

PROPOSED LAND AND WATER REGIONAL PLAN
EVIDENCE OF MICHAEL PATRICK BOURKE FOR THE CHRISTCHURCH CITY COUNCIL

Hearing Group 1
Policies 4.9, 4.12,
Rule 5.62, 5.63, 5.54, 5.65, 5.66

1.0 INTRODUCTION

1.1 My full name is Michael Patrick Bourke and I am employed as a Senior Technician in the Asset and Network Planning section of the City Environment Group of the Christchurch City Council (the Council). My qualifications are Bachelor of Civil Engineering from the University of Canterbury, and I am a Member of the Institution of Professional Engineers of New Zealand and a Member of the Water Environment Federation USA. I have over 30 years experience in provision of services in the water and wastewater area in Christchurch.

1.2 This evidence is presented on the submissions by the Council and supports the Council's submissions and further submissions in relation the treatment and discharge of wastewater. I confirm that I have read and agreed to comply with the Code of Conduct for expert witnesses (Environment Court Consolidated Practice Note 2006 and its November 2011 amendment). This evidence is within my area of expertise, except where I state that I am relying on facts or information provided by another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

1.3 The following table summaries the submissions which will be covered in this evidence.

Paragraph number in this evidence	Submission details		Page(s) in s. 42A report	s. 42A report recommendation (accept/reject)	Council position on s. 42A report recommendation (support/oppose)
	Submission number	Section			
3.0	0106.32 0106.33	Policy 4.9	141-142	reject	oppose
3.0	0106.39	Policy 4.12 (c)	146-147	reject	oppose
3.0	0106.34	Rule 5.62	179	reject	oppose
3.0	0106.35	Rule 5.63	179-180	reject	oppose
3.0	0106.36	Rule 5.64	180	reject	oppose
3.0	0106.37	Rule 5.65	180-181	reject	oppose
3.0	0106.38	Rule 5.66	181	reject	oppose

2.0 KEY ISSUES ADDRESSED IN THIS EVIDENCE

2.1 My evidence is on key issues for the Council concerning wastewater. These are:

1. Policies 4.9 and 4.12 and Rules 5.62- 5.66 relating to the treatment and discharge of wastewater .

Submitter Number(s): 0106.32, 0106.33, 0106.39, 0106.34, 0106.35, 0106.36, 0106.37, 0106.38

3.0 POLICY 4.9 AND 4.12, RULES 5.62-5.66

3.1 The proposed LWRP calls these "Activity and Resource Policies". The policies proposed in the LWRP are:

4.9 *There are no direct discharges to surface waterbodies or groundwater of:*

- (a) *untreated sewage, wastewater or bio-solids;*
- (b) *solid or hazardous waste or solid animal waste;*
- (c) *animal effluent from an effluent storage facility or a stock holding area;*
- (d) *organic waste or leachate from storage of organic material; and*
- (e) *untreated industrial or trade waste.*

4.12 *In urban areas, the adverse effects on water quality, aquatic ecosystems, existing uses and values of water and public health from the cumulative effects of sewage, wastewater, industrial or trade waste or stormwater discharges are avoided by:*

- (a) *all sewage, industrial or trade waste being discharged into a reticulated system, where available;*
- (b) *the implementation of contingency measures to minimise the risk of a discharge from a wastewater reticulation system to surface water in the event of a system failure or overloading of the system beyond its design capacity; and*
- (c) *any reticulated stormwater or wastewater reticulation system installed after 11 August 2012 is designed and managed to avoid sewage discharge into surface water.*

3.2 Proposed rules 5.62 to 5.66 relate to discharges from sewerage systems. Rule 5.64 provides that the discharge of treated sewage effluent into surface water or a natural wetland is a non-complying activity. Rule 5.65 provides that the discharge of untreated sewage to land in circumstances where a contaminant may enter water, or the discharge into surface or groundwater, "*as a result of a spill, overflow, or equipment failure*", is a non-complying activity. Rule 5.66 provides that if that discharge of untreated sewage to land in circumstances where the contaminant may enter water, or into water, is not "*a result of a spill, overflow, or equipment failure*", then it is a prohibited activity.

3.3 The Council's submissions express considerable concerns regarding the appropriateness of these provisions. The Council's submission recognises the desirability of these policies but notes the reality that there will always be situations where spills and overflows occur. Policy 4.9 seeks that there be zero discharges, in combination with Policy 4.12 which seek to require the design of wastewater systems to be designed and managed to avoid sewage discharge into surface water.

