

FLOOD RESPONSE IN THE WAIMAKARIRI DISTRICT

Kate Purton (Beca) & Gerard Cleary (Waimakariri District Council)

ABSTRACT

The Waimakariri District lies to the north of the Waimakariri River in North Canterbury. It covers an area of approximately 2,250 km², and has a population of about 55,000 in rural and urban areas.

Heavy rainfall in June 2014 resulted in widespread flooding across the district including in the towns of Kaiapoi and Rangiora, and the rural residential areas of Fernside, Ohoka and Mandeville. This was compounded by high groundwater throughout the winter causing groundwater resurgence (or springs) and issues with rural drainage and the operation of Septic Tank Effluent Pump (STEP) systems.

In response to this flood event the Waimakariri District Council set up a Flood Team including consultants and Council staff, reporting to a Project Control Group, to rapidly investigate issues and deliver solutions. The Flood Team brief included four phases of work: Response and Reconnaissance; Identify and Implement Quick Wins; Identify and Investigate Permanent Solutions; and Review Systems and Processes. The works that resulted from this included immediate maintenance works, plus quick design and implementation of key upgrade works, while keeping in mind and developing longer term solutions.

Throughout the project there was a strong focus on communication and consultation with the affected communities. This included public meetings, weekly email and website updates, on-site meetings and communication with individuals.

This paper explores the flooding issues in the district, the challenges faced, and the process worked through by the Flood Team. It also describes some of the solutions adopted, both physical works and changes to Council systems and processes, maintenance practices, and funding.

KEYWORDS

Flooding, flood response, recovery, Waimakariri District

PRESENTER PROFILE

Kate Purton is an Associate – Civil Engineering at Beca, with 14 years' experience in three waters civil engineering. Kate is based in Christchurch and focuses on stormwater management and engineering, working on projects in Canterbury and around the country. Since July 2014 she has led the Flood Team at Waimakariri District Council.

Gerard Cleary is the Manager Utilities and Roading at Waimakariri District Council, with 18 years' experience in civil engineering. Gerard manages the three waters and roading infrastructure at Waimakariri District Council including stormwater and flood risk. He led response to the 2014 floods, including the establishment and management of the Flood Team.

1 INTRODUCTION

In June 2014 a rainfall event caused widespread flooding in the Waimakariri District. Following the initial emergency response, Waimakariri District Council (WDC) established a Flood Team to investigate the issues, options and solutions, with a focus on progressing flood mitigation works as soon as possible without compromising long term solutions. This paper describes the storm event and its effects, and the Flood Team established to quickly investigate the issues and implement solutions.

2 WAIMAKARIRI DISTRICT

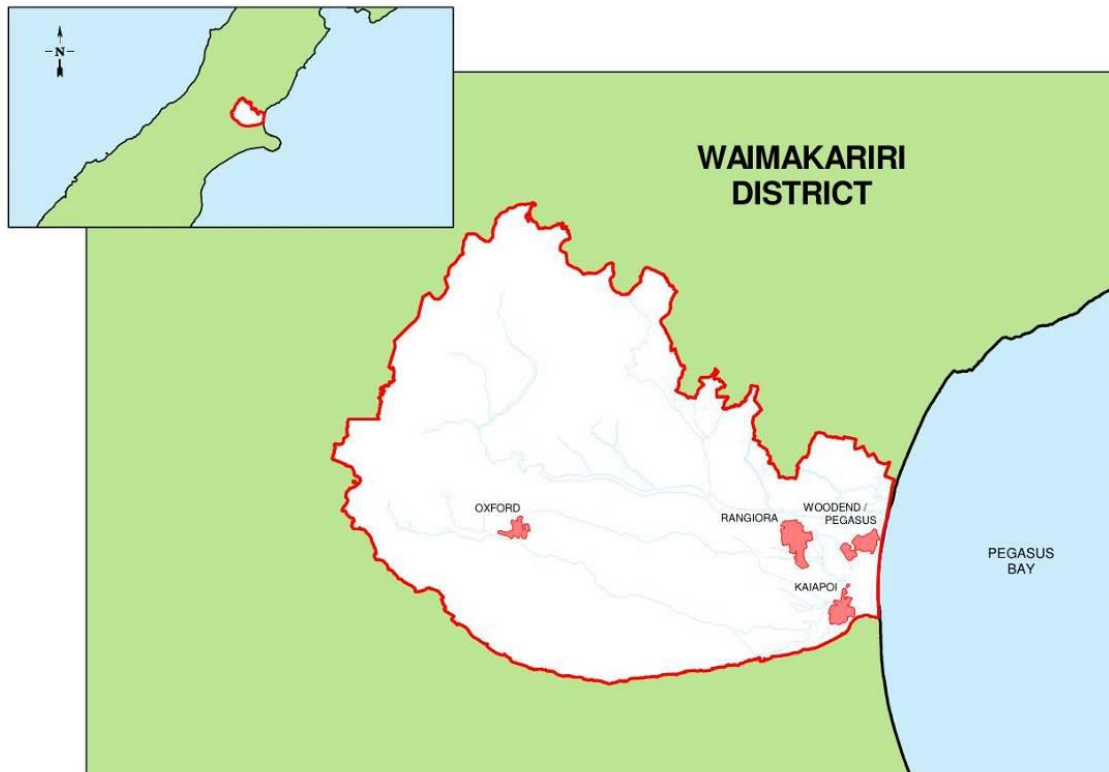
2.1 LOCATION

The Waimakariri District lies to the north of the Waimakariri River in North Canterbury. It covers an area of approximately 2,250 km² and extends from Pegasus Bay in the east to the Puketeraki Range in the west. Waimakariri District is bounded by Christchurch City south of the Waimakariri River and Hurunui District to the north.

Figure 1: Waimakariri District location



Figure 2: Waimakariri District map



2.2 CANTERBURY EARTHQUAKES

The Waimakariri District was hit very hard by the 2010 and 2011 Canterbury Earthquake series. This resulted in 1,000 homes being Red Zoned and a significant infrastructure and community facilities rebuild and repair programme that is still underway.

The Council found that it was very important to keep the community informed and engage on a regular basis during and following the earthquakes. Explaining technical engineering issues, describing problems, relaying timeframes for works and costs to the general public was very important following the earthquakes. The Waimakariri District Council was awarded a New Zealand Engineering Excellence Award for Excellence in Community Engagement in 2012. Many of the lessons and engagement techniques from the earthquake response and recovery were used in the flood response.

2.3 POPULATION, GROWTH AND DEVELOPMENT

The district has a population of about 55,000 in rural and urban areas. It is the third largest territorial authority in the South Island. The main urban areas are Kaiapoi and Rangiora, although there are a number of other settlements and villages. With many areas approximately 30 minutes' drive from the Christchurch city centre, many Waimakariri District residents commute to Christchurch.

The district has undergone rapid growth in recent years with on-going development on the edges of Kaiapoi and Rangiora and more rural areas becoming subdivided into lifestyle blocks. The district is consistently in the top two or three in the country for percentage growth rate. The population of the district has doubled from 27,000 in 1990 to the current figure of 55,000.

