

Delmore Fast-Track

04/05/2026 – Auckland Council Response

Annexure 13:

Wastewater

To: Auckland Council – Wastewater

From: Jack Taylor and Matt Savage, Apex; James Beaumont - Riley

Date: 16 April 2026

Re: Wastewater Response Memorandum

1.0 Technical Specialist Memo – Wastewater

From:

Patrick O’Riordan

Qualifications
& Relevant
Experience:

I hold the qualification(s) of: Beng (Hons) Mechanical and Manufacturing, BA. Mathematics and a PGDip in Clean Technology Management and have 16 years of experience in process, water & wastewater engineering. I am a full member of Engineering New Zealand and Water New Zealand. I am a Chartered Professional Engineer (CPEng.) My practice areas are Environmental engineering and Water engineering. I have prepared expert evidence and technical assessments for resource consent applications, plan changes, and fast-track applications and have appeared as an expert witness before consent authorities.

Preparation in
Accordance
with the Code
of Conduct:

I confirm that I have read the Environment Court Practice Note 2023 – Code of Conduct for Expert Witnesses ([Code](#)), and have complied with it in the preparation of this memorandum. I also agree to follow the Code when participating in any subsequent processes, such as expert conferencing, directed by the Panel. I confirm that the opinions I have expressed are within my area of expertise and are my own, except where I have stated that I am relying on the work or evidence of others, which I have specified.

Signature:

Patrick O’Riordan

Date:

22/04/2026

2.0 Original Specialist Review Memo

- The original review found that the proposed Stage 1 private wastewater treatment and discharge system was generally feasible in principle, but the information lodged was insufficient to complete a full technical assessment.
- Key missing information related to the land disposal components, including the absence of concept designs for the wastewater disposal trench and irrigation field.
- No field investigation information had been provided for the proposed disposal areas, limiting assessment of soil suitability, groundwater separation, setbacks, and disposal field layout.
- Confirmation was required that the instantaneous peak flow from the low-pressure sewer system had been accounted for in the wastewater treatment plant design.

- Further clarification was needed on how wastewater irrigation areas affected by earthworks or compaction would remain suitable for treated wastewater disposal.
- Slope stability of the proposed disposal areas had not been adequately addressed at the time of the original review.
- The material provided on off-site disposal did not confirm how much receiving capacity was actually available at Chemwaste for this proposal.
- No receiving soils assessment had been provided, so the effects of long-term discharge on soil condition could not be properly assessed.
- A range of amended and additional consent conditions were also recommended to strengthen flow monitoring, non-compliance response, soil monitoring, irrigation system certification, off-site disposal controls, spill response, and operational auditing

3.0 Updated Response to Applicant's Memo

The applicant's response has addressed the majority of the wastewater matters raised in the earlier memo. Concept designs have now been provided for both the disposal trench and irrigation areas; further geotechnical investigation information has been supplied in relation to the disposal areas; and Apex has confirmed that the treatment plant design includes provision for the instantaneous peak flow of the LPS system through inclusion of a balance tank.

The applicant has also provided additional explanation regarding management of disposal areas subject to cut/fill and compaction, and this can be addressed through appropriate conditions requiring inspection, scarification/ripping where needed, engineered fill specifications where relevant, and geotechnical oversight. In addition, the applicant has provided a response on receiving soils effects which, when coupled with the proposed soil monitoring conditions, is sufficient at this stage.

In relation to consent conditions, the applicant has accepted, or accepted in substance, nearly all of the wastewater conditions recommended, including conditions addressing receiving soils monitoring, baseline and ongoing soil monitoring, irrigation zone certification, nutrient loading verification, annual auditing, off-site disposal management, approved receiving facilities, tanker operator requirements, holding capacity, spill response, waste tracking, and contingency arrangements where a receiving facility is unavailable. The applicant's responses are generally acceptable from a wastewater servicing perspective.

Overall, most wastewater matters are now resolved either by the further information provided or through the amended consent conditions. The principal remaining matter is the proposed review / trigger condition relating to off-site disposal, for which the applicant has indicated acceptance in principle but has not yet provided final wording or a complete response. Subject to that matter being satisfactorily resolved, I consider the wastewater issues can be appropriately managed by condition

4.0 Outstanding Issues

The majority of my original wastewater concerns have now been addressed. The only material outstanding matter identified from the applicant's response memorandum is the review / trigger condition for the off-site disposal regime, where the applicant has stated that it accepts a review condition in principle but is still

reviewing the specific wording and will provide a separate response. This remains outstanding because off-site tankering is an important component of the Stage 1 summer wastewater disposal strategy and Council should retain an effective review mechanism if trucking volumes, associated effects, or receiving facility arrangements differ materially from those assessed.

