

**LAKESIDE
TE KAUWHATA**

**PROPOSED INFRASTRUCTURE AND
SERVICING REPORT**

Project: 1239



DOCUMENT CONTROL RECORD

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1 EXECUTIVE SUMMARY

This report along with the appended plans and calculations have been prepared by Candor³ to support a Plan Change application for land located off Scott Road, Te Kauwhata as shown in Figure 1 in this report. The report addresses the provision of all infrastructure needed to service the area for residential development with a particular emphasis on roading, stormwater, wastewater and water supply.

At present legal access to the land is via Scott Road. For a development the size of Lakeside a single point of entry / exit is inappropriate and the aim is to provide a minimum of one further entry / exit from the area. Two options exist to provide a second linkage through to the existing Te Kauwhata township being

- A) an extension of the road that serves the existing wastewater treatment plant or
- B) a new road constructed through the Te Kauwhata Memorial Domain.

Option A is preferred as it is consistent with the building of a new treatment plant and lakeside reserve. The secondary access road into the Lakeside development will be required when 1200 homes have been constructed as identified in the traffic report prepared for the proposed development and it is intended to work with Council and construct this link along the alignment of the existing road to Council's wastewater treatment plant which is intended to be decommissioned as part of the development with a new upgraded plant

The existing Te Kauwhata township has a wastewater treatment plant which can be seen in Figure 1 at the northern end of Lake Waikare to the right of the subject land however there are problems with this plant and future renewal of discharge consents will be difficult. This report discusses options for an alternative means of wastewater treatment that will serve both the existing township and cater for planned growth including for the rezoning of the subject land to allow residential development. The report concludes that a modular containerised Membrane Bioreactor (MBR) plant is the most appropriate means of providing a cost effective high quality treatment for wastewater with subsequent land disposal. It is proposed that, as a part of the Lakeside development, a new MBR plant be constructed with the existing plant being decommissioned and redeveloped as a landscaped reserve to provide a second access into the Lakeside development and to provide the township with a lakefront reserve.

Provision of an adequate potable water supply has also been investigated and it has been confirmed that there are no issues with the volume of supply and that the Te Kauwhata Water Association can provide the required volume of raw water within its consented allocation. The raw water from the Waikato River is of good quality and treatment to a potable water supply standard is relatively simple. This can be achieved through an extension and upgrade of Council's existing treatment plant in Hall Road or through the construction of a new containerised package plant. It appears, based on initial discussions with Council officers, that a new plant is the best option and the developer has had Mena Water scope and price a new plant as part of its due diligence work.

Stormwater runoff from the proposed Lakeside development will discharge to Lake Waikare with treatment prior to discharge via a system of swales and wetlands to be constructed within the development in accordance with good industry practice and relevant standards. It is proposed that some limited filling of the existing floodplain may take place to rationalise lakefront boundaries for development and to achieve coherent roading patterns however this will be offset by excavation in other areas to replace the floodplain volume lost to any filling such that hydrologic neutrality will be maintained post development.

Utility services being power and telephone services can be upgraded to service the development.

Based on work carried out to date there are no technical impediments to providing any of the necessary services to allow residential development of the land that is the subject of this report and there are no technical engineering reasons why the land should not be rezoned. Given that there are problems with the existing Te Kauwhata water and wastewater systems and the developer is offering to resolve the issues in conjunction with Council there are good reasons why the Council should support the rezoning.

2 EXISTING SITE DESCRIPTION

The proposed development is located at the end of Scott Road, Te Kauwhata, immediately west of Lake Waikare and to the north-east of Rangiriri. The area displayed in Figure 1 has a total area of approximately 194 hectares.



Figure 1 Site location, figure reproduced from Google Maps.

The North Island Main Trunk railway (NIMT) runs along the western boundary of the site and the Waikato Expressway (SH1) is located approximately 1km further to the west with a new interchange to serve Te Kauwhata under construction. Lake Kopuera lies to the south-west of the development, on the western side of the railway and low lying flood prone farmland sits along the southern boundary.

There are a number of farm buildings, associated with a working farm operation, located at the end of Scott Road. Stands of trees are dotted throughout the property as can be seen from the aerial photo with many having been planted as wind breaks to support farming operations.

The land is undulating in contour with the central and western portions being elevated in comparison to the low lying flood prone land that borders Lake Waikare in the east and along the southern boundary.

3 EARTHWORKS

3.1 Bulk Earthworks

A Geotechnical Investigation Report has been prepared for the site which is included in the Plan Change Application. The Report confirms that the land is suitable for development and there are no technical matters raised in the report that are grounds for declining a Plan Change.

In order to develop the site into residential allotments it will be necessary to recontour the land to provide more regular shapes and appropriate road gradients. While it is a matter for assessment at Resource Consent stage some commentary on the earthworks necessary to implement the masterplan is provided to give a better understanding of the proposed project.

