

**EARTHQUAKE RECOVERY
COMMITTEE OF THE WHOLE
SEPARATELY CIRCULATED REPORT**

5 JUNE 2014

AT 9.30AM

IN THE COUNCIL CHAMBER, CIVIC OFFICES, 53 HEREFORD STREET

Council: The Mayor, (Chairperson).
Councillors Vicki Buck, Jimmy Chen, Phil Clearwater, Pauline Cotter, David East, Jamie Gough,
Yani Johanson, Ali Jones, Raf Manji, Glenn Livingstone, Paul Lonsdale, Tim Scandrett and
Andrew Turner

Principal Advisors	Committee Advisor
Jane Parfitt, Acting Chief Executive Mike Theelen, General Manager Strategy and Planning	Tel: 941 8554 Tel: 941 8281
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PART A - MATTERS REQUIRING A COUNCIL DECISION
PART B - REPORTS FOR INFORMATION
PART C - DELEGATED DECISIONS

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ITEM NO.	DESCRIPTION
PART C 9	MAYORAL FLOOD TASKFORCE PHASE 2 PROGRESS REPORT
PART C 10	TAY STREET AND FLOCKTON DRAIN PUMP STATION

EARTHQUAKE RECOVERY COMMITTEE OF THE WHOLE 5. 6. 2014

9. MAYORAL FLOOD TASKFORCE PHASE 2 PROGRESS REPORT

		Contact	Contact Details
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Officer responsible:	Unit Manager, Transport and Greenspace	N	
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1. PURPOSE AND ORIGIN OF REPORT

1.1 This report describes the progress made to date since Phase 1 of the Flood Taskforce was completed and progress to date on the resolution required by Phase 2 of the Flood Taskforce by 5 June. The resolution was:

5.10 Request that a progress report comes to the Earthquake Recovery Committee of the Whole on the 5 June 2014 which is delegated the power to act on any recommendations.

2. EXECUTIVE SUMMARY

2.1 The Mayoral Flood Taskforce (the Taskforce) began on 1 May 2014 to recommend potential short-term solutions to regular flooding worsened by damage from the earthquakes. A report was delivered to an Extraordinary Council meeting on 12 May 2014 identifying responses to the most vulnerable houses in the study areas.

2.2 Phase 2 of the Taskforce was begun through a series of Council resolutions at that Council meeting. This report summarises the progress made since Phase 1 ended. The attached technical report 'Mayoral Flood Taskforce Temporary Flood Defence Measures: Phase 2 Progress Report' (refer **Attachment 1**) provides more detail on progress.

2.3 Since the release of the Phase 1 Taskforce draft report, the Council has received over 330 incoming contacts (calls, e-mails or face to face meetings) from people expressing concern about flooding. The call centre was briefed and a survey script has been written to collect uniform data across all incoming contacts.

2.4 Of the 330 incoming contacts to date, 308 have been talked through the survey script either at first point of contact or during a call back. This data is currently being processed to establish potential vulnerability and cross-referenced against field investigations from Phase 1. Of the 308 surveys completed to date, 214 relate to addresses already identified in Phase 1, and 94 are from addresses not identified in Phase 1. Of the new properties classified to date, 75 fall within the Vulnerability Levels 1-3 from Phase 1. This will change as new data comes in.

2.5 Four public meetings have been held (Little River, Heathcote, Sumner, Flockton) to present options and answer questions from the community on the options and assessments in the Phase 1 report. Taskforce members and Council staff have attended these meetings. More meetings are scheduled in the coming fortnight (Lyttelton, Southshore and New Brighton, Lower Avon, and Heathcote Valley).

2.6 One of the features of the Phase 1 report was to design local area schemes to provide temporary flood defence. The Taskforce is refining the local area schemes, which involves further defining the recommended option for each area, as well as clarifying the costs. The detail of each of these schemes is included in a separate report. The Taskforce is investigating flood defence measures which include:

- Sixteen local area schemes (which include some house defence measures and one off maintenance activities) within six priority areas.
- Seven maintenance activity areas.

