

**BEFORE THE CHRISTCHURCH REPLACEMENT DISTRICT PLAN
HEARINGS PANEL**

IN THE MATTER of the Resource Management Act 1991 and the Canterbury
Earthquake (Christchurch Replacement District Plan) Order
2014

AND the Christchurch Replacement District Plan

**STATEMENT OF EVIDENCE OF ROBERT STANLEY ROUSE
ON BEHALF OF THE CROWN**

PROPOSAL 14 (RESIDENTIAL)

Infrastructure

Dated the 20th day of March 2015

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1. INTRODUCTION

1.1 My name is Robert Stanley Rouse. I am the Asset Rebuild Manager – Horizontal Infrastructure for the Canterbury Earthquake Recovery Authority (“CERA”). I commenced employment with CERA in July 2013.

1.2 This is the second statement of evidence I have prepared on the Christchurch Replacement District Plan (“**Replacement Plan**”). My first statement of evidence was provided in the Strategic Directions hearing¹ and I continue to support the views I expressed in that evidence. Rather than repeating that evidence I will adopt that evidence for the purposes of this second statement of evidence. A summary of my qualifications and relevant past experience and my role at CERA is contained within my first statement of evidence.

1.3 My first statement of evidence addressed the following:

- (a) the description of horizontal infrastructure²;
- (b) the earthquake impacts on horizontal infrastructure;
- (c) the horizontal infrastructure rebuild and recovery;
- (d) the status of the horizontal rebuild; and
- (e) the outcome sought by the Crown on the Strategic Directions Proposal.

1.4 I have been asked by the Crown (through CERA) to provide evidence in relation to horizontal infrastructure issues associated with residential development and growth, and to provide evidence in relation to the Crown's submission on Proposal 14 (Residential) of the Replacement Plan as it relates to infrastructure.

2. CODE OF CONDUCT

2.1 I confirm that I have read the code of conduct for expert witnesses as contained in the Environment Court’s Practice Note 2014. I have complied with the practice note when preparing my written statement of evidence, and will do so when I give oral evidence before the hearings panel.

¹ Available for download at <http://www.chchplan.ihp.govt.nz/Hearings/Hearing1/Pages/default.aspx> under the heading “*Submitter Evidence and Written Statements*”.

² Horizontal infrastructure includes potable water networks, wastewater networks, stormwater networks, local land transport network and retaining walls. See paragraph 5.1 of my first statement of evidence.

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 the evidence to follow.

2.3 Unless I state otherwise, this evidence is within my sphere of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

3. SCOPE

3.1 My evidence builds on the evidence I gave on the Strategic Directions Proposal and addresses horizontal infrastructure issues associated with residential redevelopment and growth in Christchurch.

3.2 The documents that I have referred to in preparing this evidence include:

- (a) Proposal 14 (Residential) of the Replacement Plan;
- (b) the Crown's submission on the Replacement Plan, particularly Part A and Proposal 14 (Residential);
- (c) Schedule 1 to the decision of the hearing panel on Strategic Directions and Strategic Outcomes (and Relevant Definitions) dated 26 February 2015 (the "**Strategic Directions decision**");
- (d) the evidence of Brian Norton for the Christchurch City Council ("**Council**"); and
- (e) the evidence of Bridget O'Brien for the Council.

3.3 My evidence will address the following:

- (a) the context and priorities for the horizontal infrastructure rebuild and recovery as they relate to residential redevelopment and growth;
- (b) existing horizontal infrastructure constraints;
- (c) links between horizontal infrastructure provision and residential redevelopment, intensification and greenfield development; and
- (d) the outcome sought by the Crown for the Residential Proposal.

4. EXECUTIVE SUMMARY

- 4.1 The availability of horizontal infrastructure is critical to enabling residential development and growth. The effect that development has on horizontal infrastructure varies according to the type of development that occurs. Brownfield development is likely to result in the efficient and effective use of horizontal infrastructure as well as the revitalisation of damaged areas. Brownfield development for the purposes of my evidence refers to any site that was developed and serviced prior to the Canterbury earthquakes but currently has no or reduced demand on existing infrastructure.
- 4.2 Intensification also promotes the efficient and effective provision and use of horizontal infrastructure.
- 4.3 Other development, particularly greenfield development, is often the driver for the provision of new or upgraded horizontal infrastructure and may not result in existing horizontal infrastructure being utilised effectively and efficiently.
- 4.4 All residential development must be integrated with existing and, where necessary, new infrastructure to ensure that the Crown's significant investment in infrastructure is optimised and to support the recovery.