The Canterbury earthquakes have increased demand for new sections in the district, with former Christchurch residents moving north and existing residents relocating from the

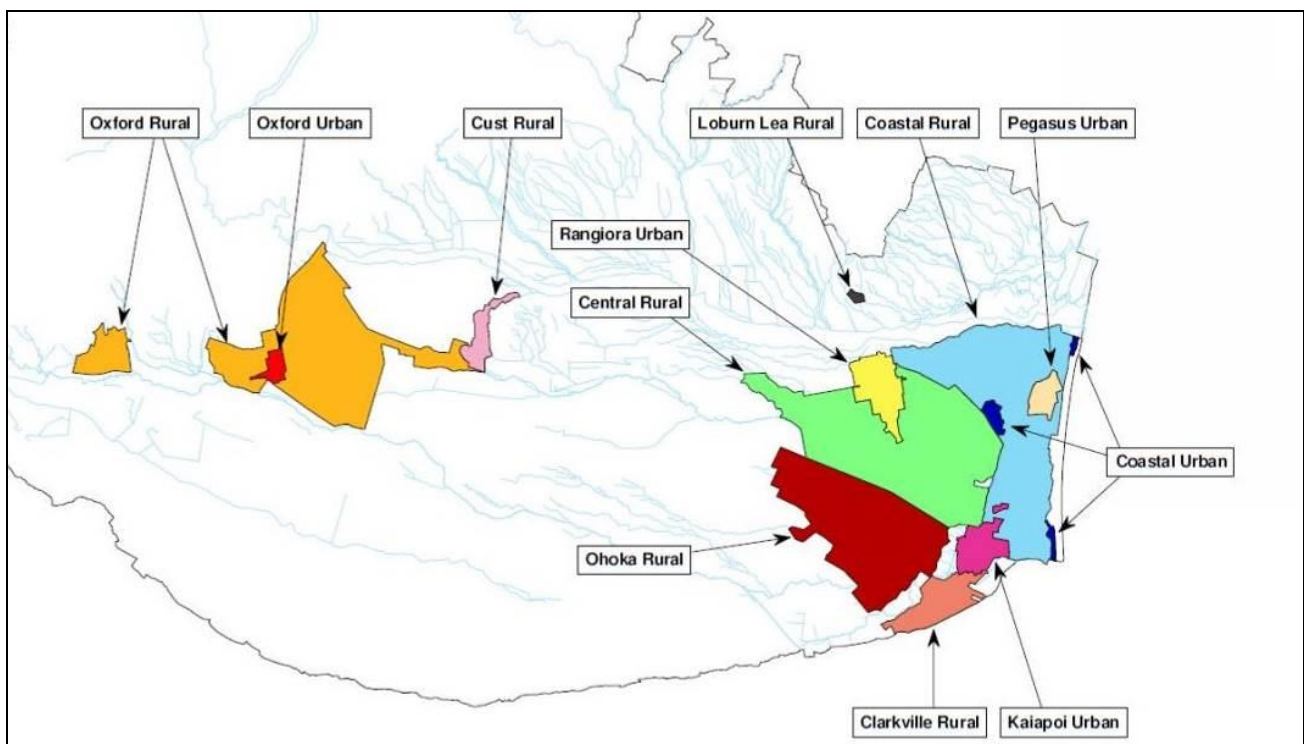
earthquake damaged areas of Kaiapoi. Following the earthquakes the district has experienced the equivalent of 10 years' average growth over the space of three years.

2.4 WATERWAYS AND STORMWATER SYSTEMS

The populated part of the Waimakariri District is relatively flat, with a general fall at about one percent across the plains south-east towards the coast, and with man-made drains and roads intersecting the natural flow paths. On the plains the soils are typically shallow stony silt loams over gravel. Near the coast the land is very low lying and flat with poorly drained sands and silts. The main rivers are the Ashley River, Waimakariri River and Kaiapoi River, all of which have stopbanks. There are also a number of waterways and drains throughout the district, with piped systems in the urban areas.

The Council has seven Rural Drainage Areas and five Urban Drainage Areas as shown in Figure 3. Within these areas Council rates properties for drainage and maintains the drainage system. Outside these areas no drainage rates are charged, only road-related drainage is maintained by the Council, with property owners responsible for maintaining the private drainage system. The Rural Drainage Areas have a lower level of service than the Urban Drainage areas. Each of the Rural Drainage Areas has a Drainage Advisory Group that meets three times per year. In rural areas the drainage systems are typically open drains with road culverts. These rural drainage systems have been built to allow the land to drain following heavy rainfall, however, they have not been designed or constructed to achieve any calculated capacity. Typically the land in these areas is subject to overland flow and ponding during storms.

Figure 3: Waimakariri District Drainage Schemes



Many of the rural residential (lifestyle block) properties are in the Rural Drainage Areas or outside the drainage rating areas. This can cause issues, with some residents having expectations of urban levels of service. The lifestyle block developments have occurred in rural areas without any significant improvement to the drainage system. The type of flooding that was once accepted as part of the rural way of life is, in many cases, not

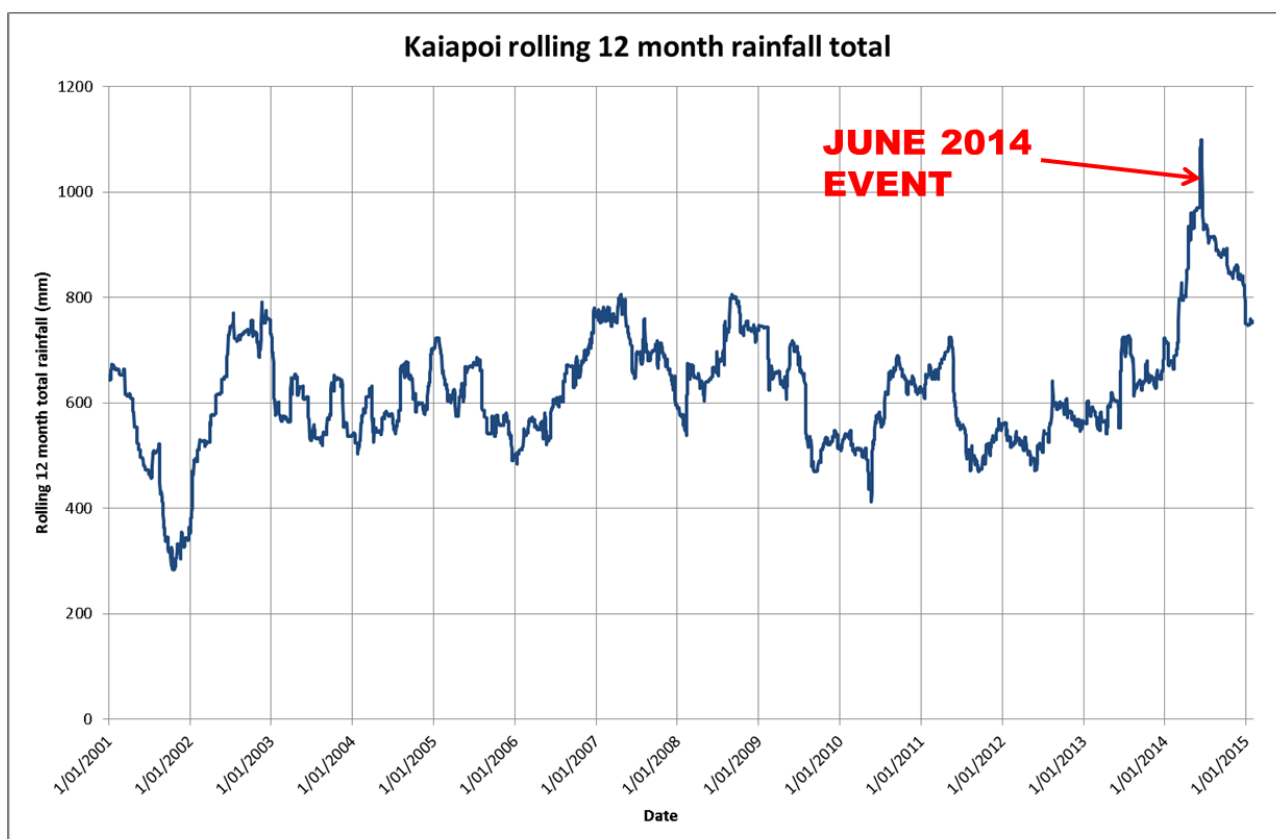
acceptable to residents who have expectations of an urban level of service, expensive houses, and landscaped properties.

