

Before Independent Hearings Commissioners At Wellington

Under the Resource Management Act 1991

In the matter of Applications for resource consents, and a Notice of Requirement for Designation by Wellington Water Limited on behalf of Upper Hutt City Council, for the construction, operation and maintenance of the structural flood mitigation works identified as the Pinehaven Stream Improvements Project.

Statement of evidence of Eric Michael Skowron for Wellington Water Limited (Project Overview)

Dated 20 July 2020

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Statement of evidence of Eric Skowron

1 Qualifications and experience

- 1.1 My full name is Eric Michael Skowron.
- 1.2 I am a civil engineer with 20 years of engineering experience. I have worked in New Zealand, the United States of America and Australia for both consulting and government entities.
- 1.3 I am currently an Associate Water Engineer at Jacobs and have been employed by the company since August 2009.
- 1.4 My previous roles include Technical Leader for Smart Water Solutions and Team Leader for the Networks and Planning team in the Brisbane, Australia office between 2011 and 2014.
- 1.5 I am a licenced Professional Engineer (PE) in the State of Colorado in the United States of America. I have a Master of Science degree in Civil Engineering - Hydraulics (Open Channel) from Colorado State University (CSU) in 1999. I also have a Bachelor of Science in Civil Engineering and a Minor in Landscape Design and Construction from Colorado State University in 1997.
- 1.6 My evidence relates to a Notice of Requirement (**'NOR'**) for Designation and associated resource consent applications for the construction, operation and maintenance of the structural flood mitigation works identified as the Pinehaven Stream Improvements Project (**'the Project'**). Wellington Water Limited (**'WWL'**) has lodged the resource consents and NOR on behalf of Upper Hutt City Council (**'UHCC'**).
- 1.7 I am familiar with the Project and the area contained within the Project reach. I have been involved with the Project in a Project Management role since June 2017.

2 Code of conduct

- 2.1 While these applications are not before the Environment Court, I have read and am familiar with the Code of Conduct for Expert Witnesses in the current Environment Court Practice Note (2014). I have complied with the Code in the preparation of this evidence, and will follow it when presenting evidence at the hearing.

- 2.2 The data, information, facts and assumptions I have considered in forming my opinions are set out in my evidence to follow. The reasons for the opinions expressed are also set out in my evidence to follow.
- 2.3 Unless I state otherwise, my 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 that I express.

3 Scope of evidence

3.1 My evidence addresses the following matters:

- a Project overview;
- b Alternative designs;
- c Operational and maintenance activities;
- d Responses to issues in submissions;
- e Response to section 42A reports.

4 Executive summary

4.1 The Project addresses structural measures proposed in the Floodplain Management Plan ('**FMP**') over approximately 1km of stream across three reaches of the Pinehaven Stream. The main physical structures or works are:

- a Replacement of private vehicle access and pedestrian bridges;
- b Grading the sides of the stream to increase capacity;
- c Integrating a low flow channel to retain the existing stream bed where possible;
- d Scour reduction and protection measures;
- e Measures to mitigate existing stream bank erosion;
- f Debris screens and debris arrestors; and
- g Securing overland and secondary flow paths.

4.2 Key alternative design options considered prior to lodgement were:

- a Two types of stream channel were considered (naturalised channel and structural channel with vertical walls) with naturalised channels being preferred where possible;
- b In relation to scour protection, native planting and geotextile matting were proposed for the Project, with rip rap protection proposed to mitigate scour potential in high risk areas and for structural protection; and
- c Removing, replacing or retaining existing private bridges.

4.3 Alternative design options have been considered post lodgement of the application, and this has resulted in the following design refinements:

- a The property at 10A Blue Mountains Road has been acquired by UHCC, which will serve as a site office during construction;
- b Retaining some private bridges where they were previously proposed to be removed;
- c The designation footprint proved to be insufficient for accommodating the agreed property access solution for 28-32 Blue Mountains Road, so the designation area over 30 Blue Mountains Road is proposed to be increased by 101m²;¹
- d Replacement of the existing pedestrian bridge at 4-8 Blue Mountains Road (Reformed Church of Silverstream) has since been considered necessary;
- e Works are no longer proposed to increase capacity of the overland flow path down 15 Clinker Grove driveway;
- f In response to the request by property owners, the existing overland flow path at 11 Birch Grove will be secured with no proposed grading or structural improvements to facilitate conveyance of the existing overland flow path across the property;
- g The number of areas for mitigation of scour risk at 50 Blue Mountains Road and 2A Freemans Way was reduced from five potential sites to two;²

¹ Section 92 response to UHCC dated 21 February, 2020, Appendix D.

² General Arrangement Plans dated 11 June 2020.