5. THE CONTEXT AND PRIORITIES FOR THE INFRASTRUCTURE REBUILD AND RECOVERY AS THEY RELATE TO RESIDENTIAL REDEVELOPMENT AND GROWTH

- 5.1 The provision of horizontal infrastructure is critical to support redevelopment of brownfield sites, growth (through intensification), and the development of greenfield sites and to enable residential and other development. The availability, capacity and management of horizontal infrastructure will influence the programme and pace of recovery, redevelopment and growth. As discussed in my first statement of evidence, the Crown's investment in rebuilding and repairing horizontal infrastructure to support redevelopment, growth and the wider recovery has been significant.³
- 5.2 The scope of horizontal infrastructure rebuild work has changed as the rebuild has progressed from the response phase, during which the focus of work was on renewing assets and restoring service in the most damaged areas.

³ See in particular paragraphs 4.2 and 7.5 to 7.9 of my first statement of evidence.

- 5.3 Most work is now focussed on the repair and rehabilitation of pipelines, to ensure that network performance, serviceability and functionality will be restored at the end of the rebuild and repair of earthquake damaged horizontal infrastructure. Horizontal infrastructure rebuild work also includes providing additional capacity where it is required.
- 5.4 I have read Ms O'Brien's evidence for the Council. At paragraphs 4.9 and 4.10, Ms O'Brien discusses the repair work being undertaken by Stronger Christchurch Infrastructure Rebuild Team ("**SCIRT**"). My first statement of evidence discusses the rebuild and recovery of horizontal infrastructure and SCIRT's role in the rebuild (see section 7 of my first statement of evidence).
- 5.5 Ms O'Brien states that "the wastewater network is expected to be much leakier than it was pre-earthquake, with high levels of stormwater inflow and groundwater infiltration" and that it is "unlikely that compliance with the overflow consent will be able to be achieved." However, the performance of the wastewater system cannot be accurately determined until the rebuild work is complete and the worst damage affecting network performance and capacity is repaired or rebuilt. As Ms O'Brien acknowledges, the effect that any unrepaired horizontal infrastructure will have on the Council's ability to achieve compliance with its discharge consents cannot be determined until after SCIRT's work is completed.
- 5.6 The horizontal infrastructure rebuild programme is anticipated to be substantially complete in 2017, although the wider rebuild and recovery will likely continue for at least another 10 years.
- 5.7 Residential redevelopment, growth and greenfield development as the recovery progresses will result in increased demand on the existing horizontal infrastructure networks. It is essential that horizontal infrastructure can meet that increased demand. Horizontal infrastructure network capacity, availability and reliability are critical to supporting and maintaining the momentum of the recovery.
- 5.8 Recent horizontal infrastructure rebuild priorities have focussed on:
- (a) network performance, serviceability and functionality – to ensure that these will be restored fully by the end of the rebuild and repair of earthquake damaged horizontal infrastructure;
 - (b) reducing the risk of asset failure in the short term (less than 5 years);

- (c) the repair and rebuilding of critical assets as a priority;
- (d) the repair and rebuilding of assets in critical locations;
- (e) the repair and rebuilding of assets where damage is resulting in high operation and maintenance costs; and
- (f) the repair and rebuilding of assets where work should or may be integrated with other rebuild and recovery work.

5.9 All horizontal infrastructure rebuild and repair work has been carried out to, as far as possible, restore the assets' ability to provide at least the same level of service as that which existed prior to the 2010 earthquake.

5.10 In my opinion, restoring network performance, serviceability and functionality provides a sound platform for residential redevelopment, growth (intensification) and for greenfield development.

5.11 It should be noted however that the horizontal infrastructure repair and rebuild programme does not include:

- (a) the repair of damaged wastewater sewer connections on private property;
- (b) the repair of damaged potable water service connections on private property; and
- (c) work to mitigate land drainage issues that have been exacerbated by the Canterbury earthquakes.

All the above matters can affect the performance, serviceability and functionality of the horizontal infrastructure networks and its ability to accept new connections. Clauses (a) and (b) require the Council to work with the private property owner to address connection defects that may be impacting on network capacity and performance.

5.9 It is critically important that residential redevelopment and growth utilises existing infrastructure and, where required, new infrastructure, effectively and efficiently. Integrating land use patterns and activities with infrastructure ensures that the Crown's significant investment in repairing and rebuilding damaged horizontal infrastructure will be best utilised to support economic activity, growth and recovery. The connection of new development with existing infrastructure, including the transport network, is also a key priority.