3 JUNE 2014 STORM EVENT

3.1 ANTECEDENT CONDITIONS

Prior to the June 2014 event, the district had experienced higher than normal total rainfall over the previous months. The average annual rainfall in the district is approximately 550mm and in the 12 months prior to June 2014 there had been 1,015mm of rainfall. The rolling 12 month rainfall total for Kaiapoi for the 13 years up to and including the June 2014 event is shown in Figure 4.

Figure 4: Kaiapoi rolling 12 month rainfall total

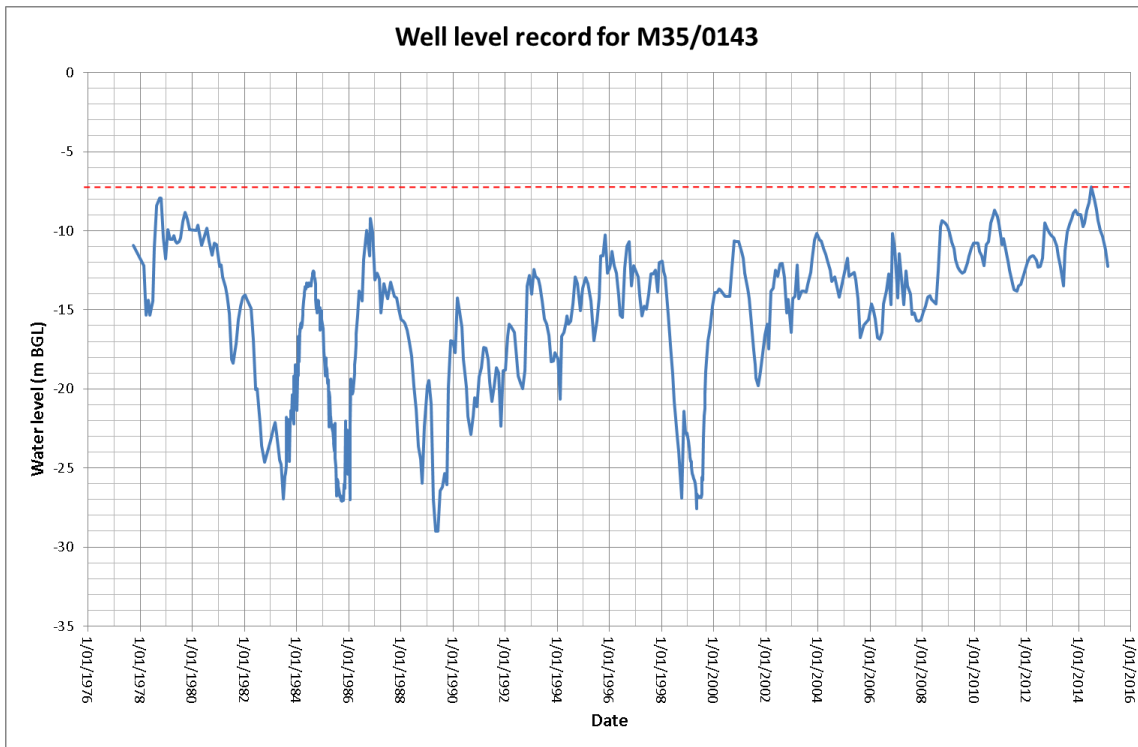


This high total rainfall in the months preceding the June 2014 storm meant that the ground was already saturated and groundwater levels were very high. In parts of the district, particularly Mandeville and Ohoka (approximately 9km west and 6km north-west of Kaiapoi, respectively), this high groundwater led to groundwater resurgence flows (springs or surface discharge of groundwater).

Figure 5 shows long term groundwater levels from an Environment Canterbury (ECan) shallow groundwater monitoring bore M35/0724, near the intersection of Tram Road and Chapmans Boundary Road, approximately 10km upgradient of Mandeville. It can be seen from Figure 4 that the groundwater level measured in mid-2014 was the highest on record, with the record dating back to the late 1970s. While the levels in Figure 4 are still several metres below ground level, the depth to groundwater decreases further east. When the groundwater level in well M35/0143 is at 10m below ground level, the water table in Mandeville and Ohoka is generally at or above the ground surface. During times when the water table is at these high levels, groundwater emerges, ponds and flows via

overland flow paths throughout these areas. This groundwater resurgence flow can be constant for many months.

Figure 5: Groundwater level data at well M35/0143, approximately 10km upgradient of Mandeville



3.2 RAINFALL

From 9 until 11 June 2014 there was approximately 180mm rainfall in Rangiora and 110mm in Kaiapoi over a 72 hour period. The rainfall is understood to have been higher in the rural area further west.

The return period of this rainfall event has been assessed (by WDC staff) as approximately a 66 year return period for Rangiora and approximately a 12 year return period for Kaiapoi, over a 48 hour duration. The rainfall intensity for Kaiapoi and Rangiora over the event and shown in Figures 6 and 7, and the return period analysis for Rangiora is shown in Figure 8.

