covers all costs described under Item 2.1 associated with the supply and installation of pressure mains by directional drilling, regardless of location.

Payment shall be as described in Item 2.1.

Rates supplied for:

2.1.3.3 a) – 2.1.3.3 b) Varying rates by pipe diameter.

2.1.3.4 Extra Over for Directional Drilling – Rock

This item will cover all extra over costs for excavation of rock for pipe installation as directed by the Engineer. Rock is defined in Section 3.10 of the Specification.

Payment shall be per lineal metre of solid in place trench excavation through rock for pipe installation. This item shall only be expended on the written approval of the Engineer.

2.2 Flush Points

This item will cover all costs associated with installation of the complete flush point assemblies including pipework, valves, chambers, covers and fittings, excavation as per Section 3 of the Specification, and Reinstatement as shown on the drawings and outlined in Section 14 of the Specification.

Payment shall be per complete pipe clean out pit installed and successfully tested and fully reinstated to the approval of the Engineer.

2.3 Scour Valves

This item will cover all costs associated with installation of the complete pipe clean out pit assemblies including pipework, valves, chambers, covers and fittings, excavation as per Section 3 of the Specification, and Reinstatement as shown on the drawings and outlined in Section 14 of the Specification.

Payment shall be per complete pipe clean out pit installed and successfully tested and fully reinstated to the approval of the Engineer.

2.4 Air Valves inclusive of odour filter

This item will cover all costs associated with supply and installation of the complete air valve assemblies, inclusive of odour filters, shown on the drawings successfully tested and fully reinstated to the approval of the Engineer.

Rates supplied for:

2.4 a) – 2.4 c) Supply and installation on various pipe diameters

Payment shall be per size of the pressure main where connected and per complete air valve assembly installed and successfully tested to the approval of the Engineer.

2.5 Isolation Valve

This item will cover all costs associated with supply and installation of the complete isolation valve assemblies including pipework, valves and fittings as shown on the drawings and outlined in the Specification, including Section 3 and Section 14.

Rates supplied for:

2.5 a) – 2.5 d) Various isolation valve sizes.

Payment shall be number basis per size and type per complete isolation valve assembly installed, successfully tested and fully reinstated to the approval of the Engineer.

2.6 Fittings

2.6.1 Reducers – Electrofusion or Butt-fusion welding

This item will cover all costs associated with supply and installation of pipe reducers as shown on

the drawings and outlined in the Specification, including Section 3 and Section 14.

Rates supplied for:

2.6.1 a) – 2.6.1 f) Supply and installation on various pipe diameters.

Payment shall be per size of the pressure main where connected and per complete pipe reducer fitting installed and successfully tested to the approval of the Engineer.

2.6.2 Tee piece

This item will cover all costs associated with supply and installation of the complete tee piece assemblies including pipework, valves and fittings as shown on the drawings and outlined in the Specification, including Section 3 and Section 14.

Rates supplied for:

2.6.2 a) – 2.6.2 d) Various tee piece installation arrangement sizes.

Payment shall be number basis per size and type per complete pipe tee assembly installed, successfully tested and fully reinstated to the approval of the Engineer.

2.6.3 Boundary Assemblies (inclusive of connection main)

This item shall include all costs related to the supply and install of the property boundary assembly including surface box and lid and making connection to the pressure sewer main by either open trenching or trenchless methods, which include, but is not limited to:

- Pipe laying by either open-trench or trenchless methods as per Section 6 and Section 7 of the Specification respectively
- Earthworks as per Section 3 of the Specification
- Supplying all materials (including saddles) and installation of the connection to the pressure sewer main as shown on the standard drawings
- Installation of the property boundary assembly including surface box and lid complete as detailed on the standard drawings
- Measuring the location and depth of the connection at the pipeline and the property end and supplying the information to the Engineer
- Installation of the pressure sewer lateral and connection to the pressure sewer main
- Inspecting the connections and pressure testing the boundary assembly
- Reinstating the ground surface.

50% payment shall be for each boundary kit installed and reinstated and the remaining 50% paid upon successful testing.

2.6.3 a) – installation of a Boundary Assembly on a lateral servicing one Boundary Assembly.

2.6.3 b) – installation of a Boundary Assembly on a lateral servicing more than one Boundary Assembly.

2.6.4 Communications Duct

This item will cover all costs associated with supply and installation of communications ducting for fibre and all associated connections as shown on the drawings.

Payment is per lineal metre for items 2.6.4 a) and 2.6.4 b) and per each for item 2.6.4 c).

2.7 Miscellaneous

2.7.1 1.5M diameter FRP Break chamber

This item will cover all costs associated with supply and installation of a 1.5m diameter FRP Break chamber as shown on the drawings.