6. EXISTING HORIZONTAL INFRASTRUCTURE CONSTRAINTS

- 6.1 Some parts of the existing horizontal infrastructure networks in Christchurch will, from time to time and for varying durations (generally driven by significant weather events), not be able to deliver the required and expected levels of service. This could be due to various factors including:
- (a) demand exceeding the capacity available;
 - (b) unrepaired earthquake damage that was not identified;
 - (c) assets reaching the end of their useful life as a consequence of the normal course of events;
 - (d) reduced capacity resulting from the infiltration of groundwater and fine material into wastewater systems and inflow from inappropriate stormwater connections to the wastewater systems;
 - (e) increased surface flooding from high intensity rainfall events that exceed the networks ability to convey and dispose of stormwater runoff; and
 - (f) high potable water demand arising from high consumption during hot dry periods where water from the potable water supply is used for other uses such as garden irrigation.
- 6.2 It is not unusual for public networks to experience these issues in extreme weather events and these issues form part of normal network management and planning for renewals and upgrading works.
- 6.3 It is however also likely, as a result of some areas having been vacated and the renewal of entire sections of pipelines in some catchments, that some of the issues identified in paragraph 6.1 above have now reduced in some areas.
- 6.4 Constraints, particularly known and site specific constraints, should be a consideration when identifying areas for residential redevelopment and growth and for programming necessary renewal and upgrading works.

7. LINKS BETWEEN HORIZONTAL INFRASTRUCTURE PROVISION AND RESIDENTIAL REDEVELOPMENT, INTENSIFICATION AND GREENFIELD DEVELOPMENT

7.1 Residential redevelopment and growth will result in pressures on the horizontal infrastructure networks. The level of effect and the consequences of that redevelopment and growth on the horizontal infrastructure network will vary depending on the type of development that occurs and the demand on and capacity of the existing horizontal infrastructure. Below I discuss the links between the provision of horizontal infrastructure and:

- (a) residential redevelopment of existing urban areas, such as brownfield sites;
- (b) intensification; and
- (c) greenfield development.

Residential Redevelopment of Existing Urban Areas

7.2 Redevelopment of existing urban areas, such as brownfield sites, is likely to have the least impact on existing horizontal infrastructure, provided there were no significant issues with that existing horizontal infrastructure prior to the Canterbury earthquakes or that any issues have been addressed.

7.3 Horizontal infrastructure will already have been in place to service properties before the earthquakes. Provided the horizontal infrastructure has been rebuilt or replaced and redevelopment demand is not greater than the demand that existed prior to the earthquakes, there should be no horizontal infrastructure constraint on redevelopment. There may also be capacity to provide for increased demand in some areas. Developers have greater certainty in existing brownfield sites that the horizontal infrastructure exists and is likely to have capacity for development.

7.4 Redevelopment of existing urban areas, including brownfield sites, is consistent with the Crown's principal outcome of using horizontal infrastructure efficiently and effectively by using existing capacity and assets rather than constructing new horizontal infrastructure. This type of redevelopment will optimise the use of existing horizontal infrastructure capacity and the significant investment made by both the Crown and the Council in rebuilding and repairing core infrastructure (including transport and horizontal infrastructure) damaged by the earthquakes.

Residential intensification

- 7.5 With respect to intensification, horizontal infrastructure will already be in place as with brownfield development. However new connections arising from intensification will have an immediate effect on existing horizontal infrastructure. While there may be areas where there is horizontal infrastructure capacity available to meet additional demand, horizontal infrastructure may be at capacity in others.
- 7.6 The effect of intensification on horizontal infrastructure will also vary according to the scale and nature of the development. For example, it is possible that a development may result in an increase in the number of residential units but may not result in an increase in demand on horizontal infrastructure depending on, for example, the occupancy rates. Another example, in the case of the potable water supply, would be a development which provides smaller lot sizes with reduced irrigation requirements in the summer months which would reduce demand on the potable water supply. There are also new technologies and ecologically sensitive and low impact systems which reduce demands on horizontal infrastructure.
- 7.7 I have read the evidence of Mr Brian Norton for the Council, who discusses at paragraph 3.2 on-site stormwater facilities or building techniques that reduce runoff and/or treat discharges.
- 7.8 Mr Norton also suggests, at paragraph 6.2, that provision of onsite facilities and low impact systems add additional costs and complexity to a development project.
- 7.9 I agree with Mr Norton that the provision of on-site facilities may add additional cost and complexity to an intensification project or any other type of development. However, this is not always the case. For example, there may be cost efficiencies in utilising such facilities and systems particularly if there are significant issues connecting to existing stormwater infrastructure or no stormwater infrastructure exists. In any event, any added cost and complexity may be acceptable to a developer, particularly if the alternative is that a development cannot proceed because of a lack of sufficient infrastructure capacity.
- 7.10 In my opinion, there are significant opportunities to utilise these building techniques and low impact systems in both brownfield and greenfield

developments and the Replacement Plan should encourage the use of these technologies.