Figure 6: Kaiapoi rainfall intensity June 2014 event

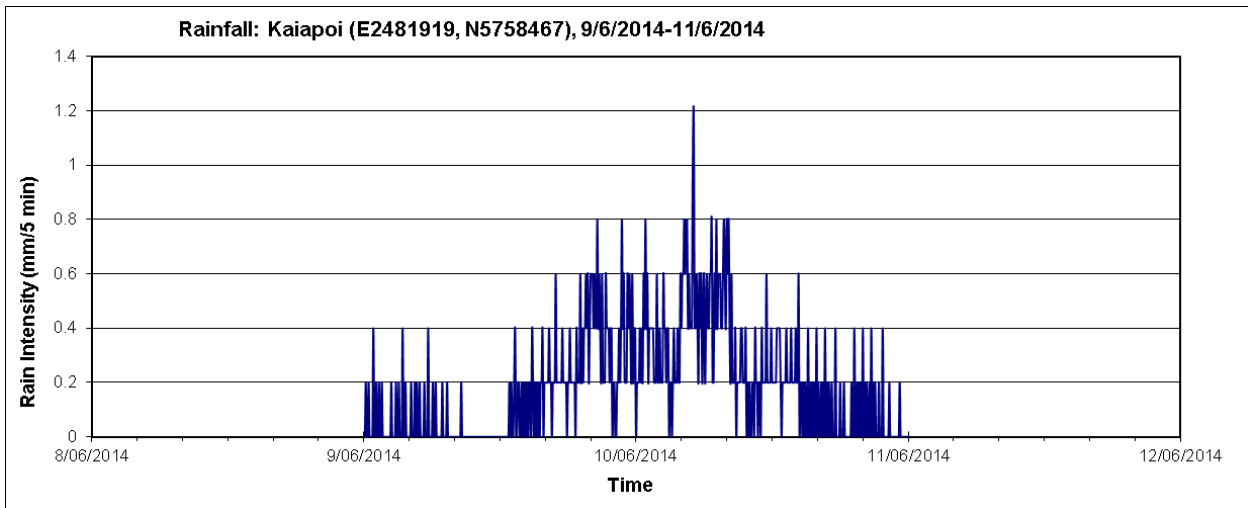


Figure 7: Rangiora rainfall intensity June 2014 event

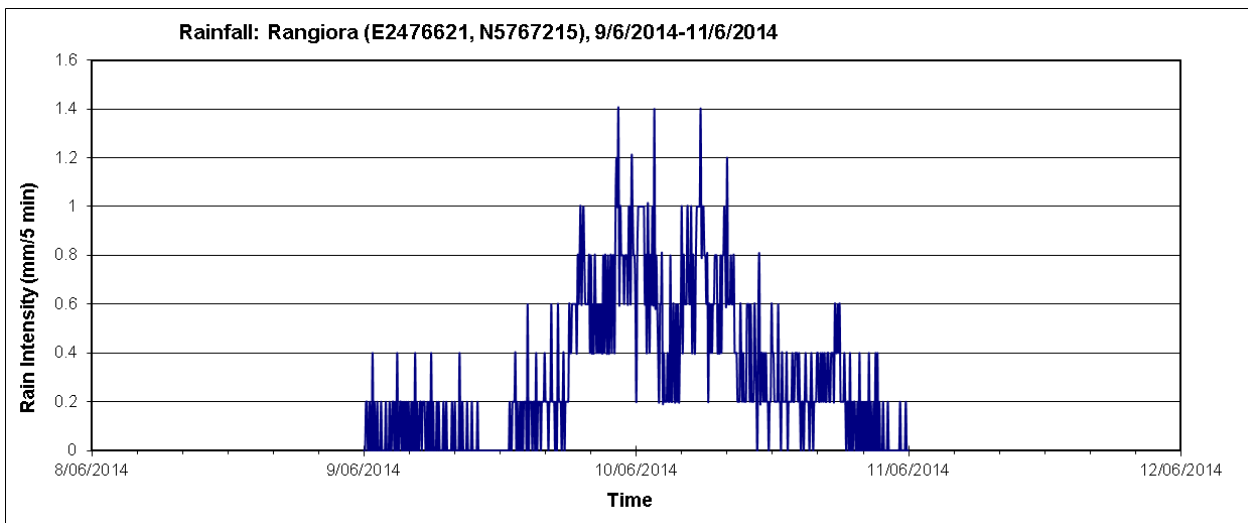
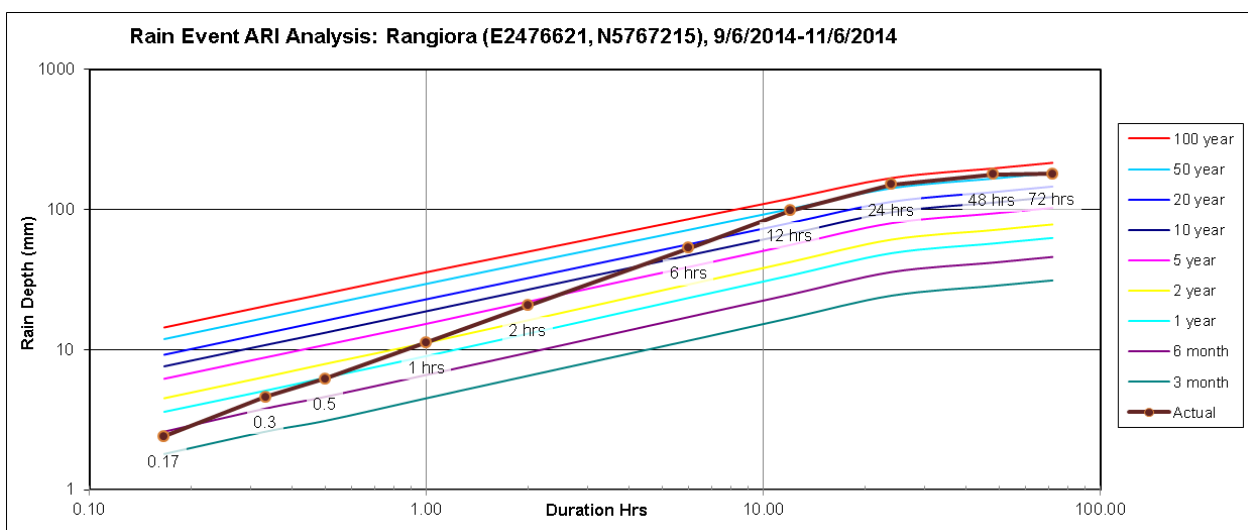


Figure 8: Rangiora June 2014 Event Return Period Analysis



The June 2014 event was the second large storm for 2014 in the Waimakariri district. On 17 and 18 April 2014 there was approximately 90mm of rainfall in Kaiapoi and 97mm in Rangiora, which also caused widespread flooding.

The rainfall records and anecdotal evidence from local farmers showed that the June 2014 storm event was the worst that had been experienced in the affected part of the district since the 1970s. Since the 1970s there has been a significant increase in the population on the flood plains.

3.3 EFFECTS

The June event caused extensive flooding in Kaiapoi, Rangiora and the lifestyle block areas of Fernside, Mandeville and Ohoka, as well as other areas. A large number of houses, garages and outbuildings around the district were flooded, and many more properties had water ponding for several days. Some rural and rural residential areas had ponding for weeks to months after the event. Many roads were impassable during the flooding, including some key transport routes such as State Highway 1.

In Rangiora the rural runoff from the north-west flowed into the town along the roads, compounding the local stormwater flooding.

In Kaiapoi the high groundwater and already saturated low-lying ground meant the stormwater system capacity was exceeded, and there was overland flow and ponding. The rainfall that actually fell on Kaiapoi was less severe than in the surrounding rural areas, however rural runoff flowed into the town causing flooding of roads and properties that took several days to drain away.

In Mandeville and Ohoka, the high groundwater and groundwater resurgence meant that in some areas the drain systems were already flowing part full before the rainfall started, and the drain systems were quickly overwhelmed. This high groundwater and resurgence flow also meant that after the storm the ponded water took a long time to drain away, with some areas ponding for several weeks.