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- 2.7 Little River is currently removed from the scope of the Taskforce as it was not earthquake related and is a joint responsibility. The matters identified in Little River have been referred to the joint Council and Environment Canterbury Stormwater Management Working Party (SWiM) for further investigation.
- 2.8 Lyttelton was identified in Phase 1 as having separate issues to the flatland areas. Therefore a separate Project Charter is being developed which will involve both geotechnical and stormwater engineers assessing the issues and risk in Lyttelton.
- 2.9 A number of maintenance items were identified in the Phase 1 report. Enhanced and accelerated maintenance has already been carried out, with more under way. Many of these are already addressed under existing maintenance contracts and have been summarised and passed through to the relevant teams in Council for action. Maintenance items outside the current contracts have been priced for this report and summarised for action. Some of these items have already been completed, such as clearing of Dudley Creek.
- 2.10 Liaison with other agencies has continued, in particular CERA, EQC, CDHB and the Insurance Council. This is to ensure that Taskforce work complements and enhances the work of these other agencies. Liaison with these (and other) agencies will continue to ensure that the best outcome is achieved.
- 2.11 Further work is progressing on wastewater overflows on the three recommendations from the Phase 1 report. There is overlap with existing Council projects and operations which needs further consideration.
- 2.12 A high level implementation programme of actions with associated costs has been developed. This has a higher level of confidence than that presented in the Phase 1 report, but still requires field teams to verify feasibility and to investigate and validate any new properties identified next to existing schemes. Operations and other Council staff also need to check each scheme. The capital expenditure (capex) and operating expenditure (opex) splits need to be verified but the total estimate currently is \$16 million capex (+/- 30 percent) and \$1.5 million opex (+/- 30 percent) but exclude a number of items identified in the Phase 1 report. These costs are comparable to the Phase 1 costs for the same items.
- 2.13 Further work items have also been identified, some of which fall within the scope of the Taskforce and others which are more appropriate for other groups.

3. BACKGROUND

- 3.1 Phase 2 of the Taskforce was begun through a series of Council resolutions at an Extraordinary Council meeting on 12 May 2014. The resolutions assigned to Phase 2 of the Taskforce were:

5.4 Requests the Acting Chief Executive establish a second phase Taskforce to:

5.4.1 Confirm the level 1 properties are appropriately identified, including face-to-face engagement to establish the most appropriate solutions

5.4.2 Provide a recommended programme of actions and costs to implement urgent solutions in each catchment:

- (a) Noting that this should include a temporary pumping solution in Flockton, the repair of flap gates in the Avon and Heathcote rivers, the dredging of the Heathcote River and the removal of debris and improved maintenance regime.*

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5.4.6 Identify any areas that have been impacted by flooding on the proposed levels 1 to 3 vulnerability and report on those.

5.4.7 Urgently review criteria for assessing flood risk and land movement in Lyttelton to improve the analysis of vulnerability and strategic infrastructure.

5.10 Request that a progress report comes to the Earthquake Recovery Committee of the Whole on the 5 June 2014 which is delegated the power to act on any recommendations.

3.2 It is understood that Phase 2 of the Taskforce will be finish on 30 June 2014.

4. CONTINUED ASSESSMENT OF VULNERABLE HOUSES

4.1 The work to establish vulnerability across the priority areas has been progressed. A survey has been written to collect uniform data from the public. This survey includes questions about the household and flooding history. This data informs engineering and vulnerability assessments and the development of flood defences.

4.2 A central list has been developed to track contact with the public (both incoming and outgoing). This provides the tool for validating Phase 1 data and any data provided by the public.

4.3 The validation and identification work is ongoing, as calls continue to come into the call centre and as the public meetings progress. The breakdown of calls is presented in the executive summary.

5. WASTEWATER

5.1 Phase 1 of the Taskforce identified options which could reduce wastewater contamination of floodwaters. Several options were investigated with three recommended:

5.1.1 Reduce floodwater inflows into the wastewater network through installation of removable non-return valves on gully traps at property level and seal vented manholes in the worst flood hit areas.

5.1.2 Reduce visible wastewater solids in floodwaters through the installation of baffle plates and inverted siphons at wastewater overflows.