7.11 Residential intensification is likely to take place over an extended period of time; potentially providing time to plan for and implement the renewal or upgrading of horizontal infrastructure to meet the increasing demand. It is important that intensification and horizontal infrastructure provision are integrated so that infrastructure is developed, upgraded and utilised effectively and efficiently.

7.12 In summary, the key issues that are associated with intensification include:

- (a) possible lack of network capacity;
- (b) an increase in impervious areas with resulting higher surface runoff and increased stormwater management requirements; and
- (c) a possible exacerbation of existing land drainage issues in some specific areas.

7.13 In my opinion, these issues can be managed by:

- (a) identifying areas suitable for intensification having regard to any horizontal infrastructure constraints that exist;
- (b) deferring zoning for intensification until horizontal infrastructure is upgraded to address known constraints;
- (c) considering the progressive nature of intensification to determine whether short term capacity issues can be managed;
- (d) demand management in the case of potable water supplies where demand is higher in summer months; and
- (e) limiting development in areas susceptible to serious flooding until the flooding issues have been sustainably dealt with.

Greenfield development

7.14 Greenfield development typically has a high impact on existing horizontal infrastructure because of the larger number of lots, possibly with larger lot sizes, and their location relative to existing horizontal infrastructure.

7.15 Residential growth arising from greenfield development is likely to be over a larger development footprint and access to horizontal infrastructure capacity

will be required over a much shorter period compared to growth arising from intensification.

- 7.16 Greenfield developments are generally significant ventures where a single developer is developing a large area of land. As a commercial venture, the developer will want to dispose of the lots as soon as possible. Once individual lots have been developed, this will have an effect on downstream infrastructure.
- 7.17 Intensification on the other hand, such as infill development, will generally result from intensive development of existing lots e.g. increasing the number of dwellings on smaller lots within the original lot footprint. To have the same impact on existing infrastructure as a greenfield development with a much larger footprint would require a large number of individual lot owners in the same area to develop at the same time. By way of example, a 300 lot greenfield development is likely to have an effect on existing horizontal infrastructure a lot sooner than an additional 300 lots created as a result of intensification and/or infill housing.
- 7.18 Greenfield development will require the construction of new horizontal infrastructure within the development footprint and to connect the new development to the existing infrastructure. New horizontal infrastructure within the development footprint will need to be constructed to ensure adequate capacity is available and ensure levels of service can be maintained. Difficulties often arise in connecting new developments to existing horizontal infrastructure where:
- (a) the existing horizontal infrastructure does not have sufficient capacity;
 - (b) there is a significant distance between the new development and the existing horizontal infrastructure;
 - (c) there is a need for additional capacity to accommodate additional future development, if development occurs between the new greenfield development and the current existing horizontal infrastructure;
 - (d) there is a need to fund works outside of the greenfield development and the possible reallocation of Council and Crown funds from more critical work; and
 - (e) there is the potential for a significant impact on the transport network and community disruption.

7.19 The key issues associated with greenfield development include:

- (a) the need for new horizontal infrastructure to be provided;
- (b) the reduced resilience resulting from the significant increase in new horizontal infrastructure and its exposure to damage in future earthquake events, when compared to intensification.
- (c) a failure to optimise the availability of existing horizontal infrastructure and the inefficiencies that result from that;
- (d) the higher costs associated with new horizontal infrastructure and on-going operation and maintenance costs;
- (e) a likely quicker 'uptake' in this type of development, and the consequent increased demand on existing horizontal infrastructure, bringing forward the need to upgrade downstream infrastructure;
- (f) the ability to determine and provide for further additional development between the development requiring service and the existing horizontal infrastructure; and
- (g) potential diversion of Council and Crown funds from other upgrading and renewal work.

8. RESIDENTIAL PROPOSAL – CROWN OUTCOMES

8.1 I have been asked to comment on horizontal infrastructure issues relating to the outcomes sought by the Crown in Proposal 14 (Residential) of the Replacement Plan.

8.2 The Crown also identified principal outcomes in Part A of its submission relevant to horizontal infrastructure which include:

- (a) the use of horizontal infrastructure efficiently and effectively; and
- (b) revitalising damaged areas.

