

**BEFORE THE WAIMAKARIRI DISTRICT COUNCIL
HEARINGS PANEL**

IN THE MATTER of the Resource Management Act
1991

AND

IN THE MATTER of a submission by Andrew
McAllister (submission 8)

REBUTTAL STATEMENT OF EVIDENCE OF JAMES CAMERON MARS

Date: 12 July 2024

INTRODUCTION

1. My name is James Cameron Mars. I am an Environmental and Three Waters Engineer at Survus Consultants Limited. I hold a Bachelor of Engineering (First Class Honours) majoring in Environmental Technology and Sustainable Energy Engineering from Massey University (2008). I am a member of Engineering New Zealand (CMEngNZ 1012375) and am a Chartered Professional Engineer.
2. I have 15 years' experience as an Environmental/Three Waters Engineer and currently hold the position of Senior Engineer with Survus Consultants Limited. I have held this position since January 2023; prior to this I worked for Eliot Sinclair and Partners Limited for 6 years as a Senior Three Waters Engineer. My work is centred on providing designs for civil and three waters infrastructure (roading, stormwater, wastewater and water supply). This work involves project management, feasibility studies, consultation with affected parties, assessment of environmental effects, conceptual and detailed design, flood hazard assessments, construction monitoring, erosion and sediment control planning and monitoring, and preparation of resource consent applications.
3. I have been involved in the proposal since October 2023 and was responsible for preparing the Preliminary Services Design Report for 1379, 1401 & 1419 Tram Road (Block A) and the Preliminary Services Design Report for 1275 Tram Road (Block B). Both reports addressed the servicing requirements for the sites.
4. I have also been involved in ongoing correspondence (via email) with the Wiamakariri District Council (the "Council") regarding the existing Mandeville Area Wastewater Scheme capacity issues and potential upgrade requirements (and/or solutions) that would free up sufficient capacity to allow additional connections to the network.
5. I confirm that I have prepared this evidence in accordance with the Code of Conduct for Expert Witnesses contained in Part 9 of the Environment Court Practice Note 2023. The issues addressed in this statement of evidence are within my area of expertise except where I state that I am relying on the evidence or advice of another person. The data, information, facts and assumptions I have considered in forming my opinions are set out in the part of the evidence in which I express my opinions. I have not omitted to consider material facts known to me that might alter or detract from the opinions I have expressed.

SCOPE OF EVIDENCE

6. The purpose of the evidence is to confirm whether the submission to rezone land at 1275, 1379, 1401 and 1419 Tram Road, Swannanoa, as Large Lot Residential Zone (LLRZ) can be serviced for wastewater. My Preliminary Services Design Reports for "Block A" and "Block B" were attached to the Statement of Evidence of Mr Ivan Thomson, consultant planner appointed by Mr McAllister. I have not previously provided a Statement of Evidence.
7. For the purpose of my assessment I reviewed the submission as two separate land areas (Block A and Block B).

8. The 1379, 1401 & 1419 Tram Road submission zone was referenced as Block A. This approximate 15.73 ha land area is located to the southwest of the Tram Road and Two Chain Road intersection. My reporting was based on a preliminary layout plan indicating a possible 28 allotment layout, with an internal link road allowing access between Two Chain Road and Tram Road, with internal right of ways.
9. The 1275 Tram Road submission zone was referenced as Black B. This approximate 21.25 ha land area is located off Tram Road, approximately 730 m to the east of the Tram Road and Two Chain Road intersection (or Block A). My reporting was based on a preliminary layout plan indicating a possible 37 allotment layout with an entrance off Tram Road, internal local road and internal right of ways.
10. In summary for Blocks A & B:
 - a. Swannanoa is located within the Mandeville Area Wastewater Scheme which is a Septic Tank Effluent Pumping (STEP) system. At the time of initial my reporting I had not been provided with information from the Council as to whether the existing wastewater network had sufficient capacity; therefore, I proposed that the site could be serviced by either a STEP network, Low Pressure Sewer (LPS), Gravity Sewer discharging to a pump station, or onsite wastewater disposal (noting that this last option was the least favourable and would require agreement from the Council and Resource Consent from Environment Canterbury). The memo issued by Mr Aramowicz states there is no capacity within the Mandeville-Rangiora rising main for the wastewater that would result from the Applicant's proposal to zone 1275 (Block B) and 1379, 1401 & 1419 (Block A) Tram Road as LLRZ.
11. I have been asked to review and provide expert opinion on the wastewater capacity constraints associated with the Mandeville Area Wastewater Scheme and whether there are potential mitigation options that would allow enough capacity to become available for additional connections.
12. My review and expert opinion is primarily centred around two sets of email correspondence provided by Council, which detailed the issues associated with the wastewater scheme and potential mitigation / upgrade options which may allow for additional connections.
13. The following details the correspondence / information provided by the Council.
 - a. Mr Mark Buckley (Principal Policy Planner) forwarded on wastewater capacity comments (10 June 2024) provided by the Council engineers (the reporting engineers name and contact details were not provided). The comments briefly outlined the issues associated with the Mandeville Area Wastewater Scheme, but I considered it did not provide sufficient engineering detail to allow us to consider mitigation options.
 - b. A second email (11 July 2024) was provided by Mr Chirs Bacon (Network Planning Team Leader) which provided comment on wastewater modelling and an analysis of potential options that may be sufficient to free up capacity within the scheme.
14. Consequently, I have addressed the existing Mandeville Area Wastewater Scheme capacity constraints and have also addressed potential options that would allow enough capacity to become available for additional connections.