- h At locations between Sunbrae Drive to 28 Blue Mountains Road where the stream will be widened on both sides, rip rap protection has been added upstream of Sunbrae Drive culvert;
 - i At 4-8 Blue Mountains Road (Reformed Church of Silverstream) the school field was previously identified as a receiving site for cleanfill material. Use of the school field for this purpose is no longer proposed.
- 4.4 The RMA approvals will also authorise ongoing operation and maintenance of the Project. This will include maintenance of new private bridges and jointly accessed driveways constructed as part of the Project. Access locations for long term maintenance will be confirmed after construction is complete, and the Project designation footprint will be reduced down to those areas required for ongoing mitigation, operation or maintenance.

5 Project overview

- 5.1 The Project addresses structural measures proposed in the FMP over approximately 1km of stream across three reaches of the Pinehaven Stream. The three reaches are (from north to south or downstream to upstream):
- a Reach 1 Lower (48 Whitemans Road to Sunbrae Drive),
 - b Reach 2 Mid (Sunbrae Drive to Pinehaven Road); and
 - c Reach 3 Upper (upstream of 2A Freemans Way to the Pinehaven Reserve).
- 5.2 The design of proposed stream improvements resulted from iterations in the hydraulic model with consideration of safety, physical constraints, constructability, construction access, method of construction, minimisation of impacts to the stream and surrounding environment during construction, inputs from adjacent property owners, inputs from stakeholders including UHCC and GWRC and inputs from technical advisors including terrestrial ecologists, aquatic ecologists, landscape architect, geotechnical information, maintenance, and other factors.

Key physical structures or works proposed

- 5.3 The key physical structures or works proposed are shown on the General Arrangement Plans provided to UHCC and GWRC on 11 June 2020.
- 5.4 Works will occur within three reaches of the Pinehaven Stream between Whitemans Road at the downstream extent of Reach 1 and the Pinehaven Reserve at the upstream extent of Reach 3. Works also include improvements to

storm water inlets and debris screens in parts of the upper catchment (not within the scope of this NOR and resource consent applications).

- 5.5 The following section of my evidence briefly describes each of the key Project works.
- 5.6 *Replacement (and consolidation) of private vehicular access bridges:* one private vehicular bridge to provide access to 10A, 10B and 10C Birch Grove, one private vehicular bridge to provide access to 34 and 36 Blue Mountains Road, one private vehicular bridge to provide access to 28 to 32 Blue Mountains Road.
- 5.7 *Replacement of private pedestrian bridges:* one private pedestrian bridge at 12 Birch Grove, one private pedestrian bridge at 50 Blue Mountains Road, one public pedestrian bridge at Willow Park and one private pedestrian bridge at 4-8 Whitemans Road (Reformed Church of Silverstream).
- 5.8 *Grading the sides of the Stream:* increases to stream capacity by grading (excavating) the sides of the Stream. The bed elevation (bottom of the stream) through the Project area will remain unchanged. Where feasible, the sides of the stream will retain a sloped, vegetated bank (i.e. naturalised stream banks) with slope (batter) of 1V:2H. Design information for stream improvements in Willow Park have more gentle slopes.. Where constrained by adjacent infrastructure and private property, (near) vertical walls (constructed of precast block walls) are proposed.
- 5.9 *Low flow channel:* a low flow channel of nominal 200 mm depth has been integrated in areas where stream channel upgrades are proposed to retain existing stream bed where possible and avoid any change to the instream habitat.³
- 5.10 *Scour reduction and protection measures:* scour reduction and scour protection measures are integrated into the design. In most areas, the widening works of the stream channel result in decreased velocities which decreases scour risk. The 1% AEP flood event has been used for designing scour protection measures at structures as there is a high likelihood a 4% AEP storm event or greater will occur within the design life of the proposed structures. Scour reduction measures include improving flow conditions at structures interfacing with the stream by removing existing stream constriction at private bridges. Where practical scour reduction measures did not sufficiently mitigate scour risk, scour protection measures were implemented. Mitigation measures for scour at structures

³ James EIC, para 8.3.

(including stream walls) included either extending the foundation of the structure below the depth of predicted scour or protecting the toe of the structure through armouring of the channel bed with placement of riprap (rock).