Bulk earthworks for the proposed development will be carried out over the entire site in a staged manner as development proceeds. Subject to detailed design and consenting some earthworks are also proposed for the low lying areas along the lake edge within the existing floodplain to the east and south of the site. This will be required to rationalise the lake frontage and deliver coherent roading alignments and grades. Where filling within the floodplain is proposed compensating earthworks will be carried out in other areas to replace any flood storage lost such that hydrologic neutrality is maintained.

The total volume of earthworks across the site will ultimately be determined by detailed design, however, an initial design based on the concept masterplan indicates the volume of earthworks required to recontour the site will involve approximately 1,350,000m³ cut to fill. Detailed design will be carried out so as to minimise land disturbing activities and while the total volume appears significant it equates to circa 1000m³ per proposed residential lot which in land development terms is relatively minimal. The earthworks will be undertaken in multiple stages, to suit the staged release of completed sections.

3.2 Sediment and Erosion Control

Erosion and sediment control measures will be established prior to construction beginning, and will be monitored throughout the construction phase. The removal of any measures will not occur until all surfaces have been sufficiently stabilised. Erosion and Sediment Control will be incorporated into the detailed engineering design work and will be in accordance with appropriate Waikato Regional and District Council guidelines with works generally undertaken as follows:

- Construction of a stabilised vehicle entrance at the entrance to any stage.
- Install clean water diversion drains to redirect upstream runoff where required.
- Construct the Sediment Retention Pond(s).
- Construct silt fences and earth bunds around the perimeter directing water to sediment retention ponds.
- Carry out any clearing required
- Strip topsoil and stockpile on site.
- Carry out cut to fill earthworks.
- Complete civil works as appropriate with topsoil respread and grassing on completed areas as soon as possible after works are complete.
- Re-spread topsoil immediately after completion of earthworks on areas not subject to civil works.
- Seed area with grass seed and where necessary, straw mulch.
- Remove erosion and sediment control measures once site is stabilised.

The site is proposed to be treated predominantly by a number of Sediment Retention Ponds (SRP) treating areas of up to 5ha each. Continuous earth bunds will pick up runoff from overland flow / contour drains, and direct it to the ponds. The SRP will have storage volume equal to 3% of its catchment area and will be PAC flocculent dosed to assist in the settling of suspended soil particles. All chemical treatment will be designed by the contractor and submitted to council for approval prior to works commencing.

As part of the detailed engineering design, USLE calculations will be produced, primarily to identify risky areas or “hotspots” of earthworks sites in terms of their potential to generate sediment.

Additional measures will be employed to minimise potential erosion on site such as; completing the earthwork stages as quickly as possible, and minimising exposed areas or stabilising as soon as possible following achievement of final level.

A preconstruction meeting will be held with a District / Regional Council Field Officer, the contractor, client and consultant to confirm the methodology and that all works will be carried out in accordance with the consent conditions and Regional / District guidelines.

A post construction meeting will also be held, to confirm that all works were carried out in accordance with the consent conditions and provide certification and as-builts.

Technically there are no impediments to carrying out earthworks in a manner that will result in stable platforms for development and, with appropriate sediment control measures in place to minimise sediment runoff during works, there is no reason from an earthworks perspective that the land cannot be rezoned.

4 ROADING

4.1 Existing Roading

A Traffic Report has been prepared to support the application for a Plan Change and reports on traffic volumes and the wider context of traffic movements and effects. This document focusses on the technical requirements necessary to implement roading for the development and should be read in conjunction with the Traffic Report.

The subject land is currently accessed off Scott Road which starts adjacent to the rail crossing at Te Kauwhata Road. From the intersection with Te Kauwhata Road to the intersection of St Andrews Place, Scott Road has kerb and channel both sides with a footpath on the eastern side, typical of an urban street. Past the intersection of Scott Road and St Andrews Place the existing road narrows to a typical rural road with table drains both sides and a metalled shoulder.

It is proposed that Scott Road be upgraded to an urban standard as part of the Lakeside development with the rural section of the road being widened from St Andrews Place to the development proper with kerb and channel and footpaths both sides in accordance with District Council standards. The completed road cross section will match the section of Scott Road that is currently of an urban standard.

There are no technical impediments to carrying out this work, the nature of which is routinely carried out when urbanising rural areas.

4.2 Proposed Roading

The development of Lakeside will require the construction of numerous local roads, including roads of varying width and function such as a main boulevard, park edge roads, secondary roads, cul-de-sacs and private jointly owned access lots (JOAL).

The legal width of the roads proposed will generally vary from 12.0m to 20.0m as per Council’s standards but exact roading cross sections will be subject to detailed design and Council consent. All roads will be constructed to Council standards with kerb & channel, footpaths and a hotmix surface. Parking and appropriate landscaping will be provided where required.

Road pavement depths will be designed based on an expected CBR value of 7% across the site. Pavement depth will be increased or stabilisation measures implemented in case the on-site Scala Penetrometer test results show a lower CBR value.

Stormwater runoff will be managed through a combination of standard road cesspits, swales, raingardens and treepits.

Street lighting will be provided on all roading in accordance with Council standards. Street trees and landscaping will also be provided throughout the development.

