

**BEFORE THE INDEPENDENT  
COMMISSIONERS APPOINTED BY  
WELLINGTON CITY COUNCIL**

SR471670  
**Ryman Karori**

**IN THE MATTER OF:**                      **Resource Consent Application** for the  
construction, operation and maintenance  
of a retirement village

**APPLICANT:**                              **Ryman Healthcare Limited**

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**Brief of Evidence of** David Patrick Wilson

**Acting on behalf of:** Wellington City Council

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## **INTRODUCTION**

### **Qualifications and experience**

1. My full name is David Patrick Wilson.
2. I am a Natural Resources Engineer with over 20 years of experience in three waters infrastructure engineering. I am currently a Director at The Urban Engineers Ltd. I have a Bachelor of Natural Resources Engineering (Hons) from Canterbury University. I am a Chartered Professional Engineer in the practice areas of Civil and Environmental Engineering, a Chartered Member of Engineering New Zealand, and a Member of the New Zealand Water and Wastes Association.
3. I am a Principal Engineer and Director at The Urban Engineers Ltd and have held this role for the last four years. I have been providing technical assistance to Wellington Water's Land Development team for more than six years.
4. I have particular expertise in stormwater treatment, disposal and management, including undertaking Water Sensitive Design assessments on behalf of Greater Wellington Regional Council. I am an author and the technical reviewer of Wellington Water's *Water Sensitive Design for Stormwater: Treatment Device Design Guideline* and was a member of the Ministry of the Environment's Urban Water Working Group.

### **Involvement in project**

5. My current involvement in this project has involved undertaking three waters infrastructure impact assessments of the resource consent application on behalf of Wellington Water Limited for Wellington City Council (the Council).

### **Expert Witness Code of Conduct**

6. I have a copy of the Code of Conduct for Expert Witnesses contained in the Environment Court's Practice Note dated 1 December 2014. I have read and agree to comply with that Code. This evidence is within my area of expertise, except where I state that I am relying upon the specified evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

### **PURPOSE AND SCOPE OF EVIDENCE**

7. The purpose of this evidence is to assess the three waters effects of the proposal.
8. I have also addressed stormwater quality in my evidence.

9. The proposal is to construct and operate a comprehensive care retirement village (Proposed Village) at 26 Donald Street and 37 Campbell Street, Karori, Wellington (Site).

## **SUMMARY OF CONCLUSIONS**

10. My conclusions are that;
  - i. the impact of the proposed development on existing upstream and downstream inundation risk can be mitigated.
  - ii. the local wastewater network has sufficient capacity for the proposed development.
  - iii. the local water supply network has sufficient capacity so that the proposed development can meet the requirements of the Regional Standard for Water Services Version 3.0 December 2021 (RSWS 2021).
  - iv. the adverse effects of stormwater runoff from the Site on stream health can be minimised through the use of on-site treatment devices and restricting the use of copper and zinc roofing, guttering and cladding materials.

## **ASSESSMENT**

### **Basis of Assessment**

11. My initial report was based on an assessment against the requirements of the Regional Standard for Water Services Version 2.0 May 2019. This evidence is based on an assessment of the proposal against the requirements of the Regional Standard for Water Services Version 3.0 December 2021, as this version will apply to any engineering approval and public drainage permit process.
12. The stormwater flows and inundation impact assessment is not changed as both versions of the Regional Standards require the use of Wellington Water's Reference Guide for Design Storm Hydrology dated April 2019.
13. Design wastewater and water supply flows are not changed as these are based on agreed flows for this particular development. Both versions of the Regional Standards are consistent in this regard.
14. The most significant change between the two versions of the Regional Standard is that the 2021 version has detailed requirements regarding building in close proximity to public mains. These requirements are discussed in paragraphs 27 and 28.
15. One significant difference between the two versions of the RSWS is that Version 2.0 did not require easements over public

drainage mains, whereas Version 3.0 does. The existing public drains on the Site are not covered by easements, ideally, this would have been changed as part of the proposed development. However, I have been informed by Council's Planner that as this is a Land Use consent, Council does not have the ability to impose easement conditions.