Pricing is per each after installation and successfully testing to the satisfaction of the Engineer.

2.7.2 Landing Relay Unit

This item will cover all costs associated with supply and installation of a landing relay unit as shown on the drawings.

Pricing is per each after installation and successfully testing to the satisfaction of the Engineer.

2.7.3 Connection to Okareka rising main – 225OD on 250OD

This item will cover all costs associated with connection to the Okareka rising main as shown on the drawings.

Payment is by lump sum after successful completion of the Principal's protocols for connecting to live sewers and ground reinstatement to the satisfaction of the Engineer.

3. Pump Station

3.1 Pump Station TPS1 – Stoney Point

3.1.1 Site preparation & earthworks

These items will cover all plant, labour and materials for site preparation to the approval of the Engineer. This item includes all approvals, excavation, laying, jointing (if required), backfilling and reinstatement.

These items will cover all plant, labour and materials for earthworks for the pump station construction as shown on the drawings and in accordance with the specification.

Payment shall be a Lump Sum when the works are complete to the approval of the Engineer.

3.1.2 Dewatering and base preparation

This item will cover all plant, labour and materials for dewatering and base preparation as shown on the drawings and in accordance with the specification.

Payment shall be a Lump Sum when the works are complete to the approval of the Engineer.

3.1.3 Pavement

This item will cover all plant, labour and materials for construction of the pavement area within the pumpstation compound as shown on the drawings and in accordance with the specification.

Payment shall be made by lump sum following completion to the satisfaction of the Engineer.

3.1.4 Wetwell, pump & valve chamber

This item will cover all design, plant, labour and materials for the supply and install of the wetwell, pump and valve chamber as designed and all ancillaries complete as shown on the drawings and in accordance with the specification.

Item pricing is based on Maskells branded wetwell and valve chamber.

Payment shall be a Lump Sum when the works are installed complete to the approval of the Engineer.

3.1.5 Emergency Storage

This item will cover all design, plant, labour and materials for the supply and install of the emergency storage tank as designed and all ancillaries complete as shown on the drawings and in accordance with the specification.

Item pricing is based on Maskells branded emergency storage tank.

Payment shall be a Lump Sum when the works are installed complete to the approval of the Engineer.

3.1.6 Civil, mechanical and commissioning works

This item will cover all design, plant, labour and materials for all other civil, mechanical and commissioning works required to complete the pump station and all ancillaries as designed as shown on the drawings and in accordance with the specification.

Payment shall be a Lump Sum when the works are installed complete to the approval of the Engineer.

3.1.7 Electrical

This item will cover all design, plant, labour and materials for all other electrical, instrumentation and control system works required to complete the pump station and all ancillaries as designed as shown on the drawings and in accordance with the specification.

Payment shall be a Lump Sum when the works are installed complete to the approval of the Engineer.

3.2 Pump Station TPS2 – Refuse Transfer Station – Tarawera Road

3.2.1 Site preparation & earthworks

These items will cover all plant, labour and materials for site preparation to the approval of the Engineer. This item includes all approvals, excavation, laying, jointing (if required), backfilling and reinstatement.

These items will cover all plant, labour and materials for earthworks for the pump station construction as shown on the drawings and in accordance with the specification.

Payment shall be a Lump Sum when the works are complete to the approval of the Engineer.

3.2.2 Dewatering and base preparation

This item will cover all plant, labour and materials for dewatering and base preparation as shown on the drawings and in accordance with the specification.

Payment shall be a Lump Sum when the works are complete to the approval of the Engineer.

3.2.3 Pavement

This item will cover all plant, labour and materials for construction of the pavement area within the pumpstation compound as shown on the drawings and in accordance with the specification.

Payment shall be made by lump sum following completion to the satisfaction of the Engineer.

3.2.4 Wetwell, pump & valve chamber

This item will cover all design, plant, labour and materials for the supply and install of the wetwell, pump and valve chamber as designed and all ancillaries complete as shown on the drawings and in accordance with the specification.

Item pricing is based on Maskells branded wetwell and valve chamber.

Payment shall be a Lump Sum when the works are installed complete to the approval of the Engineer.

3.2.5 Emergency Storage

This item will cover all design, plant, labour and materials for the supply and install of the emergency storage tank as designed and all ancillaries complete as shown on the drawings and in accordance with the specification.

Item pricing is based on Maskells branded emergency storage tank.

Payment shall be a Lump Sum when the works are installed complete to the approval of the Engineer.

3.2.6 Civil, mechanical and commissioning works

This item will cover all design, plant, labour and materials for all other civil, mechanical and commissioning works required to complete the pump station and all ancillaries as designed as shown on the drawings and in accordance with the specification.

Payment shall be a Lump Sum when the works are installed complete to the approval of the Engineer.