- 3.4 I appreciate that these two policies are intended to be read together and should therefore be considered together. However, even when read together I consider that there may be an underlying assumption by the community that there will be a time when there will be no overflows or spills from the City's wastewater system. This is a situation which will not occur, and since the 2011 and 2012 earthquake events even getting back to overflow levels resembling those pre earthquake will likely take up to 10 years.
- 3.5 I consider that the policies and rules within the LWRP need to more closely reflect this reality that there will be discharges from the City's wastewater system to water, all the more so because there are no explanations to the policies within the LWRP.
- 3.6 The following evidence in section 3 covers an explanation of the constraints to achieve the above policies, both from a practical and economic viewpoint.
- 3.7 The City operates separate sewer and stormwater networks, which implies that all stormwater goes down the stormwater pipes to the rivers and all sewage goes down the sewerage pipes to the treatment plant. However in reality, in wet weather, flows in the sewer system increase significantly due to the increased ground water and surface water getting into the sewer pipes. Ground water infiltration into the pipes and surface inflow due to flooding in low lying areas makes up a significant proportion of the flow in the sewer system during and following a storm event. These additional extraneous flows can cause the sewer system to reach capacity in wet weather. The flows above capacity must be directed somewhere. Even in dry weather in pre earthquake times the flow of ground water into the pipes contributed approximately 30% of the total flow. This is the result of developing a city on land with high groundwater levels. Our city is built on a swamp.
- 3.8 In those circumstances, wet weather sewer "overflows" are a foreseen, predictable and inevitable aspect of the existing provision of the City's wastewater infrastructure. "Overflows" are constructed into the sewage system. Prior to the recent earthquake events the City was in the process of obtaining a new resource consent for the discharge of wastewater from sewer overflows, based on the understanding that wet weather sewer overflows are a foreseen event.. The first consent (CRC991222) was granted in 2002 and expired on 17 September 2012. The Conditions required the City Council to achieve a two year overflow standard for the Heathcote River by December 2005 and for the Avon River by 2012. Despite progress with the significant capital works required to achieve that two year standard, updated modelling pre-earthquake showed that the two year standard was not able to be achieved. Rather than continue to be in breach of this consent, the

City Council sought a new consent in 2009 (CRC092692). This consent uses the hydrodynamic model of the sewer system to measure compliance, that is, the improvements in overflow recurrence achieved with various pipe replacement and renewal works. The model is calibrated from actual field recorded flow and level data taken during both wet weather and in normal dry weather. The Council was granted this consent (CRC092692) on 20 July 2010 to permit overflows of raw sewage from 22 locations throughout the network in wet weather. This consent, which expires on 19 July 2025, is currently under appeal before the Environment Court. This consent while not finally resolved is being effectively operated by the Council in terms of overflow monitoring and reporting: that is, wherever possible the Council is complying with the conditions of that consent following the earthquakes after the development of a Consent Compliance Strategy Agreement with Environment Canterbury. The consent conditions require a demonstrated improvement to the network over time so that the volume and frequency of overflows reduces over an agreed timeframe to agreed levels.

- 3.9 The earthquakes have caused significant damage to the sewer services, particularly in the east of the city. Repairs to the main pumping mains were finally completed by November 2011, and this milestone saw the cessation of the direct discharge of large flows of raw wastewater to the rivers, but the huge task of fully assessing the extent of damage to the 1700 km of gravity pipes is yet to be completed. There has been a 48% increase in average daily flows to the treatment plant. That means that the groundwater infiltration to the sewer network has increased significantly. As more “red zone” areas are isolated from the network as these areas are vacated the additional infiltration will reduce. Limited flow monitoring data from the network however indicates that this increase in ground water infiltration is widespread across the city and not confined to just the areas of major damage.
- 3.10 The rebuild of the horizontal infrastructure (mainly water, wastewater, stormwater pipes and roads) was originally estimated in February 2012 by SCIRT (Stronger Christchurch Rebuild Team) at \$2.2b, before full investigation of the extent of the damage was completed. A new estimate of the horizontal infrastructure rebuild costs due to be published by SCIRT in February 2013 is expected to be closer to \$3b. The SCIRT investigation and assessment of the sewer network damage so far suggests that approximately 30% of the sewer network (mainly in the eastern part of the city) will be totally replaced. The current estimated cost of just the sewer portion of the work is approximately \$800m. While damage to the wastewater network is widespread across the city, pipes will not be replaced where they generally still provide the pre-earthquake level of service to

the customers as there is still useable life left in these assets. While the pipes that are being replaced will allow much less groundwater infiltration in the areas where they are being replaced, there will be increased infiltration from the damaged but serviceable pipes remaining in the other two thirds of the network. Further the private laterals (pipes on private property) also contribute to infiltration and where these are not being replaced infiltration will still continue.