### **Stormwater - Flood Hazard effects**

16. The Proposed Village will increase the total impervious area of the Site from 1.84ha to 2.16ha, post development imperviousness of the Site will be of approximately 70.6%. The increase in impervious area (pre-development to post-development) is about 17.5% which will result in an increase of runoff from the Site.
17. During consultation meetings, it was discussed and agreed with Wellington Water that any flood effects upstream or downstream of the Site will be managed with a practical on-site stormwater detention solution that is capable of maintaining existing upstream and downstream inundation risk for a 1% Annual Exceedance Probability (AEP) (storm event (12 hour nested storm event with an allowance for climate change as agreed with Wellington Water Modelling Team).
18. It was agreed with Woods (Ryman's Engineering Consultants) that the on-site stormwater management solution would:
  - Not increase flooding upstream or downstream along the overland flow paths/flood extents of the Site compared to the base case in terms of flood levels and/or flood extents.
  - Provide for flows to the stormwater network that would not result in increased flooding downstream with manholes spilling more than the base case in terms of flood levels and/or flood extents.
19. Woods was provided with Wellington Water's Karori Stormwater catchment model. Wellington Water's model was updated by Wood's in consultation with Wellington Water, and the updated model was used as the base to undertake an effects assessment in terms of flood risk. The post-development model has been developed to include the proposed terrain and landform/ land use changes proposed within the Site. An additional model that assumed 50% blockage at the detention structure inlet was also developed.
20. The updated flood model was subject to Peer review by a stormwater modelling consultancy on behalf of Wellington Water. The Peer review confirmed that the updated model was fit for its purpose.

21. Flood modelling concluded that:
- There is no flood risk to the Proposed Village within the Site for all the scenarios modelled;
  - There is no increased flood risk to properties upstream or downstream of the Site for all the scenarios modelled;
  - The flood storage solution works as expected resulting in no increased water levels or flood extents in neighbouring properties with significant benefits along Donald Street, minor improvements along Campbell Street and no change on Scapa Terrace<sup>1</sup>;
  - The modelling undertaken confirms that flood storage of approximately 1,275m<sup>3</sup> is required for mitigation for the 1% AEP with climate change 12-hour nested storm event. However, the volume of the configuration proposed is 1,400m<sup>3</sup>, which exceeds the required flood storage.
  - The modelling has shown that the proposed solution will achieve hydraulic neutrality for the 10% AEP and 1% AEP events. Therefore, there will be no offsite adverse quantity effects. This includes all offsite infrastructure such as culverts, bridges and private property, roads and reserves.
  - With 50% of the weir structure blocked, the weir will operate at a peak head of 0.61m with no increases in water levels or flood extents on neighbouring properties.
22. Therefore, the applicant has demonstrated that the proposed development can achieve the agreed flood hazard management requirements. These requirements will be included as consent conditions. The proposed detention system will be privately owned and operated, and consent conditions will detail the need for ongoing maintenance requirements. The ongoing obligation to operate and maintain the detention structure should also be recorded on the property title.
23. Consent conditions will be required to ensure that a Stormwater Management Plan is provided that demonstrates that the detailed design does not increase flooding upstream or downstream along the overland flow paths/flood extents of the Site compared to the base case in terms of flood levels and/or flood extents.
24. The WCC public stormwater network runs through the Site. The proposal will require alterations to the existing public

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<sup>1</sup> Table 3 Infrastructure Assessment Report by Woods 25 August 2020

stormwater network to avoid pipelines under buildings.