3.2.7 Electrical

This item will cover all design, plant, labour and materials for all other electrical, instrumentation and control system works required to complete the pump station and all ancillaries as designed as shown on the drawings and in accordance with the specification.

Payment shall be a Lump Sum when the works are installed complete to the approval of the Engineer.

3.3 Booster Pump Station – Cliff Road

3.3.1 Site preparation & earthworks

These items will cover all plant, labour and materials for site preparation to the approval of the Engineer. This item includes all approvals, excavation, laying, jointing (if required), backfilling and reinstatement.

These items will cover all plant, labour and materials for earthworks for the pump station construction as shown on the drawings and in accordance with the specification.

Payment shall be a Lump Sum when the works are complete to the approval of the Engineer.

3.3.2 Dewatering and base preparation

This item will cover all plant, labour and materials for dewatering and base preparation as shown on the drawings and in accordance with the specification.

Payment shall be a Lump Sum when the works are complete to the approval of the Engineer.

3.3.3 Pavement

This item will cover all plant, labour and materials for construction of the pavement area within the pumpstation compound as shown on the drawings and in accordance with the specification.

Payment shall be made by lump sum following completion to the satisfaction of the Engineer.

3.3.4 Wetwell, pump & valve chamber

This item will cover all design, plant, labour and materials for the supply and install of the wetwell, pump and valve chamber as designed and all ancillaries complete as shown on the drawings and in accordance with the specification.

Item pricing is based on Maskells branded wetwell and valve chamber.

Payment shall be a Lump Sum when the works are installed complete to the approval of the Engineer.

3.3.5 Emergency Storage

This item will cover all design, plant, labour and materials for the supply and install of the emergency storage tank as designed and all ancillaries complete as shown on the drawings and in accordance with the specification.

Item pricing is based on Maskells branded emergency storage tank.

Payment shall be a Lump Sum when the works are installed complete to the approval of the Engineer.

3.3.6 Civil, mechanical and commissioning works

This item will cover all design, plant, labour and materials for all other civil, mechanical and commissioning works required to complete the pump station and all ancillaries as designed as shown on the drawings and in accordance with the specification.

Payment shall be a Lump Sum when the works are installed complete to the approval of the Engineer.

3.3.7 Electrical

This item will cover all design, plant, labour and materials for all other electrical, instrumentation and control system works required to complete the pump station and all ancillaries as designed as shown on the drawings and in accordance with the specification.

Payment shall be a Lump Sum when the works are installed complete to the approval of the Engineer.

4. Testing

4.1 Pre-acceptance Testing of PE Pipe Materials

This item will cover all costs associated with the pre-acceptance testing of PE pipe materials to provide proof that the PE pipe is on the Approved Materials List as outlined in the Specification.

Payment of the lump sums shall be of all documentation to the approval of the Engineer to provide that the PE pipe materials have achieved approved status.

4.2 Pipe Material Testing (Provisional Item)

This item will cover all costs associated with the destructive testing of PE pipe materials by request from the Engineer in accordance with the Approved Material List test procedure.

Payment shall be on a per test basis upon supply of each test certificate to the approval of the Engineer.

4.3 Testing of Trench Subgrade

This item will cover all costs associated with the Contractor's scala penetrometer (dynamic cone penetrometer) testing of the trench subgrade in accordance with the specification.

Payment shall be per scala test log supplied to the approval of the Engineer.

4.4 Pre-Construction Weld Testing

This item will cover all costs associated with the destructive weld testing of the pre-construction PE pipe as outlined in the specification, including all costs for cutting of the weld, testing by an IANZ registered laboratory in accordance with ISO 13954 Peel decohesion test, and re-welding of the pipeline.

Quantity is one test set, being one test per pipe diameter.

Rates supplied for:

4.4.a) Butt Fusion Joints - Pre-construction testing as per the Specification

4.4.b) Electrofusion Joints - Pre-construction testing as per the Specification

Payment of the lump sums shall be on supply of each test certificate to the approval of the Engineer.

4.5 Destructive Weld Testing

This item will cover all costs associated with the destructive weld testing of the installed PE pipe as outlined in the specification, including all costs for cutting of the weld, testing by an IANZ registered laboratory in accordance with ISO 13954 Peel decohesion test, and re-welding of the pipeline.

Rates supplied for:

4.5.a) – 4.5.h) Various pipe diameters

Payment of the lump sums shall be on supply of each test certificate to the approval of the Engineer.

4.6 Pressure Testing

This item will cover all costs associated with the pressure testing of the pipelines as jointly developed following completion of the Detailed Design, consistent with the Specification.