For completeness, I note that the slope stability matter is now adequately addressed at the level required for this application, noting Riley's advice that the proposed dripper line locations are suitable subject to GD06-aligned application rates, separation distances, and implementation of the stability enhancement measures identified in the geotechnical reporting. I do not consider this to remain an outstanding issue for the purposes of this memo.

Response to Further Information Requests / Technical Comments

- All of the further information requests raised in Section 67 of the original memo have now been addressed to a level sufficient for this stage of the consent process. This includes provision of concept designs for the disposal trench and irrigation field, investigation information relevant to the proposed disposal areas, confirmation regarding treatment plant peak flow design, clarification on management of disposal areas affected by earthworks or compaction, confirmation of how off-site disposal will be managed through conditions, and commentary on receiving soils effects. No further wastewater information requests are recommended at this stage.

Response to Recommended / Amended Conditions

- I continue to recommend inclusion of a review condition allowing Council to review the trucking / off-site disposal conditions if truck movements materially exceed those anticipated, complaints are received, a receiving facility changes its acceptance criteria, or monitoring indicates that off-site disposal is being used more extensively than assessed. Given the seasonal dependence on off-site disposal, particularly during summer, this condition remains appropriate and should be finalised before the wastewater package is considered fully resolved.
- I recommend that a condition for the remediation of areas of cut/fill in the disposal field is included, stating a methodology and supervision requirements, as per the following condition:

Prior to installation of any wastewater disposal lines within the disposal field, all areas of cut, fill, or otherwise disturbed ground within the proposed disposal area shall be identified and assessed by a suitably qualified and experienced person.

Where wastewater disposal lines are proposed to be installed within areas of cut or fill, those areas shall be remediated to ensure that soil structure, permeability, stability, and wastewater treatment and dispersal capacity are suitable for the proposed onsite wastewater system.

Remediation shall include, as a minimum:

- a. removal of unsuitable, compacted, or poorly draining fill material where necessary;*
- b. reinstatement using clean, suitable, permeable soil material compatible with wastewater disposal;*
- c. placement of material in controlled layers to avoid excessive compaction;*
- d. contouring of the disposal field to prevent ponding, scouring, or concentration of stormwater*

flows; and

e. confirmation that the final ground conditions are suitable for installation and operation of the wastewater disposal lines.

All remediation works and installation of wastewater disposal lines within any cut or fill areas shall be undertaken under the supervision of a suitably qualified and experienced wastewater practitioner, geotechnical engineer, or soil specialist. Written confirmation shall be provided to the Council prior to commissioning of the wastewater system, confirming that the disposal field has been remediated and installed in accordance with this condition and is suitable for its intended use.

5.0 Conclusion

The applicant's further information and condition amendments have addressed the wastewater concerns identified in my original memo. In my opinion, the wastewater treatment, discharge, irrigation, and off-site disposal aspects of the proposal can now generally be managed through the amended condition framework. Subject to satisfactory resolution of the remaining review / trigger condition for off-site disposal, I consider that the wastewater issues are substantially resolved and do not present a reason, in themselves, to decline the application.

1.1 Introduction

This memorandum responds to the Technical Specialist Memo prepared by Auckland Council (Wastewater) in relation to the above fast-track application (as lodged). This response addresses:

- Further information requests / technical queries; and
- Recommended amendments to consent conditions.

1.2 Response to Further Information Requests / Technical Comments

Information Request from Council on the lodged material	Applicant Response	Council Specialist Response
No concept design for wastewater disposal trench has been provided.	Apex: A concept design for the treated effluent disposal trench is attached as Appendix A .	Accepted
No concept design for wastewater irrigation field has been provided. A detailed design is not required, but the level of information on the disposal field currently provided is not sufficient.	Apex: A concept design for the wastewater irrigation field is attached as Appendix B .	Accepted
No field investigation (hand augers or surface assessment) for proposed disposal field.	Riley: Across the site we have drilled 85no. hand auger boreholes, excavated 53no. test pits and drill 6no. deep machine boreholes. A number of them are near or immediately adjacent to the areas identified for effluent disposal. Overall, we consider that the number and spread of the investigation test locations provides an appropriate level of coverage for assessment of the soil soakage category for the site in terms of GD06.	Accepted