5.1.3 Until longer term solutions are in place, the Council should consider offering flooding clean-up / decontamination of properties facing large insurance excesses.

5.2 Further work is being undertaken to determine how to progress the recommended options and how these will be funded. A meeting with key decision-makers and stakeholders has been set up for 6 June. This meeting will allow the next steps in the decision-making process to be determined, in particular when and how the identified options will be implemented.

6. HOUSE DEFENCE

6.1 House defence measures are considered if there are no appropriate local area schemes available or where there are isolated vulnerable houses. Typically, house defence measures are more expensive than local area schemes.

6.2 The house defence measure which is currently considered most viable is tanking. This involves applying a waterproof membrane to the exterior of a property, including but not limited to:

6.1.1 Sealing of house structure.

6.1.2 Installation of non-return valves to sewer pipes on property.

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- 6.1.3 Sealing pipe and cable inlets.
- 6.1.4 Flood door barriers.
- 6.1.5 Air brick / ventilation covers.
- 6.1.6 Installation of submersible pump beneath floor.
- 6.3 As part of the property defence solution several technologies have been identified that are new to the New Zealand industry. These technologies have been used most frequently on brick houses, rather than houses with timber weatherboards.
- 6.4 A pilot study is proposed to test their effectiveness of the technology in protecting New Zealand style houses using a red zone house. The pilot study provides the opportunity to make any necessary changes to improve the protection measures, and prove the concept to the Council and the public.
- 6.5 The pilot will consist of tanking a red zone house and constructing a bund of proprietary products. The space between the house and the bund will then be flooded to test both bund and tanking. A public viewing platform is currently being considered, subject to health and safety considerations. Discussions with CERA to identify an appropriate house are positive and ongoing.
- 6.6 A number of suppliers have offered to supply reusable protection products for testing at no cost to the Council, such as those used to create the bund around the house and protection of doorways. Costs to the Council will be for consumables and labour time required to implement the protection measures. This includes the barrier membrane to be applied. The estimated costs to carry out the pilot study to the Council are between \$10,000 to \$15,000.
- 6.7 There has been no allowance for removing the protection measures after their design life of five years.
- 6.8 The pilot study will show if the protection measures will be effective in the 'real world'. Leakage paths can be identified and design measures installed to prevent any issues before application to occupied houses.

7. FINANCIAL IMPLICATIONS

- 7.1 Overview of funding available:
 - 7.1.1 Storm water and fresh water infrastructure damaged in the earthquakes is included in the Christchurch City Council and Crown cost share agreement. The cost share agreement includes the Horizontal Infrastructure Rebuild estimate, which covers both permanent and temporary repairs/maintenance. For the period 2014-2019, \$29.4 million (inflation excluded) is included for storm water and fresh water infrastructure temporary repairs/maintenance. As at the end of April 2014 \$2.9 million has been spent with a further \$1.3 million forecast for the balance of the year. The balance of the \$29.4 million has been included in the quarterly prioritisation work undertaken by the Council/Crown. While not specifically defined, this work is given high priority and therefore included as funded. Any flood protection options meeting the earthquake temporary works funding criteria could utilise the storm water temporary works funding source.
 - 7.1.2 The Council could elect to fund additional mitigation works outside of the cost share arrangement and go beyond the scope of the agreement. Any of the aforementioned options would require additional funding. The only funding source currently included in the Council's financial strategy for additional works is the Building and Infrastructure Improvement Borrowing Allowance. The current unallocated balance of the Building and Infrastructure Improvement Borrowing Allowance stands at \$56 million.

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7.2 High Level Estimate of Costs:

7.2.1 An implementation programme of actions with associated costs has been developed. This has a higher level of confidence than that presented in the Phase 1 report, but still requires field teams to verify feasibility and also to investigate and validate any new properties identified adjacent to existing schemes. Operations and other Council staff also need to check each scheme. The capex and opex splits need to be verified but the total estimate currently is \$16 million capex (+/- 30 percent) and \$1.5 million opex (+/- 30 percent) but exclude a number of items identified in the Phase 1 report. These costs are comparable to the Phase 1 costs for the same items.