The high groundwater and flooding also caused problems with the STEP (Septic Tank Effluent Pumped) wastewater systems in Mandeville. Groundwater flowed into the systems, causing the private pumps and the downstream Council pump station to run continuously and the systems to overflow. Approximately 50 houses reported not having any wastewater disposal and more are understood to have had problems that were not reported.

3.4 INITIAL RESPONSE

A large number of flooding related calls (service requests) were received from the public and the Council's emergency Operations Centre was set up to manage the response. WDC staff went out in the field to investigate and monitor the situation, and contractors were deployed to carry out emergency works including clearing debris, placing inflatable flood barriers and temporary pumping. Emergency services, particularly the Fire Service, also dealt with a large number of calls.

WDC staff visited a range of affected areas across the district, in teams of two for safety, and took photos of the flooding. When the weather cleared sufficiently a helicopter was also used to assess the extent of flooding and take photos. These staff and aerial photos, as well photos submitted by members of the public and aerial photos from ECan, have been invaluable in understanding the effects of the storm.

Once it became apparent that properties in Mandeville were without wastewater services, due to the inundation of the STEP system, portaloos were dispatched to the affected properties.

4 FLOOD TEAM

4.1 ESTABLISHMENT & BRIEF

A report to Council on 1 July 2014 sought approval to establish a Flood Team to quickly investigate problems and solutions, with a proposed reporting structure (refer section 4.2) and an initial \$1.5m budget. This report identified four phases: Response and Reconnaissance; Identify and Implement Quick Wins; Identify and Investigate Permanent Solutions; and Review Systems and Processes.

The report to Council noted that the Flood Team would be made up of consultants (seconded to WDC) and Council staff. WDC then approached consultants regarding available resources. Rather than seeking one consultancy to supply the team, WDC targeted individuals known to WDC, from several consultancies, based on their skills and experience. The consultant team comprised three senior civil engineers: Kate Purton, Flood Team Lead (Beca); Peter Carter (GHD); and Regan Smith (Aurecon); and one intermediate civil engineer Amber Murphy (Beca). (David Gardiner (Beca) also provided initial senior input.) The consultant team had strong stormwater engineering and contract management experience, and Peter and Regan were already both very familiar with, and living in, the Waimakariri District. Although they had not worked together before, they were known to each other from their work as part of the Christchurch earthquake infrastructure rebuild (for Stronger Christchurch Infrastructure Rebuild Team, SCIRT).

The Flood Team consultants were initially seconded to WDC four days per week from July to October, working from a meeting room converted into the Flood Team office. While full-time input would have been preferable from WDC's perspective, WDC was realistic about the consultants other commitments. This approach established a dedicated team, who worked collaboratively with WDC staff.

4.2 MANAGEMENT, GOVERNANCE & DECISION MAKING

A unique management and governance structure was set up for the Flood Team, to enable quick but robust decision making. This structure is shown in Figure 9.

Figure 9: Flood Team reporting structure



The Flood Reference Group included senior Council engineering managers and two Councillors, and had delegated authority to make decisions regarding options and

expenditure within Council approved budgets. Additional expenditure and funding required approval of Council's Utilities and Roading Committee and the full Council.

The Flood Reference Group consisted of:

- Cr Felstead (Deputy Mayor, Stormwater/Drainage Portfolio Holder)
- Cr Farrant (Utilities Portfolio Holder)
- Gerard Cleary (Manager, Utilities and Roading)
- Gary Boot (Project Delivery Manager)
- Kalley Simpson (3 Waters' Manager)

The Flood Team reported to the Project Control Group (PCG) made up the Flood Team Lead, other Flood Team members as required, and key WDC stormwater and management staff.

This structure allowed for minor decisions to be made in a timely manner through Flood Team PCGs, elected member engagement in more important decisions through the Flood Reference Group, and Committee and Council meetings (open to the public) for decisions affecting budgets and rates.

4.3 EVOLUTION

Over the course of the project the composition of Flood Team and frequency of meetings changed to meet the changing needs of the project. In the initial months a number of WDC staff were involved in the Flood Team work, but as time progressed they returned to "business as usual" work (capital programme and asset management projects) and more external survey and design resource was required.

Secondments of consultants into the Flood Team were initially four days per week, but once the options phase was complete and the programme agreed in October/November 2014, the secondments were extended but reduced to one to two days per week.

The frequency of Flood Team PCGs and Reference Group meetings also evolved from weekly initially, while issues and options and priorities were being explored, to fortnightly PCGs and as-required Reference Group meetings once the programme of works was agreed and being implemented.

5 PROCESS

5.1 INTRODUCTION

Phases 1 to 3 of the Flood Teams brief were: Response and Reconnaissance; Identify and Implement Quick Wins; and Identify and Investigate Permanent Solutions. These three phases of the work, including the development of the works programme, consultation and construction, are described in section 5 below and section 6. Phase 4 of the Flood Team work Review Systems and Processes is described in section 7.

5.2 INVESTIGATIONS, OPTIONS & SOLUTIONS

Areas were identified and prioritised for investigation based on the severity of the flooding issues. Initial areas investigated included:

- Clear View Lane/Mandalea
- Fernside

- Kaiapoi east
- Kaiapoi south-west
- Mandeville
- Rangiora

Several other areas including Ashley, Ohoka and Tuahiwi were also investigated.

5.2.1 PHASE 1 - RESPONSE

Following an initial briefing by WDC staff on the issues, historical and recent flooding and previous work, the Flood Team staff headed out into the field with the relevant plans to identify areas requiring maintenance and immediate works (refer section 6.1).

5.2.2 PHASE 2 & 3 – QUICK WINS AND PERMANENT SOLUTIONS

The next step was to carry out more detailed investigation of the areas using maps of service requests and Flood Survey information, event photos, and background information held by WDC (including plans, LiDAR contours, GIS information, reports and existing flood hazard mapping). This was carried out in conjunction with site visits and discussions with property owners/residents.

This was followed by catchment definition, runoff calculations and assessment of existing capacity. Short and long term options were then identified and analysed, high level engineering estimates and programmes were prepared, and preferred options were identified.

WDC staff were involved throughout this process and the Flood Team PCG and Flood Reference Group were kept informed and provided direction. Once this investigation and options assessment was complete a memo was provided to the Flood Team PCG with recommended options, costs estimates and programme, for both short and long term works. This was reviewed, discussed and amended with final approval from the Flood Reference Group. These approved options fed into a proposed capital works programme for the current financial year (2014/15) and Long Term Plan (LTP).

Where immediate works were recommended and could be completed within the initial \$1.5m budget, these were immediately progressed to detailed design and construction.

5.3 WORKS PROGRAMME

Following the identification of urgent works committing the initial \$1.5m budget, other projects were prioritised. Timeframes for investigation, design and construction works were assessed and a programme of works was developed for the current financial year and inclusion in the proposed Long Term Plan (LTP). An additional \$2.54m of work was identified for the current financial year, which with \$0.16m available roading culvert budget, brought the total recommended expenditure for the current financial year to \$4.19m. In addition to this \$17.3m was identified for inclusion in the proposed LTP.