	The locations of the investigations in relation to the wastewater disposal areas are depicted in Appendix C of this memo.	
Confirmation that the peaking factor for the LPS, not the infiltration peaking factor, but instantaneous flow rate of the LPS system has been accounted for in the design of the wastewater treatment plant.	Apex: The treatment plant design has considered the instantaneous peak flow rate within the design of the treatment train. Specifically, the membrane bioreactor is decoupled from the incoming flow through the inclusion of a raw wastewater balance tank.	Accepted
The Apex report states that the irrigation field will be installed as follows: <i>The installation of the surface drip irrigation line shall be carried out in both newly developed and earth worked areas, as well as in existing bush.</i> Can the applicant provide details of how this area shall be managed so that the disposal field will not be installed in areas that are compacted and no longer suitable for wastewater irrigation?	Apex: The design cut / fill contours have been presented alongside the proposed irrigation areas. By comparing these two drawings, it can be seen that the proposed irrigation zones fall in areas that generally require removal of material to achieve the final development levels. Zones E and H are the exceptions which require both localised cut and fill to achieve the final design levels. In areas requiring cut to achieve final development levels, prior to the placement of topsoil the area shall be inspected for compaction caused by the movement of plant and smearing caused by scraping or contouring areas. Where identified these areas shall be lightly scarified / ripped to reopen the soil structure prior to the placement of topsoil. In areas where localised fill is required, such as zones E and H, it is proposed that where native soils are exposed these are lightly scarified / ripped	Accepted. This needs to be reflected in an appropriate condition. <i>Prior to installation of any wastewater disposal lines within the disposal field, all areas of cut, fill, or otherwise disturbed ground within the proposed disposal area shall be identified and assessed by a suitably qualified and experienced person.</i> <i>Where wastewater disposal lines are proposed to be installed within areas of cut or fill, those areas shall be remediated to ensure that soil structure, permeability, stability, and wastewater treatment and dispersal capacity are suitable for the proposed onsite wastewater system.</i> <i>Remediation shall include, as a minimum:</i> <i>a. removal of unsuitable, compacted, or poorly draining fill material where necessary;</i>

	prior to fill placement and a specification for a engineered soil fill including compaction is provided by a Geotechnical specialist that has for a suitable level of permeability allowing treated wastewater to reach the underlying native soils whilst providing structural stability necessary for the location. This work would need to be overseen and inspected by a suitably trained and competent Geotechnical engineer.	<i>b. reinstatement using clean, suitable, permeable soil material compatible with wastewater disposal;</i> <i>c. placement of material in controlled layers to avoid excessive compaction;</i> <i>d. contouring of the disposal field to prevent ponding, scouring, or concentration of stormwater flows; and</i> <i>e. confirmation that the final ground conditions are suitable for installation and operation of the wastewater disposal lines.</i> <i>All remediation works and installation of wastewater disposal lines within any cut or fill areas shall be undertaken under the supervision of a suitably qualified and experienced wastewater practitioner, geotechnical engineer, or soil specialist. Written confirmation shall be provided to the Council prior to commissioning of the wastewater system, confirming that the disposal field has been remediated and installed in accordance with this condition and is suitable for its intended use.</i>
Slope stability of the disposal field is proposed for detailed design. Where the slopes of the disposal field are a concern, this would typically be assessed during the resource consent application.	Riley: As highlighted in Section 5.10 of the Riley GIR we consider that the proposed dripper line locations should be suitable with respect to stability, provided the application rate gives due allowance to the land gradients and separation	Accepted

	distances recommended in GD06. Review of the cross-section layout indicates that geotechnically critical cross-sections are nearby or aligned through the proposed disposal areas and that the scenarios considered (eg. a high level of ground saturation) are appropriate to inform our views in regard to the suitability of the slopes for effluent disposal. In a number of cases, stability enhancement measures have been proposed in our GIR to ensure that adequate FoS against instability are available.	
Communication provided by the applicant with Chemwaste indicates that Chemwaste has a consent to discharge 400m3/day but does not indicate how much of that capacity is available for this specific discharge.	Vineway is providing further information on this which will be addressed in a separate letter. Notwithstanding, the applicant accepts the conditions proposed (refer below) relating to the "Off-site Disposal Management Plan". This requires confirmation of the receiving facility prior to the commencement of any tankering from the site.	Accepted.
No commentary has been provided on the effect on receiving soils. A receiving soils assessment should be undertaken.	Riley: Assuming a well maintained treatment plant, discharging secondary or advanced second effluent at rates not exceeding the recommended design maximum for the soils present on the site and with adequate surface and ground water separation, the effects of this discharge on the receiving soil should be equivalent or less than those outlined in the TP58/GD06 for this system type and, as such, are considered to be less than minor.	Accepted