Rates supplied for:

4.6.a) – 4.6.h) Various pipe diameters

Payment shall be on lineal metre basis as the pipeline construction and pressure testing is completed to the approval of the Engineer.

5. Dayworks

This section shall be read in conjunction with A.10 Dayworks.

5.1 Labour

Refer to Section A.10.1.

5.2 Materials

Refer to Section A.10.3.

5.3 Major Plant (with operator)

Refer to Section A.10.2.

5.4 Working Day Rate

The tendered rate shall be the rate per Working Day in compensation for time related Cost and Profit Incurred in relation to an extension of Time

5.5 Vegetation Clearance

The provisional sum for “Vegetation Clearance” provides for the payment of the net invoiced cost of all vegetation clearance carried out as dayworks as authorised by the Engineer. Supplier’s invoices will be required to be attached to the dispatch/es.

5.6 Cut to waste unsuitable material & dispose of offsite

This item will cover all costs for excavation, removal and disposal of unsuitable material offsite as directed by the Engineer.

Payment shall be per cubic meter of the solid in place trench excavation volume of unsuitable material removed and disposed offsite.

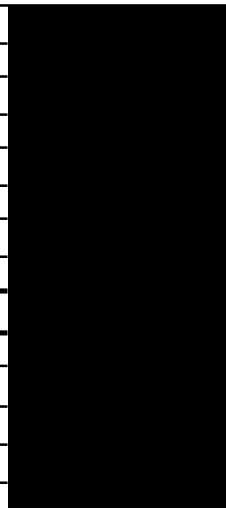
5.7 Supply and place imported fill

This item will cover all costs for supply, lay and compact imported backfill material as directed by the Engineer.

Payment shall be per cubic meter of the solid in place trench excavation volume of unsuitable material removed and disposed offsite.

Tarawera Sewerage Scheme Construction - Stage 1
Contract 22/038
Section C.2 Schedule of Prices

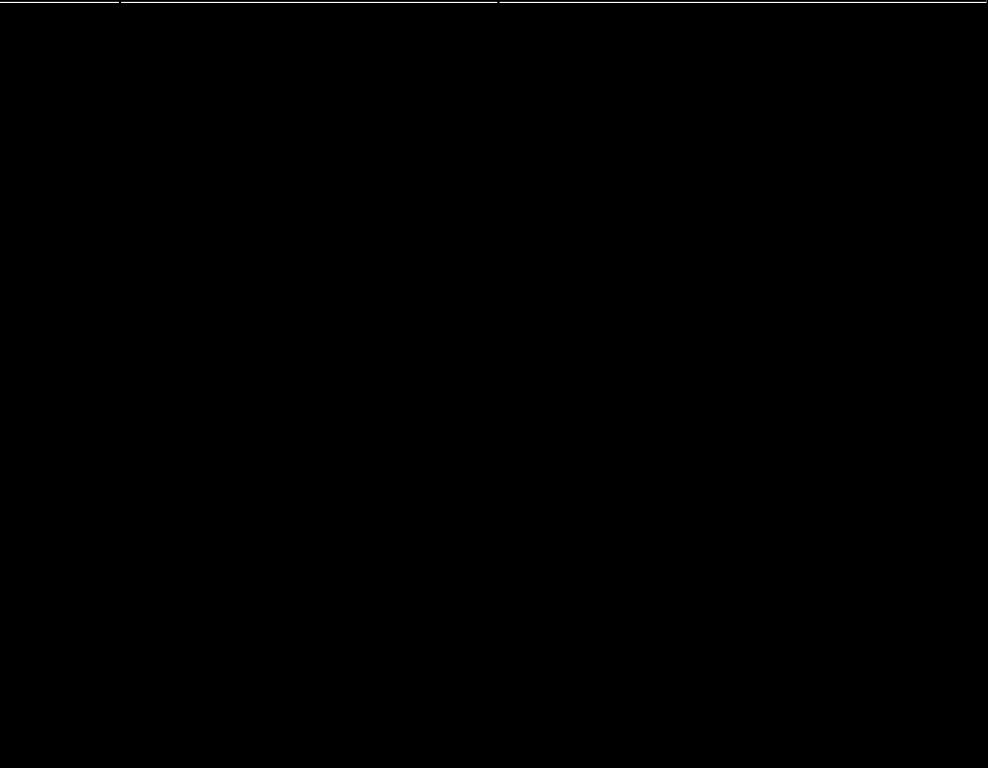
Tarawera Sewerage Scheme Construction - Stage 1 - GHD - Specimen Design and Associated Schedule	
Pricing Summary	
Item	Total
Preliminary & General costs	\$
Pressure Sewer costs	\$
Pump Station costs	\$
Testing	\$
TOTAL NETWORK COSTS	\$
Additional Provisional Sums	
Relocation of Services (provisional sum)	\$
Additional Boundary Kits (provisional sum)	\$
TOTAL CONTRACT SUM (exclusive of GST)	\$ 13,333,536.39