A key component of the development will be the construction of a secondary access road into the Lakeside development. The traffic reporting carried out indicates that this secondary link will be required when 1200 homes have been constructed. It is intended to work with Council and construct this new link along the alignment of the existing road to Council's wastewater treatment plant which is intended to be decommissioned as part of the development with a new upgraded plant (see the wastewater section below).

A masterplan is included with the Plan Change application setting out intended roading layouts although detailed design and consenting processes may require changes to the masterplan. The masterplan is therefore included for information and is only intended to inform the rezoning process. The ultimate form of development will be guided by the decisions that Council makes regarding zoning of the land and the formal processes leading to that point.

Technically there are no impediments to forming roading in a manner that will adequately serve the development and there is no reason from a roading perspective that the land cannot be rezoned.

5 STORMWATER

a. Existing Situation

There is no existing public stormwater reticulation in the subject area. The land proposed for development is elevated above the surrounding land and generally falls towards the lake to the east or to low lying flood plains to the south and the bulk of runoff from the land currently finds its way to Lake Waikare although some runoff may discharge to the west under the railway into Lake Kopuera.

b. Stormwater Reticulation System

A new stormwater reticulation system will be constructed to serve the proposed development. Stormwater reticulation will be designed to convey the 2 year ARI storm event in accordance with Council standards (Hamilton City Design Manual as adopted by Waikato District Council). The proposed reticulation will work in conjunction with "on-line" treatment devices such as rain gardens, swales and engineered wetlands before ultimate discharge into Lake Waikare. Where possible pipework will be minimised and swales will be used to collect and direct runoff to a discharge point. Typically such devices can be used where land is flat with pipework being used on steeper terrain where stormwater runoff velocities will be higher and erosion can be problematic.



Figure 3 Raingardens / Streetscape at Long Bay Auckland



Stormwater swales Albany Centre Auckland

c. Stormwater Runoff Quality Control

A variety of industry proven best practice methods will be used to treat and control stormwater from the Lakeside development before discharge into Lake Waikare.

Raingardens and swales within roads can provide "at source" and "train" treatment with retention and contaminant removal for roads and private driveways.

Engineered wetlands are also very effective at removing contaminants from stormwater and providing attenuation and there are numerous good examples of engineered wetlands that provide treatment, habitat and amenity. Figure 2, below, shows two examples of engineered wetlands that the applicants consulting team have been involved in designing and implementing.

Designs for these devices will be in accordance with Auckland Regional Council Technical Publication TP10 (Design guideline Manual Stormwater Treatment Devices) and TP124 (Low Impact Design) as well as relevant Hamilton City Council and Waikato District Council requirements.



Figure 2 Pegasus Town Engineered Wetland



Stonefields Engineered Wetland

d. Overland Flow Paths

The proposed development will be designed to ensure that runoff from large storm events up to and including the 100 year ARI event where the capacity of reticulation systems is exceeded are contained with carriageway and flow to Lake Waikare in a controlled manner.

Based on work carried out to date there are no technical impediments to managing stormwater runoff from the proposed Lakeside development should the area be rezoned to allow for residential development.

6 WASTEWATER

There is currently no public wastewater network in or adjacent to the site however the existing Te Kauwhata wastewater treatment plant (WWTP) is situated to the north-east of the site. Council have advised there are a number of issues with the existing facility, both in terms of it's capacity to serve the growth envisaged for Te Kauwhata and it's current discharge direct into Lake Waikare after treatment. In particular it is likely that renewal of the discharge consent will be difficult in future unless the discharge is redirected away from Lake Waikare.

The Lakeside developers have proposed to design and install a new wastewater treatment facility in the form of a Membrane Bioreactor (MBR) plant to serve the new development. The new plant will be designed to treat the existing wastewater flows from Te Kauwhata including an allowance for the growth currently envisaged by Council together with the future flows from the planned Lakeside development that is the subject of this application for rezoning. MBR plants are common around the world and are recognised as being effective at treating wastewater and there are an increasing number of these plants currently operational in New Zealand. The treated effluent produced is of a very high quality and is commonly discharged to ground, so as to replenish the treated water with minerals which are stripped out during the treatment process.

It is intended that the new plant proposed will be sited adjacent to Council's recycling facility in Rata Road on land owned by Council. A preliminary design has been commissioned from Mena Water which is appended to this report and is as shown in Figure 3 below.

Refer to “Lakeside Wastewater Treatment Plant Briefing Paper”, prepared by Mena Water Ltd, and appended to this report for further details.

The Mena Water Treatment Plant proposed has been peer reviewed by Mott McDonald and a copy of this report is included with the Plan Change application. The peer review confirms that the MBR technology proposed is appropriate for the proposed development although there are detailed technical matters to work through at Resource Consent stage.

The Mena system is modular and provides the ability for the new plant to be expanded gradually as growth occurs and treatment requirements grow. This allows capital costs to be spread over a number of years thus reducing the financial burden on the developer, Council and the community. When the new plant is commissioned the developer has offered to decommission the existing plant and to restore the area on which the plant currently sits to a lakeside reserve giving the town access to the lake with public access also being continued through the Lakeside development where walking and cycling paths are intended as shown on the indicative masterplan.