7.2.2 Both level 1 and 2 vulnerability dwellings are targeted for relief from regular flooding in the costs estimated above

7.3 The full expenditure of the Phase 2 Flood Taskforce was not included in the current year's financial forecasts. The expected cost of approximately \$830,000 may result in an additional borrowing impact based on the financial position in the Council's March 2014 quarterly Performance Report. A large portion of these costs would have been incurred over a longer period, so can still be applied to the Horizontal Infrastructure Rebuild temporary works programme.

7.4 A team of 26 people, comprising Council staff from Land Drainage Operations and Network Planning, as well as the Strengthening Communities and Communications teams, consultant engineers, maintenance contractors and physical works contractors was pulled together to form the Taskforce. The total effort is estimated to be roughly equivalent to 18 full time equivalent (FTE).

7.5 The team covered the full spectrum of planning and policy, strategy, communications, investigation, design and implementation, as well as improvements to asset management and maintenance.

8. IMPLEMENTATION

8.1 The programme for implementation is very high level but should be achievable within six months. Further work will be required to confirm the implementation programme after vulnerability is confirmed.

9. FURTHER WORK

9.1 The Taskforce plans to further work in a number of areas, including: vulnerability assessments, dredging, wastewater, house protection, bridging, Lyttelton, feasibility, finalising the Phase 1 report and liaison with other agencies.

9.2 A key activity will be the validation of Phase 1 vulnerability and identification of new areas through field assessment.

10. STAFF RECOMMENDATION

That the Committee:

10.1 Approve the pilot study for house protection with a budget of \$15,000.

10.2 Retrospectively approve the expenditure for the Phase 2 Taskforce of up to \$830,000. To be applied to the storm water temporary works programme part of the Council Horizontal Infrastructure Rebuild Programme.

10.3 Note that staff are to continue to work on validation of vulnerability and complete the delivery of earlier resolutions from the report to Council 'Mayoral Taskforce on Flooding' dated 12 May 2014.

MAYORAL FLOOD TASKFORCE

Temporary Flood Defence Measures: Phase 2 PROGRESS REPORT

4 June 2014



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Figure 1 Clearing vegetation on Dudley Creek, May 2014

Executive summary

The Mayoral Flood Taskforce began on 1 May 2014 to recommend potential short-term responses to regular flooding worsened by damage from the earthquakes. A report was delivered to an Extraordinary Council meeting on 12 May 2014 identifying solutions for the most vulnerable houses in the study areas.

Phase 2 of the Taskforce was begun through a series of Council Resolutions at that Council meeting. This report summarises the progress made since Phase 1 ended.

Since the release of the Phase 1 Taskforce draft report, Council has received over 330 incoming contacts (calls, e-mails or face to face meetings) from people expressing concern about flooding. A call centre has been set up and a survey script has been written to collect uniform data across all incoming contacts.

Of the 330 incoming contacts to date, 308 have been talked through the survey script either at first point of contact or during a call back. This data is currently being processed to establish potential vulnerability and cross-referenced against field investigations from phase 1. Of the 308 surveys completed to date, 214 relate to addresses already identified in Phase 1, and 94 are from addresses not identified in Phase 1. Of the new properties classified to date there are 75 fall within the Vulnerability Levels 1-3 from Phase 1. These will change as new data comes in.

Three public meetings have been held (Little River, Heathcote, Sumner) to obtain feedback from the community on the options and assessments in the Phase 1 report. Taskforce members and Council staff have attended these meetings. More meetings are scheduled in the coming fortnight.

One of the features of the Phase 1 report was to design local area schemes to provide temporary flood defence. Refinement of the local area schemes is taking place, which involves further defining the recommended option for each area, as well as clarifying the costs. The flood taskforce is investigating flood defence measures which include:

- 16 local area schemes (which include some house defence measures and one off maintenance activities) within 6 priority areas
- 7 maintenance activity areas

Little River is currently removed from the scope of the Taskforce. The matters identified in Little River have been referred to the joint Council and ECan Stormwater Management Working Party (SWiM) for further investigation. Lyttelton was identified in Phase 1 as having separate issues to the flatland areas. Therefore a separate Project Charter is being developed which will involve both geotechnical and stormwater engineers assessing the issues and risk in Lyttelton.