Tarawera Sewerage Scheme Construction - Stage 1 - GHD - Specimen Design and Associated Schedule

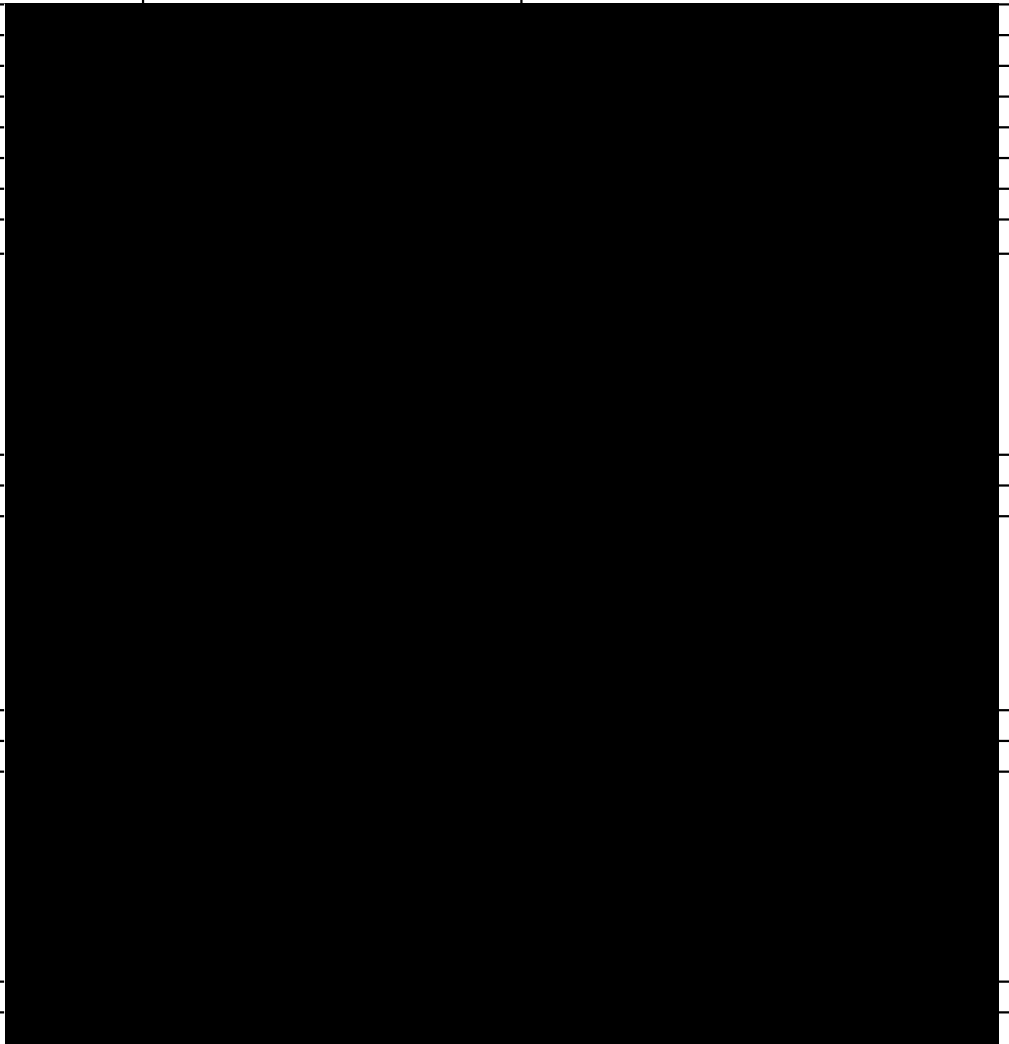
2. Pressure Sewer

Item	Description	Qty	Unit	Rate	Amount	Comments
2.1	Pipework					
2.1.1	Falling Pressure Main					
2.1.1.1	Open Trenching - In District Council Road Supply all materials, labour and plant and excavate, testing of subgrade, lay, backfill approved excavated material, tracer wire, compact and reinstate. PE100 SDR20 pipes and fittings.					
	225OD PE100 PN10	67	m			
2.1.1.2	Extra Over For Open Trenching - Rock Supply all materials, labour and plant and excavate, testing of subgrade, lay, backfill approved excavated material, tracer wire, compact and reinstate. PE100 SDR11 pipes and fittings.					
	225OD PE100 PN10	17	m			
2.1.1.3	Directional Drilling - In District Council Road Supply all materials, labour and plant and install PE100 SDR11 pipes and fittings by horizontal directional drilling including all excavation of drill and receiving pits, backfilling compaction and reinstatement.					
	225OD PE100 PN10	1263	m			
2.1.1.4	Extra Over For Directional Drilling - Rock Supply all materials, labour and plant and install PE100 SDR11 pipes and fittings by horizontal directional drilling including all excavation of drill and receiving pits, backfilling compaction and reinstatement.					
	225OD PE100 PN10	126	m			