A report to the Utilities and Roading Committee in October 2014 and then full Council in November 2014 sought and gained approval for the increase in the current financial year's budgets and inclusion of the flood mitigation works programme in the draft LTP.

5.4 DESIGN & TENDERING

For the Phase 1 response (immediate and maintenance works), suitable local contractors well-known to the Council and with available resource were assigned work. These works were generally paid for on a dayworks basis.

For Phase 2 and 3 quick wins and permanent solutions, the design and tendering process for the current financial year's works was optimised, with the approval of Flood Reference Group, to expedite the construction of these critical works.

Detailed design was kept as efficient as possible by producing clear plans and diagrams of works, with as much information as needed for construction, but not necessarily full CAD drawings. Although CAD drawings were produced for some projects, other construction issue drawings included 12d long-sections, marked-up GIS plans, schematic diagrams, hand-drawn cross-sections and details, and tables of levels with long-sections plotted in Excel.

Some service clashes (with telecom, power, water etc) were also resolved during construction rather than during detailed design to reduce design timeframes. Service plans were obtained during design, potential service clashes identified, and services marked-out on site. Design was undertaken for more complex service conflicts, otherwise they were highlighted to the tenderers, and a Provisional Sum allowed for in the contract for the contractor to address on-site during construction.

Tendering of construction works was streamlined by using:

- Invited tenders to selected tenderers, using competent local contractors suited to the type and scale of the projects. This shortened the advertising and tender period.
- "Short form" NZS3910 construction contracts, with straightforward special conditions, and basic specification. This made it easier for the tenderers to understand the works and price them within tight timeframes.
- Measure and value contracts (rather than lump sum) with provisional sums for service conflicts and other details to be resolved on site. This meant tenderers could price more efficiently and didn't need to factor in risk into their pricing to the same extent as they would with lump sum work.
- Tender evaluation by lowest price conforming. This is appropriate for selected tenderers and simplified evaluation.
- Good communication with tenderers. Initial phone calls were made to invited tenderers to advise of the upcoming tender, and confirming their intent to price. On-site meetings were held with tenderers to explain works, and tender queries were responded to promptly with Notices to Tenderers.
- Evaluation of tenders immediately following tender closing and Council tender opening process. The normal Council tender opening, evaluation and approval processes for contracts were still followed.

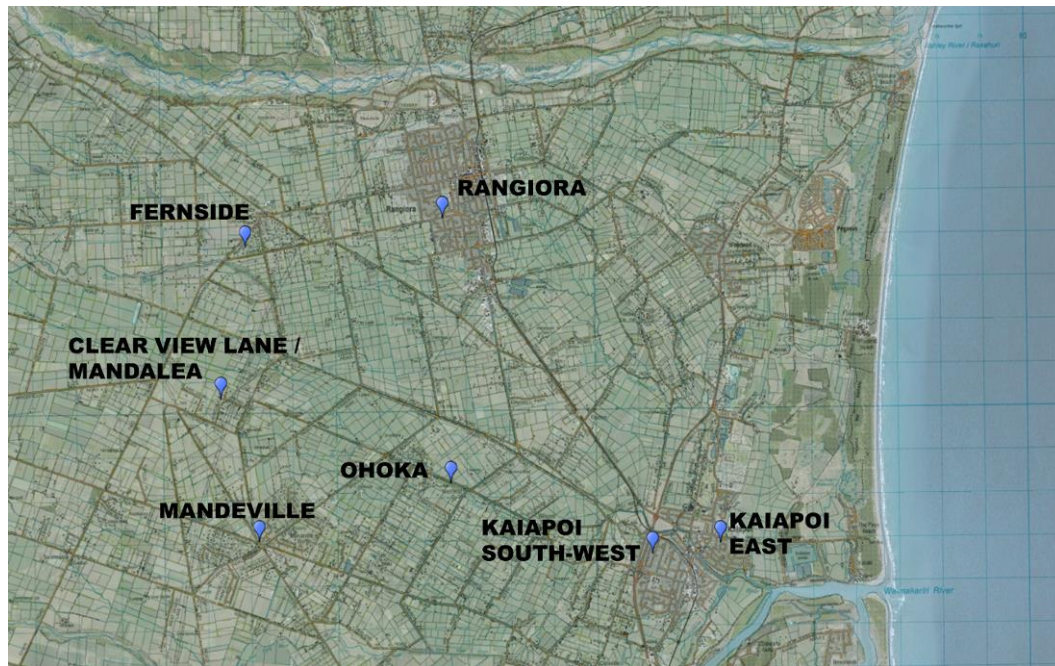
5.5 CONSULTATION AND COMMUNICATION

There was a strong focus on public communication and consultation throughout the project. This took place in various forms.

5.5.1 SERVICE REQUESTS

WDC's initial contact with the public was via the service requests logged by the Council call centre. There were 270 flooding related service requests lodged in June 2014. The main areas affected areas are shown in Figure 10. All service requests were followed up by WDC staff or the Flood Team. In some cases, where no immediate action was required, the initial response was just a letter to advise the resident that we had received their request and that it would be looked into based on prioritisation.

Figure 10: Main areas of flood service requests for June 2014 flood



5.5.2 PUBLIC MEETINGS

A series of initial public meetings was held in June and July 2014, in each of the affected communities. Letters were sent to residents inviting them to attend and the meetings were advertised in local community papers and on the Council website.

The purpose of these meetings was for WDC to front up to the affected communities, explain the flood event and specific issues to each community, seek information and feedback from the residents, and describe the proposed Flood Team work. The meetings were chaired by the Mayor or Deputy Mayor, who also responded to political questions. The presentations at these meeting were given by Gerard Cleary, Manager Utilities and Roding, who also responded to the majority of questions with the support of other WDC engineering staff.

Some of the meetings were very heated and difficult. Residents in some situations had been subject to flooding in the past and several times already in the year. At Mandeville a large portion of the community had been without a functioning wastewater system for weeks. Many residents were of the view that the Council had allowed the development to happen without adequate consideration of issues such as drainage, flooding and groundwater resurgence. The experience for the earthquakes had shown that it was important to be transparent and honest with the community. Although these meetings were very tough to lead, it was generally appreciated by the community that the Council was prepared to front up, listen and explain the plan of action.

The public were very critical of the Council where they perceived there had been an under-investment in maintenance. In many cases this was a fair criticism, which was acknowledged and accepted by the Council with a commitment to step up the level of maintenance.

There was a real concern from some people that the proposed drainage improvement works in some areas would lead to exacerbating downstream issues. It was openly acknowledged by the Council that this was a risk. However this issue was considered in all cases and works were carried out to ensure there were significant benefits in the areas of improvements while avoiding or minimising downstream impacts.

Attendance sheets were circulated at the public meetings for residents to complete, including email contact details. Distribution lists were then set up for email updates.

5.5.3 FLOOD SURVEY

A flood survey was also circulated to residents in Kaiapoi requesting information about the flooding experienced at their property, including whether the house or other buildings were flooded and the depth of flooding. Some residents were concerned that information provided to the Council about the flooding at their property would end up on the LIM for their property, which could make it difficult to sell in future. Council was up front in advising people that information provided by property owners about flooding would be included on future LIMs.

