BEFORE COMMISSIONERS APPOINTED BY THE NELSON CITY COUNCIL

IN THE MATTER OF	Applications for resource consent under the Resource Management Act 1991
AND IN THE MATTER OF	The aberrational discharge of sewerage from Nelson Sewerage Business Unit (NSRBU) pump stations and reticulation network

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STATEMENT OF EVIDENCE OF DERRICK EDMUND RAILTON

Dated 27 November 2017

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1. INTRODUCTION

1.1 My name is Derrick Edmund Railton. I am a Director and Civil Environmental Engineer at Fluent Infrastructure Solutions Ltd (Fluent Solutions).

1.2 My evidence is given in relation to the application for resource consent by the Nelson Regional Sewerage Business Unit ("NRSBU") to discharge untreated sewage during emergency events from four wastewater pump station (PS) sites on the Nelson Regional Sewerage Scheme ("the Scheme", or "Regional Scheme").

1.3 I have the following qualifications and experience relevant to the evidence I shall give:

(a) BE Hons (Civil), University of Auckland, 1975.

(b) CPEng, Int PE (NZ).

(c) I am a Chartered Professional Engineer with 40 years' experience in civil, environmental and infrastructure engineering, having a particular focus on 3-Waters infrastructural planning and design, hydraulic design, water and wastewater treatment, small systems and on-site wastewater management; resource consenting, project management, expert evidence, peer reviews and staff mentoring.

(d) I am familiar with the NRSBU's Regional Scheme having had 15 years of almost continuous involvement with the Scheme in all its many facets over the period 1998 to 2013. I was directly responsible for all strategic reporting and options studies leading up to the identification of the strategic plan to upgrade the Scheme that was subsequently adopted by the NRSBU around 2009.

(e) From 2008 through to 2013 I was responsible for managing the resource consenting process for the new duplicate pipeline across to Bell Island and the design and subsequent construction management of the Stage 1 Scheme Upgrade of which that duplicate pipeline was part.

1.4 I am a member of the following relevant associations:

(a) IPENZ (Civil – Environmental).

(b) Water New Zealand.

1.5 I confirm that I have read the Environment Court's Code of Conduct for Expert Witnesses (2014), and I agree to comply with it. My qualifications as an expert are set out above. My evidence has been prepared in compliance with that Code. In particular, unless I state otherwise, this evidence is within my sphere of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

2. ENGAGEMENT AND PREPARATION

2.1 Fluent Solutions has been engaged by the NRSBU to provide independent expert evidence in relation to this hearing.

2.2 I have visited and am familiar with the various pump station sites. I have been to all of the discharge points and other relevant locations such as the Monaco Peninsula contact recreation area.

2.3 As part of my preparation I have read the Section 42A report prepared by Ms Lojkine and reviewed submissions made by submitters.

3. OUTLINE OF EVIDENCE

3.1 In this statement of evidence I will:

(a) Explain the inevitability of aberrational discharges from wastewater pump stations and place these in the wider NZ and Australian context;

(b) Review the approach taken by Local Authorities in NZ and Australia to meet Best Practice guidelines for managing aberrational discharges;

(c) Demonstrate how the NRSBU meets such Best Practice through its strategic planning and Long Term Plan; and

(d) Respond to matters relevant to my evidence raised in the Section 42A report and by Submitters.

(e) Present my conclusions.

4. ABERRATIONAL DISCHARGES

4.1 As outlined in Mr Butler's evidence, aberrational discharges from wastewater pump stations comprise:

Accidental discharges, being discharges caused by human error or system malfunction or breakdown; and

Overflow discharges, being discharges caused by excessive wastewater flow or insufficient pumping capacity.

4.2 It is the nature of aberrational discharges that they occur infrequently, in exceptional circumstances. It is not reasonably practicable, and arguably not possible to avoid such discharges 100 percent of the time. Key factors for this are:

(a) Increased wastewater flows during high rainfall event caused by infiltration and (surface) inflow; all municipal wastewater systems in NZ and worldwide are affected by this.