RESPONSE TO WASTEWATER CAPACITY CONSTRAINT

15. We were informed by the Council engineers (in correspondence forwarded on by Mr Buckley, dated 10 June 2024) that the existing STEP systems suffer from inflow and infiltration (I&I). I&I refers to the entry of stormwater into the wastewater network through gully traps, and other open infrastructure, or groundwater (and stormwater) entry into the wastewater network through cracked pipes and leaky or faulty infrastructure, such as below ground tanks. The Council engineers stated, *“The current issues in Mandeville are largely due to high volumes of floodwater and groundwater resurgence flowing into the septic tanks (either directly or via gully traps). This results in the pumps running for long periods overwhelming the system and resulting in other downstream pumps not being able to operate.”* The Council engineers also stated, *“The STEP systems suffer from I&I which occurs over days not just hours”*.
16. Mr Bacon (email correspondence dated 11 July 2024) confirmed that there is some spare capacity downstream of the Bradleys Road pump station for some additional connections, and that any such connection downstream of the pump station would need to be LPS.
17. Mr Bacon also noted that a “big chunk” of the existing capacity at Bradleys Road has been taken up by future connections which have been allowed for, to give effect to the LLRZ zoning, so there is some time dependant capacity available.
18. Mr Bacon considered that there are a number of options, as detailed below:
 - a. Install additional STEP connections onto the existing STEP network, undertake any necessary reticulation pipe upgrades and do an upgrade of the Bradleys Road pumpstation to accommodate the extra flow. Mr Bacon felt that the key issue with this option is the downstream rising main, which has a nominal pressure (PN) classification of 10 (maximum operating pressure of 1,000 kPa). The PN10 pressure rating limits the pumping head to allow more flow (capacity) within the reticulation, and Mr Bacon considered a significant length of pipeline would need to be replaced. Mr Bacon also considered that this option also adds more STEP connections to the network which have proven to be problematic during major flood events which overwhelm the system for days.
 - b. Installation of a new LPS system running in parallel with the STEP system via a new dedicated reticulation network. The LPS network would connect into the existing network downstream of the existing Bradleys Road pump station. There would be a limit as to how much flow can be accommodated in the downstream network, prior to its capacity being exceeded. Mr Bacon considered that this should be something Council could calculate.
 - c. Conversion of part (or all) of the existing network to LPS which would free up capacity at the Bradleys Road pump station and in turn the downstream rising main and the network in general. This has a number of long term benefits in reducing I&I but there is a significant upfront cost. The conversions would need to be undertaken in blocks by redirecting and reconfiguring parts of the reticulation network to bypass the Bradleys Road pump station. This is something that could be done relatively easily at

the San Dona end, but it comes with the same cost considerations if carried out at the Swannanoa end. There may also be some opportunity to do this in San Dona to create capacity for Swannanoa but would need to be tested in the Councils wastewater model. Mr Bacon noted that the key issue with this option is the cost in converting over existing connections to LPS, which he estimated as being approximately \$25k per property based on recent work in Tuahiwi and Fernside. There is also the possibility that the existing reticulation mains will need to be upgraded if the existing pressure class is not sufficient.

