OPPORTUNITIES FOR CATCHMENT-SCALE STORMWATER MANAGEMENT IN POST-EARTHQUAKE CHRISTCHURCH

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ABSTRACT

Earthquakes have been a game-changer for urban stormwater catchment management planning in Christchurch. The Avon Stormwater Management Plan (SMP) is the first fully post-earthquake SMP. Setting up the SMP framework is different because of the earthquakes. This paper discusses the opportunities and challenges that have confronted the developing Avon SMP. Channel morphology and hydrology have changed, the central city has changed and the future of the residential red zone has not yet been decided – what assumptions can we reasonably make? Changes in land use, fast tracking of urban expansion and subdivisions required re-working of planning implications and re-analysing stormwater effects on waterways.

Stakeholder interest in the Avon is much higher than the other catchments in Christchurch where SMPs have been completed to date. Because of its location, aesthetics and recreation are more important. There are plenty of opportunities for the Avon SMP to drive a major sea change in the way urban stormwater is managed in Christchurch.

Are we integrating building materials with consideration of environmental factors (e.g., copper)? Are we selecting stormwater treatment devices appropriately and are people ready for integrated stormwater management in dense urban areas such as the new city? Or is the dream of a green city just that?

KEYWORDS

Urban stormwater management, integrated catchment management

PRESENTER PROFILE

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1 INTRODUCTION

The earthquakes have been a game-changer for urban stormwater catchment management planning in Christchurch. Opportunities for improving stormwater management have presented themselves on a number of fronts but alongside those opportunities lie unprecedented challenges.

Christchurch City Council has an enormous task in hand to rebuild this city, and the management of urban stormwater is but a small piece of the puzzle. Tight budgets and stretched resources will inevitably guide what can reasonably be achieved.

Golder Associates (NZ) Limited (Golder) has been working with Christchurch City Council on stormwater catchment management plans (SMP) since the inception of the first plan, for South West Christchurch. The Styx SMP has been completed and work has commenced on the Avon SMP, easily the most complex of the stormwater management plans to date. The purpose of this paper is not so much to look back but to observe where we are at, consider what we have learned and to look forward at what the future might hold for urban stormwater management in Christchurch.

2 OPPORTUNITIES AND CHALLENGES FOR THE AVON

2.1 OPPORTUNITIES

2.1.1 OVERVIEW

It would be easy to say that opportunities for stormwater management in a heavily urbanised catchment such as the Avon are limited. There is little scope for greenfields development, a good proportion of the residential area is long established and includes a higher likelihood of poorly maintained properties where contaminant runoff concentrations are likely to be higher than newer residential areas. In addition, the Avon catchment includes the central city which has the largest traffic volumes of anywhere in the city.

However, the reality is that the earthquakes have presented a number of opportunities for stormwater management in the Avon River catchment. Some opportunities will be maximised and others, for various reasons, will have to be passed over. Nevertheless, it is important to consider what could be, even if what eventuates is somewhat more modest.

2.1.2 AVON RIVER PRECINCT

All too often waterways in urban areas are written off as targets for restoration because of space constraints. The Avon River Precinct is the first of the Christchurch Central Recovery Plan (known as the Blueprint) Anchor Projects to be commissioned. The Blueprint requires a 30 m setback through the central city from Antigua Boatsheds to Manchester St. This is to allow construction of the precinct which includes realignment of the channel to create more riffle run instream habitat, riparian planting, as well as recreational opportunities through walkways and boardwalk access to the river itself.

The 30 m setback provides an opportunity for stormwater treatment facilities to be installed in appropriate places to provide treatment prior to stormwater discharging into the river.

Construction phase discharges from the central city rebuild are an issue that the Christchurch City Council has to contend with. While the hope is that these discharges will be dealt with before leaving individual sites, the scale of the rebuild lends itself to considering the possibility of making room for stormwater treatment devices within the precinct design.

2.1.3 LOW IMPACT DESIGN

The Share an Idea campaign which ran as part of the public consultation on the Central City Blueprint revealed that people wanted a 'green city.' A debate on what a green city might look like is worthy of a paper in its own right - for some it translates to parks and trees while for others a truly sustainable city is the aspiration.

For the purpose of this paper, we shall assume the latter aspiration. At the heart of sustainable stormwater management is low impact design. Low impact design means managing the ratio of pervious to impervious surfaces in any development to ensure that surface runoff is minimal and that as much runoff from that development is detained and treated on site.