(b) The system relies on pipes, pump stations, and human operators, all of which are inherently and unavoidably fallible. Pipes and reticulation fittings can continue to be upgraded, but there is always the possibility of a discharge from breakage caused, for instance, by an earthquake, or material defect.

4.3 It is not practically possible to predict and design for the maximum or even which rain event that may affect the wastewater catchment and lead to an aberrational discharge. Referring to graph B3 (in the Data Bundle) "Highest 20 Rainfall Events Since 2000", not all events resulted in aberrational discharges. Whilst greater volumes of emergency storage can be provided, it is always possible that the storage will be overwhelmed.

4.4 It is of course possible to reduce the risk and the frequency of aberrational discharges to very low levels and I will shortly address how the NRSBU achieves Best Practice in this regard.

5. ABERRATIONAL DISCHARGES – BEST PRACTICE MANAGEMENT

5.1 Design standards or codes in NZ and Australia applying to infrastructure design (and more particularly wastewater pump stations) are principally governed by two documents:

(a) NZS4404:2010: Land Development and Subdivision Infrastructure; and

(b) Water Services of Australia (WSA) Codes; more specifically WSA 04-2005 "Sewage Pumping Station Code of Australia – 2005".

5.2 NZS4404:2010 governs most aspects of infrastructure design in NZ, but is strangely quiet in regard to pump station design and the way in which emergency discharges should be managed, or prevented.

5.3 The WSA document, however, does address the matter reasonably comprehensively, stating that overflow provisions are considered necessary, as follows:

"Pumping stations shall be provided with an emergency relief system (ERS) which shall overflow from the inlet MH wherever practicable or alternatively, from the emergency storage"

5.4 In Section 1.3.1 the Code goes on to identify design considerations for managing and mitigating overflows:

"(f) The risk of overflow from a pumping station has to be managed, often when the need for the station is greatest (e.g. in a storm event when power supply failures have potential to cause overflows). Regulators have become aware of these shortcomings and increasingly demand higher standards of storage capability, stand-by power generation, remote monitoring and telemetry control. Regulators expect better contingency planning and higher levels of environmental compliance"

5.5 Aberrational discharges occur in most, if not in all Local Authority regions and is an issue that affects all Local Authorities. Many take the position that as long as reasonable measures are taken to prevent overflows, then the rare occasions on which discharges occur are covered by the emergency provisions of the RMA. For this reason many Authorities do not have consents for emergency discharges, despite them being foreseeable.

5.6 In NZ, there are 78 Local Authorities, comprising of Regional, City, District and Unitary Councils, who have all developed their own infrastructure design codes. In most cases these design codes are principally the same with just minor differences, many being based on the aforementioned guidelines.

5.7 The Nelson City Council Land Development Manual 2010 is quite typical in this regard and provides as follows: *"4) A minimum of four hours on-site emergency storage, not including reticulation storage shall be provided based on the design average dry weather flow volume measured above the overflow to storage, or high level alarm level (measured by Multitrode or ultra sonic level detector)….*". I note, in passing, that it is standard practice to reference emergency storage volumes in terms of average dry weather flow, and this is the context of following references to emergency storage volumes.

5.8 Most Local Authorities identify that unplanned discharges are ideally avoided, but will typically specify the need for an overflow outlet. It is generally considered that the risk of sewage overflow on the streets and at properties is a higher public risk than overflow from a controlled outlet away from inhabited areas.

5.9 Key design and management components considered as Best Practice to reduce the risk of aberrational discharges to very low levels include as follows:

Key Design Component	Purpose
Standby Pump	A second pump that operates in the event the first pump malfunctions
Wet Weather Flow Capacity	The provision of sufficient pumping capacity to manage wet weather flows
Emergency Storage	Typically 4 to 8 hours Average Dry Weather Flow of storage is targeted, the higher durations tending to apply to smaller pump stations; the required volumes, and associated costs, for larger pump stations are often considered to be unreasonably high
Emergency Power Generation	Used in the event of a power outage to keep pumps running – particularly desirable where emergency storage volumes are limited
Infiltration and Inflow (I/I) Reduction	Investigations to identify sources of I/I and measures to address these
Overflow Facility	Necessary to prevent back up in the reticulation system
Emergency Plan	Emergency Management procedures to react to an overflow incident, and to manage and mitigate the effects of such an event

5.10 I now review how NRSBU design and management practices compare to Best Practice as just outlined, and to practice generally around NZ.