- d. Mr Bacon considered that Council could accept additional connections now, in lieu of those future connections taking up the capacity in the future. The issue with this approach is that the site will have taken up capacity and the means for some of those LLRZ properties to subdivide in the future. Further, if there is a desire to convert the whole of Mandeville to LPS in the future to deal with the I&I we would be creating an investment in private infrastructure that may be obsolete in the medium to long term. We would also need to put together a plan or strategy for upgrades in the future and collect contributions from the properties connecting now to pay for that. Mr Bacon considered this would be challenging as Council does not collect development contributions for projects beyond 10 years, so either the works would need to be completed earlier or the Council would end up funding those future properties to subdivide in the future.
19. Mr Bacon acknowledged that Council has not tested each of the proposed rezoning applications in their modelling software, only the one received from the San Dona area. The modelling for San Dona indicated that the current network does not have capacity, but capacity could be freed up via the following two options:
 - a. Reticulation pipe upgrades combined with conversion to LPS.
 - b. Reticulation pipe upgrades combined with an upgrade to the Bradleys Road pump station, including part of the rising main.
 20. Mr Bacon felt that the simplest approach at this stage would be to install an independent LPS pipeline connecting downstream of the Bradleys Road pump station. He considered that the available capacity in the downstream rising main could be estimated by assuming the Bradleys Road pumps are operating at maximum flow for an extended period and the demand in Ohoka calculated by using the future number of LPS connections in the Ohoka area based on the figures in the Provincial Development Unit (PDU) report.
 21. There are differing complexities to each option provided by Mr Bacon and capital expenditure considerations that need to be accounted for. I agree in principal with the comments and information provided by Mr Bacon, and I agree in principal with the four potential options suggested. However, I consider that it not enough investigation into viable options has been carried out at this early stage, including modelling, but Mr Bacon's email suggests there is scope to allow for future subdivision (re-zoning) to connect into the wastewater network.
 22. I do not consider that any upgrade or alternative discharge option should be discounted at this early stage due to pre-conceived capital expenditure requirements. Rather each option should be reviewed for functionality and a cost analysis can be carried out for confirmation of viability, including a review of the wastewater development contributions requirement.

23. There could well be alternative options beyond the four provided by Mr Bacon, however a better understanding of the I&I issues and the network as a whole would be required, and this would necessitate further modelling of the network and higher level of design/performance information supplied by Council.
24. The Council engineers have stated (in correspondence provided by Mr Buckley) that "*The current issues we have in Mandeville are largely due to high volumes of flood water and groundwater resurgence flowing into the septic tanks (either directly or via gully traps)*". This also brings into question how much capacity would be available in the network if the I&I issues were resolved and would there be sufficient capacity to allow both Blocks A & B to be connected into the network. I am under the impression from correspondence provided by Council that if the I&I issues were resolved then there would be sufficient capacity in the network to accept wastewater discharges from future development areas. However, I recognise that potentially should all I&I issues be resolved some parts of the network may still require upgrading to cater for future development. However, I do not consider this latter statement is development prohibitive and would require further investigation.
25. If parts, or all, of the existing network is at or near capacity (ignoring I&I issues), then I would consider LPS is a viable option in conjunction running a new pipe run to a point downstream of the Bradleys Road pump station. LPS pump stations have 24 to 48 hours of storage capacity, and the pumps can be fitted with Scada control which can limit the discharge period, so that pumping timeframes would occur during off peak periods and/or discharges from a development area can be staggered. Further, development construction could be staged so that only a limited number of Lots would be connected to the wastewater network, dependant on the sewer capacity and ongoing upgrades to the network (e.g. as more capacity becomes available additional lots can be developed).
26. The Council has stated that when major flood events occur the network is overwhelmed for days. Council has also stated that during these periods of I&I additional storage would not solve the capacity constraint. However, we would require a more precise timeframe of the ongoing effects of I&I on the wastewater network prior to being able to discount additional storage as being viable.
27. Potentially, one option is to install large storage tanks to hold back subdivision flows for an extended duration during flood events. Based on an average occupancy of 2.7 people per dwelling and a wastewater use of 250 L/person/day, a 5,000 L storage tank would provide on average 7 days storage for a single dwelling. Therefore, until such time as Council can provide a more detailed assessment of the I&I effects on the network capacity, we do consider there is the potential for future subdivisions to provide onsite storage or downstream storage facilities to hold back wastewater flows during peak flood events. The stored wastewater would be pumped out after a storm event during off peak periods, or the pumping rate could be staged/staggered as to not overwhelm the downstream network.
28. The Council correspondence suggests that a STEP network (in general) is problematic and is obsolete in comparison to LPS networks. I do not agree and consider that both systems are compatible and operate via similar principles in that wastewater from a dwelling is discharged via gravity to a tank (or pump chamber) from where it is pumped to a pressure main. The primary difference is the tank size and pump type/operating pressure. STEP systems are extremely useful in providing primary treatment for wastewater flows (in a similar manner to septic tanks) which can reduce the loading on an existing downstream wastewater treatment plant. LPS systems do not provide primary treatment, rather wastewater is gravity feed into a pump chamber, prior to being discharged to the downstream network (no solids settling etc.).