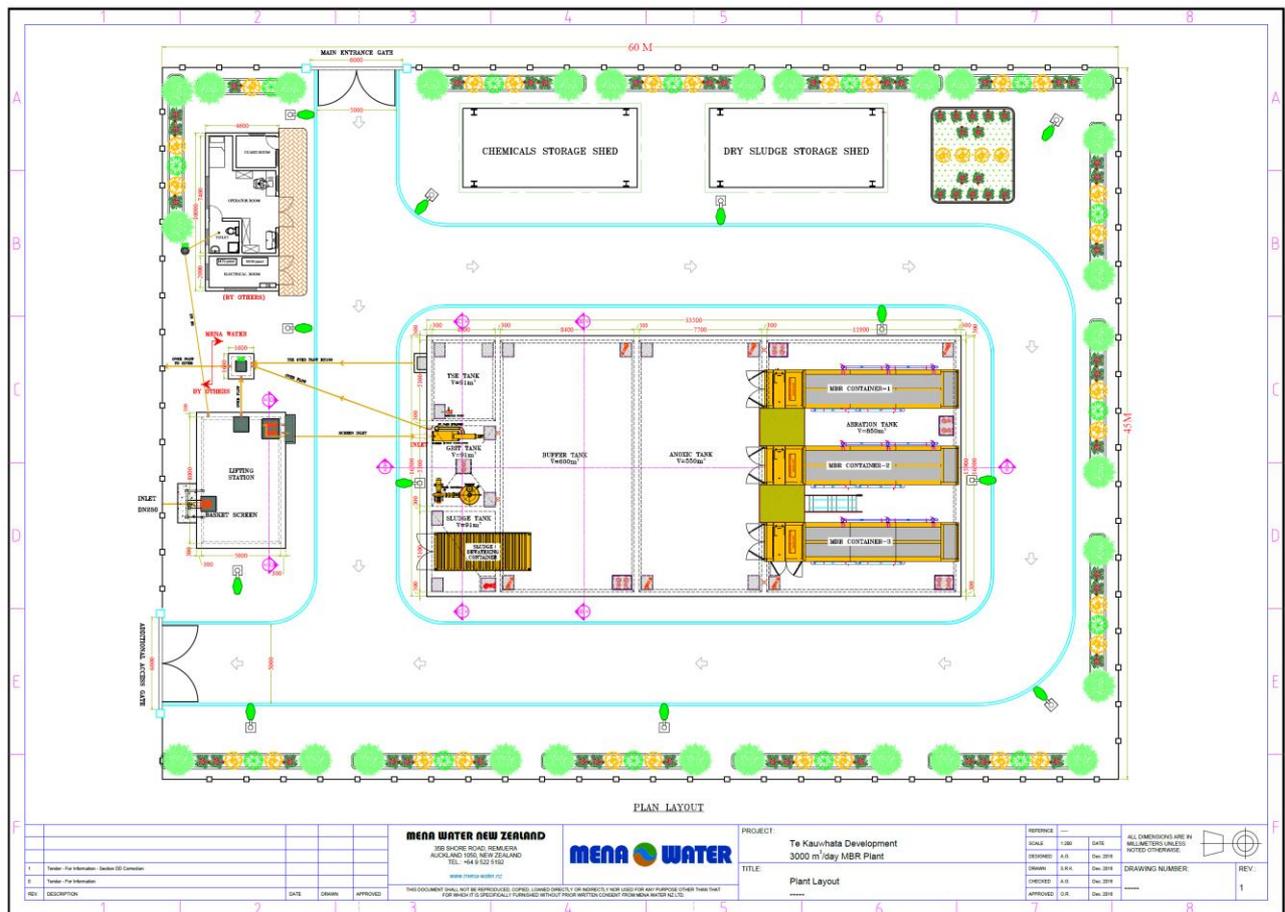


Figure 3 Draft MBR Treatment Facility layout

The wastewater reticulation for the proposed development will be designed to service the proposed lots with pipe sizes comprising primarily of 150mm dia. pipes. The topography of the development is such that pump stations will be required with associated rising mains in order to transport wastewater to the new treatment plant proposed.

All pipework, manholes and pump stations will be designed in accordance with Council standards and will be vested in Council upon completion.

A new discharge consent will be required for the disposal of treated effluent from the proposed plant. The discharge consent held by Waikato District Council for the existing treatment plant expires within the next few years and will require renewal irrespective of the proposed Lakeside development. As an existing township cannot be left without a means of wastewater disposal it can be assumed that

a new discharge consent must be granted in some form and the issue is not therefore about the ability to gain a discharge consent but rather what is the best practicable technical solution that will allow a new discharge consent to be granted and whether the proposed Lakeside development increases flows from Te Kauwhata to an unacceptable level.