25. This work will require the submission of construction drawings for Engineering Acceptance from Wellington Water and a public drainage permit from Wellington City Council.
26. The proposed layout of stormwater infrastructure has been designed to avoid buildings where possible however, Woods has assessed there are several areas where it is not possible to entirely avoid passing under buildings, including:
  - The existing 1200mm pipe will remain under Buildings B02 and B03 as there is no other feasible route for this pipe;
  - The new 1500mm diversion of the line entering the Site from Scapa Terrace will pass under a carpark and courtyard located between Buildings B04 and B05, the alternative is a crossing under a main building;
  - The existing 375mm pipe at the northern end of the Site previously passed under a building associated with the former campus. This building has since been demolished and will be replaced with Building B01A. It is not feasible to realign this pipe to avoid the proposed building, therefore it will be lowered to provide clearance to the foundations.
27. Building in close proximity of public pipelines should be avoided where possible. Therefore, consent conditions shall cover the requirement for the detailed design of any proposed pipes under buildings requiring Wellington Water acceptance as per the requirements of the RSWS 2021.
28. Section 3.8 of RSWS 2021 details the Wellington Water requirements for building in close proximity to public pipelines. A key requirement is that "*All practicable alternatives to relocate the pipe or relocate the structure/retaining wall must be considered at the developer's expense.*" An assessment of all practicable alternatives will have to be provided with the application for Engineering Approval from Wellington Water.

### **Stormwater - Stream Health effects**

29. The adverse effects of urban stormwater runoff on stream health relate to the generation and flushing of contaminants and increased imperviousness that leads to increases in peak flow, runoff volume and frequency of runoff from the Site during low flow high frequency, less than 50% AEP events (adverse of larger events less frequent events are addressed under Stormwater - Flood Hazard effects). If not managed, both these effects can have detrimental impacts on

downstream ecological and cultural values.

30. There are a total of 230 car parks proposed within the Site. While 190 of these carparks are under cover, the associated accessways are not. Therefore the proposed carparks are considered to be a high contaminant generating zone. To ensure adverse effects in the receiving environment are no more than minor, stormwater being discharged off the carparks, including associated accessways (manoeuvring, entries and exits), requires treatment for contaminants including sediment, copper and zinc.
31. The applicant has indicated that they propose to provide treatment via Stormwater 360 EnviroPod® or similar. The EnviroPod® is considered a pre-treatment device and will not provide the level of treatment provided. Treatment devices, for example rain gardens, will need to be provided in accordance with Wellington Water's Water Sensitive Design for Stormwater: Treatment Device Design Guideline. Consent conditions shall detail this requirement.
32. As noted above, the proposed development will result in the Site becoming approximately 70% impervious. The key to mitigating the adverse effects of this level of imperiousness is hydrological retention and detention. Mitigation measures are designed to minimise the increase in the runoff frequency, velocity and volume. Woods has used the hydraulic model to undertake an assessment of the changes in the low flow high frequency events. The model results showed that baseflows are maintained to the open stream with an increase from 0.2m<sup>3</sup>/s to 0.3m<sup>3</sup>/s with no significant increase in velocities (~0.3m/s). Woods also proposes the use of roof runoff harvesting for landscape irrigation. While these are appropriate hydrological mitigation measures, I have not been provided with an assessment of the reduction in runoff frequency and volume. Resource consent conditions are necessary to require that appropriate hydrological mitigation is provided.
33. The applicant has indicated that building materials will be carefully selected to ensure that the use of materials that have the potential to harm and/or pollute waterways is avoided (e.g. unpainted zinc or copper cladding or roofing). Consent conditions shall detail this requirement.

### **Wastewater**

34. Ryman has collected historic information on occupancy rates and wastewater loads for this type of village. Domestic sewer loads are on average 160 litres/resident/day, with a peaking factor of 3, based on information that has been collected by Ryman on sewer loads for its operational comprehensive care retirement villages. This includes an allowance for all core

functions such as kitchens, common rooms and staff usage.