- 5.11 Locations where additional scour protection was determined to be necessary often coincided with areas where the low flow channel was in close proximity to a wall, often at bends in the horizontal geometry of the stream where the proposed bank has not significantly changed from its existing location. To mitigate the risk of scour undermining the toe of retaining walls where scour risk was determined, rip rap scour protection was designed to be placed at an elevation 300 mm below the surface (with 300 mm of bed material reinstated above the rip rap). At areas where the in-situ materials forming the low flow channel will need to be removed to enable placement of rip rap at the toe of the structure, the in-situ materials will be reinstated above the rip rap with the stream bed surface elevation equal to the existing stream bed surface elevation.
- 5.12 *Measures to mitigate existing stream bank erosion:* measures have been proposed to mitigate existing stream bank erosion at three locations outside of areas where stream improvements are proposed (between project Reach 2 and Reach 3). At one site, located at 50 Blue Mountains Road, structural improvements to the embankment above the stream were avoided to protect significant vegetation by relocating the driveway away from the embankment at that location . With this change, no scour mitigation is required at that location.
- 5.13 At a second location within the 50 Blue Mountains Road property, a previously constructed in-situ concrete wall has failed with portions of this wall lying within the stream channel. The failed wall and continued erosion of the alluvial materials within the stream, places foundations of an existing pedestrian footbridge at risk. A replacement mass block Redi-Rock wall solution approximately 2.5 – 3.0 m high and 15 m long is proposed at this site. The design has accommodated replacement of the pedestrian footbridge with new shallow foundations at a location upstream from the existing location to avoid disturbance to notable trees.
- 5.14 The third site (Site E),⁴ located within the property at 2A Freemans Way, low to moderate strength sandy SILT and medium gravels of alluvial origin are exposed within the bank of the stream and are subject to erosion resulting in minor slope failures. This site contains numerous trees of notable value, both above and below the scour site, requiring a solution which manages the risk of further stream scour while minimising negative impact on notable trees and enabling

⁴ This is described as Site C in the evidence of Dr Adam Forbes.

construction in a constrained environment. The design solution comprises the advancement of shallow soil nails and installation of flexible facing geotextile system (Maccaferri MacMatR) into the slope above the stream channel. The flexible facing will stabilise the near surface alluvial soils and permit regrowth of vegetation at this site. In addition to this, the base of the stream channel will be lined with placed rip rap rock sized to meet the anticipated stream flow conditions.

- 5.15 *Debris screens:* improvements to existing debris screens at the Whitemans Road Bypass are proposed. The existing Whitemans Road Bypass currently has a debris screen at the inlet with wide spacings to prevent coarse debris from entering the pipe system. Flow through the bypass is controlled by a weir which is approximately 9 m long. The screen covers only the front section of the weir (7 m), with a significant gap on the left side edge where there are no bars. A Safety in Design workshop (17 December 2019) identified that the risk of children entering the culvert inlet is particularly high at this site. Therefore a new screen has been designed with full coverage to limit spaces at side interfaces so that there are no gaps on the sides in excess of 150mm to reduce risk of entry by children.
- 5.16 *Debris arrestors:* replacement of existing vertical steel railway sections with a debris screen has been designed to provide a debris arrestor for reducing risk of large debris from the Pinehaven Stream from entering the culvert at Whitemans Road (downstream extent of Reach 1). Due to the long length of pipe downstream of this location (which eventually discharges to Hulls Creek), the consequences of children entering the culvert barrel and sustaining injuries is high. The proposed design includes galvanised steel debris screens with a front-facing screen at a 1V:1H slope. An operating platform or deck and handrailing are provided above the screen to enable cleaning and removal of debris. Bar spacing has been designed at 150mm centres (134mm clear span) to mitigate both debris risks and entry risk..
- 5.17 *Overland and secondary flow paths:* works are proposed to secure overland flow paths and secondary flow paths at a number of locations outside of the designation footprint (e.g. at Jocelyn Crescent). These works are indicated on the Sheet Layout Plan of the General Arrangement Plans, but will be carried out in reliance on permitted activity rules (or separate consents sought if required). The following paragraphs describe those overland and secondary flow path works which are within the designation footprint.
- 5.18 Following assessment of the secondary flow path at Sunbrae Drive and Deller Grove it was determined that no improvements are required to secure the

secondary flow path. The Deller Grove catchment is a relatively small catchment consisting of approximately 92 properties which contribute to a secondary flow path at the intersection between Sunbrae Drive and Deller Grove. The secondary flow path finishes at a sag point located at 6 Sunbrae Drive, then overtops the footpath and travels through the footpath before eventually discharging to Pinehaven Stream at 4 Sunbrae Drive. As part of the Project, the structures at 4 Sunbrae Drive will be removed and the property will become part of Willow Park. Conveyance of the overland flow path through the property at 4 Sunbrae Drive to the Pinehaven Stream has been accounted for in the Willow Park design.