Low impact design measures could extend to the re-use of stormwater for non-potable supply i.e., toilet flushing, laundry and garden irrigation. Or they could simply be reducing the impervious areas through the use of pervious paving or installing tree pits and rain gardens to provide detention and treatment prior to discharging into a network.

There is a plethora of literature on low impact design but for the purpose of this paper it is sufficient to say that low impact design measures have been considered as part of the toolbox of stormwater treatment options for the Avon SMP. The effectiveness of a range of stormwater treatment trains is currently being modelled as part of the technical components supporting the SMP.

2.1.4 RESIDENTIAL RED ZONE

The future of the residential red zone land is yet to be decided. Public debate on how this land should be used has deliberately not been instigated while there are still residents living there. The debate will no doubt be heated with a number of stakeholders already expressing their desires for the land. These range from open space parkland connecting the city to the sea, retaining residential gardens for public enjoyment as part of a heritage garden trail, to a river-based aquatic sporting facility with the associated buildings on the banks of the river. Each of these projects has merits; perhaps the ultimate would be finding a way to incorporate all three.

Stormwater detention and treatment facilities could integrate with any of these options, should the opportunity be made available to Christchurch City Council.

2.1.5 MONITORING

Two SMPs (South West Christchurch and the Styx) have been granted discharge consents. Each consent has a comprehensive monitoring programme attached to its conditions. As the Avon SMP is developed, it will have the benefit of the monitoring that is being carried out in South West Christchurch and the Styx. Through discussions between Environment Canterbury and Christchurch City Council, the monitoring programme for the Avon SMP will be informed and enhanced to ensure that robust data is collected.

2.1.6 OTHER OPPORTUNITIES

Other opportunities come via a more indirect route. With large numbers of houses, particularly to the east of the central city, requiring extensive repairs or to be rebuilt, improvements in the calibre of roofing materials should result in a net reduction of contaminant concentrations in roof runoff.

Land use in the city is changing – the introduction of the 'frame' to the east and south of the central city provides opportunities for stormwater management in the inner city that were not available in the pre-earthquake city. Whether these opportunities will be put to good use remains to be seen.

2.2 CHALLENGES

2.2.1 OVERVIEW

Many of the challenges faced in developing the Avon SMP are symptomatic of the times we live in. The Canterbury Earthquake Recovery Authority (CERA) and Christchurch City Council are under enormous pressure to ramp up the rebuild. Inevitably with speed comes haste, which may constrain the potential to achieve the most sustainable options for managing stormwater in Christchurch.

2.2.2 AVON RIVER PRECINCT

The Avon Precinct has been discussed as an opportunity yet it also provides a challenge to stormwater management. The project is design-led and it can be difficult to convince a designer of the merits of a stormwater detention and/or treatment facility – they just don't sound pretty enough! It is an achievement in itself that instream ecological improvements are being realised through channel realignment and improvements to habitat quality and quantity. Therefore it is also important that the SMP delivers on improvements to stormwater quality and management of stormwater quantity so that these valiant efforts are not compromised.

2.2.3 LOW IMPACT DESIGN

Opportunities for low impact design appear to have largely been overlooked as the Stronger Christchurch Infrastructure Rebuild Team (SCIRT) fulfills its mandate of replacing 'like with like'. Developers are eager to commence rebuilding and taking the path of least resistance by sticking to stormwater management tools of decades past is the norm. Economics feature high on the list of reasons 'why not' and there are few, if any, motivating factors to turn the table on this sentiment. It seems that the opportunity to evolve from a garden city to a truly green city may be lost.

2.2.4 STAKEHOLDER INTEREST

Stakeholder interest in the Avon SMP is higher than in previous SMPs. Not only is the catchment more urbanised than the SMP catchments addressed to date but the Avon River is an icon of the city of Christchurch. Citizens and visitors alike expect the river to 'look good.' In addition, the number of parallel projects occurring in the city is unprecedented e.g., the Avon Precinct, Justice Precinct and SCIRT programmes. The City Council must ensure that the implementation of the SMP will complement these projects whilst engaging with other stakeholder groups such as runanga, recreational users, tourism operators etc. The consultation programme for the Avon SMP is being developed and in response to the expected high level of stakeholder interest will be more extensive than for previous SMPs.

