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10 July 2025

Grant Fahey
Fulton Hogan Land Development Limited
Level 2, 15 Sir William Pickering Drive
Burnside
Christchurch 8053
New Zealand

Kia ora Grant,

Construction of Temporary Wastewater treatment plant in Upper Orewa to serve the Milldale development

1. Fulton Hogan Land Development Ltd (**FHLDL**) is undertaking a major development known as Milldale. The development is at the northern edge of Auckland consisting of approximately 4500 new homes with a mix of densities from standalone through to terraced and apartment buildings. It includes a new school, a retirement village, a town centre with a supermarket and medical centre as well as a range of recreational spaces. The development is approximately 50% complete with around 2000 lots remaining to be developed.

2. FHLD has submitted Fast Track application for Milldale Stages 4C and 10-13 (**Fast-Track Application**).

3. FHLD is seeking consent to construct and operate a temporary wastewater treatment plant (**WWTP**) to service the development proposed under the Fast Track Application. This is intended as an interim solution until the upgrades to the Army Bay Treatment Plant are completed and sufficient network capacity is available to support the Milldale development.

4. On 17 December 2024, Watercare Services Limited (**Watercare**) sent a letter to FHLDL setting out the basis upon which Watercare would support the establishment of the temporary WWTP by FHLDL.

5. As part of the proposed temporary WWTP, a reverse osmosis (**RO**) unit is expected to be installed to improve the quality of treated water meet the regulatory requirements of discharge to the receiving environment. This RO unit is in addition to the MBR plant.

6. FHLDL has advised Watercare that the RO process separates a portion of the flow, concentrating residual contaminants in a brine waste stream, while the remaining flow meets the required high-quality discharge standards. Watercare understands that FHLDL proposes to discharge the RO waste stream into the Watercare wastewater network while simultaneously extracting an equivalent volume of additional wastewater from the network for treatment within the proposed temporary WWTP in certain limited situations.

7. FHLDL has advised Watercare that this approach would result in no net change to the total flow into the Watercare wastewater network. Furthermore, the RO waste stream will be of higher quality than the existing flows within the network at the point of discharge.

8. The purpose of this letter is to clarify that Watercare agrees in principle to:

    a. the discharge of the RO waste stream from the temporary WWTP to the Watercare wastewater network in certain limited scenarios; and

    b. the extraction of an equivalent volume of wastewater from the same transmission main (in addition to the wastewater that is extracted from the network for treatment for the proposed upstream development the WWTP will service) for treatment at the WWTP resulting in a neutral net flow impact.

9. Watercare’s agreement in principle as set out above is subject to and conditional on:

    a. the parties reviewing and Watercare agreeing to flow volumes, rates and quality of the waste stream discharge; and

    b. the waste stream from the RO unit being of a quality that is not detrimental to the operation, integrity or compliance of the Watercare network or the Army Bay WWTP.

10. Watercare wishes to take this opportunity to clarify that a formal agreement will be required to capture the overall arrangement — including all matters outlined in Watercare’s letter dated 17 December 2024, as well as the additional elements set out in this letter. This agreement will define the technical, operational, and commercial responsibilities of each party, and will be subject to further review and approval by Watercare.

11. Please note that this letter is not legally binding and Watercare’s agreement in principle remains subject to formal documentation and approvals. Any support indicated is conditional on the resolution (to Watercare’s satisfaction at its sole discretion) of all outstanding matters, including (but not limited to) technical feasibility, network impact assessments, and final legal review.

Yours faithfully,

Anna Jennings
Manager Major Developments
Watercare Services Limited

To

Watercare Services Ltd.

From

Woods
Tim Rickards – Principal Engineer

W-REF: P24-189
31 July 2025

Milldale Wastewater Treatment Plant – Response to Watercare Services Ltd feedback to the Milldale Fast-track application.

This Memorandum has been prepared as a response to the feedback received from Watercare Services Ltd. (WSL) with regards to the Milldale Fast-track application, specifically the design of the proposed Temporary Wastewater Treatment Plant (WWTP).

Through the Fast-track process WSL have provided feedback to the Milldale Fast-track panel in the form of a letter (dated 29/7/2025). This letter raises concerns with aspects of the proposed design as follows:

1. Concerns around the proposed Reverse Osmosis (RO) waste stream from the WWTP that is proposed to be returned to the WSL network. Concerns focus on the volume and frequency of this waste stream, as well as the contaminants present within the waste stream. A subsequent meeting with WSL has identified the key contaminant of concern to be the salt content of the proposed waste stream.
2. The requirement for emergency storage at the WWTP. Currently it is not proposed to provide emergency storage at the WWTP and WSL are concerned about the impact of operational failures at the WWTP on their downstream network.