With New Zealand's population increasing, Council's throughout New Zealand are having to plan for growth and there are numerous discharge applications seeking increases in consented outflows of treated wastewater before the relevant authorities across the country at the present time. For example Watercare are currently seeking to increase the allowable discharge from their Pukekohe Treatment Plant into the Waikato River from 30,000 to 60,000 people to allow for planned growth in the area.

There are numerous technical solutions available for disposal of wastewater from Te Kauwhata post the treatment process including disposal to land within the proposed Lakeside development boundaries (preferred solution), disposal to land at some other location, pumping and discharge to the Waikato River or pumping to the Huntly or Pokeno Treatment Plants. Detailed design work, stakeholder inputs and the resource management process will determine the best practicable solution from the options available. A key factor to bear in mind, as stated above, is that a new discharge consent is required for Te Kauwhata in conjunction with a new treatment solution irrespective of the Lakeside development and that this must inevitably be granted in some form. Wastewater flows generated by the Lakeside development simply increase the volumes to be discharged which can be managed in our professional opinion.

The preferred method of disposal of treated wastewater is via engineered reed beds (a dispersal cell) sited between 300 and 600m from Lake Waikare and above flood flow levels. Reed beds are a common means of polishing wastewater post treatment and are in common use in Europe and other regions. The beds can be compartmentalised to allow rotation and resting of soakage media and, should soil media become less permeable over time, the soil media can be removed and replaced one compartment at a time. Careful selection of native salt marsh plants such as flax, sedges, toe toe and cabbage trees for the reed beds can help to remove any residual salts remaining after treatment. Control systems will be installed to ensure a consistent dosing rate throughout the day rather than the morning and evening peaks typically associated with wastewater flows.

After soakage through the engineered reed beds any excess flows will be passed through flat vegetated swales and onto the flat areas of the site where further soakage will occur. During high groundwater conditions or during heavy rainfall soakage may be limited however all treated wastewater will soak through the reed beds and will subsequently be highly mixed and diluted by stormwater runoff before it reaches any significant water body such as Lake Waikare. The railway provides a physical barrier preventing any runoff entering Lake Kopuera directly.



Figure 4 - Engineered soakage / reed beds / swales

In our opinion there is no impediment to providing wastewater disposal for this development in accordance with Council standards and good engineering practice which also resolves existing problems facing Council in managing their existing facility.

7 POTABLE WATER SUPPLY

The Te Kauwhata Water Association has consent to extract water from the Waikato River and Council currently purchases water from this association to supply Te Kauwhata. The Te Kauwhata Water Association consented allocation is more than sufficient to supply the needs of the wider Te Kauwhata area including for envisaged growth and the proposed Lakeside development without requiring amendments to the consents that are in place.

The proposed development lies within an area identified for potential network extensions and the developer proposes to work with TKWA to advance network extensions to serve the proposed development.

TKWA Supply Network

This map shows the extent of the current supply network along with the adjacent areas. Potential network extensions are also shown.

Key

-  Current Reticulation Area
-  Adjacent Areas for Future Extensions
-  Potential Network Extensions

Google Maps

You can view this map in full detail on Google Maps with zoom and pan functions.

View on Google Maps:

[TKWA Current Reticulation](#)

[TKWA Adjacent Areas](#)

[TKWA Future Development](#)

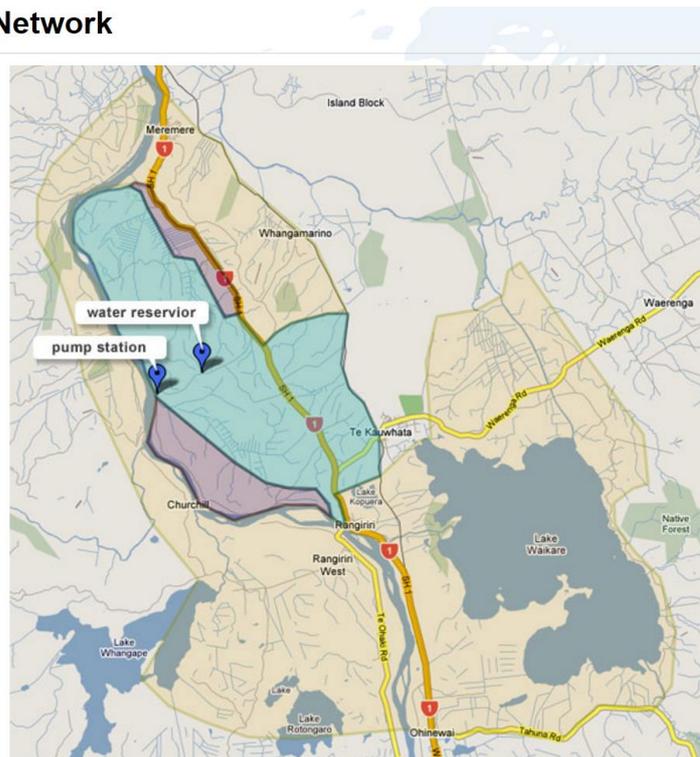


Figure 4 TKWA Supply Network

Council currently maintains a treatment plant and reservoir in Hall Road as shown on the Figure 4, above. This treatment plant will require an upgrade to deal with the Lakeside development and the planned growth envisaged for Te Kauwhata and the developer has offered to work with Council to facilitate this upgrade. The developer has provided Mena Water with the raw water quality data and has had them prepare a preliminary design for a new MBR plant to treat the raw water to a standard that meets Council's requirements for potable water. Water quality information provided by TKWA indicates that improvements to the potable water quality from the draw at the Waikato River are easily achieved via an MBR plant.