- 5.19 Works to secure a secondary flow path at 2 – 4 Pinehaven Road are necessary to direct flow from the Pinehaven Road secondary flow path to the stream without contributing to flooding of Pinehaven Road. A Hynds Megapit on each side of Pinehaven Road has been sized to intercept 1% AEP event flow and direct the flow into the Pinehaven Stream on both the upstream and downstream sides of Pinehaven culvert. There are two contributions to flow at this location: overland flow from the overtopping Pinehaven Stream at the 50 Blue Mountains Road property and from the Pinehaven Road secondary flow path..
- 5.20 *Construction of accessways:* Construction of access to 28 to 32 Blue Mountains Road, 34 and 36 Blue Mountains Road and 10A, 10B and 10C Birch Grove is required to provide access across the replacement vehicular bridges. The access driveways are private and do not provide public access.
- 5.21 The driveway to 30 and 32 Blue Mountains Road connects with Blue Mountains Road at the existing property at 28 Blue Mountains Road which has been purchased as part of the Project (existing structures at 28 Blue Mountains Road will be removed to enable relocation of the stream and to facilitate the re-alignment of the access driveway to properties at 30 and 32 Blue Mountains Road). This access will also provide access to the remaining area of the 28 Blue Mountains Road property (which will remain UHCC property following the project) to enable infrequent maintenance access when required.
- 5.22 Access to 34 and 36 Blue Mountains Road will provide vehicular access across the stream to 34 Blue Mountains Road (which is not currently available to 34 Blue Mountains Road). The access location will be near the alignment of the existing driveway to 36 Blue Mountains Road and has incorporated an island in the driveway to enable retaining an existing power pole in its current location. Overland flow to the rear of the left hand bank Redi-Rock wall (encompassing any flow from 2 – 4 Pinehaven Road) is to be collected by a local drainage system designed at 36 Blue Mountains Road.

- 5.23 The existing bridge to 10A, 10B and 10C Blue Mountains Road is to be replaced with a new bridge at a higher level to provide freeboard above the 1% AEP (including climate change) water level. To achieve this, the private driveway will be raised to connect to the bridge, located in a similar alignment to the existing bridge.
- 5.24 *Utilities:* the Project will require relocation of, or alterations to, water and wastewater utilities which cross or are adjacent to the stream.
- 5.25 For the avoidance of doubt, the following works are no longer part of the Project Works:
- a The Sunbrae Drive and Pinehaven Road culverts will be replaced in advance of the works described above, but as part of the wider Project. The replacement of these culverts has been separately consented.⁵
 - b At the time the RMA applications were lodged, the Project included use of the Reformed Church of Silverstream school field as a cleanfill site. This is no longer proposed.

6 Alternative designs considered

- 6.1 The preferred design solution has evolved through multiple project stages including concept design, hydraulic analysis, preliminary design, property engagement, RMA applications, early contractor involvement ('**ECI**'), and detailed design. A number of alternative designs were considered before the application was lodged. Further design refinement has occurred after the application was lodged as a result of independent modelling review, property owner engagement, ECI and progression of detailed design. Those alternatives either applied to the entire Project length, or for short sections.

Design alternatives considered before the applications were lodged

- 6.2 Figure 19 in the Assessment of Environmental Effects ('**AEE**') provides an overview of the alternatives assessment process, and identifies at what stage of the Project alternative designs were explored. This section of my evidence summarises the alternative designs considered when developing the Project before the application was lodged, in relation to particular design subjects (further information is provided in sections 8.2 and 8.3 of the AEE).

⁵ Consent WGN200101, 5 March 2020.

- 6.3 *Stream banks and channel hierarchy:* In general terms the two types of stream channel considered when increasing stream capacity are:
- a Naturalised channels with sloped (battered) stream banks which are typically vegetated with erosion control measures where required; and
 - b Structural channels with walls, sheet piles or other structural solutions to achieve vertical, near vertical or shorter stepped sections. Structural channels are typically considered in space constrained locations where increase of channel capacity is required.
- 6.4 Generally, naturally battered stream banks provide greater environmental and amenity value benefits, while the vertically sided channel profile can provide increased channel capacity within a reduced footprint compared to a naturalised channel. This enables achieving increased conveyance while minimising potential impact on surrounding infrastructure and private property. Benched retaining walls can provide for potential additional environmental enhancement and amenity values but will require a larger footprint than single-wall vertically sided stream banks.
- 6.5 Stream channel profiles identified in the Pinehaven Stream FMP included naturalised sections of stream, and sections with near-vertical retaining walls. The retaining walls were to be used where there was inadequate space for a naturalised stream section yet enabled conveyance of the 'design event' (i.e. 4% AEP and 1% AEP) within a reduced footprint to accommodate adjacent infrastructure and private property in close proximity to the stream. The preferred options plans contained in the Pinehaven Stream FMP identified approximate locations of naturalised stream banks and vertical sided lined sections (retaining walls)⁶ that were estimated prior to the design and analysis stage of the Project.
- 6.6 *Gravity retaining walls:* Alternative retaining wall designs were also considered during the design stage. A multi-criteria assessment ('**MCA**') was used to compare options including bored soldier pile walls, sheet piles, reinforced concrete walls, and mechanically stabilised earth ('**MSE**')⁷. The MCA process⁸ suggested that timber retaining walls and MSE walls performed similarly well. Following the MCA process, additional options were identified including block veneer over steel sheet piles, plastic sheet piles and block work with a Rockcrete