It is noted that the letter from WSL also addresses concerns around a proposed pipe bridge in the Milldale Fast-track application. This concern will be addressed separately from this memorandum as part of a wider response for the subdivision portion of the fast-track application.

1. Background

As part of the Milldale Fast-track application it is proposed to construct a temporary WWTP to treat the wastewater runoff from the proposed new lots created through the Fast-track application. The WWTP is required due to a shortfall in capacity at the Army Bay WWTP creating a restriction on development in the Hibiscus Coast catchment.

It is understood that an upgrade to the Army Bay WWTP is planned to be completed in 2031. The proposed Temporary WWTP at Milldale is intended to be in operation until this upgrade is completed. The consent application is for 10 years to account for any potential delays.

The shortfall in capacity of the Army Bay WWTP was identified by WSL mid-2024 and the Milldale design team has been working with WSL since that time to find solutions to the capacity issue that will allow development to continue in the catchment.

The team has met with WSL fortnightly since August 2024 to consult with them around the proposed temporary WWTP design and have included WSL feedback into the design decisions of the proposed plant. Key decisions that were agreed with WSL through this process are:

- In September 2024 a proposal was agreed with WSL around the way the plant would operate with the WSL network. This agreement included:
    - That the pipe network within the proposed development would be a public system gravitating to the existing WSL Milldale Transmission Pipe.
    - That the proposed WWTP would extract flows from the WSL network proportionate to the flow generated from the proposed Milldale Fast-track Development. Extraction would be via a pump station from the Milldale Transmission Pipe to offset the increased flows from the proposed Milldale Fast-track development.
    - The flows extracted from the Milldale Transmission Pipe will be withdrawn at a constant rate to ensure the required daily volume of wastewater treatment is achieved and there is no impact on the Army Bay WWTP. It was agreed that the diurnal and wet weather peaking of the flows could be buffered by the storage capacity in the WSL network.
    - It was agreed that during wet weather, the required daily volume to be treated would be increased to offset any stormwater infiltration into the network.
    - This was a critical decision as it meant that the temporary WWTP would not need to include onsite storage tanks to buffer the peaks of diurnal and wet weather flows.
- In January 2025 it was identified by the design team that due to quality testing of the receiving environment a very high level of wastewater treatment would be required. This triggered the need to include a RO unit as part of the design.
    - The RO unit creates a waste stream that could not be discharged onsite, and it was proposed to discharge this flow back into the Milldale Transmission Pipe. It was proposed to increase the offtake flow from the Milldale Transmission Pipe to offset this proposed discharge. The proposed waste stream discharged back to the pipeline will be highly treated and of much better quality than the existing flow.
    - WSL agreed to this proposal in late January 2025. This was on the basis that no changes were made to the total approved flows to the Army Bay WWTP. They also wanted to understand the concentration of contaminants being discharged back to the network through the waste stream.
    - As part of the initial council feedback on the Milldale Fast-track application it was requested to obtain written acceptance of this arrangement from WSL. This was discussed with WSL in early July and WSL provided a letter acknowledging the agreement on 10/7/2025.

- o The letter was conditional on agreement of the proposed flows to be extracted and discharged, and that the waste stream from the RO unit was of a quality not to be detrimental to the WSL network or operations. These conditions are acceptable to the design team and have been considered as part of the design approach.

2. Plant Configuration

It is proposed to locate the temporary WWTP on the private lot northeast of Lysnar rd.