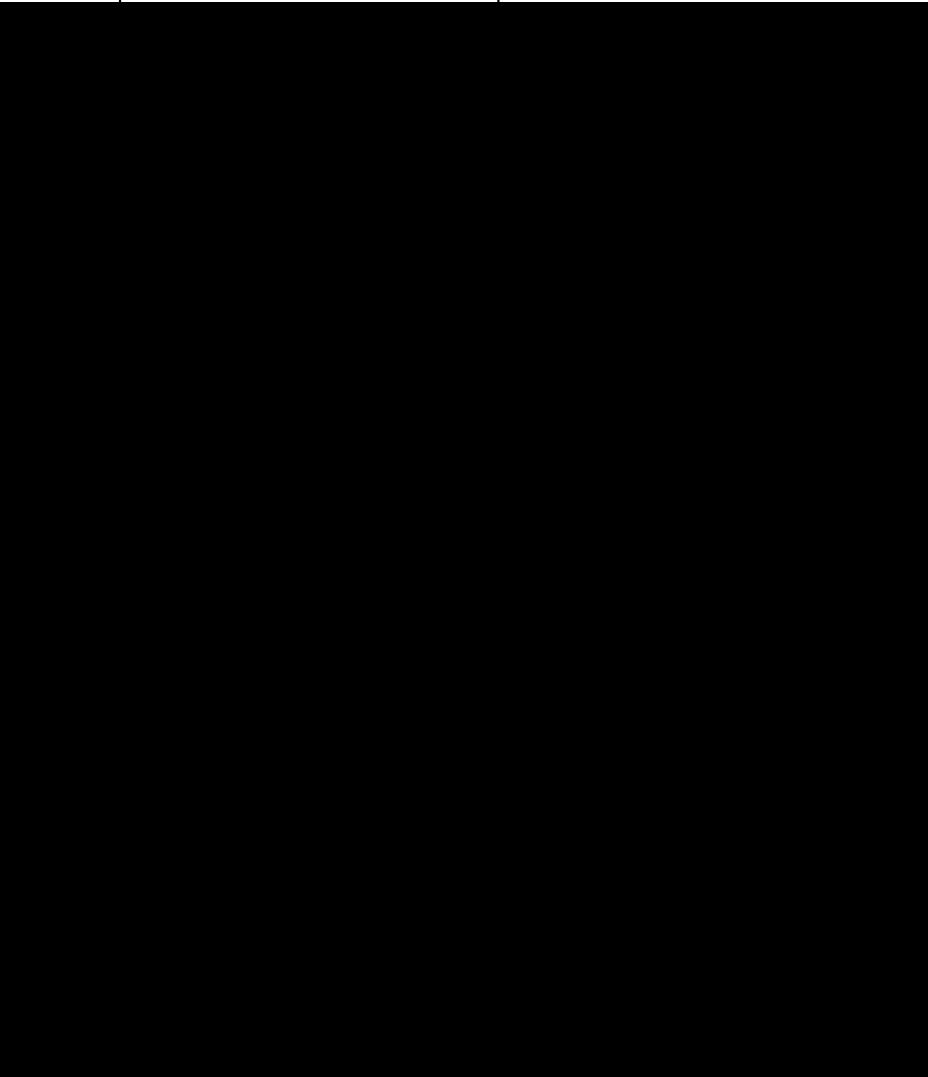


2. Pressure Sewer						
Item	Description	Qty	Unit	Rate	Amount	Comments
2.1.2	Pressure mains					
2.1.2.1	Open Trenching - In District Council Road Supply all materials, labour and plant and excavate, testing of subgrade, lay, backfill approved excavated material, tracer wire, compact and reinstate. PE100 SDR11 pipes and fittings.					
a	125OD PE100 PN16	13	m			
b	110OD PE100 PN16	159	m			
c	90OD PE100 PN16	103	m			
d	75OD PE100 PN16	5	m			
e	63OD PE100 PN16	37	m			
f	50OD PE100 PN16	96	m			
2.1.2.2	Extra Over For Open Trenching - Rock Supply all materials, labour and plant and excavate, testing of subgrade, lay, backfill approved excavated material, tracer wire, compact and reinstate. PE100 SDR11 pipes and fittings.					
a	125OD PE100 PN16	1	m			
b	110OD PE100 PN16	8	m			
c	90OD PE100 PN16	10	m			
d	75OD PE100 PN16	0.5	m			
e	63OD PE100 PN16	4	m			
f	50OD PE100 PN16	10	m			
2.1.2.3	Directional Drilling - In District Council Road Supply all materials, labour and plant and install PE100 SDR11 pipes and fittings by horizontal directional drilling including all excavation of drill and receiving pits, backfilling compaction and reinstatement.					
a	125OD PE100 PN16	240	m			
b	110OD PE100 PN16	3022	m			
c	90OD PE100 PN16	1958	m			
d	75OD PE100 PN16	96	m			
e	63OD PE100 PN16	710	m			
f	50OD PE100 PN16	1828	m			