35. The average daily wastewater flow is less than the residential flowrates specified in section 5.3.1.3 of the RSWS 2021 of 200 litres/resident/day. However, section 5.3.1.4 of the RSWS 2021 allows for flows from large residential and nursing homes to be established via specific design and submitted for approval to Wellington Water for approval.
36. In response to a further information request, Ryman supplied the data used to support these design figures.
37. The supporting information has been reviewed, and the average wastewater flow per person of 160 litres/resident/day has been accepted by Wellington Water's Chief Advisor for Wastewater.
38. The peaking factor of 3 for establishing peak dry weather flow from the Site has been accepted by Wellington Water as being appropriate.
39. Wellington Water has used the flows generated by its Karori WWTP 2017 (Maximum Proable Development (MPD) 2063) 1-year Long Time Series (LTS) design event model to assess the capacity of the local network. The model indicates that the local network has at least 2.7 L/s spare capacity.
40. A review of development within the local network catchment since the model was generated in 2017 showed there have only been 17 new connections. This number of new connections is less than the scale of development in the MPD scenario (30% for the entire catchment). Therefore, using the MPD 2063 flows is considered conservative for assessing current capacity.
41. The model also shows that the trunk network mains are already over their design capacity during a 1-year LTS design event, with overflows of over 50m<sup>3</sup> and 500m<sup>3</sup> occurring into the Karori Stream at engineered overflows.
42. Wellington Water's current policy is that on-site wastewater detention is only required where there are capacity constraints within the local network. Trunk network capacity constraints are addressed at a whole of catchment scale.
43. Based on Ryman's flowrates and peaking factor, the peak dry weather flow from the proposed development is 2.01 L/s. This is less than the spare capacity in the local network. The inflow and infiltration from the Site is generated by the model and has not changed.
44. My original assessment made the following statement "the wastewater generated by the development of this Site will require careful consideration at Engineering Approval stage as on-site wastewater detention maybe required"



45. However, based on the matters discussed above, it is now my opinion that there is sufficient capacity within the local wastewater network for the proposed development and that on-site wastewater detention will not be required.
46. The Site can discharge to two different wastewater sub-catchments. Due to capacity constraints within these sub-catchments, Wellington Water will have to be consulted to ensure the flows from the Site do not exceed the capacity of the receiving sub-catchments. Therefore, an advice note is required to ensure that Wellington Water is consulted to confirm available capacity within the local sub-catchments.
47. The Site has existing gravity public sewer mains that convey wastewater from upstream catchments through the Site. These mains also convey the wastewater from the existing buildings on the Site. The existing mains will need to be realigned through the Site to avoid buildings and underground services where possible.
48. This work will require the submission of construction drawings for Engineering Acceptance from Wellington Water and a public drainage permit from Wellington City Council
49. Woods have assessed that there is no feasible option to divert pipeline 1 around Building B01A, therefore the line will be lowered to avoid the foundations of this building. This is an improvement over the existing scenario where the line passes under two existing buildings.
50. Pipeline 3 will be realigned to avoid the new Building B04, this will involve passing below a carpark with a courtyard above. This is the best practical solution to avoid the building.
51. The realigned gravity pipelines have the capacity to convey PWWF from the upstream catchment as well as the Proposed Village to meet the requirements of Wellington Water.
52. As discussed in paragraphs 27 and 28, building in close proximity to public pipelines should be avoided where possible. Therefore, consent conditions shall cover the requirement for the detailed design of any proposed pipes under buildings requiring Wellington Water acceptance.

### **Water Supply**

53. As with the wastewater, Ryman has collected historic information on occupancy rates, water demands for this type of village. Domestic water supply demand loads are on average 200 litres/resident/day, with a peaking factor of 3, based on information that has been collected by Ryman on water supply demands for its operational comprehensive care retirement villages. This includes an allowance for all core functions such as kitchens, common rooms and staff usage.

54. These figures are less than the domestic flowrates specified in the RSWS, and in response to a further information request, Ryman supplied the used to support these design figures. This supporting information has been reviewed and accepted by Wellington Water's Chief Advisor for Water Supply.
55. It is proposed to provide two new connections to the Site from the 150mm main on Donald Street. The first connection will provide the potable supply and supply the private fire hydrants within the Site. The second connection will be a dedicated supply for fire protection sprinklers. Both connections will be provided with backflow preventors near the Donald Street boundary, and all reticulation within the Site will be privately owned by Ryman.
56. Based on measured hydrant flow and pressure readings Woods have demonstrated, using a hydraulic model, compliance with RSWS, which includes compliance with the New Zealand Fire Service Firefighting Water Supplies Code of Practice.
57. The water supply connections will require a separate application and approval from Wellington Water.

### **PROPOSED THREE WATER-RELATED CONDITIONS**

58. I have been advised that due to the activity status the drainage and water supply requirements can be provided as conditions of consent. The matters covered are also dealt with by separate approval process to connect to and alter public drainage and water supply networks.