A number of maintenance items were identified in the Phase 1 report. Many of these are already addressed under existing maintenance contracts and these items have been summarised and passed through to the relevant teams within Council for action. Maintenance items outside of the current contracts have been costed for this report and summarised for action. Some of these items have already been completed, such as clearing of Dudley Creek.

Liaison with other agencies has continued, in particular CERA, EQC, CDHB and the Insurance Council. This is to ensure that the work undertaken compliments and enhances the works of these other agencies. Liaison with these (and other) agencies will continue to ensure that the best outcome is achieved.

A high level implementation programme of actions with associated costs is presented. This has a higher level of confidence than that presented in the Phase 1 report, but still requires field teams to verify feasibility and also to investigate and validate any new properties identified adjacent to existing schemes. Operations and other Council staff also need to check each scheme. The presented CAPEX and OPEX splits need to be verified but the total estimate currently is \$16M CAPEX (+/-30%) and \$1.5M OPEX (+/-30%).

Further work items have also been identified, some of which fall within the scope of the Taskforce and others which are more appropriate for other groups to undertake.

1 The Mayoral Flood Taskforce

The Taskforce started work on 1 May with members from Council staff, engineering consultants, the Stronger Christchurch Infrastructure Rebuild Team (SCIRT), Environment Canterbury (ECan), the Canterbury Earthquake Recovery Authority (CERA) and the Earthquake Commission (EQC).

1.1 Phase 1 Taskforce Objective

The objective of Phase 1 of the Taskforce was to recommend potential short-term responses to regular flooding worsened by damage from the earthquakes. It will report these recommendations to a special meeting of the Christchurch City Council (Council) on 12 May 2014.

The Phase 1 report detailed a package of measures that could *assist the most vulnerable households in Christchurch cope in the short-term with the increase in regular flooding due to earthquake land damage.*

1.2 Phase 2 Taskforce Objective

Phase 2 of the Taskforce was begun through a series of Council Resolutions at an Extraordinary Council meeting on 12 May 2014. The resolutions assigned to Phase 2 of the Taskforce were:

- 5.4 Requests the Acting Chief Executive establish a second phase Taskforce to:
 - 5.4.1 Confirm the level 1 properties are appropriately identified, including face-to-face engagement to establish the most appropriate solutions
 - 5.4.2 provide a recommended programme of actions and costs to implement urgent solutions in each catchment:
 - (a) noting that this should include a temporary pumping solution in Flockton, the repair of flap gates in the Avon and Heathcote rivers, the dredging of the Heathcote River and the removal of debris and improved maintenance regime.
 - 5.4.6 Identify any areas that have been impacted by flooding on the proposed levels 1 to 3 vulnerability and report on those.
 - 5.4.7 Urgently review criteria for assessing flood risk and land movement in Lyttelton to improve the analysis of vulnerability and strategic infrastructure.
- 5.10 Request that a progress report comes to the Earthquake Recovery Committee of the Whole on the 5 June 2014 which is delegated the power to act on any recommendations.

It is understood that Phase 2 of the Taskforce will be finish on 30th June 2014.

1.3 Report Purpose

This report describes the progress made to date since Phase 1 of the Taskforce was completed, and also progress made to date on the resolutions required to be delivered by Phase 2 of the Taskforce.

The report is also to provide sufficient information to the Mayor, Chair of the Environmental Committee and the Acting Chief Executive to agree the programme and implementation timeframe.

1.4 Progress on Council resolutions

The table below summarises the progress to date on Council resolutions and the section in the report which addresses each resolution.