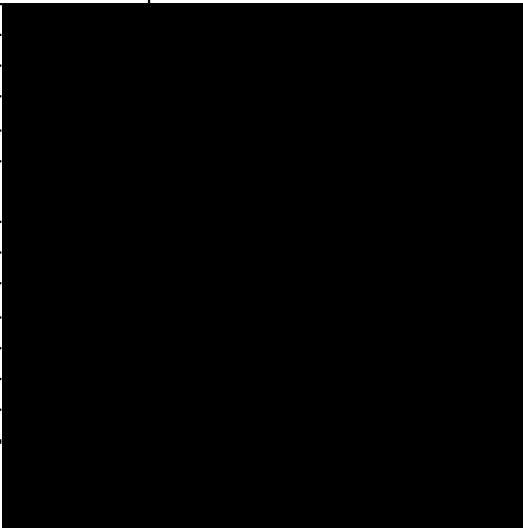
2. Pressure Sewer						
Item	Description	Qty	Unit	Rate	Amount	Comments
2.1.2.4	Extra Over For Directional Drilling - Rock Supply all materials, labour and plant and install PE100 SDR11 pipes and fittings by horizontal directional drilling including all excavation of drill and receiving pits, backfilling compaction and reinstatement.					
a	125OD PE100 PN16	24	m			
b	110OD PE100 PN16	302	m			
c	90OD PE100 PN16	196	m			
d	75OD PE100 PN16	10	m			
e	63OD PE100 PN16	71	m			
f	50OD PE100 PN16	183	m			
2.1.3	Rising mains					
2.1.3.1	Open Trenching - In District Council Road Supply all materials, labour and plant and excavate, testing of subgrade, lay, backfill approved excavated material, tracer wire, compact and reinstate. PE100 SDR11 & SDR9 pipes and fittings.					
a	160OD PE100 PN16	417	m			
b	160OD PE100 PN20	94	m			
2.1.3.2	Extra Over For Open Trenching - Rock Supply all materials, labour and plant and excavate, testing of subgrade, lay, backfill approved excavated material, tracer wire, compact and reinstate. PE100 SDR11 & SDR9 pipes and fittings.					
a	160OD PE100 PN16	42	m			
b	160OD PE100 PN20	10	m			
2.1.3.3	Directional Drilling - In District Council Road Supply all materials, labour and plant and install PE100 SDR11 & SDR9 pipes and fittings by horizontal directional drilling including all excavation of drill and receiving pits, backfilling compaction and reinstatement.					
a	160OD PE100 PN16	7918	m			
b	160OD PE100 PN20	1781	m			



2. Pressure Sewer						
Item	Description	Qty	Unit	Rate	Amount	Comments
2.1.3.4	Extra Over For Directional Drilling - Rock Supply all materials, labour and plant and install PE100 SDR11 & SDR9 pipes and fittings by horizontal directional drilling including all excavation of drill and receiving pits, backfilling compaction and reinstatement.					
a	160OD PE100 PN16	792	m			
b	160OD PE100 PN20	178	m			
2.2	Flush points					
a	DN50 Flush point	12	ea			
2.3	Scour Valves					
a	DN160 Scour Valve in Chamber	2	ea			
2.4	Air Valves inclusive of odour filter					
a	DN50 Air Valve	9	ea			
b	DN225 Air Valve	3	ea			
c	DN160 Air Valve	6	ea			
2.5	Isolation Valve					
a	DN63 Isolation Valve	5	ea			
b	DN90 Isolation Valve	4	ea			
c	DN50 isolation Valve	4	ea			
d	DN110 Isolation Valve	1	ea			
2.6	Fittings					
2.6.1	Reducers - Electrofusion or Butt-fusion welding					
a	50OD - 63OD	4	ea			
b	63OD - 75OD	1	ea			
c	75OD - 90OD	1	ea			
d	90OD - 110OD	1	ea			
e	110OD - 125OD	1	ea			
f	63OD - 90OD	3	ea			
2.6.2	Tee piece					
a	50OD on 90OD EF Tee	3	ea			
b	63OD on 90OD EF Tee	2	ea			
c	50OD on 125OD EF Tee	2	ea			
d	63OD on 63OD EF Tee	1	ea			