- 3.11 The Council and CERA aim is to return the assets to their pre-earthquake condition but cost does not permit replacing assets that still have some service life remaining.. For the sewer network this also includes the aim to reduce inflow and infiltration to pre-earthquake levels. Whether this will be possible to achieve or not with the approximate 30% replacement is unknown at this time and therefore following the SCIRT (Stronger Christchurch Rebuild Team) effort the city may have a higher level of inflow and infiltration than the pre-earthquake situation. Two further rounds of flow monitoring and re-calibrations of the wastewater model are planned before the SCIRT rebuild work ceases at the end of 2016. These recalibrations of the model will determine whether a return to pre-earthquake inflow and infiltration conditions is likely to be achieved. The Compliance Strategy Agreement with Environment Canterbury (expires March 2017) provides the detail of these recalibrations and if at the end on the SCIRT rebuild period the current consent (CRC09/2692 before the Environment Court) can be complied with then that consent will become fully operative. If the inflow and infiltration is still significantly greater than pre-earthquake inflow and infiltration then that consent is unlikely to be able to be complied with, and a new consent will be sought by the Council.
- 3.12 The impact of this increase in flow post-earthquake will increase operational costs but should not impact on consent compliance in the discharge from the wastewater treatment plant. The impact of this increase during periods of wet weather will however be significant with respect to wet weather sewer overflows. The overflows constructed into the sewer system will operate more frequently and discharge greater volumes than in the pre-earthquake situation. In addition, a greater number of the constructed overflows will discharge in a given wet weather event. Some of the 22 consented overflow points have been destroyed in the earthquakes, forcing these overflows to occur at other upstream constructed overflow sites or through informal discharge points at manholes in the streets.
- 3.13 The hydrodynamic model of the sewer system to measure compliance that was developed for the 2009 discharge consent application is no longer a valid tool to predict overflow frequency, volume

and location, due to progressive changes in demographics of the city, changes in levels of parts of the reticulation, and most significantly the vast increase in ground water infiltration due to network earthquake damage. A new model has just now been developed. This new model predicts that under the current situation of post earthquake flows, wet weather overflows (more frequent than the desired less than 2 year recurrence interval) will occur at some 43 locations (compared to the previous 22 locations).

- 3.14 The development of the new hydrodynamic model of the sewer system is also necessary in the longer term for planning purposes. Preliminary flow measurements have been taken to develop an understanding of the current post earthquake situation in terms of wet weather sewer overflow frequency and volume. This model can also be used as a tool to assist with design of the required trunk mains and major pipeline and sewer pumping station replacements over the coming few years. The base flow in the reticulation system will change as Red Zone areas are disconnected, new areas built on and the inflow and infiltration reduced by pipe repair, relining and replacement as the rebuild progresses. The model will also be used to determine the comparative “leakiness” of the over all system from pre-earthquake to the current time.
- 3.15 At the point in time when the rebuild is considered complete, the system model can be finalised and then used to measure compliance with the current consent (CRC092926). Council officers cannot be sure now whether compliance could be achieved with CRC092692 at that time. There is a good chance that compliance will be achieved at that time and if not the capital works to achieve compliance can then be programmed.
- 3.16 In submission point 0106.39 the Council sought to have Policy 4.9 changed so that it clearly identifies that some overflows will always occur, thereby making the policy achievable. The Council sought the amendment
- “ 4.9 *There are no direct discharges to surface waterbodies or groundwater of*
- (a) *untreated sewage or wastewater (except as a result of an extreme weather condition overflows and spill, or system failures) “or similar.*
- 3.17 The s42A report rejects this submission (page 141). The s42A authors suggest that the change proposed in the Council’s submission would limit the express acknowledgement of overflows to “extreme” weather events, rather than including other unintended events and they seem to reject

the Council's submission on that basis, maintaining that in those circumstances it is better to leave the policy "*as one which is to be aimed for but which will not necessarily be achieved in all situations*".