1.3 Response to Recommended / Amended Conditions

Condition Request from Council on the lodged condition document (Appendix 44 to the AEE)	Applicant Response	Council Specialist Response
209. The WWTP shall be designed and constructed in general accordance with the “Delmore Wastewater Treatment Plant Design Report” prepared by Apex and approved under Condition 1. Comment: The WW system is designed for Stage 1 of the development only. What is the trigger point for transferring to Stage 2?	Consent has not been sought for Stage 2 wastewater discharge. The subdivision conditions (section 3.1.12 – infrastructure servicing) requires that evidence is provided to Council to show that suitable provision has been made for the disposal of wastewater prior to the occupation of any dwellings within Stage 2.	Accepted.
218. Should three consecutive samples return results above the median mass load limits for the parameters detailed in Condition 216 or Condition 217 (depending on the time of the year), the consent holder shall notify Auckland Council within 5 working days. The consent holder must then conduct an investigation into the cause, supported by a report to be supplied to Auckland Council. The report shall outline the actions being undertaken to address and remedy the cause of the exceedance and detail whether further monitoring is required. Comment: As I&I is a risk where a low infiltration factor is used, some more flow monitoring at	The reason we have used three in this instance is that testing turnaround times for a fortnightly sampling regime means that once a non-compliant result has been received there is typically insufficient time for the changes to be made, the process to respond accordingly and the operator to validate this change has impacted the discharge quality prior to the next fortnightly sample being taken. As such, a single non-compliant result may be captured by two sampling occurrences due to result turnaround times. In the pre-consenting phase this was recommended by the council’s expert, and Apex agrees that this provides a proactive means of ensuring compliance is maintained.	Accepted

various pump stations may be appropriate to isolate sources of infiltration when it occurs. This would mean 6 weeks of the effluent potentially being out of spec. Re-sampling and investigation needs to happen sooner to understand the reason for non-compliance and strategy to rectify. Recommended failure of samples should trigger immediate re-sampling and investigation.		
227. No more than 12 samples out of any 24 consecutive fortnightly samples shall exceed the specified limit. Comment: This appears to be very lenient, allowing considerable non-compliance.	The terms agreed during pre-consenting were for median limits. This condition simply defines the basis by which the median is calculated. To avoid extended non-compliance condition 218 was added in addition to median compliance requirements.	Accepted
231. The total nutrient loading into the irrigation field must not exceed the following application rates: Comment: The nitrogen loading in the design will exceed this limit very slightly. 220kg/ha/yr vs 220.8kg/ha/yr. No headroom in event of extended non-compliance for N.	The sustainable irrigation nutrient loadings have formed the basis of irrigation field sizing, hence the matching numbers at full design flow. While non-compliance will require a year to establish (by definition) regular testing and continuous flow monitoring to each irrigation zone will provide early indication if the limits are likely to be reached, allowing mitigation or corrective measures to be implemented.	Accepted.
Suggested New Consent Conditions		
Receiving Soils Monitoring Plan Prior to discharge commencing, the consent holder shall submit to Council for certification a Receiving Soils Monitoring Plan for all irrigation	This condition is accepted and has been included within the updated condition set (refer Section 7 – wastewater discharge permit).	Accepted

areas and land treatment areas. The plan shall identify: • baseline soil sampling locations and depths; • parameters to be monitored, including at least total nitrogen, nitrate-nitrogen, ammonium-nitrogen, Olsen phosphorus or equivalent plant-available phosphorus, pH, electrical conductivity, sodium adsorption ratio or sodicity indicator, organic matter, and soil permeability/infiltration characteristics; • sampling frequency; • trigger levels for management response; and • corrective actions if adverse trends are identified		
Baseline and ongoing soil monitoring The consent holder shall: • undertake baseline soil monitoring before the first discharge to each irrigation area; and • thereafter undertake soil monitoring at least annually for the first 5 years, and thereafter at a frequency approved by Council based on demonstrated performance. If monitoring identifies nutrient accumulation, declining infiltration, salinity/sodicity effects, or other deterioration in soil condition attributable to the discharge, the consent holder shall investigate and implement remedial action.	This condition is accepted and has been included within the updated condition set (refer Section 7 – wastewater discharge permit).	Accepted
No discharge to saturated soils / during unsuitable conditions	This condition is partially accepted and has been included within the updated condition set (refer Section 7 – wastewater discharge permit).. The	Accepted

No treated wastewater shall be applied to land irrigation areas when soils are saturated, when rainfall conditions are such that ponding or runoff is likely, or when field conditions are inconsistent with the certified Seasonal Discharge Management Plan.	update has removed reference to a seasonal discharge management plan as there is no requirement for this in the conditions.	
Irrigation zone integrity and as-built certification Before operation of any irrigation area, the consent holder shall provide to Council: • as-built plans of all irrigation lines, valves, zones and buffers; • certification from a SQEP that the irrigation system has been installed in accordance with the certified design; and • confirmation that all buffer setbacks to bores, watercourses, buildings and other sensitive features have been achieved.	This condition is accepted and has been included within the updated condition set (refer Section 7 – wastewater discharge permit).	Accepted
Nutrient loading verification by zone The consent holder shall maintain a monthly record of: • the volume discharged to each irrigation zone; • the nutrient concentrations used for loading calculations; and • the resulting nitrogen and phosphorus loading rate for each zone and for the irrigation field as a whole. These records shall be provided to Council on request and summarised annually.	This condition is accepted and has been included within the updated condition set (refer Section 7 – wastewater discharge permit).	Accepted