5.5.4 EMAIL NEWSLETTERS

Regular email updates were sent out for the Rangiora, Kaiapoi East, Kaiapoi South-West, Fernside, Mandeville and Clear View Lane/Mandalea areas. These provided details of the works completed and planned, and were sent to residents who provided email contact details. These email updates were initially weekly, while the immediate works were being carried out, then fortnightly and later as required.

5.5.5 WEBSITE

A flood response page was set up on the Council website in June 2014, and updated regularly. Amongst other information, the presentations from the initial public meetings, the regular email updates, and links to the Council reports were included on the webpage.

5.5.6 ONE-ON-ONE DISCUSSION

WDC staff and the Flood Team members had individual discussions with many members of the public, both over the phone and on-site, regarding the issues and options.

5.5.7 COMMUNICATION & CONSULTATION REGARDING PROPOSED WORKS

Targeted communication and consultation was also carried out for the proposed works. This included letters, phone calls, site meetings, written approvals for work in private properties, and start work notices.

5.5.8 COMMUNICATION DURING CONSTRUCTION

During construction the contractors managed day-to-day issues with residents, with WDC staff or Flood Team contact details also provided to residents.

6 WORKS

6.1 PHASE 1 RESPONSE – MAINTENANCE & IMMEDIATE WORKS

Maintenance and immediate works following the June 2014 event included clearing debris, sediment and excessive vegetation from drains, re-grading and widening drains, cleaning pipes, CCTV, replacing blocked and damaged sumps and pipework, pump maintenance, installing flap gates, inlet grate repairs and removing or replacing severely undersized culverts. The immediate works were generally assigned to local contractors well-known to the Council and paid for on a dayworks basis (refer section 5.4).

In addition to the stormwater works described above, WDC staff arranged for two 30,000L effluent storage tanks to be installed connecting to the STEP system wastewater rising main in Mandeville, upstream of the Council pump station. These tanks diverted

part of the catchment, improving service and reducing overflows. The tanks were drained by sucker trucks.

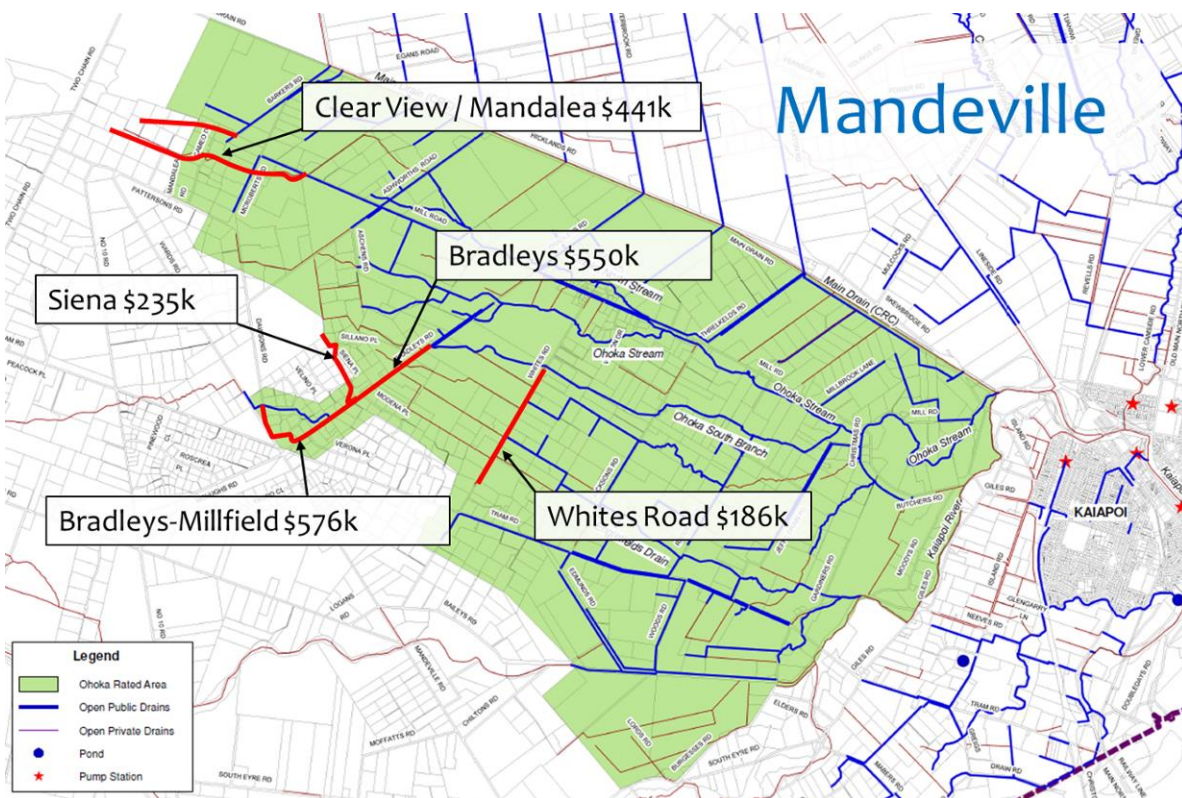
6.2 PHASE 2 & 3 QUICK WINS & PERMANENT SOLUTIONS - CURRENT FINANCIAL YEAR'S WORKS

The current financial year's (2014/15) works included works in Clear View Lane/Mandalea, Mandeville, Kaiapoi, Rangiora and Fernside. These included drain capacity upgrades, bunding to modify secondary flow paths, road and driveway culvert replacements, pump station modifications, and pipework upgrades. These works were generally carried out under NZS3910 construction contracts, following invited tenders from selected local tenderers (refer section 5.4). Examples of projects for two areas are described below.

6.2.1 MANDEVILLE

The key issues for Mandeville are insufficient drain capacity for rural residential areas and groundwater resurgence. The current financial year's works in Mandeville include drain and culvert capacity upgrades to convey the 5 year flow within the channel and at driveway culverts and the 10 year flow at road crossing culverts. The location of the Mandeville works is shown on Figure 11.