6. NRSBU AND BEST PRACTICE

6.1 I find that the NRSBU fares well in respect of best practice measured against NZ and Australian technical guidelines and practice by other infrastructure providers in NZ. Examples of how minimum requirements have been achieved include:

(a) Systems are in place to deal with emergencies.

(b) Pump Stations have been designed in accordance with industry practice.

(c) Asset Strategic Plans and Instructure Plans identify issues and future improvements.

(d) Regular inspections and maintenance of the pumping systems are undertaken.

(e) An investigations programme for Inflow and Infiltration reduction by Tasman District Council (TDC) and Nelson City Council (NCC) is in place.

(f) The last scheme upgrade commissioned in 2013 recognised and provided for the need for additional wet weather flow pumping.

6.2 There is one exception where it might be argued that Best Practice has not been met. This is in regard to the volume of emergency storage provided. Here the large size of the pump chambers provides some emergency storage, but the magnitude of storm flows effectively means that large reservoirs or chambers would need to be constructed to store excess flows, something that for the most part is not practically feasible given site space constraints at each pump station – not to mention budgetary cost constraints.

6.3 Rather, NRSBU has taken appropriate steps to meet Best Practice and to minimise the occurrence of overflows through:

(a) The provision of standby <u>wet weather</u> pump capacity at Saxton, Airport and Songer Street PS;

(b) A planned upgrade strategy for the NRSBU Scheme to manage wet weather flows, the first stage of which was commissioned in 2013;

(c) The installation of permanent standby generation facilities;

(d) A programme of I/I investigations and follow-up action in both NCC and TDC to address identified issues;

(e) The provision of overflow facilities at all four pump stations to avoid surcharging of sewers and overflows in the wastewater catchment;

(f) The implementation of Management and Contingency Plans to avoid the risk of overflows in the first instance (addressed in the evidence of Johan Thiart), and define actions taken in the event of a discharge.

6.4 Turning to the matter of emergency storage volume, "smaller" pump stations in providing 4 to 8 hours emergency storage volume will typically provide storage volumes in the order of 50 to 100m^3. This represents a significant additional cost for even 'small' pump-stations.

6.5 For a larger pump station like Songer St, a storage volume of around 1300m^3 would be required to provide just 4 hours emergency storage. The provision of such volume would require a significantly sized and costly structure – the space to construct this being very limited. In the end, this volume would not have been enough to contain the spill (2000m^3) that occurred on 23 March 2016 (A6).

6.6 The Saxton pump-station would require much more emergency storage than for Songer, the provision of which would incur even greater expense, again at a very restricted site. An exercise undertaken for this pump-station has identified an estimated cost of $4.9M to provide around 6 hours emergency storage.

6.7 The Airport pump station has reasonably significant emergency storage in the form of the old wastewater treatment plant clarifier, but even this is still not enough at times.

6.8 The Wakatu pump station has approximately 140m^3 emergency storage in compliance with NCC standards and has no record of overflows.

6.9 Importantly, the NRSBU has been progressively working on upgrades to the Regional Scheme to reduce aberrational discharges. The success of the Stage 1

upgrade in 2013 is clearly evident in diagrams A1, A2 and A3 of the data bundle, with a marked reduction in the size and frequency of overflow events. All except one were small and attributed to operator error and equipment failure (ref. A2, A3 of data bundle). The exception in 2014 was caused by rainfall, but was, on this occasion relatively modest by historical standards.

6.10 Looking to the future, further scheme upgrades are planned. The NRSBU Long Term Strategy Review 2008 split planned upgrade works in two stages:

(a) The Stage 1 upgrade (completed in 2013) allowed a deferment of further work for approximately 8-10 years, or beyond, before the Stage 2 works were required. The Stage 1 Upgrade works involved the upgrade of Beach Rd PS, Saxton Rd PS, Songer Rd PS, Airport PS and construction of a duplicate main between Monaco Peninsula and Bells Island WWTP.