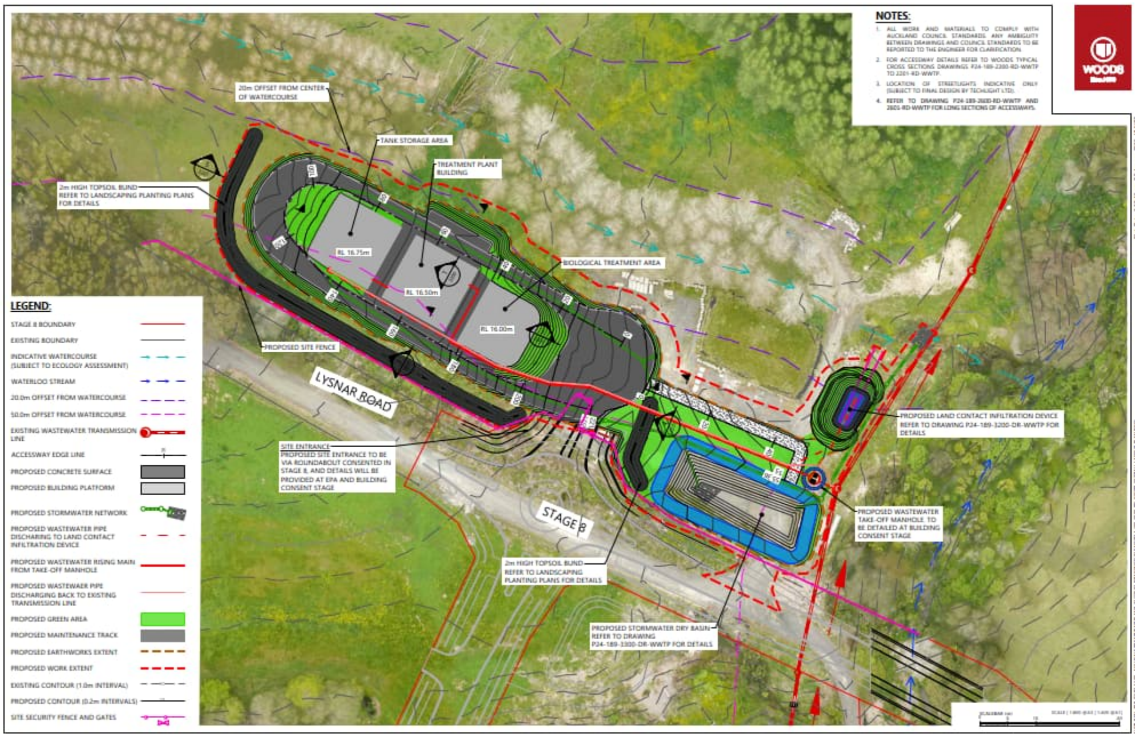

Figure 1: Proposed Treatment Plant.

The majority of the Milldale wastewater passes through this lot via the Milldale Transmission Pipe parallel to the Waterloo Stream. All new lots proposed as part of the Milldale Fast-track application will also gravitate to this transmission pipe.

It is proposed to install a take-off manhole on this line to pump flows out of the transmission line to the proposed WWTP. The take-off manhole will be a pump chamber with a take-off pipe from the main transmission main. The wastewater in the transmission main will flow to the chamber until the chamber is full, and then bypass back along the existing transmission main to flow to the Army Bay Treatment Plant. Flow to the proposed Milldale treatment plant can then be controlled via a pump system drawing down the pump chamber as required.

Flows from the pump chamber will be pumped to the proposed WWTP, which is proposed to be a Membrane Bioreactor system (MBR) with an RO unit doing a final treatment of the flows prior to treatment.

Following treatment, it is proposed to pump the treated effluent to be discharged to a proposed artificial wetland within the subject site to be discharged into the receiving environment. There will be a small waste stream from the RO unit that will be discharged back to the Milldale Transmission Pipe.

It is proposed that the take-off manhole and WWTP would be private and remain in FHLDL ownership for them to maintain and operate. On completion of the upgrade of the Army Bay WWTP facility the take-off manhole and temporary WWTP will be decommissioned, and flows will continue down the transmission line to the Army Bay facility.

3. Design Wastewater Plant Flows

FHLDL have proposed sizing the Temporary WWTP to service up to 1250 lots (1250 DUE's).

An assessment has been undertaken of the expected flows to the Milldale treatment plant from the proposed 1250 lots. This results in an expected peak average dry weather flow (ADWF) of 675 m^3/day once full development is achieved. A wet weather flow rate has also been calculated to give a wet weather peak treatment volume of 829 m^3 per day.

As agreed with WSL previously, there is suitable capacity in the downstream network to accommodate balancing of the diurnal peaks and wet weather events from the network, the treatment plant is designed to treat the average flows from the network over a 24hr period. No buffering tanks are proposed as part of the WWTP design.

The Milldale Transmission Pipe has already been approved by WSL through previous consents to convey flows from approximately 1800 DUE's. These approved DUE's will be fully utilised before the proposed WWTP comes online. This corresponds to an average dry weather flow of 972 m^3/ day already being conveyed in the pipeline before the Milldale Fast-track lots are added.

The below table shows the required flow rates from the Milldale Fast track development that the WWTP will be designed to treat when operating at capacity. These flows do not include the additional flows that are proposed to be extracted to offset the proposed waste stream.

	Daily flow rate	Treatment flow rate
Dry weather flow	675 m^3/ day	7.8 l/s
Wet weather flow	829 m^3/ day	9.6 l/s

It is proposed to stage the development of the Milldale Fast-track development over several years. The off-take flows will be staged to match the discharge from the lots from the staged development as they come online. This means that wastewater flows from the catchment being treated by the WWTP will increase over time to eventually reach the designed WWTP capacity.

Through the Engineering Approval process for the development of these stages, agreement will be reached with WSL regarding the required treatment flowrates of the temporary WWTP to address each subdivision stage flows.