### **Engineering Standards**

59. The consent holder shall comply with the requirements of the Wellington City Council Code of Practice for Land Development (either its current version or replacement document), unless otherwise modified by condition(s) of the consent or agreed in writing by the Wellington Water Land Development Team. These are the engineering standards for mitigating adverse effects on the environment from earthworks, traffic (roading and vehicle access), wastewater and stormwater drainage, water supply and utility structures.
60. No construction shall start prior to the following engineering plans in relation to water supply, stormwater or wastewater drainage, being accepted in writing by the Wellington Water Land Development Team:
- engineering plans and design certificate,
  - specifications
  - relevant draft commissioning, operational and maintenance documentation

- The application for engineering plans must be accompanied by a Wastewater Management Report, prepared and certified by a Chartered Professional Engineer, which as a minimum includes :.
- identification of drainage catchment and drainage sub-catchment areas for the pre-development and post-development scenarios including a suitably scaled wastewater master plan showing the aforementioned catchment details including lawful point(s) of discharge, complying with the requirements of the Regional Standard for Water Services.

61. The application for engineering plans must be accompanied by a Stormwater Management Report, prepared and certified by a Chartered Professional Engineer, which as a minimum include:

- i. identification of drainage catchment and drainage sub-catchment areas for the pre-development and post-development scenarios including a suitably scaled stormwater master plan showing the aforementioned catchment details including lawful point(s) of discharge, complying with the requirements of the Regional Standard for Water Services.
- ii. an assessment of the peak discharges for all events up to 1%AEP including climate change for the pre-development and post-development scenarios.
- iii. details of any proposed on-site detention / retention systems and associated outlet systems required to mitigate the impacts of the proposed development on downstream lands and existing upstream and downstream drainage systems;
- iv. engineering design of all new drainage systems servicing the development, and modifications (if any) to existing drainage systems required to adequately manage stormwater collection and discharge from the proposed development;
- v. identification of the area of land inundated (if any) as a consequence of the minor and major design storm events in the catchment for both the pre-development and post-development scenarios;
- vi. All land proposed as major overland flow paths must

be identified and provided with easements. The design shall demonstrate that all secondary flow paths proposed in the design can manage flows beyond the capacity of the primary stormwater system;

- vii. details of all calculations, assumptions and data files (where applicable).

**Advice Notes:**

*Where drainage works are required, permits in addition to this resource consent will be required namely:*

- *building consent for private drains, and*
- *Public drainage permit for all public drains*

*Scheme and other indicative layout plans that were submitted as part of the application will be used by Council for information purposes only. These plans will not be used for granting approval under the condition above. Approvals will only be given on detailed engineering plans.*

**Water Supply**

- 62. The consent holder shall provide an appropriately sized metered water supply connection to the public main for potable and private fire hydrant supply. An engraved plastic tag reading "WATER SUPPLY MANIFOLD FOR (Street No)" is to be secured to the manifold clearly showing which property is served by the manifold. An RPZ-type backflow preventer is required if the connection is greater than 20mm DI.
  
- 63. The consent holder shall provide for fire-fighting requirements in accordance with the NZ Fire Service Code of Practice for Firefighting Water Supplies NZS PAS 4509:2008. Calculations are to be provided by a suitably qualified engineer to certify that there is sufficient pressure and flow for the development to meet the Code of Practice for Land Development requirements. Calculations are to be based on pressure logging (seven day log) and flow readings taken from the nearest hydrant.
  - a separate application for the fire connection shall be submitted. Applications for fire service connections shall provide a copy of a flow test and pressure log (seven day log) along with supporting calculations conducted by a suitably qualified engineer as well as a detail layout plan showing the proposed connection. The design of the fire service connection and sprinkler

system shall allow for any head loss incurred by the required backflow prevention containment device.

- The consent holder shall provide all fire connections/sprinkler connections with a double check detector check backflow prevention containment device.