Independent annual operational audit The consent holder shall engage a suitably qualified and independent wastewater professional to undertake an annual audit of: • treatment plant performance; • compliance with discharge limits; • irrigation and infiltration field performance; • maintenance records; • alarm history; • incidents, spills, odour complaints, and corrective actions; and • adequacy of on-site discharge capacity relative to actual flows. The audit report shall be provided to Council.	This condition is partially accepted and has been included within the updated condition set (refer Section 7 – wastewater discharge permit).	Accepted
Off-site Disposal Management Plan Prior to the commencement of any tankering of treated or untreated wastewater from the site, the consent holder shall submit to Council for certification an Off-site Wastewater Disposal Management Plan. That plan should identify: • the circumstances in which wastewater may be removed from the site; • whether the wastewater is treated wastewater, untreated wastewater, or sludge; • the approved receiving facility or facilities; • maximum daily volumes to be removed; • temporary storage arrangements on site; • truck loading procedures;	This condition is accepted and has been included within the updated condition set (refer section 2.1.21 – on-site wastewater servicing). The existing tankering management plan condition has been removed.	Accepted

• hours of operation; • spill prevention and spill response measures; • contingency measures in the event the nominated receiving facility is unavailable; and • record-keeping and reporting requirements. This is justified because the application material contemplates both treated and untreated wastewater being removed off site, and identifies third-party disposal pathways rather than a single permanent receiving point.		
Restriction to approved receiving facilities No wastewater shall be tankered from the site except to a lawfully authorised receiving facility that is identified in the certified management plan and has confirmed capacity and acceptance criteria. The consent holder shall maintain current written confirmation of acceptance from each receiving facility.	This condition is accepted and has been included within the updated condition set (refer section 2.1.21 – on-site wastewater servicing).	Accepted
Code-compliant tanker operators only All wastewater removed from the site shall be transported only by operators holding all required approvals, licences and codes of compliance for wastewater transport.	This condition is accepted and has been included within the updated condition set (refer section 2.1.21 – on-site wastewater servicing).	Accepted
Holding Capacity The consent holder shall maintain sufficient on-site holding capacity at all times to avoid unauthorised discharge, including during delays to tanker collection or temporary closure of any receiving facility. No wastewater shall be loaded to	This condition is accepted and has been included within the updated condition set (refer Section 7 – wastewater discharge permit).	Accepted

or stored in a manner that could result in overtopping, leakage, or emergency discharge to land or water.		
Spill response and emergency management The consent holder shall maintain spill kits and emergency response procedures at the loading area and along the tanker loading interface. In the event of any spill, leak, tanker rollover, hose failure, or other accidental discharge, the consent holder shall: • immediately stop the discharge if safe to do so; • contain and recover the spill; • prevent any wastewater entering the stormwater system or watercourses; • notify Council as soon as practicable; and • provide a written incident report within a specified period.	This condition is accepted and has been included within the updated condition set (refer Section 7 – wastewater discharge permit).	Accepted
Odour and nuisance control All wastewater holding, loading and transport operations shall be undertaken so as to avoid offensive or objectionable odour beyond the site boundary. The consent holder shall maintain odour controls associated with the storage and handling infrastructure, particularly during any period of raw wastewater storage prior to collection.	Section 8 of the conditions relates to air discharges from the WWTP. This condition is not considered necessary as it is covered under the air discharge conditions.	Accepted
Waste tracking and reporting	This condition is accepted and has been included within the updated condition set. Wording has	Accepted

The consent holder shall keep a record of every tanker load removed from the site, including: • date and time of collection; • tanker operator; • wastewater type; • load volume; • destination facility; and • evidence of receipt / disposal. A summary of all off-site wastewater removed from the site shall be provided to Council at regular intervals.	been amended to say that the records must be provided to Council every 3 months (refer section 2.1.21 – on-site wastewater servicing).	
Contingency if receiving facility unavailable If an approved receiving facility cannot accept wastewater, tankering from the site shall cease unless and until wastewater can be directed to another approved facility identified in the certified management plan. The consent holder shall maintain contingency storage and alternative disposal arrangements sufficient to avoid any unauthorised discharge.	This condition is accepted and has been included within the updated condition set (refer section 2.1.21 – on-site wastewater servicing).	Accepted
Review / trigger condition Council should reserve the right to review the trucking conditions if: • truck numbers materially exceed those anticipated; • complaints are received regarding traffic, noise, odour or spills;	The applicant accepts a review condition in principle, however is reviewing the specific wording and will provide a separate response to Council on this matter.	I continue to recommend inclusion of a review condition allowing Council to review the trucking / off-site disposal conditions if truck movements materially exceed those anticipated, complaints are received, a receiving facility changes its acceptance criteria, or monitoring indicates that off-site disposal is being used more extensively than assessed. Given the seasonal dependence on off-