Council have plans for a new reservoir and have secured land in Te Kauwhata Road for this purpose and it is envisaged that the developer and Council will work together to develop an holistic plan that deals with the future water supply needs of Te Kauwhata and the proposed Lakeside development.

There are currently watermains located in Scott Road, serving the existing farm buildings, however these do not have sufficient capacity to serve the proposed development. Subject to detail engineering design, it will be necessary to upgrade the existing watermain for several kilometres off-site. This design will be done in conjunction with Council to ensure the full future growth for the Te Kauwhata area are catered for.

New water supply reticulation within the proposed development will be designed in accordance with Council standards, ensuring hydrant spacings, flows & pressures comply with New Zealand Fire Service Firefighting Water Supplies Code of Practice.

In our opinion there is no impediment to providing an adequate potable water supply for the Lakeside development in accordance with Council standards and good engineering practice and that there are no grounds for declining the Plan Change based on water supply matters.

8 UTILITY SERVICES

Chorus and WEL Networks have been contacted regarding the proposed development.

Chorus have confirmed that there is no impediment to serving the proposed development and a significant fibre optic cable exists within the property. No upgrades to telephone, exchanges or existing infrastructure are required.

WEL Networks have advised that adding capacity to their network for the proposed 1600 dwellings will not cause any issues and they are able to make provision for the Lakeside development.

Based upon advice from Chorus and WEL networks and our 30 years experience in large scale land development, there is no impediment to providing satisfactory utility services for the proposed development in accordance with relevant standards.

Based on the advice from WEL Networks and Chorus there is no impediment to providing adequate utility services for the proposed Lakeside development in accordance with Council standards and good engineering practice and that there are no grounds for declining the Plan Change based on utility service matters.

9 CONCLUSION

This report, along with other specialist documents, has been prepared in support of a Plan Change application to rezone approximately 194 hectares of land to the south of and immediately adjacent to the existing Te Kauwhata township. Based on investigations and preliminary work carried out and as presented in this document all necessary services required to facilitate development of the subject land can be provided.

In summary the subject land is

1. Geotechnically stable and there are no matters raised in the Geotechnical Investigation Report that cannot be adequately dealt with during construction to provide stable platforms for dwellings.
2. Free from inundation in large storm events. Most of the land proposed for development is well elevated above calculated flood levels in Lake Waikare. Some localised filling will be carried out in the proposed floodplains to rationalise roading layouts and where this occurs this land will also be raised above flood levels. Where filling of floodplains occurs additional flood storage will be provided in other areas to maintain hydrologic neutrality.
3. Able to be serviced adequately with stormwater reticulation in accordance with Council and Regional Council standards. A discharge consent will be required.
4. Able to be provided with adequate wastewater servicing in accordance with Council and Regional Council standards through the construction of a new treatment plant which will also serve the existing Te Kauwhata township including for future growth. Council have obligations to seek a new solution for the Te Kauwhata wastewater within the next few years including seeking new discharge consents for the solution settled upon and there are synergies in Council working with the developer of lakeside to accelerate this process.
5. Able to be provided with an adequate water supply in accordance with Council and Regional Council standards and the New Zealand Fire Service Firefighting Water Supplies Code of Practice through an upgrade of existing systems. The Te Kauwhata Water Association has confirmed that they can supply all required volumes of raw water under their existing consent.
6. Able to be provided with necessary utility services including power and phone to adequately service the proposed development.

In our professional opinion, there is no technical impediment to providing the necessary infrastructure to serve the proposed Lakeside development and there are no engineering matters that prevent the rezoning of the land. With the construction of new water and wastewater systems as discussed in this document the proposal will have positive beneficial effects for the existing township of Te Kauwhata.

**APPENDIX A
MENA WATER
DRAFT WASTEWATER TREATMENT PLANT**

Lakeside Wastewater Treatment Plant Briefing Paper

1. Executive Summary

The purpose of this paper is to provide a high-level summary of Lakeside Developments 2017 Limited (“LDL”) proposed wastewater solution for the Lakeside residential development in Te Kauwhata.

A private Plan Change submission is to be made to the Waikato District Council to rezone a 194-hectare parcel of land located at 65 and 94 Scott Road, Te Kauwhata (the “Property”).

Following the private plan change, the opportunity exists to develop the Property into a medium density master-planned community of about 1,600 residential lots and community hub to be known as “Lakeside”.

As part of the development of Lakeside the opportunity exists to implement a wastewater solution which will future proof the township of Te Kauwhata’s wastewater infrastructure for generations to come.