4. WSL Reverse Osmosis (RO) Waste Stream Concerns

WSL have raised concerns around the proposed RO waste stream from the WWTP that is proposed to be returned to the WSL network. The concerns focus on the volume and frequency of this waste stream, as well as the contaminants present within the waste stream.

A meeting was held with WSL on the 30/7/2025 and it was identified that the key contaminant of concern is the salt content of the proposed waste stream and the effect this may have on the WSL Network and the Army Bay WWTP.

The waste stream from the RO unit back into the WSL network will be a constant flow. The flowrate of the waste stream will fluctuate in accordance with the treatment flowrate of the WWTP, with a consistent percentage of treatment flow being discharged as a waste stream back to the WSL network.

The key point here is that the flowrate in the Milldale Transmission Pipe downstream of the waste stream discharge point will not be affected by this waste stream discharge. This is achieved by increasing the off-take flowrate from the transmission main at an equivalent flowrate to that of the discharge flowrate from the waste stream. This has been detailed in all correspondence with WSL to date and is covered by the letter WSL have provided to FHLDL to be used as part of the Fast-track application.

With regards to the contaminants in the waste stream it should be noted that the effluent will have already been treated to a very high standard by the proposed MBR system in the WWTP. The RO process is a final polishing process to enable the flow discharged to the receiving environment to be at the exceptional quality needed to ensure less than minor impacts. The waste stream discharged back to the Milldale Transmission Pipe will still be of very high quality and a significant improvement on the additional offtake flow that is withdrawn to offset this waste discharge.

WSL have correctly identified that there is a small increase to the concentration of salt in the flow being discharged back to the network when compared to the predevelopment flows. APEX have undertaken an assessment on the impacts of this increase in the salt concentration on the operation of the WSL network and Army Bay WWTP. It is not anticipated that this increase in salt concentration will have any negative impact on the WSL operations. Further to this, the waste stream proposal is anticipated to have a positive effect on the operation of the Army Bay WWTP through the reduction of other contaminants in the discharged when compared to predevelopment flows. Please refer to APEX's attached memorandum for further details on this assessment.

5. WSL Emergency storage concerns

It is not proposed to provide emergency storage at the WWTP and WSL have raised concerned about the impact this decision with have on the operation of their network. They are concerned that operational failures at the temporary WWTP will result in increased flows to the WSL network and Army Bay WWTP.

The lack of emergency storage is a function of the design decision to not provide buffering tanks to store the peak flows, and instead allow the WSL network and Army Bay WWTP storage to buffer the peaks with the temporary WWTP designed to treat a daily flowrate. This was a decision made in conjunction with WSL in September 2024 and has set the direction of the WWTP design process since.

The lack of emergency storage has been considered as part of the design process. The WWTP has been designed with duty/ stand-by systems throughout. It is also proposed to have a permanent emergency generator onsite to protect against loss of power. This approach ensures that the proposed WWTP is robust in its ability to consistently treat the required flows and not require offset by the public system.

The available peak buffering in the WSL network also allows a second layer of protection. In the event the temporary WWTP does need to go offline, the flows can be buffered through the WSL network. This allows the temporary WWTP, once operational again, to treat at a higher flowrate and catchup on its daily treatment flowrate. If the outage is planned the plant can treat at a higher rate ahead of the outage to get ahead of its daily rate. This is the same approach that is used to address the diurnal and wet weather peaks.

The above provides suitable insurance against plant failure which mitigates the need for emergency storage capacity. As a final point, as with all engineering designs, consideration needs to be given to what is a preferable means of failure. The proposed temporary WWTP is designed to fail back into the WSL network, rather than via an emergency discharge to the receiving environment. This provides an opportunity for the WSL network to buffer the increase flows, and the Army Bay WWTP an opportunity to provide an element of treatment to them before they are discharged to the receiving environment. While not a desired outcome for either FHLDL or WSL, this is a robust strategy which in the event of a failure will have the best outcome for the receiving environment.

6. Summary

The above memo addresses the concerns raised by WSL in their letter to the EPA regarding the Milldale Fast-track application. It shows that WSL concerns are unwarranted, and the items raised have been considered and addressed as part of the temporary WWTP design.

Tim Rickards

Principal Civil Engineer

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TECHNICAL NOTE			TN. 03
Revision	2	Date:	31st July 2025
Principal's Representative:	Grant Fahey		
Contractor:	Apex Water		
Contract:	Milldale Wastewater Treatment Plant		
Contract No.:	240805		
Subject:	**Technical Note – Milldale Wastewater Treatment RO Reject Discharge**		

Dear Grant,

Technical Note – Milldale Wastewater Treatment RO Reject Discharge

Prepared by: Apex Water

In their comments on the Milldale Fast Track consent application of 29 July 2025, Watercare requested additional information on the Reverse Osmosis (RO) system reject that is proposed to be discharged to the Watercare network from the temporary on-site wastewater treatment system at the Milldale development.