29. STEP networks should not result in I&I issues if installed correctly and should have the same level of water tightness as an LPS network. The tanks themselves should comply with AS/NZS 1546.1:2008 (Onsite Domestic Wastewater Treatment Units – Septic Tanks), which specifies the performance requirements and criteria (including water tightness). STEP systems that meet this performance criteria and have been installed correctly should not leak.
30. I consider that the possible reason the existing STEP network is subject to I&I issues is due to the use of poor components (e.g. tanks, pumps, fittings etc.), poor installation (contractor knocking holes in the side of tanks for pipe connections and then not sealing them adequately, gully trap installation and location, cold joints etc.) and a lack of quality control during installation (ongoing installation inspections and monitoring of all components used). I state the above because a well installed STEP system complying with AS/NZS 1546.1 that has a high standard of quality control will not leak.
31. An additional reason for I&I, can be due to cross connections such as downpipes or other parts of the stormwater network being plumbed into the wastewater system.
32. It is my opinion that further investigation work should be undertaken by Council to determine what properties or wider areas are causing the I&I before considering a blanket upgrade of the entire (or part of) STEP network or requiring existing STEP tanks be replaced with LPS. Retrofitting the existing network maybe an alternative and cost effective option. Council could track down all sources of I&I in an effort to stop the I&I at the source. Telemetry could be used to monitor pump run times to determine those that could be subject to I&I, e.g. long pump run times would suggest I&I issues, the source of the I&I could then be inspected and isolated/remediated.
33. To provide an example of the significant effects of I&I, a 3 mm diameter hole with 300 mm of head (water depth above the orifice) will allow approximately 1,000 L of water to pass through it over a 24 hour period (based on the standard orifice discharge equation). AS/NZS 1547:2012 (Onsite Domestic Wastewater Management) suggests a design flow of 1,000 – 1,400 L/day for a 4 bedroom dwelling. Therefore, a small 3 mm hole within a tank can effectively (almost) double the discharge from a STEP system over a 24 hour period.
34. I consider that finding a solution to the current I&I issue by Council should be of a high priority due to environmental concerns. My expertise is not hydrology or contamination effects; however, a commonsense approach would suggest that if external groundwater can enter the existing network, then raw sewerage can discharge into the surrounding environment and could potentially cause groundwater and surface water contamination. The locality is located above the unconfined and semiconfined aquafer zone and Canterbury Maps (2024) bore logs shows the presence of 317 active wells within a 2 km radius of the Bradleys Road pump station alone, with well depths ranging from 12 m to 32 m.

CONCLUSION

35. I have reviewed the information provided by Council engineers which briefly detailed the I&I issues occurring within the Mandeville Wastewater Scheme and the information provided by Mr Bacon which detailed potential options which would allow wastewater servicing of the proposed Block A and B rezoning land areas (or part them).

36. I consider that there are interim options available to service at least part of the site (Blocks A and B), such as using future capacity that has been set aside for LLRZ subdivision, the use of LPS (and Scada control) and running a new dedicated rising main to a location downstream of the Bradleys Road pump station. I also consider that an investigation into which properties are causing I&I should be carried out and retrofit options for the existing STEP systems should be reviewed.
37. There are options available to free up capacity within the existing network and four potential options have been highlight by Mr Bacon. At this early stage the most feasible options appear to be:
- a. Council modelling of the existing wastewater network to confirm the capacity under various scenarios to allow for servicing of Blocks A and B.
 - b. Investigation into which properties or areas (STEP systems) are subject to I&I, and an investigation into potential remediation (retrofit) of the properties identified.
 - c. Running a new dedicated pressure rising main down past the Bradleys Road pump station, which would allow future subdivision areas to be serviced by LPS systems.
 - d. Scada control of future LPS systems to allow greater control of the discharge frequency/distribution.
 - e. Staging of future developments (as the downstream sewer network capacity is upgraded, additional stages can be developed).
 - f. The potential for onsite or offsite storage until such time as the I&I issue is rectified. This option requires further investigation and additional information to be provided by Council.
38. It is noted that the downstream rising main has a PN10 rating and therefore further investigation is required to determine how much additional capacity this pipe run can tolerate. This could also be coupled with Scada control of the discharge frequency/timing of any future LPS pump stations.
39. Overall, I remain able to support the submission from a wastewater servicing perspective. I understand that there are capacity constraints within the Mandeville Area Wastewater Scheme, however, I consider there are viable options available to reduce the effects of I&I on the network and to allow future development to be serviced by the wastewater network.

Cameron Mars

12 July 2024