⁶ Greater Wellington Regional Council "Pinehaven Stream Floodplain Management Plan" (6 September 2016) <<https://www.gw.govt.nz/assets/floodprotection/Waiohine-FMP/Pinehaven-printing-FMP-volume-1-update-6-September-2016.pdf>>, Appendix F.

façade. Retaining wall solutions that proceeded into design included sheet piles and precast block walls.

- 6.7 *Scour protection:* Design of solutions for mitigation of scour risk was completed after lodgement of the AEE as velocity data from finalised modelling is a required input for scour mitigation design. This is discussed in my evidence below at paragraph 6.28. Options identified and considered for mitigation of scour prior to lodgement of the AEE include:
- a Riprap protection (rock and material placed to armour the bank). Riprap protection is still required where space limitations restrict the use of geofabrics and native plants. Riprap will provide toe protection for vertical retaining walls where space restricts a planted bench from being installed.
 - b Geotextile matting (permeable fabrics used to protect the soil surface);
 - c Vegetative cover including native (tussock) grass plantings or lawn grass (Kikuyu grass); and
 - d Structural protection (sheet piles or other physical structures to protect the toe of proposed walls from scour).
- 6.8 Native planting and geotextile matting were proposed for the Project, given the high velocity resilience of matting, and the riparian habitat advantages of native plantings.
- 6.9 *Purchase of property:* Prior to lodgement of the AEE, options considered through the purchase of properties at 4 Sunbrae Drive, 28 Blue Mountains Road and 48 Blue Mountains Road included improvement of stream conveyance, habitat enhancement and environmental benefit, providing public amenity improvements, boundary adjustment with adjacent properties and retaining a sellable parcel with remaining property following completion of works. Further detail about the alternatives considered on each property is included at section 8.2.1.2 of the AEE.
- 6.10 *Private bridges vehicular bridges and access:* The Project includes the removal or replacement of some of the existing private bridges within the designation footprint if:

- a The bridge spans needed to be increased to match widened stream banks required to convey the design event (4% AEP plus climate change and freeboard); or
 - b Erosion protection, retaining walls or other channel works are required at the location of an existing bridge, and would compromise that structure.
- 6.11 Section 8.2.1.4 of the AEE describes the two types of bridge construction which were considered for the Project, and notes that flat slab bridges have been selected for all shorter vehicle bridges or a double tee or hollow core unit to enable longer spans for vehicle bridges.
- 6.12 *Private pedestrian bridges:* Flat slab bridges were selected for all pedestrian bridges (refer to section 8.2.1.4 of the AEE).
- 6.13 *Avoidance of significant trees:* The options considered for proposed works were assessed to minimise disruption to significant trees where possible. This was addressed through an MCA process for each significant tree expected to be impacted by proposed works.⁹

Design optimisation after the applications were lodged

- 6.14 During the design phase of the Project (post FMP), it was apparent that the design of the stream banks could be optimised to take into account hydraulic, environmental, amenity, private property and operational maintenance factors while achieving the required stream capacity.
- 6.15 The final proposed channel treatments along the length of the Project are illustrated in the General Arrangement Plans dated 11 June 2020.
- 6.16 *Stream banks and channel hierarchy:* Only minor modifications were made to stream improvement design following lodgement of the applications. These changes were as a result of evolving inputs including property engagement, and model refinement following the review by Mike Law in October 2019. Constraints from adjacent infrastructure and private property minimised opportunity to revise the channel design.
- 6.17 *Gravity retaining walls:* Redi-Rock block walls (recommendation from ECI Contractor, Downer) and steel sheet piles were included in the final design following assessment of options following lodgement of the applications.

⁹ See section 8.2.1.6 of the AEE.