In order to provide a very high level of on-site treatment, the proposed plant will use membrane bioreactor (MBR) technology to treat wastewater drawn from the Watercare transmission main prior to further polishing by reverse osmosis. The primary objective of the reverse osmosis system is to reduce the load of nutrients (primarily phosphorus and nitrogen species) to very low levels prior to discharge to the receiving environment. The RO does however produce a (still relatively clean) waste stream that needs to be disposed of separately.

Figure 1 below provides approximate flows and loads through the treatment system using average dry weather flow rates and typical raw sewage strengths to show the expected contaminant loads through the system and returned via RO reject to sewer:

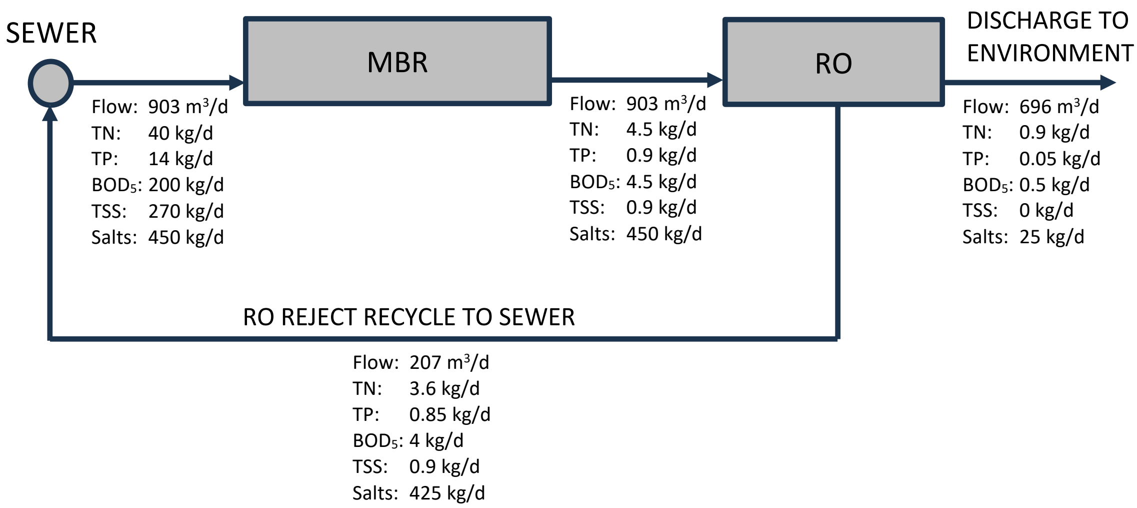

Figure 1 Mass balance of treatment plant loads detailing RO reject to sewer

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Of note are the following key points:

- An additional dry weather flow of approximately 207m^3/day beyond the agreed dry weather flow of 696m^3/day (29m^3/hr) is abstracted from the sewer main and treated to compensate for the hydraulic load of the RO reject flow discharged back to the sewer.
- Around 60 – 70% of the nutrient load (TN and TP) and more than 90% of the organic load (BOD_5) and suspended solids is removed from this additional flow via treatment before returning to the sewer as RO reject.
- The total salt load removed from the sewer is slightly reduced before being returned to the sewer.

This operational philosophy ensures that there is no net negative hydraulic impact on the Watercare transmission network or treatment plant, and a net positive impact of the proposed discharge on Watercare's treatment plant capacity.

The salt loading on the Watercare treatment plant from the RO reject would be the same (actually very slightly better) than if the abstracted sewage was permitted to flow past without passing through the RO. There would however be a net reduction of approximately 2kg/day Phosphorus, 5kg/day Nitrogen, 36 kg/day of BOD_5, and 60 kg/day of Suspended Solids load on the Watercare treatment plant from abstraction, treatment, and return of the RO reject flow to the network.

While high salt concentrations (typically due to infiltration of sea water into the sewer network, Industrial discharges, or salt water toilet flushing in Island environments) can have a negative impact on activated sludge in the sewage treatment process by inhibiting biological activity and disrupting flocculation processes, this does not typically present below concentrations of 2,000mg/L, which is over double the strength of the proposed raw RO reject discharge, even before dilution by other flows in the network. This means that even in the unlikely case that RO style treatment plants of this type are more widely adopted the catchment, there would still be no significant impact on the Watercare treatment plant or discharge.

<u>Effect on the discharge from Army Bay sewage treatment plant</u>.