The Lakeside wastewater proposal includes an overall wastewater solution for the township of Te Kauwhata that will see the removal of the existing wastewater treatment ponds and the elimination of the discharging that is currently occurring into Lake Waikare.

The Lakeside wastewater solution has been developed by Orod Roostae of Mena Water New Zealand.

2. Proposed Lakeside Wastewater Solution

The proposed Lakeside wastewater solution is to install a self-contained wastewater package plant to process all of the wastewater created by the Te Kauwhata township (including the wastewater that is generated by the Lakeside development).

The wastewater package plant proposed is a membrane bioreactor (“MBR”) being a wastewater treatment process combining membrane filtration with biological treatment. This innovative technology offers several advantages over the conventionally activated sludge processes. Among these advantages are higher biomass concentration, eliminating the need for secondary clarifiers and improved effluent quality.

Key features of the MBR unit area:

- Fast delivery and start-up due to the mobile concept,
- German quality equipment in stainless steel housing,
- Compact design,
- High packing density,
- Effluent with irrigation water qualities (no microorganism, no smell)
- Very good price-performance ratio,
- Low maintenance and minimum operation requirement,
- Minimum construction work on site and easy to relocate.

The installation of the MBR plant will allow the existing wastewater treatment ponds located south of Rata Street and Roto Street to be decommissioned and removed once the new plant is commissioned.

The existing treatment plant area can then be transformed into a reserve with extensive green spaces, a playground and car park. This reserve area would become the starting point for the public to access the walkways links along the west edge of Lake Waikare which will be created as part of the Lakeside development.

3. MBR Hardware Requirements

Note the below information is provided by Orod Roostae of Mena Water New Zealand based on a high-level assessment of Te Kauwhata wastewater treatment needs. A full assessment of Te Kauwhata's current and future wastewater needs will be required to determine the required MBR solution.

Based on servicing the wastewater needs of 10,000 people, with an estimated flow rate of 2,500 m³ per day (considering 220 to 250 L/Day/Person).

The largest MBR unit available treats 1,000m³ per day, so to cater for the above flow would require either:

- three MW-MR1000 containers which would create total capacity of 3,00m³ per day; or
- two MW-MR1000 containers and one MW-MR600 container which would create total capacity of 2,600m³ per day.

The treatment plant includes the following treatment stages.

1. Inlet work
 - An automatic screen remove solids materials larger than 3 mm. form raw sewage.
2. Grit trap
 - Grit and silt will be separated from raw sewage and transferred to sludge holding tank.
3. Buffer tank / Anoxic tank
 - Variations in incoming flow will be dampened in the buffer tank and a constant flow will be pumped to the biological reactor of the treatment plant.
 - An anoxic zone will be created in the tank for denitrification process.
4. Aeration tank
 - Fine air bubbles are sparged into mixed liquor (activated sludge + raw sewage) to supply enough oxygen which is required for biological degradation of organic contamination in water.
 - The nitrification process happens in this tank as well.
5. Membrane filtration
 - Mixed liquor is transferred to MBR container which sits above aeration tank. UF filtration is used to separate solids from water.
 - Ultra-filtration effectively remove 99.9999% of bacteria and viruses from water.
6. Disinfection
 - Chlorination or UV disinfection will eliminate any remaining microorganisms in the treated water.
7. Sludge treatment
 - Primary sludge from grit trap and excess activated sludge from aeration tank are stored in sludge holding tank. Sludge thickening happens in the tank.
 - A belt filter press is then used for dewatering of thickened sludge.
8. Odor control system
 - Inlet work equipment, grit trap and buffer tank are connected to an odor control system which prevents foul air and disturbing odor spreads in the area.

The area of land required to house the MBR units would be approximately 600 m².

4. Forecasts Costings of the Proposed Wastewater Solution

The costings below are based on the three MW-MR1000 container solution which would create total capacity of 3,000m³ per day.

The capital cost of the proposed Wastewater Treatment Plant is \$6.5m including, the cost of three MBR containers, control system and all electro- mechanic equipment related to the treatment process, above ground and all underground tanks.

The Civil Works, Construction of Building and Associated Landscaping cost of \$1,000,000 includes, the cost of civils works associated with implementing the MBR units, constructing a building to house the MBR units and associated landscaping.

The Decommissioning of the Existing Wastewater Plant cost of \$1,000,000 includes, the decommissioning of the existing wastewater system, removal of the existing wastewater treatment ponds and the creation of the reserve.

Category	Forecast Cost
Wastewater Treatment Plant	\$6,500,000
Civil Works, Construction of Building and Associated Landscaping	\$1,000,000
Decommissioning of the Existing Wastewater Plant	\$1,000,000
Total	\$8,500,000

5. Examples of MBR Units in New Zealand

MBR treatment plants are increasing in number all over the world.

There are large MBR plants in Europe and North America that handle +150,000 m³/day.

There are numerous examples of MBR treatment systems in New Zealand. The largest is the Rotorua wastewater treatment plant which treats 7,300 m³ of the total 22,000 m³ raw sewage that flows in daily.