8.3 The availability of horizontal infrastructure is critical to enabling residential redevelopment and growth. Often development, particularly greenfield development, is the driver for the provision of new or upgraded infrastructure. In my opinion, this potentially reactive rather than planned strategic approach to development does not result in the effective or efficient use of horizontal infrastructure. Development needs to be integrated and co-ordinated with

the transport and wider horizontal infrastructure networks. New greenfield development which requires new horizontal infrastructure to service it carries an opportunity cost where existing or planned horizontal infrastructure capacity is not utilised or built.

- 8.4 I support the Crown's submissions seeking enhanced provisions for:
- (a) the efficient and effective use of horizontal infrastructure by optimising the use of existing horizontal infrastructure where possible and appropriate; and
 - (b) the integration of development with the upgrading of existing horizontal infrastructure and the construction of new horizontal infrastructure.
- 8.5 Objectives 3.3.7(i) and (j) and 3.3.12(a) in the Strategic Directions decision also support these outcomes.
- 8.6 I therefore support the changes that the Crown proposed, and which the Council has now made in its 9 March 2015 version of the Proposal, to Policy 14.1.1.1 to seek to provide for the integrated provision of infrastructure. This policy signals that intensification can occur when programmed upgrades have occurred.
- 8.7 The Crown's submissions supporting the integration and efficient and effective use of existing horizontal infrastructure also support its submissions seeking a Proposal that is more enabling of residential intensification and a Replacement Plan that enables recovery and economic prosperity.
- 8.8 New housing will be required to meet demand as the recovery progresses. In my opinion, by adopting a less restrictive approach to intensification and identifying areas suitable for redevelopment and intensification, the demand for greenfield development, which increases pressure on existing horizontal infrastructure, will be reduced.
- 8.9 Brownfield development results in the efficient and effective use of horizontal infrastructure overall as well as the revitalisation of damaged areas. As indicated above at paragraph 7.2, brownfield development is likely to have the least effect on existing horizontal infrastructure. The demand created by the redevelopment will essentially replace the demand that has been removed as a consequence of the Canterbury earthquakes. This type of development will ensure that the investment made so far in rebuilding and repairing the existing horizontal infrastructure network is optimised.

- 8.10 Intensification and brownfield development promotes the efficient and effective provision and use of infrastructure, particularly in optimising the use of existing horizontal infrastructure, as recognised by objective 3.3.7(i) of the Strategic Directions decision. I therefore support the Crown's proposed new objective and policy relating to brownfield development which is discussed at pages 240 and 241 of the Crown's submission.
- 8.11 Identifying and providing for land that is suitable for development which is supported by existing horizontal infrastructure will support the economic growth and activity which is critical to the recovery. Economic growth and recovery will also be supported where the nature, timing and sequencing of new development is co-ordinated with the funding, upgrading, construction and operation of necessary transport and other infrastructure.⁴
- 8.12 I support the Crown's proposed amendment to Policy 14.1.1.6 which seeks to clarify that intensification is to be avoided where there is inadequate horizontal infrastructure capacity and support the adoption of those amendments in what is now clause 14.1.2.2 in the 9 March version of the Proposal. This policy will ensure the integration of the provision of horizontal infrastructure with development.
- 8.13 I agree with the Crown's view that greenfield development will result in an increase in demand on existing horizontal infrastructure and that greenfield development must be integrated with upgrading downstream infrastructure where required.
- 8.14 Greenfield development will provide opportunities to ensure horizontal infrastructure within the development's footprint, and its connection to existing horizontal infrastructure, will meet foreseeable demand and maintain levels of service. A comprehensive approach to the planning and development of greenfield sites will encourage developers to provide sufficient capacity and will likely reduce infrastructure costs. I support the amendments that the Crown proposed to Policy 14.1.6.1 and the adoption of them in the 9 March version of the Proposal. The amendments seek to have matters relating to service infrastructure and transport networks (amongst other things) be considered in relation to subdivision development and design.

⁴ Objective 3.3.7(j).

8.15 I also support the Crown's submission seeking flexibility and opportunities for developers to use new technologies and low impact infrastructure to mitigate impacts on existing infrastructure e.g. rain gardens for stormwater treatment and the capture of rainwater in onsite tanks for irrigation use to reduce demand on the potable water supply during hot dry periods where water is used for irrigation.

A handwritten signature in black ink, appearing to read 'R. Rouse', with a large, sweeping flourish underneath.

Robert Stanley Rouse

20 March 2015