As detailed above, raw sewage abstraction, treatment, and discharge of RO permeate into the sewer is expected to have a net positive impact on the performance of the Army Bay treatment plant. This carries forward to improved environmental effects of the discharge from the Army Bay treatment plant due to reduced nutrient and organic loads to the plant.

By the time the discharge reaches the Army Bay treatment plant, dilution with other incoming sewage is expected to reduce the increase in total chloride concentration to approximately 12mg/L under dry weather flows (less under wet weather flows).

Given that the discharge occurs via ocean outfall into seawater with a chloride concentration of approximately 19,000mg/L, this is not likely to represent any measurable effect on the receiving environment.

<u>Contaminants of Emerging Concern (CECs)</u>

A study by Incheon National University[1] showed removal rates of CECs such as acetaminophen, Ibuprofen, Diclofenac Ofloxacin, Estriol, Erythromycin and Caffeine ranged from 90 to >99% in membrane bioreactor systems, with many other CECs being removed at rates of 50 – 90%. This shows that abstraction from the network, treatment by MBR and

[1] Kwon Y, and Lee D.G. (2018) Removal of Contaminants of emerging concern (CECs) using membrane Bioreactor (MBR): a short review. Global NEST Journal Vol. 21, No.3 pp 337-246

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return to the network will have a net positive effect on CEC loading in the discharge from the Army Bay sewage treatment plant

Network effects.

Whilst the discharge of RO reject to sewer will be managed in such a way as to mitigate any hydraulic effect on network capacity, discharges to sewer can also result in increased corrosion and sulphide generation in the network, which can contribute to odour generation in addition to corrosion.

From a corrosion perspective, the most significant effect of the RO reject will be to increase the chloride concentration in the sewer main (chloride is a subset of the total salt load shown in Figure 1). The proposed discharge will be to a 675mm concrete gravity sewer main, which ultimately enters a pump station prior to a polyethylene rising main to Army Bay treatment plant.

Whilst polyethylene is highly corrosion resistant, concrete can be susceptible to attack by high concentrations of chloride. Typical concentrations of chloride in domestic sewage range from 50 – 400mg/L[2]. Sewers with a high level of industrial discharge or coastal saltwater infiltration can rise to 1,000 – 1,500mg/L chloride concentration[3].

At an elevation of 30 – 40m above sea level, and with no industrial contributors, the raw sewage discharge from the Milldale catchment to be processed by the proposed treatment plant is expected to fall at the low end of this range of chloride concentrations in domestic sewage.

If the raw wastewater is conservatively assumed to fall in the mid-range chloride concentration for domestic sewage it can be expected to contain less than 250mg/L, the 4-fold increase in salt concentration by the RO process will therefore result in a final chloride concentration in the discharge of approximately 1,000mg/L. This is still at the bottom of the range expected in domestic sewage effected by coastal infiltration (as can be expected in coastal areas of the Army Bay catchment).

With a population of approximately 5,400 (1,800 lots) in the upstream catchment, this discharge will result in an increase in chloride concentration in the network of approximately 130mg/L to approximately 380mg/L at the point of discharge. Flows from a further 970 lots enter the network approximately 500m further downstream diluting the resulting chloride concentration further to 340mg/L.

By the time the flow reaches the Orewa pumpstation, a total flow from approximately 6,000 lots has entered the network, diluting the chloride concentration even further to approximately 295mg/L.

Chloride corrosion of concrete is associated with the resulting chloride concentration at the embedded reinforcing steel. This is controlled by factors such as minimum cover over reinforcing, and concrete strength (MPa)[4]. Concrete used for infrastructure exposed to fresh sewage in New Zealand needs to meet the durability requirements of NZS 3106:2009 exposure class B2, which is the same exposure classification required of concrete permanently submerged

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[2]Metcalf & Eddy, *Wastewater Engineering: Treatment and Resource Recovery*, 5th ed., McGraw-Hill (2013)

[3]U.S. EPA, *Wastewater Technology Fact Sheet: Infiltration/Inflow*, EPA 832-F-98-017

[4] British Standards Institution. (2019). *BS 8500-1:2015+A2:2019: Concrete – Complementary British Standard to BS EN 206 – Part 1: Method of specifying and guidance for the specifier*. BSI Standards Limited

in seawater[5]. As seawater has a chloride concentration of around 19,000mg/L, the effect of increasing network chloride concentration from 250mg/L to between 295 – 380mg/L (all of which still fall within the normal range for domestic sewage) is expected to be negligible.

Notably, as the raw RO reject stream is only expected to contain around 1,000mg/L chloride, even if multiple RO treatment systems are implemented in the Army Bay catchment, neither network durability nor treatment plant performance would be expected to be negatively affected.