This work also included the installation of new wet weather pumps and emergency generators to address the immediate capacity issues at both Beach Road and Saxton Road pump-stations. A new larger capacity pump station was installed at Songer Street with two wet weather flow pumps, and the provision to increase the pump capacity, including emergency power generator. An emergency generator was installed at Airport pump-station.

(b) The Stage 2 upgrade may involve a new pipeline around or across the Waimea inlet, which could change the flow direction of part of the existing network. Potentially half of the system could be reversed to flow clockwise to Bells Island WWTP, taking the pressure off the four pump stations that are the subject of this Hearing.

6.11 The Stage 2 future work is, however, subject to further review and consultation. In this regard the NRSBU's 2016/17 Business Plan provides for a review of the regional pipeline upgrade strategy in 2017/18.

6.12 Finally, I note that both NCC and TDC are undertaking annual programmes to identify and reduce I/I, and this should see an ongoing reduction in storm infiltration and the occurrence and severity of overflow events.

7. SECTION 42A REPORT

7.1 My foregoing evidence has largely addressed matters raised in the Planner's Section 42A Report and by the submitters. A few matters in the 42A report have not, however, been fully covered and I address these now.

7.2 In 5.86 Ms Lojkine refers to the "*possibility of 'upstream' storage, particularly for the major industrial contributors to the Saxton pump station* …" as an alternative to reduce the effects of the high BOD levels (in particular) in any discharge. I note that storage for the industrial contributor flows is already provided for dry weather overflow events.

7.3 However, for significant overflow events caused by high rainfall, upstream storage is not likely to be effective with regard to BOD levels as the flow volumes from the industrial contributors are small compared to the largely domestic flows from Nelson City Council and Tasman District Council, where the additional inflow volumes originate. This means that the BOD concentrations from the industrial contributors are quickly reduced down close to that in the domestic wastewater – which in turn are reduced below normal levels by the high, relatively clean, inflow/infiltration volumes.

7.4 On the subject of inflow and infiltration reduction, Ms Lojkine, in 5.86, comments that Nelson City Council and Tasman District Council have not considered the reduction of inflow and infiltration into their sewer systems. I suggest that this statement is demonstrably incorrect, as significant works are in fact undertaken.

7.5 Paragraph 5.86 finally refers to the possibility of UV disinfection of wastewater overflows. This is not practical in this case because of the relatively high turbidity of the wastewater overflows. UV disinfection processes require reasonable clarity of the water being treated so that the UV light can, in the first instance, penetrate the wastewater. Secondly, turbid water contains particles that shield pathogens from the UV light and prevent the light reaching them. Significant works and significant costs are associated with making UV disinfection of wastewater work. Apart from the high cost perspective, there is no room to install such facilities at Saxton or Songer St, in particular.

7.6 In 5.89 Ms Lojkine states that Council has "no specific future upgrades" planned for the regional scheme. This also is demonstrably incorrect as the asset management plans and LTP plans for both Councils provide for construction of further scheme

upgrading (Stage 2 of the original upgrade strategy) starting in 2020. I understand that the details and timing of this is dependent on more detailed investigations due to be commissioned shortly.

8. CONCLUSIONS

8.1 Affordability by the communities affected by occasional emergency discharges is a universal issue throughout NZ. Local authorities have to balance the cost of infrastructure to the population served, against the effects of discharges to the environment. In this regard I consider that the NRSBU is striking an appropriate balance relating to staged upgrading of the Regional Scheme, and management of expenditure and the associated impact to rate payers.

8.2 Further, NRSBU have implemented Maintenance Plans and Emergency Procedures, which mitigate the effects of an overflow incident and comply with the RMA. Ongoing I/I reduction works continue and are an important long term strategy to reduce future overflows.

8.3 In conclusion, I am satisfied that the NRSBU is meeting Best Practice measured against NZ and Australian technical guidelines and practice by most other infrastructure providers in NZ.

Derrick E Railton

Derrick Edmund Railton