- 6.18 *Purchase of property:* After lodgement of the applications, the property at 10A Blue Mountains Road has been acquired by UHCC. This property is adjacent to Willow Park. In addition to serving as a site office during construction of the proposed stream works, the purchase of the property will enable efficient improvements to boundary fencing and the interface with Willow Park, while retaining a sellable asset for UHCC at the completion of the Project. The purchase of the property at 10A Blue Mountains Road enabled realignment of proposed stream improvements to minimise impacts on adjacent properties however this did not result in any change to the stream bank and channel hierarchy.
- 6.19 *Private vehicular bridges and access:* The existing vehicular bridge at the Reformed Church of Silverstream at 8 Blue Mountains Road was previously proposed to be replaced however is now intended to be retained. Some construction activity will require access over this existing bridge, however as discussed with the Church this will be restricted to a maximum loading less than loadings currently experienced from a commercial passenger bus. Accordingly, the existing bridge will be sufficient for construction access as proposed.
- 6.20 The General Arrangement Plans lodged with the RMA applications noted that the driveway arrangement to 30 and 32 Blue Mountains Road and to 34 and 36 Blue Mountains Road was indicative and subject to change.¹⁰ After the RMA applications were lodged, the Project team undertook additional design work to identify options in this area, and consulted with the landowners on those options. The Updated General Arrangement Plans show the revised access for this area. Earthworks will also be required at 30 Blue Mountains Road, to connect the proposed bridge to the new driveway at that property.
- 6.21 *Private pedestrian bridges:* At the time the RMA applications were lodged, the three pedestrian bridges at 50 Whitemans Road, 15 Clinker Drive and 56 Whitemans Road were intended to be replaced. However, further analysis has enabled them to be retained. This was explained in the section 92 response.¹¹ If the three pedestrian bridges on these properties were replaced, the bridge decks would need to be raised above the 4% AEP peak water surface level. To do this would require the access on each side of the new bridges to also be raised which would result in an obstruction of flow along the stream corridor for events in

¹⁰ IZ089000-300-CD-DRG-2004, Appendix B to the AEE.

¹¹ See 25 March 2020 and 23 April 2020 letters to GWRC.

excess of channel capacity. Retaining these bridges reduces construction effects of the Project (when compared to bridge replacement).

- 6.22 The existing private pedestrian bridge at 4 – 8 Blue Mountains Road (Reformed Church of Silverstream) was previously identified to be retained. The replacement of the existing pedestrian bridge has since been considered necessary because the remaining useful life of the existing bridge is unknown and the stream improvement works required in this location are immediately adjacent to the existing bridge structure and may damage the existing bridge. Retaining the existing bridge in its current condition poses a significant health and safety risk to contractors during construction and may pose a risk to those who use the bridge following construction. The removal and replacement of this existing bridge may result in additional earthworks and stream bank disturbance, similar to the work occurring elsewhere along this part of the stream. Construction timeframes and extent of earthworks and vegetation clearance required remains consistent with the original application.
- 6.23 Three existing pedestrian foot bridges at 50 Blue Mountains Road and one at 2A Freemans Way will remain undisturbed as a result of proposed scour mitigation work in this area. The removal and replacement of the pedestrian foot bridge at Site B at 50 Blue Mountains Road is required to undertake the bank stabilisation works where an existing concrete wall has failed and is lying on the bed of the stream. The bridge will be replaced at a location approximately 7m upstream of the existing bridge to avoid impacts to notable trees located immediately adjacent to the existing bridge. All other pedestrian footbridges at the 50 Blue Mountains Road property will not be impacted and are to be retained in place. This is explained in the letter to GWRC dated 23 April 2020, and shown in the General Arrangement Plan appended to that letter (it is also shown in the General Arrangement Plans dated 11 June 2020).
- 6.24 *Overland flow paths and secondary flow paths:* The local wall and possible grading options adjacent to the west property boundary at 50 Blue Mountains Road have been removed from the project works following engagement with GWRC and WWL. The works were previously proposed to remove the potential for minor nuisance flooding that currently occurs at 7 Pinehaven Road and 9 Birch Grove as a result of flows that exit the stream corridor from within the property at 50 Blue Mountains Road during the 4% AEP and 1% AEP events. Some localised ponding may continue to occur on these properties, but flood effects following completion of upstream improvement works to the stream are comparable to the current situation. However, these properties will benefit from significant improvements in flood effects under the 4% AEP event as a result of

upstream channel improvements between the Pinehaven Reserve and Birch Grove. A sump (Hynds megapit) has been designed at the south side of Pinehaven Road to capture this overland flow for the 1% AEP event and prevent the overland flows from continuing further downstream. This megapit in conjunction with another one on the north side of Pinehaven Road also captures the 1% AEP From the Pinehaven Road secondary flow path.