The other main potential effect on the network is the possibility of forming hydrogen sulphide, which contributes to both odour and corrosion in the network.

Because the raw sewage is aerobically treated before passing through the RO for discharge back to sewer, reduced sulphur compounds such as hydrogen sulphide and thiols are largely removed. Because the discharge occurs from the aerobic MBR tank, the RO retentate will also tend to have a positive dissolved oxygen content, further inhibiting odour and sulphide formation in the network. This combined with approximately 90% removal of organic contaminants from the raw sewage that is abstracted, treated, and returned to sewer *reduces* the odour risk in the sewer network compared to not abstracting, treating and returning the RO reject.

In conclusion, the application of reverse osmosis at the proposed Milldale wastewater treatment plant is very different to traditional industrial or desalination reverse osmosis applications and is therefore expected to have a net positive effect on network resilience and treatment capacity of the Army Bay wastewater treatment plant by reduction in the net nutrient and organic loading on the Watercare plant than would be the case without the RO system.

[5] Standards New Zealand. (2009). *NZS 3106:2009: Design of concrete structures for the storage of liquids*. Standards New Zealand.

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4 August 2025

Grant Fahey
Fulton Hogan Land Development Ltd
Via email: grant.fahey@fultonhogan.com

Kia Ora Grant,

Subject Milldale Fast-Track application number: BUN60446761 & FTAA-2503-1038 Wainui Road, Milldale, Upper Orewa, Review of further information provided.

Thank you for providing on 31 July 2025 the memoranda from Woods and Apex Water of the same date responding to the concerns raised by Watercare Services Limited (**WSL**) in its letter to the EPA, dated 29 July 2025, regarding the Milldale Fast-track application (**Milldale Application**). Given the limited amount of time available to review and respond to the Woods and Apex Water memoranda, this response is provided on a without prejudice basis. WSL remains open to further dialogue and engagement.

While the rationale provided by Woods and Apex Water is noted, further information and assurance is required in certain areas, especially in relation to the Reverse Osmosis (**RO**) Waste Stream, proposed to be discharged to the WSL network. WSL needs further assurance before we are in a position to agree conditions to mitigate the information gaps.

Key Considerations with RO Reject and WSL's Stage 1 Army Bay WWTP Consent Conditions are discussed below.

1. Army Bay WWTP Consent Condition Trigger – Flow Constraint

The Stage 1 Army Bay WWTP consent condition is flow-based (13,500 m^3/day), which remains the primary constraint until the WWTP upgrade is complete. While the RO system may offer a net positive effect in terms of Contaminants of Emerging Concern (**CECs**) if full flows from the Milldale Application were already being received at the plant, that is not the case, and the additional proposed RO reject stream would still represent a net increase in current contaminant load.

Both submitted reports suggest an overall decrease in contaminants. However, this is not accurate in the current context. Since we are still below the Stage 1 consent flow limit, accepting the RO reject would increase total contaminant load at the Army Bay WWTP. If the area were fully developed, those loads would eventually arrive — but that is not yet the case, so the proposed approach would front-load those contaminants.

2. RO and Membrane Treatment – Efficiency and Limitations

While membrane technology does produce high-quality effluent, it does not remove all contaminants. Larger compounds (salts, organic compounds, viruses, pharmaceuticals) are not effectively treated by membranes alone. RO, however, is efficient in this regard — typically achieving:

- ~90% PFAS removal
- 80–90% CEC removal
- ~95% salt/ion removal

These contaminants are then concentrated in the RO reject stream, while the permeate often requires post-treatment due to its low ionic content. WSL's key concern remains: the reject stream concentrates both CECs and salts to 3–4 times the concentration of a standard discharge, even if the total mass is comparable.

3. Discharge Consent – Emerging Contaminants

The Army Bay Treatment Plant Discharge consent condition 22 (**see Appendix 1**) references Emerging Contaminants Risk Assessment. Based on our understanding, this condition applies to long-term discharges, and we are unlikely to trigger it in the current context. However, we are awaiting confirmation from our Environmental Care team on this matter.

4. Project Communications and Flow Clarification

The initial email from FHLDL in January 2025 did not reference RO, and the proposal was unclear at the time, prompting our follow-up. The first explicit mention of RO was in the Letter of Intent from FHLDL, dated 3 July 2025. This is why it is taking Watercare time to process the information provided and ensure that any risks to the current operation of the Army Bay Treatment Plant and network are not compromised.

There are inconsistencies in design flows that have been provided by Fulton Hogan:

- October memo: 378 m^3/day
- Apex mass balance: 900 m^3/day

While WSL acknowledges the need to design for RO/membrane downtime (for cleans), we require a clear definition of min/average/max flows to assess localized impacts of reintroducing the RO reject. While the average RO return flow may appear acceptable, there is a risk that overnight peaks could exceed recommended limits for chloride and sulfate ions. As such, further discussion may be needed to determine the most appropriate method for managing and returning these flows.