### **Stormwater Quantity**

64. To avoid impact on the downstream network, stormwater neutrality is required for all rainfall events up to the 1% AEP event (1 in 100 year event) plus climate change. The Site will therefore be required to provide a stormwater management system(s). The stormwater management design shall be approved in writing by the Wellington Water Land Development Team.
65. The owner of Site will be required to install an approved stormwater management system or systems in accordance with plans approved under the Building Consent and agreed with the Wellington Water Land Development Team.
66. The stormwater management system(s) shall be designed so that the total stormwater discharge post-development from the Site for all rainfall events up to the 1% AEP plus climate change event does not increase and does not lead to an increase in the inundation risk upstream and downstream of the site.

### **Stormwater Quality**

67. All runoff from the proposed carpark areas including associated accessways (manoeuvring, entries and exits) will be required to be treated prior to discharge.
68. The stormwater treatment systems will be required to be designed in accordance with Wellington Water Limited's Water Sensitive Design for Stormwater: Treatment Device Design Guideline December 2019 Version 1.1.
69. Bare galvanised, zinc alum or unpainted metal (including copper) may result in contamination of stormwater runoff upon corrosion of surfaces and therefore shall not be used for exterior construction, including but not limited to roofing, cladding, gutters and downpipes.
70. The consent holder shall install stormwater educational plaques alongside each stormwater sump that is installed within, or in association with, the development which promote

public awareness toward maintaining the water quality of the stormwater discharge. The educational plaques and their placement must be approved by the Compliance Monitoring Officer.

### **Operation and Maintenance Manual**

71. Prior to Engineering Approval, the consent holder shall prepare a draft Operation and Maintenance manual for all stormwater devices, setting out the principles for the general operation and maintenance for the stormwater system (treatment and detention). The draft Operation and Maintenance Manual shall be submitted to the Wellington Water Land Development Team for approval. The Operation and Maintenance manual is to include, but not be limited to:
- i. a detailed technical data sheet
  - ii. all the requirements as defined within the Water Sensitive Design for Stormwater: Treatment Device Design Guideline.
  - iii. details of who will hold responsibility for short-term and long-term maintenance of the stormwater devices
  - iv. a programme for regular maintenance and inspection of the stormwater system
  - v. a programme for the collection and disposal of debris and sediment collected by the stormwater management device or practices
  - vi. a programme for post storm maintenance
  - vii. a programme for inspection and maintenance of outfall erosion
  - viii. general inspection checklists for all aspects of the stormwater system, including visual check of roadside sumps and outfalls
  - ix. a programme for inspection and maintenance of vegetation associated with the stormwater devices.
  - x. recommended ongoing control methodology to eradicate established pests and invasive weeds from both terrestrial and aquatic areas
72. The owner of the Site shall follow the required operation, maintenance and renewal of the system(s), set out in the

maintenance manual, to ensure it is in full working order at all times.

73. Details of all inspections and maintenance for the stormwater management system, for the preceding three years, shall be retained.

A maintenance report shall be provided to the Council on request. The maintenance report shall include the following information:

- i. details of who is responsible for maintenance of the stormwater management system;
- ii. details of any maintenance undertaken; and
- iii. details of any inspections completed.

The owner(s) of the Site cannot increase stormwater discharge, through an increase in non-permeable areas, without Council approval; as an increase in stormwater discharge may result in failure of the stormwater detention systems.

74. Within one month of the stormwater management system becoming operational. A covenant that specifies conditions 72 and 73 above shall be entered into in with Wellington City Council.

### **Public Wastewater and Stormwater Network**

75. The Site shall have a separate and direct connections to the public stormwater and wastewater networks at locations accepted in writing by the Wellington Water Land Development Team.

#### **Advice Notes:**

*The local wastewater network has limited capacity and flows from the site will have to be split between the two wastewater sub catchments as determined by the Wellington Water Land Development Team.*

76. The development of this Site will require the public drainage network to be extended/alterd to serve the proposed development. All newly constructed sewer/stormwater mains to be vested in Council shall be approved by Wellington Water Land Development Team based on a [video or] closed circuit television (CCTV) inspection carried out by the consent holder in accordance with the New Zealand Pipe Inspection Manual. A pan tilt camera shall be used and lateral connections shall be inspected from inside the main.