3.18 I strongly disagree with the reasoning in the s42A report. It has not engaged with the substance of the Council's submission. The Council's submission stated "*the reality is that there will always be situations where spills and overflows occur*", and that the Council opposed the policies because they are unachievable. The relief sought in the submission was the change proposed in the submission, or similar changes to like effect. The s42A report authors appear to accept that there will always be discharges that mean that the policy cannot be achieved. In those circumstances, I consider that it is more appropriate to expressly acknowledge that in the policy, rather than leave the policy as one that cannot be achieved. The fact that the policy cannot be achieved is not recorded in the proposed LWRP. For any resource consent application by the City for these discharges, there will be a disconnect between the policy, and the factual reality of the City's situation.

3.19 As discussed earlier in my evidence the inevitable discharges from the sewage system to water is both an ongoing issue related to the earthquake event but is also the general overflow events which cannot be eliminated due to the topography of land on which the City is built and the flooding potential that results from that geography. The City is built on an area that always has high ground water levels. Even if the other two thirds of the network were also to be totally replaced at a cost today of approximately \$1.6b to substantially reduce infiltration into the public network overflows are still likely to occur where flooding of low lying areas allows surface water to inundate the system.

3.20 Therefore I disagree with the recommendation of the officer's report.

3.21 In submission point 0106.39 The Council sought an amendment to Policy 4.12 condition (c) as follows:

"(c) *any reticulated stormwater and wastewater reticulated systems installed after 11 August 2012 is designed and managed to avoid sewage discharge into surface water* " or similar

3.22 The reason for that submission was that it would be poor practice to design a system which does not direct overflows and spills to the most appropriate discharge environment. If the sewage system was designed to avoid discharges to surface water, then there would be unplanned sewage

discharges to land occurring randomly throughout the City. The primary purpose of a sewer system is to protect public health, so it is prudent to design a system so that when it fails or its capacity is exceeded a discharge occurs to the least risk environment , namely a waterway or drain rather than onto public streets or private properties.

- 3.23 The Officer's Report (pages 146-147) recommends that there is no need to amend clause (c) as it relates to

"interaction of new stormwater and reticulated sewerage systems and avoiding, by design and management, the potential of infiltration between these two systems which can cause discharges of sewage into surface water through spills and leakages due to a lack of capacity in the system."

- 3.24 I am puzzled by that analysis in the s42A report. Policy 4.12(c) does not say that it is confined to infiltration between the stormwater and the sewerage systems. I consider that if this is what is meant by the clause it is ambiguous, and it should be amended to improve clarity. Or perhaps the s42A authors were just unaware of the factual reality described earlier in my evidence, in which there is planned discharge of untreated sewage to water in wet weather events that is unrelated to "infiltration between these two systems". On its face, I read proposed policy 4.12(c) as the requirement that all new sewerage system be design to avoid overflows. My concern with this is that it is not possible, and it is important that any new systems are designed so that any potential overflows are designed into the system so that they minimise any potential adverse effects. Sewer and stormwater systems are designed with sufficient capacity to ensure that sewer systems do not overflow into stormwater systems nor stormwater systems to flow back into sewer systems,. However in extreme events, such as when extensive surface flooding occurs flooded sewer systems will overflow, and it is a prudent design measure to ensure that if overflow is to occur that it happen into the least risk environment. It is preferable to overflow into a river or drain in wet weather than into the street where children play, or onto private property where Johnny eats dirt.

- 3.25 The s42A report officers' recommendation appears to have missed the point of the Council's submission. If the Officer's Report analysis is what is actually the aim of clause (c) then it should be amended to the following:

(c) any reticulated stormwater or wastewater reticulated system installed after 11 August 2012 is designed and managed to avoid movement of reticulated stormwater entering the sewer systems.

3.26 An alternative amendment that I consider would appropriately address the point made in the Council's submission would be to leave in the reference to design of infrastructure, but to change the imperative from "avoid" to "minimise", such as:

(c) *any reticulated stormwater or wastewater reticulation system installed after 11 August 2012 is designed and managed to ~~avoid~~ minimise sewage discharge into surface water.*

SUMMARY

4.0 My evidence presented covers submissions to the

1. Policy No 4.9 which prohibits direct discharges of untreated wastewater which is clearly an unachievable outcome
2. Policy No 4.12 which requires design systems to avoid discharges entirely which is not an effective or efficient design of infrastructure systems
3. Policy 4.9 is inconsistent with rules 5.62 to 5.66 which provide for discharges to land where it may enter water and into surface water and ground water due to overflows as non-complying activity. These are summarised in the Table in section 1.3.

6.2 I agree with the Christchurch City Council's submission, which seeks:

1. Ensure consistency between the policies and rules relating to discharges of wastewater.
2. To seek recognition in the Plan that overflows will always occur and that policies need to reflect that reality.

Date: 4 February 2013

Mike Bourke