2. Pressure Sewer						
Item	Description	Qty	Unit	Rate	Amount	Comments
2.6.3	Boundary Assemblies (inclusive of connection to main)					
a	DN50 Tee	274	ea			
b	DN50 Tee,on shared lateral	170	ea			
2.6.4	Communications duct - 32mm					
a	32 OD PE Fibre Duct - Green - inclusive of fibre optic	7950	m			
b	32 OD PE Fibre Duct - Green (Landing to main) inclusive of fibre optic	530	m			
c	Telecom pulling pit with Class B lid	rate only	ea			
2.7	Miscellaneous					
7.1	1.5M diameter FRP Break chamber	1	ea			
7.2	Landing Relay Unit	1	ea			
7.3	Connection to Okareka rising main - 225OD on 250OD	1	PS			
	Total Pressure Sewer Cost to be carried forward to summary					



Tarawera Sewerage Scheme Construction - Stage 1 - GHD - Specimen Design and Associated Schedule

4. Testing

Item	Description	Qty	Unit	Rate	Amount	Comments
	TESTING					
4.1	Pre-Acceptance Testing of PE Pipe Materials Prior to ordering materials, provide proof that PE pipe supplier is on the Approved Materials List as outlined in the Specification	1	LS			
4.2	Pipe Material Testing (Provisional Item) Cut out representative samples of pipe material as selected by the Engineer and have them testing in accordance with the Approved Materials List test procedure	1	No.			
4.3	Testing of Trench Subgrade Scala Penetrometer testing as per the Specification	50	No.			
4.4	Pre Construction Weld Testing					
a	Butt Fusion Joints - Pre-construction testing as per the Specification	1	No.			
b	Electrofusion Joints - Pre-construction testing as per the Specification	1	No.			
4.5	Destructive Weld Testing Cut out representative samples of pipe welds as selected by the Engineer and have them testing in accordance with the specification					
a	50 OD	2	No.			
b	63 OD	2	No.			
c	75 OD	2	No.			
d	90 OD	4	No.			
e	110 OD	2	No.			
f	125 OD	2	No.			
g	160 OD	2	No.			
h	225 OD	2	No.			



4. Testing						
Item	Description	Qty	Unit	Rate	Amount	Comments
4.6	Pressure Testing Pressure testing of all pipelines in accordance with the Specification prior to progress payments					
a	50 OD	1924	m			
b	63 OD	747	m			
c	75 OD	101	m			
d	90 OD	2061	m			
e	110 OD	3181	m			
f	125 OD	253	m			
g	160 OD	10210	m			
h	225 OD	1330	m			
	Total Testing Cost to be carried forward to summary					

Tarawera Sewerage Scheme Construction - Stage 1 - GHD - Specimen Design and Associated Schedule

5. Day Works / Provisional Works

Item	Description	Qty	Unit	Rate	Amount	Comments
5.0	DAYWORKS					
	PROVISIONAL ITEMS					
5.1	Labour					
a)	Project Manager	60	Hrs			
b)	Project Engineer	80	Hrs			
c)	Site Representative	120	Hrs			
d)	Foreman/Works Supervisor	120	Hrs			
e)	Geotechnical Engineer	20	Hrs			
f)	Surveyor including survey equipment	50	Hrs			
g)	Surveyor & chainperson including survey equipment	50	Hrs			
h)	Drainlayer	60	Hrs			
i)	Electrician	30	Hrs			
j)	Labourer	120	Hrs			
k)	Traffic Management	40	Hrs			
5.2	Materials					
a)	Provisional Sum for mathe net cost of any materials (suppliers Invoices required) used in execution of dayworks	1	PS	\$		
b)	Contractor to specify the percentage that will related to 5.2a) (e.g., 80%)	\$ 100,000.00	%			
5.3	Major Plant (with operator)					
a)	Provisional Sum for major plant (with operator) dayworks. To be the NZ Contractors Federation rates (2005 ed.)	1	PS			
b)	Contractor to specify the percentage that will related to 5.3 a) (e.g., 80%)	\$ 100,000.00	%			
5.4	Working Date Rate					
a)	Rate per Working Day in compensation for time related Cost and Profit Incurred in relation to an extension of Time	25	day			

5. Day Works / Provisional Works						
Item	Description	Qty	Unit	Rate	Amount	Comments
5.5	Vegetation clearance	1	PS			
5.6	Cut to waste unsuitable material & dispose of offsite	Rate Only	m3			
5.7	Supply and place imported fill	Rate Only	m3			
	Total Dayworks					