There is increasing interest in MBR plants among councils in the country. Rotorua Lake Council has planned to upgrade the existing treatment plant to a full MBR system by 2020.

Satellite MBR plants are now planned to be built for residential areas around the town.

6. Environmental Benefits

Raw sewage is contained in underground concrete tanks which prevent infiltration of contaminated water into underground water reservoirs. The tanks also prevent foul odor in the area and allows a clean surface on the ground.

Required footprint of an MBR plant is as low as 1/3rd of a typical activated sludge treatment plant footprint.

Quantity of excess sludge produced in an MBR plant is generally less compared with other activated sludge based treatment systems.

For municipal sewage, typical quality of treated wastewater is as follows:

- COD <15 mg/L
- BOD₅ <5 mg/L
- Suspended Solids <1 mg/L
- Total Nitrogen <5 mg/L
- Total Phosphorus <1 mg/L
- Turbidity <0.5 NTU
- Oil & Grease <1 mg/L
- Fecal Coliform 0 cfu/100mL

Reduce concentration of nitrogen and phosphorus in treated water prevent excessive growth of algae and other harmful microorganism in water bodies such as lakes and rivers.

APPENDIX B
WEL NETWORKS / CHORUS

John Gardiner

From: John Sia
Sent: Monday, 3 April 2017 12:23 PM
To: John Gardiner
Subject: FW: 40034965 - Lakeside Te Kauwhata

Hi John,

Confirmation of Te Kauwhata network not having any supply issues.

Kind Regards,
John

From: Grant Morris [mailto:Grant.Morris@wel.co.nz]
Sent: Monday, 3 April 2017 12:18 PM
To: John Sia <John.Sia@candor3.co.nz>
Subject: 40034965 - Lakeside Te Kauwhata

Hi John,

I can confirm that we can see no impediment in supplying power to the 1600 lot residential development at Te Kauwhata.

We have allowed to install 150 lots per year.

There will be costs associated with this.

Regards

Grant Morris

Grant Morris | CIW Account Manager | WEL Networks Ltd
DDI 07 850 3104 | **M** +64 27 535 2802 | **W** www.wel.co.nz
A 114 Maui Street, Te Rapa, Hamilton | PO BOX 925 Hamilton
Email grant.morris@wel.co.nz

www.wel.co.nz
114 MAUI STREET, TE RAPA
PO BOX 925, HAMILTON 3240, NEW ZEALAND

BEST IN SERVICE, BEST IN SAFETY



This message is privileged and confidential. If you are not the intended recipient, please delete the message and notify the sender.

Any views or opinions presented are solely those of the author.

Simon Ash

Subject: RE: 75 Scott Rd, Te Kauwhata - Potential Subdivision - Network Query

Hi John,

Chorus is fine for us to connect into the existing network off of Scott Road, and there is capacity on the network for the planned expansion of Te Kauwhata.

Something of note is the attached service plan from Chorus, which indicates that we will need to undertake service relocation due to the proposed earthworks.

Kind Regards,

John

From: Grant Walker [<mailto:Grant.Walker@chorus.co.nz>]
Sent: Thursday, 16 March 2017 3:00 PM
To: John Sia <John.Sia@candor3.co.nz>
Cc: TSG <TSG@chorus.co.nz>
Subject: RE: 75 Scott Rd, Te Kauwhata - Potential Subdivision - Network Query

Hi John,

As per our recent conversation...

Thank you for providing an indication of your development plans in this area. I can confirm that we have infrastructure in the general land area that you are proposing to develop. Chorus will be able to extend our network to provide connection availability. However, please note that this undertaking would of course be subject to Chorus understanding the final total property connections that we would be providing, roll-out of property releases/dates and what investment may or may not be required from yourselves and Chorus to deliver the infrastructure to and throughout the site in as seamless and practical way as possible.

The cost involved would be a minimum of our current standard fee of \$1600 per lot excluding GST. The 1st stage would also incur the cost of establishing the feeder fibre to the subdivision. This cost can only be finalised at the time that you are ready to proceed with the 1st stage.

Chorus is happy to work with you on this project as the network infrastructure provider of choice. What this ultimately means is that the end customers (business and home owners) will have their choice of any retail service providers to take their end use services from once we work with you to provide the physical infrastructure.

Please reapply with a detailed site plan when you are ready to proceed with stage 1.

I've also attached plans of the Chorus cables presently running through the subject property. These may need to be relocated to allow earthworks/development to proceed

Regards

Grant Walker | Network Scoper
 Chorus

**TUW/39462
75 Scott Rd
1600 Lot Development**

**4 cables—3 copper and 18F to
potentially relocate
Blue lines are indicative only
See pages below**



‘Engineering for life’ isn’t just a line. It’s a philosophy.

We believe the most commercially successful projects are the ones that are built for people. At Candor³ we make better use of resources to deliver quality outcomes and to address the immediate needs of clients and the community, without constraining future opportunities.

This holistic, people-focussed approach isn’t just about feeling good - it also makes business sense. Outcomes that enhance the lives of people attract attention, accolades, and support in the market place.

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