- 6.25 Works are no longer proposed for increasing capacity of the overland flow path down the 15 Clinker Grove driveway. Flood modelling results show that the previously proposed works are not required to achieve the objectives of the Project, so no additional flood effects are anticipated by removing these works. However the works to provide scour mitigation at the edge of the stream bank are still required as per the original application.
- 6.26 The length of the low wall along the boundary between Willow Park and 10A Blue Mountains Road has increased and will require additional earthworks however it is not considered that extension of the wall length will result in additional adverse effects. The original design was indicative only prior to UHCC's purchase of the adjacent property at 10A Blue Mountains Road.
- 6.27 The existing overland flow path at 11 Birch Grove will be secured with no proposed grading or structural improvements to facilitate conveyance of the existing overland flow path across the property. This change is in response to desires expressed by the property owners.
- 6.28 *Scour mitigation:* The number of areas for mitigation of scour risk at 50 Blue Mountains Road and 2A Freemans Way was reduced from five potential sites to two (Site B at 50 Blue Mountains Road and Site E at 2A Freemans Way).¹² Proposed mitigation at Site A adjacent to the driveway at 50 Blue Mountains Road has been avoided by relocation of the driveway. As a result, scour risk mitigation in this area has been reduced to replacement of part of an existing wall within the property at 50 Blue Mountains Road in the stream that has failed and the existing private pedestrian bridge (Site B).
- 6.29 Following site visits by the terrestrial ecologist, arborist and geotechnical engineer to the scour mitigation site E on the 2A Freemans Way property¹³, a stabilisation technique was selected to minimise impacts to significant trees.

¹² General Arrangement Plans dated 11 June 2020.

¹³ General Arrangement Plans dated 11 June 2020.

- 6.30 Additional rip rap protection measures have been proposed or confirmed in the following locations: adjacent to 1 Tapestry Grove, upstream of the Sunbrae Drive Culvert, where the stream will be realigned at 26 and 28 Blue Mountains Road, downstream of the Pinehaven Stream culvert, and at the upstream end of Reach 1 (near Pinehaven Reserve). No adverse effects in addition to those already considered for the surrounding proposed works are expected.
- 6.31 *Other design changes after AEE lodgement:* At the Reformed Church of Silverstream, the school field was previously identified as a receiving site for cleanfill material as a potential construction cost saving measure. Use of the school field for this purpose is no longer proposed. If any fill activities occur at the school field, these will be managed through standard consenting processes, unrelated to the main works.
- 6.32 A debris/security screen at the downstream end of the Pinehaven Reserve at the upstream extent of stream improvements in Reach 3 is no longer proposed and has been removed from the design.

7 Operational and maintenance activities

- 7.1 The RMA approvals are intended to authorise construction of the Project, as well as its ongoing operation and maintenance. Maintenance of the stream and other structures will be performed by the Wellington Water operations team on behalf of UHCC (including cleanup of debris following flood events in the stream). Maintenance of Willow Park and vegetation management along the stream (on public property) will be managed by UHCC Parks and Reserves.
- 7.2 New private bridges and jointly accessed driveways constructed as part of the Project are expected to be maintained by UHCC (funded through a targeted rates approach). Discussions with UHCC and affected property owners thus far regarding targeted rates have been well received.
- 7.3 Private property owners will continue to look after their gardens and vegetation within their properties adjacent to the stream.
- 7.4 Three types of maintenance for Pinehaven Stream are envisioned:
- a Establishment maintenance (frequent maintenance during the establishment period to manage newly established vegetation, irrigate if necessary);
 - b Routine maintenance on an ongoing basis (mowing, minor vegetation management, cleaning of debris screens, litter removal); and

- c Flood response maintenance (major vegetation management: storm damage clean up, major debris/sedimentation removal, replanting or infrastructure repair).

7.5 Frequent vegetation management, litter collection, mowing and weed control does is not expected to require direct vehicular access. This is consistent with how UHCC Parks and Reserves currently maintains locations like Willow Park. Vehicle access for long term (flood response) maintenance will be required. Access locations for long term maintenance will be confirmed after construction is complete, and the Project designation footprint will be reduced down to those areas required for ongoing mitigation, operation or maintenance.

8 Responses to issues in submissions

- 8.1 I have reviewed each of the 16 the submissions lodged in relation to the resource consent applications for the Project. Where I am able to respond to the matters raised, I do this below.
- 8.2 Eleven submissions were in support of the Project.¹⁴ Key themes in support of the project include damage, financial implications and stress from repeated flooding. My evidence has described the works proposed to reduce the property damage and personal risk caused by large flood events.
- 8.3 Five of the submissions received opposed the Project. Themes in opposition of the Project included suggestions that the flood modelling underpinning the Project was exaggerated or conservative (resulting in overengineered proposed works)¹⁵, overland flow paths at Birch Grove not being confirmed¹⁶, stormwater and proposed fill at the sports field of the Reformed Church of Silverstream¹⁷. I note that the fill site was not proposed as an integral part of the stream improvement works, but solely as a potential construction cost saving measure, and is no longer proposed¹⁸. If any fill activities occur these will be managed through standard consenting processes, unrelated to the main works.