• a nominated receiving facility changes its acceptance criteria; or • monitoring shows the off-site disposal regime is being used more extensively than assessed. That would give a practical mechanism to respond if trucking becomes a more intensive or longer-term part of the operation than currently presented.		site disposal, particularly during summer, this condition remains appropriate and should be finalised before the wastewater package is considered fully resolved. Noted that the applicant is preparing a condition.
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Appendix A: Wastewater Disposal Trench

A concept design for a treated effluent disposal trench was designed by Calthom Consultants for the Karaka North Village land development project and has been shown in the figure below. The concept that this trench design is based on is well suited to the Delmore site as it does not rely on infiltration through the native soils but rather provides a naturalised and discrete discharge pathway allowing flows to enter the local unnamed tributary.

The trench consists of two separate parts, (i) the trench itself and (ii) the drainage blanket that extends from the edge of the trench down to the edge of the unnamed tributary. When the underlying soils are unable to assimilate flows into the trench, it shall overfill beneath the surface before diverting down through the drainage blanket. The drainage blanket, installed beneath the surface as a part of riparian improvement works provides a naturalised discharge pathway

where discharges can enter the unnamed tributary without requiring a physical pipe, or other discharge structure. This allows the discharge to have minimal impact on the natural environment while also making the treated wastewater available for uptake by planting within the riparian zone.

The figure below shows a conceptual design for this infiltration trench and drainage blanket. Site topography, slope stability and various other geotechnical considerations will be confirmed prior to detailing a suitable design for construction.

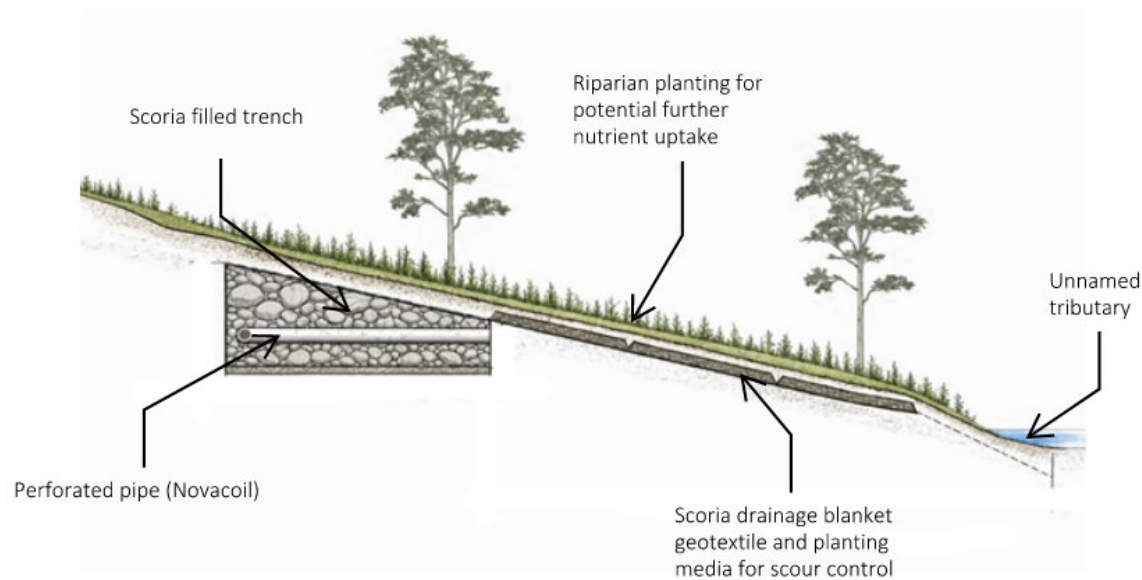


Figure 1 – Concept design of the infiltration trench used to provide land contact to discharges prior to entry into the unnamed tributary. (Calthom Consultants, 2021)

Appendix B: Wastewater Irrigation Areas

A concept design for the irrigation areas is shown below in Figure 2, 3 and 4.