2.2.5 FLOODING

Recent flood events in Christchurch are resulting in a change in priorities for stormwater management in the city. Depending on resources available, this will likely impact on the timeframe and extent to which the Avon SMP can be implemented in coming years. At this stage, it is difficult to quantify the magnitude of this challenge but the recent flooding is a very visible reminder of the wider impacts of the earthquakes on the city of Christchurch.

2.2.6 CHANGES TO THE PLANNING FRAMEWORK

Changes to the planning framework have impacted on the Avon SMP in a number of ways. The preparation of an SMP is a slow and sometimes arduous exercise. Rezoning of land to allow for additional greenfields development can cast doubt on hydrologic and contaminant load modelling exercises that may already be complete. However, the impact of rezoning usually falls within typical model uncertainties.

Dealing with plan reviews is more complex. In the case of the Avon SMP, there are two concurrent plan reviews taking place. The Christchurch District Plan is under review and at the time that contaminant load modelling is taking place, the review of central city residential densities is not available publically. The effect of this is that assumptions (e.g., roof areas and areas of impervious surfaces) must be adopted with careful consultation with Christchurch City Council and documented accordingly.

Environment Canterbury is in the process of replacing chapters of its Natural Resources Regional Plan with the Land and Water Regional Plan (LWRP). With the LWRP under appeal regard must be had to both plans. This adds a layer of complexity when deriving appropriate SMP objectives and ensuring that the SMP will be consistent with expectations for the receiving environment.

3 STORMWATER TREATMENT – DREAMS AND REALITY

3.1 DREAMS

The dreams for stormwater treatment might conjure an image of a central city full of narrowed streets with wide swathes of permeable paving for footpaths, separated from the vehicle carriageway by trees and rain gardens. Buildings would be set back from the street front with landscaping irrigated by roof water surplus to the non-potable supply for the building. The building would be clad with inert materials and not a bit of copper spouting in sight.

If the City Planners dared to write rules to make that dream a reality the developers would likely run a mile! But tease the dream apart into practical components and the city will still achieve desired improvements in stormwater management using modern, sustainable methods.

3.2 REALITY

While the dreams might seem far flung from reality there is no shortage of desire and willing on the part of Christchurch City Council to improve stormwater management through the bounds of the Avon SMP. The primary constraint will, as always, be financial resourcing.

The approach to stormwater treatment extends beyond proprietary devices and includes planning, education, source control and enforcement, if necessary. The desired outcome is to produce a package of measures that over time improves the water quality, ecosystem health and cultural values of surface water resources in the Avon River catchment.

A toolbox of stormwater treatment devices for the Avon SMP is still under development. The final specimen design is expected to comprise a mix of bio-retention devices (e.g., tree pits and rain gardens) integrated into a 'green street' landscape concept with 'end-of-pipe' proprietary devices.

Part of the reality of stormwater treatment is education – people should know that what might appear as a 'street tree' actually performs an important function in managing the health of the river. However seeing is believing, and while there are flooding issues in the city it is a difficult task to turn the focus from water quantity to water quality.

3.3 ENVIRONMENTAL OUTCOMES

The ultimate aim of any SMP is to deliver improved environmental outcomes at a level that meets regional plan aspirations. Environmental outcomes include both water quantity and water quality outcomes.

Environmental outcomes for the Avon SMP include:

- restoring flood-carrying capacity of waterways to pre-earthquake levels, where practicable
- recognising areas with high ecological and/or water quality values and ensuring that these are protected as the SMP is implemented
- recognising and providing for cultural, recreational and amenity values
- improving, where possible, the quality and quantity of stormwater discharges to the Avon River and its tributaries through implementation of appropriate stormwater detention and treatment devices

The proposed format of the Avon SMP and the toolbox of treatment devices that will be available to implement it will ensure that, over time, receiving environment objectives are met through improved stormwater quality and better managed stormwater quantity. The Avon SMP will also ensure that stakeholder needs are met through robust consultation and ongoing engagement.

4 CONCLUSIONS

The Avon SMP is very much a work in progress. It will be a different SMP to those prepared to date because it is being written to a different set of rules and in an environment faced with unprecedented opportunities and challenges.

While the Avon SMP plays a key role in guiding stormwater management in Christchurch for the foreseeable future, it must sit comfortably alongside the plethora of other large-scale projects occurring in the city and being managed by other agencies or private developers.

Ultimately, the Avon SMP will deliver an achievable strategy for improving the health of the river whilst managing stormwater runoff from the surrounding Christchurch city catchment.

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