5. Cleaning/CIP Waste Streams Not Addressed

There is no detail provided regarding waste streams from RO or membrane cleaning processes. We assume these are not included in the RO reject stream. This requires clarification.

6. Request for Further RO Reject Characterisation

We request further speciation detail on salts in the RO reject stream to fully understand the localised impacts. A breakdown example from the Mangere pilot RO system has been included for reference — **Appendix 2**.

7. Precedent Risk

WSL have concern around setting a precedent with accepting RO reject streams - this aspect warrants careful consideration. We are open to further discussion on this and note in this instance it is only for a temporary period of time while the Army Bay Stage 1 upgrade is completed. Watercare is very unlikely to accept a permanent RO waste stream arrangement.

8. Emergency Storage Concerns and Gaps

As noted in WSL's letter of 29 July 2025, the lack of emergency storage still poses a risk.

Considering that the Army Bay wastewater network is already under stress, if multiple upstream issues arise (e.g. storm events), the buffer may be insufficient — leading to risks of overflows or reduced treatment quality. The current strategy appears to assume short-term or planned outages, where the WWTP can either treat flows in advance or catch up afterward. However, there is no discussion regarding contingency measures or backup solutions should an unplanned outage extend beyond the WSL network's buffering capability.

While there may be benefits to using RO technology, for the adjacent stream health, in the current context, the proposed RO reject stream presents several unresolved concerns to Watercare's network — including flow inconsistencies, concentrated contaminant loads, lack of cleaning waste detail, and precedent risk.

Further engagement with FHLDL and WSL may be warranted, but additional technical clarification and agreement are essential before any approval or acceptance of the RO waste stream can be considered and any associated conditions agreed to.

Yours faithfully,

Anna Jennings

Manager Major Developments

Watercare Services Limited

Appendix 1

Army Bay WWTP Emerging Contaminants Discharge Consent Condition

Emerging Contaminants Risk Assessment - Long Term Discharges

22. The Consent Holder shall engage a suitably qualified person to undertake an Emerging Contaminants Risk Assessment of the treated wastewater from the upgraded Army Bay Wastewater Treatment Plant (WWTP) within six months of each upgrade becoming operational and subsequently at five yearly intervals thereafter following the Stage 3 upgrade. The Emerging Contaminants Risk Assessment shall as a minimum include:

    a. A review of changes in the state of knowledge of emerging contaminants relevant to the WWTP either since the assessment of emerging contaminants included in the Application for these consents or the previous Emerging Contaminants Risk Assessment, whichever is more recent.

    b. Identification of any new or changed emerging contaminants which need to be included in this Emerging Contaminants Risk Assessment.

    c. Measurement of any new or changed emerging contaminants identified in Condition 22(b).

    d. An assessment of the risks to the environment from all emerging contaminants in the treated wastewater discharged from the upgraded WWTP.

23. The Emerging Contaminants Risk Assessment shall be forwarded to the Auckland Council by 30 September of each year that it is required for certification that it meets the requirements of Condition 22.

Appendix 2

Contaminant Breakdown Example From the Mangere Pilot RO system

Ions, mg/l		Product	Concentrate
Calcium		16.37	87.01
Magnesium		0.13	38.48
Sodium		4.13	648.77
Potassium		0.62	98.30
Ammonia - N (NH4)		0.02	1.53
Barium		0.00	0.02
Strontium		0.00	0.39
Iron		0.00	0.30
Manganese		0.00	0.00
Sulfate		0.90	265.79
Chloride		5.89	981.73
Fluoride		0.02	3.11
Nitrate		0.69	20.37
Bromide		0.00	0.00
Phosphate		0.02	4.34
Boron		0.18	0.50
Silica		0.49	78.66
Hydrogen Sulfide		0.00	0.00
Bicarbonate		48.69	277.77
Carbon Dioxide		0.26	34.94
Carbonate		0.72	0.22
TDS, mg/l		78.88	2507.30
Flow	m3/hr	48.03	15.97
Temperature	C	20.00	20.00
Pressure	kPa	1.00	870.03
Osm. Pressure	kPa	3.93	163.93
pH		8.50	7.03
Conductivity at 25C	µS/cm	109.00	4019.00
Saturation Data			
BaSO4	%	0.04	**101.14**
CaF2	%	0.00	63.82
CaSO4	%	0.03	3.73
SiO2	%	0.38	62.85
SrSO4	%	0.00	0.99
Struvite	%	0.00	0.00
LSI		0.00	-0.27
S&DI		-0.47	-0.53