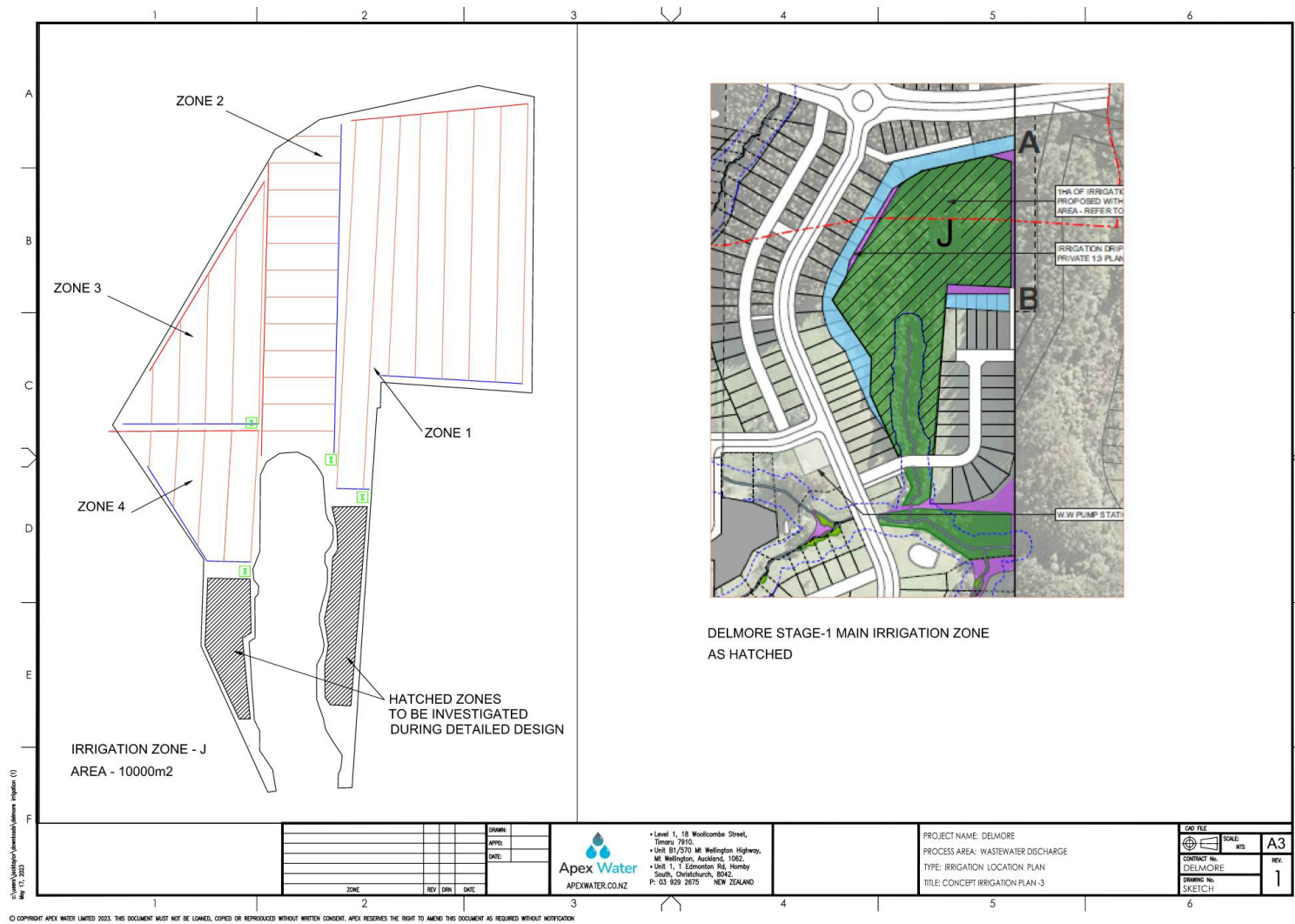
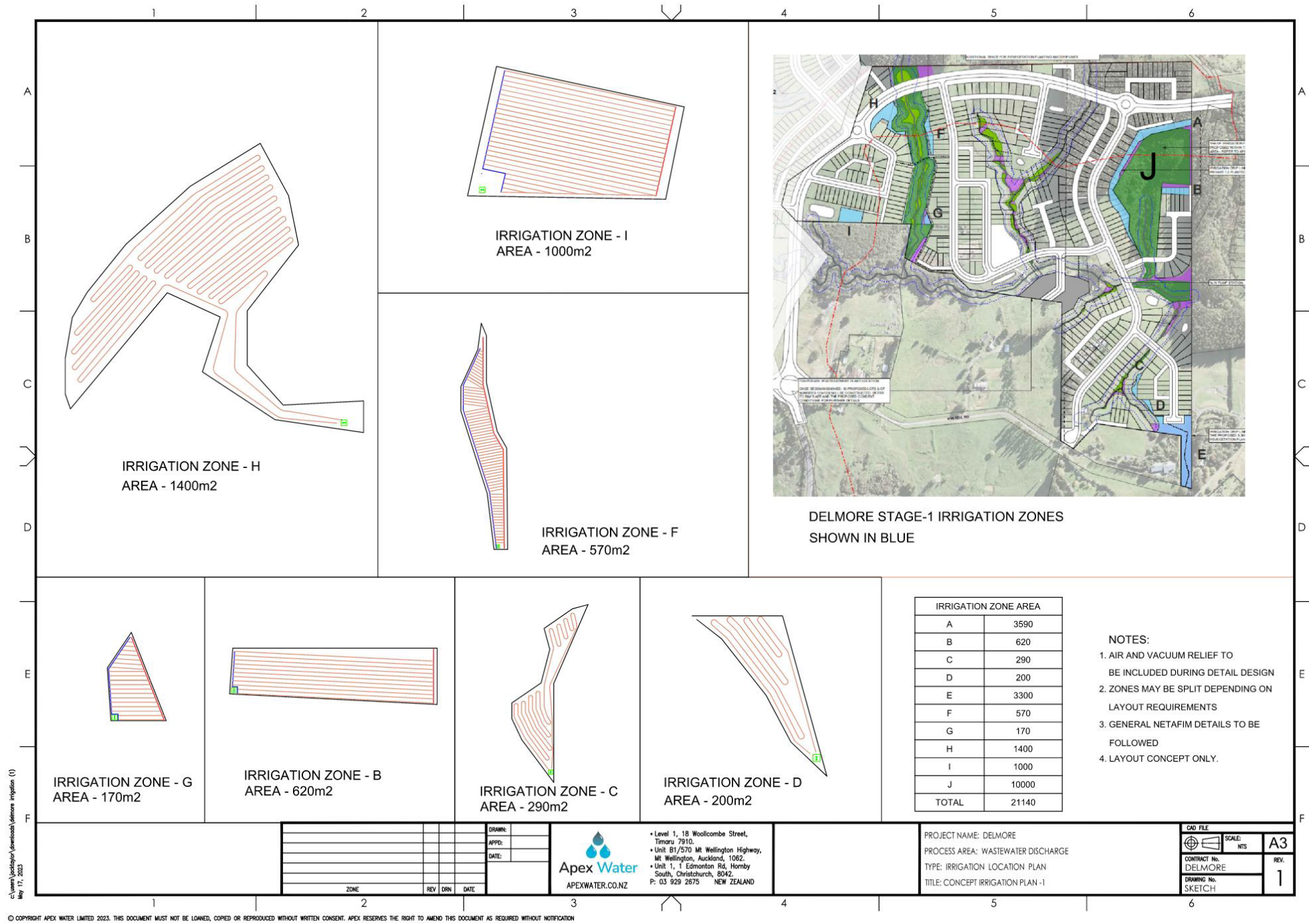