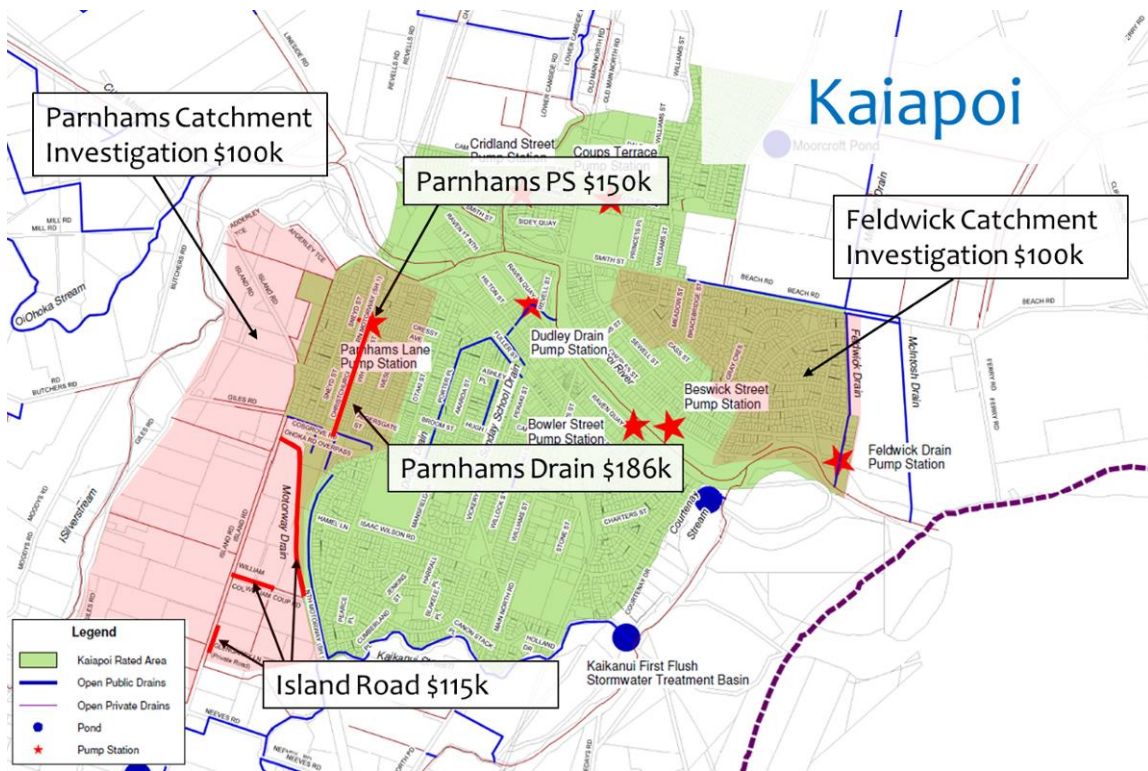
Figure 11: Mandeville flood mitigation works 2014/15 financial year



6.2.2 PARNHAMS DRAIN, KAIAPOI SOUTH-WEST

The two problem areas in Kaiapoi are Kaiapoi east and Kaiapoi south-west. The locations of the proposed projects in the current financial year are shown in Figure 12.

Figure 12: Kaiapoi flood mitigation works 2014/15 financial year



The key issues for Kaiapoi south-west area are the low-lying catchment, Parnhams Drain capacity, and managing growth that is occurring in the west to improve rather than worsen the existing flood problems downstream.

The major project for Kaiapoi south-west in the 2014/15 financial year was the Parnhams Drain and pump station upgrade. Parnhams Drain is an open drain in south-west Kaiapoi, between the residential area and the Northern Motorway, discharging to the Kaiapoi River via the Parnhams Drain pump station and pipeline. When the level in the Kaiapoi River is low it drains by gravity, with the pumps operating when the level in the river is high (due to high tide or a flood event).

The Parnhams Drain and pump station upgrade work involved widening the existing drain, upgrading an existing culvert and modifications to the pump station controls to increase the system capacity from approximately $1\text{m}^3/\text{s}$ to $2\text{m}^3/\text{s}$. In conjunction with this work, the pump station maintenance access was improved, with a new unsealed access road and a turning area constructed, to improve safety for staff. The Parnhams Drain pump station work also includes concrete repairs at the pump station, pipe joint sealing and flap gate maintenance.

A photograph of the Parnhams Drain works, showing the new box culvert (under construction) and drain widening (complete downstream of the culvert) is included in Photograph 1. The Northern Motorway can be seen at the left hand side of the photograph and the new drain access road on the right. The pump station is at the far end of the drain in the distance.

Photograph 1: Parnhams Drain upgrade works, Kaiapoi, December 2015



The works carried out in Parnhams Drain and pump station are a good example of getting the best “bang for your buck” getting a massive capacity improvement for a relatively low cost. The capacity of a system that would cost many millions of dollars to replace had its capacity doubled for a few hundred thousand dollars.

6.3 PHASE 3 PERMANENT SOLUTIONS - LONG TERM WORKS

The long term projects included in the proposed LTP include further investigations (including modelling) for long term upgrade works, drain upgrades, pipework upgrades, and new drains and pump stations.

7 SYSTEMS, PROCESSES, MAINTENANCE & FUNDING CHANGES

7.1 PHASE 4 REVIEW

The earlier sections of this paper have described the Phase 1 to 3 works of the Flood Teams brief, that is, Response and Reconnaissance; Identify and Implement Quick Wins; Identify and Investigate Permanent Solutions. Phase 4 of the brief was Review Systems and Processes. This phase of work involves reviewing Council’s systems, practices and processes related to flooding and stormwater, with a view to understanding best practice and making improvements. This work is on-going at time of writing. Items identified to be covered in Phase 4 include:

- Review of LIM, PIM, Building Consent, Subdivision Consent, and vehicle crossing approval processes with respect to stormwater and flood mitigation
- Improvement and updating of stormwater information in the GIS system
- Review of CCTV (pipe video inspection) data management
- Review of levels of service for stormwater and flooding

- Updating the Engineering Code of Practice
- Use and further development of existing hydraulic models
- Mapping of groundwater resurgence/springs
- Mapping of service requests
- Review flood forecasting and response planning
- Review of flood-related emergency management
- Guidance on planting of drains and waterways
- Information for residents on drain maintenance
- Changes to maintenance practices
- Review of drainage rating areas and consideration of a district wide rate.

7.2 MAINTENANCE

In recent years, WDC's stormwater and drainage maintenance programme has been largely reactive. While this approach has been appropriate for some areas, it has not worked well in others. This approach is being reviewed and is likely to be modified to include regular planned maintenance.

7.3 FUNDING

It is proposed that the flood mitigation works programme will be funded through the existing Drainage Rating Areas and a new district-wide general rate for flooding work. This is currently being consulted on through the Council's proposed LTP.

The stormwater and flood mitigation funding is a significant issue for Council and the community. Funding is required not only for the capital works but for the ongoing commitment to a higher level of drainage maintenance. Some of the cost will be spread district wide and some will be borne directly by the affected communities. Ultimately, the cost has to be paid by the ratepayers one way or another. The issue of cost, rates and funding was discussed with the communities at each of the public meetings, and generally this was accepted.

8 CONCLUSIONS

The June 2014 storm event caused extensive flooding in both rural and urban areas of the Waimakariri District. The antecedent conditions of saturated ground, high groundwater levels and groundwater resurgence contributed to the extent and duration of ponding and drainage issues.

Direct and early engagement with the community was critical. As was the need to genuinely listen, respond and follow up with concrete action. Many of the flooding issues are as much a change in the expectations of a better level of service from the community as they are about deficiencies in the infrastructure. Flooding that was once considered a natural recurring event in a rural area is not acceptable to a residential population on lifestyle blocks.

The establishment of the Flood Team allowed issues and options to be assessed, solutions implemented quickly and a programme of short and long term works developed. This was achieved by seconding of selected external consultant engineers working closely with WDC staff, a unique project reporting and governance structure, good engagement

with the community and Councillors, a streamlined design and tendering processes, and construction by competent local contractors.

ACKNOWLEDGEMENTS

The Flood Team, WDC staff, contractors & Councillors.

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