9 Response to section 42A reports

¹⁴ Submissions by Lloyd May, Jayne Roberts (2), Deborah Anne Griffiths, Graeme Dean McCarthy, Steve and Kate Hunt, Sharlene Olsen, Elaine Alsop, Bob the Builder, Robyn Hickson, Brian Powell. The Griffiths submission has subsequently been changed to note opposition.

¹⁵ Submissions by Save Our Hills, Peter and Rosalyn Ross, Alexander Ross.

¹⁶ Submission by Peter and Rosalyn Ross.

¹⁷ Submission by David Kyle.

¹⁸ See the Section 92 response to GWRC dated 21 February 2020.and Letter to GWRC dated 23 April 2020.

- 9.1 I have read those parts of the GWRC and UHCC Section 42A Reports¹⁹ which describe the Project. The descriptions provided accurately describe the works proposed, with the following exceptions and clarifications:
- a Earthworks are not proposed for secondary flow path capacity;²⁰
 - b No trees are proposed for removal for proposed erosion mitigation (riprap) between 15 Clunker Grove and the Stream. There is no minor bank raising proposed;²¹
 - c The reserve near 4 Sunbrae Drive is Willow Park;²²
 - d A section of existing vertical wall at 50 Blue Mountains Road will be replaced with an existing pedestrian bridge to be replaced and relocated approximately 7m upstream to retain valued trees adjacent to the existing bridge;²³
 - e The existing private vehicular bridge at 12 Birch Grove will be replaced with a pedestrian foot bridge;²⁴
 - f Vertical walls commence at 4 Blue Mountains Rd consistent with the UHCC Section 42A Report. There are no vertical walls proposed to be constructed at 58 Whitemans Rd. The list provided does not include every vertical wall to be constructed as part of the Project. Refer to the General Arrangement plans dated 11 June 2020 for location of vertical wall sections;²⁵
 - g Utility services are also being relocated at 10A and 10C Birch Grove in addition to 10B Birch Grove;²⁶
 - h A Redi-rock wall is only being proposed at one location at 50 Blue Mountains Road (Site B) and Macromat solution is being proposed at one location at 2A Freemans Way (Site E);²⁷
 - i No walls will be benched as a result of space constraints;²⁸

¹⁹ Section 4.1 of the GWRC Section 42A Report, and paragraphs 3.6, 3.7 and 3.12 - 3.25 of the UHCC Section 42A Report.

²⁰ UHCC Section 42A Report, paragraph 3.7.

²¹ UHCC Section 42A Report, paragraph 3.13.

²² UHCC Section 42A Report, paragraph 3.15.

²³ UHCC Section 42A Report, paragraph 3.23.

²⁴ UHCC Section 42A Report, paragraph 3.24.

²⁵ GWRC Section 42A Report, paragraph 4.1.

²⁶ GWRC Section 42A Report, paragraph 4.1.

²⁷ GWRC Section 42A Report, paragraph 4.1.

²⁸ GWRC Section 42A Report, paragraph 4.1.1.

j Bridge abutments have been designed with piled or pad foundations. Pedestrian bridges are a single span bridge with timber decking. Vehicular bridges are a precast concrete beam design. The Willow Park bridge is proposed to be a steel truss frame design.²⁹

9.2 I also agree with Paragraph 10.2 of the GWRC Section 42A Report in relation to the effects of erosion and scour. I have also reviewed Ms Westlake's final review in Appendix 7B of the GWRC Section 42A Report and am comfortable with her response.

10 Conclusions

10.1 The Project addresses structural measures proposed in the FMP over approximately 1km of stream across three reaches of the Pinehaven Stream. The main physical structures or works have been designed to achieve the Project objectives.

10.2 The preferred design solution has evolved through multiple project stages and a number of alternative designs were considered before the application was lodged.

10.3 Further design refinement has occurred after the application was lodged as a result of independent modelling review, property owner engagement, ECI and progression of detailed design.

10.4 The RMA approvals will also authorise ongoing operation and maintenance of the Project, this will include maintenance of new private bridges and jointly accessed driveways constructed as part of the Project. Access locations for long term maintenance will be confirmed after construction is complete, and the Project designation footprint will be reduced to those areas required for ongoing mitigation, operation or maintenance.

Eric Michael Skowron

20 July 2020

²⁹ GWRC Section 42A Report, paragraph 4.1.4.