Figure 4 – Proposed Irrigation Zone (Sheet 3 of 3)

Figure 3 – Proposed Irrigation Zone (Sheet 2 of 3)

Appendix C: Geotechnical Investigations in relation to Wastewater Disposal Areas

Appendix D: Redundancy in design to avoid loss of containment (in response to Terrestrial Ecology Comments)

There are various aspects of the proposed wastewater treatment plant design that protect against the accidental loss of containment of raw or partially treated wastewater. These include:

Duty / Standby Configuration of Key Equipment

By providing redundancy in the form of a duplicated items of equipment for critical plant or control elements (i.e pumps or instrumentation) the process can automatically switch to the spare piece of equipment in the event of a failure. This means that in practice, if a critical pump was to fail the process would identify this and the spare would come automatically into service. If an instrument was to fail to same would occur and the plant control would be secured. This protects against accidental overflows, loss of containment or loss of control and aligns with standard practice for municipal level wastewater treatment plants throughout New Zealand.

Balance Tank

Should a process interruption or maintenance activity require a restriction to the plant throughput or for the plant to be taken offline entirely, the balance tank will act as a buffer to allow for the receipt of flows regardless of downstream treatment. Raw wastewater will flow into the balance tank and accumulate until the process is back online. Should the works require a significant period of time offline (greater than 1-day) then the raw wastewater can be removed from site utilising the existing infrastructure proposed.

Back-up Generator

It is proposed that the plant includes provision for a back-up generator with auto-changeover in the event of power loss. The generator would be sized to power all critical processes and would in short allow the treatment plant to operate without mains supply power. It is noteworthy that if the treatment plant does not have power, it is likely that the development is also without power and the low-pressure sewer system will not be in use and all flows to the plant will seize over this period of time.