77. As the proposed construction will not comply with the Regional Standard for Water Services requirement for building/working near public drains, the consent holder/property owner will provide pre- and post-CCTV footages and reports of the existing main to the Wellington Water Land Development Team.

Any new defects identified post-development must be repaired by the consent holder/property owner. All costs incurred for repairs post development will be at the expense of the consent holder.

78. Where building in close proximity cannot be avoided, proposals to build over will be assessed by Wellington Water based on council policy all relevant requirements in the Regional Standard for Water Services and Regional Specification for Water Services. In particular a proposal must address the following:

- i. All practicable alternatives to relocate the pipe or relocate the structure/retaining wall must be considered at the developer's expense.
- ii. Relaying with or without sleeving of the pipe at the developer's expense is generally required as detailed in the Regional Specification for Water Services. Geotechnical investigation or confirmation of the soil type may be required at the discretion of Wellington Water.
- iii. Design of the works shall:
  - a. include consideration of seismic resilience of both the pipeline and building works.
  - b. provide for a secondary flow path if needed and as far as practicable.
  - c. maximise the ease with which the pipe can be maintained and replaced.
  - d. take into account network structures such as chambers and manholes, maintenance access for machinery at a future date, and access to manholes.

**Advice Notes:**

*Any alteration or addition to the existing public drainage network is required to be carried out under a Public Drainage Permit (as distinct from a Building Consent) issued by the Wellington Water Land Development Team.*

*All Public Drainage work is required to be carried out by a suitably experienced Registered Drainlayer; who is employed by a contractor who has an approved Health and Safety Plan and Public Liability Insurance.*



**As Built**

79. At the conclusion of the engineering works, and prior to occupation or code of compliance (whichever comes first) the consent holder shall submit as-built drawings that meet the requirements of Wellington Water Regional As-built Specification for Water Services, for water supply, wastewater and stormwater drainage.
80. Once an as-built plan has been submitted and within one month of completion of the water supply and drainage works, the Consent holder shall arrange for a final inspection with the Wellington Water drainage and water supply inspectors.

**Advice Note:**

*Where possible, all as-built plans shall be submitted in both hard copy (PDF) and electronically. Electronic copies are to be submitted in CAD format (.DWG file) drawn in the NZGD 2000 New Zealand Transverse Mercator' coordinate system. Easements on the parent parcel for public mains / overland flow paths.*

**SUBMISSIONS**

81. In general, submissions are concerned about the impact of the proposed development on the local inundation risk and drainage and water supply networks.
82. Several submissions raise the issue of local and trunk wastewater network capacity, this issue is addressed in paragraphs 31 and 45 of my evidence. Appropriateness of the design wastewater flows is also addressed paragraphs 37 and 38 of my evidence.
83. There were some submissions regarding the level of detail provided, an example is the submission by Richard Leikis regarding the levels of the scruffy dome inlets. This information will be required to be provided with any drawings submitted for Engineering Approval, these details will be reviewed against the levels used in the flooding model to ensure that they are consistent.

**CONCLUSIONS**

84. Regarding the impact on existing inundation risk, it is my opinion that based on the flood modelling work completed to date that a suitable stormwater management system can be built on the Site so that stormwater discharge post-development from the Site for all rainfall events up to the 1% AEP plus climate change event does not increase upstream or downstream inundation risk.

85. Regarding wastewater, it is my opinion, based on the information provided to date, that the local wastewater network has sufficient capacity for the proposed development.
86. Regarding the capacity of the trunk wastewater network, Wellington Water's current policy is that on-site wastewater detention is only required where there are capacity constraints within the local network. Trunk network capacity constraints are addressed at a whole of catchment scale.
87. Regarding water supply, the information supplied to date has demonstrated that RSWS 2021 requirements regarding both potable water and firefighting water supply can be met.
88. The adverse effects of stormwater runoff from the Site on stream health can be minimised through the use of on-site treatment devices and restricting the use of copper and zinc roofing, guttering and cladding materials.
89. Based on these conclusions, I support the proposal from a three waters servicing perspective.



**David Patrick Wilson**

19 August 2022