Table 1 Progress on Council Resolutions

Council Resolution	Progress	Report Section
<p>5.4.1 Confirm the level 1 properties are appropriately identified, including face-to-face engagement to establish the most appropriate solutions</p> <p>5.4.6 Identify any areas that have been impacted by flooding on the proposed levels 1 to 3 vulnerability and report on those.</p>	<ul style="list-style-type: none"> ■ Public meetings underway ■ Call centre and survey established to contact residents ■ Mapping of newly identified houses underway 	2. Continued assessment of vulnerable houses
<p>5.10 Request that a progress report comes to the Earthquake Recovery Committee of the Whole on the 5 June 2014 which is delegated the power to act on any recommendations.</p>	<ul style="list-style-type: none"> ■ This report updates progress 	Entire report
<p>5.4.7 Urgently review criteria for assessing flood risk and land movement in Lyttelton to improve the analysis of vulnerability and strategic infrastructure.</p>	<ul style="list-style-type: none"> ■ Discussion with geotechnical engineers to scope ■ Project Charter being written 	3.6 Lyttelton
<p>5.4.2 provide a recommended programme of actions and costs to implement urgent solutions in each catchment:</p> <p>(a) noting that this should include a temporary pumping solution in Flockton, the repair of flap gates in the Avon and Heathcote rivers, the dredging of the Heathcote River and the removal of debris and improved maintenance regime.</p>	<ul style="list-style-type: none"> ■ Preliminary programme and costs completed ■ Field verification and technical review of designs required ■ New vulnerable houses to be added to schemes 	<p>3. Progress on local area schemes</p> <p>4. Progress on temporary flood defence measures</p> <p>5. Progress on maintenance</p> <p>7. Programme of actions and costs</p>

2 Continued assessment of vulnerable houses

2.1 Phase 1 report numbers

The Phase 1 Technical Report identified the number of parcels in each vulnerability level. It was always expected that the number of vulnerable houses would change, but it was not possible to quantify this until the findings were publicised. Since those numbers were published the way of identifying vulnerability has also been modified. Previously vulnerability was counted at the legal parcel level. Now it is being counted at the street address level. Essentially there may be multiple occupied buildings on a single parcel boundary. This revised method changed the Phase 1 counts of Level 1 from 56 parcels to 67 addresses. The Level 2 count increased from 451 properties to 508 addresses. Table 2 below summarises the original Phase 1 (parcel) numbers and the revised (house) numbers. These still need to be verified as part of the Phase 2 review process.

Table 2 Numbers of Vulnerable Houses Identified in Phase 1

Reported numbers	Revised numbers	Vulnerability Level	Description of Vulnerability Level
56	67	Level One	Two or more instances of flooding of dwelling floors since the earthquakes
451	508	Level Two	Two or more instances of flooding under dwellings since the earthquakes
487	TBC	Level Three	Two or more instances of flooding restricting access to dwellings since the earthquakes

2.2 Phase 2 Confirmation of Level 1 Houses

One of the key tasks of Phase 2 of the Taskforce was to confirm the Level 1 addresses and identify new vulnerable areas. This process is still underway and so the information presented in this section is preliminary only. More than 50 calls are still coming into Council daily which need to be assessed.

A survey has been developed to help verify the data captured in Phase 1 of the Taskforce and new data reported by residents since. The survey was initially developed for the Phase 1 Taskforce community meeting in the Flockton area on 3 May 2014. The survey has been in use in a more refined form since the start of Phase 2 of the Taskforce.

The survey collects consistent and comprehensive information on the number of times an address has flooded above floor level, below floor level and the number of times access issues have been identified. It also collects information on the number of children, elderly and vulnerable residents in each property. This data will allow the engineers to assign a vulnerability level to each property. It will later also assist with evaluation of schemes. The purpose is also to gather residents contact details so that the Council can stay in touch with those affected.

The Council has assigned three call centre staff to phone residents and obtain the required information. This work commenced on Monday 26 May 2014 and data from 83 residents was collected on the first day.

Council has now received collected over 330 contacts (calls, e-mails, face-to-face meetings, and information from existing databases) from people expressing concern about flooding. Over 308 residents have been talked through the survey either at first point of contact or during a call back. This data is currently being processed to establish potential vulnerability and cross-referenced against field investigations from Phase 1. This is shown graphically on Figure 2.

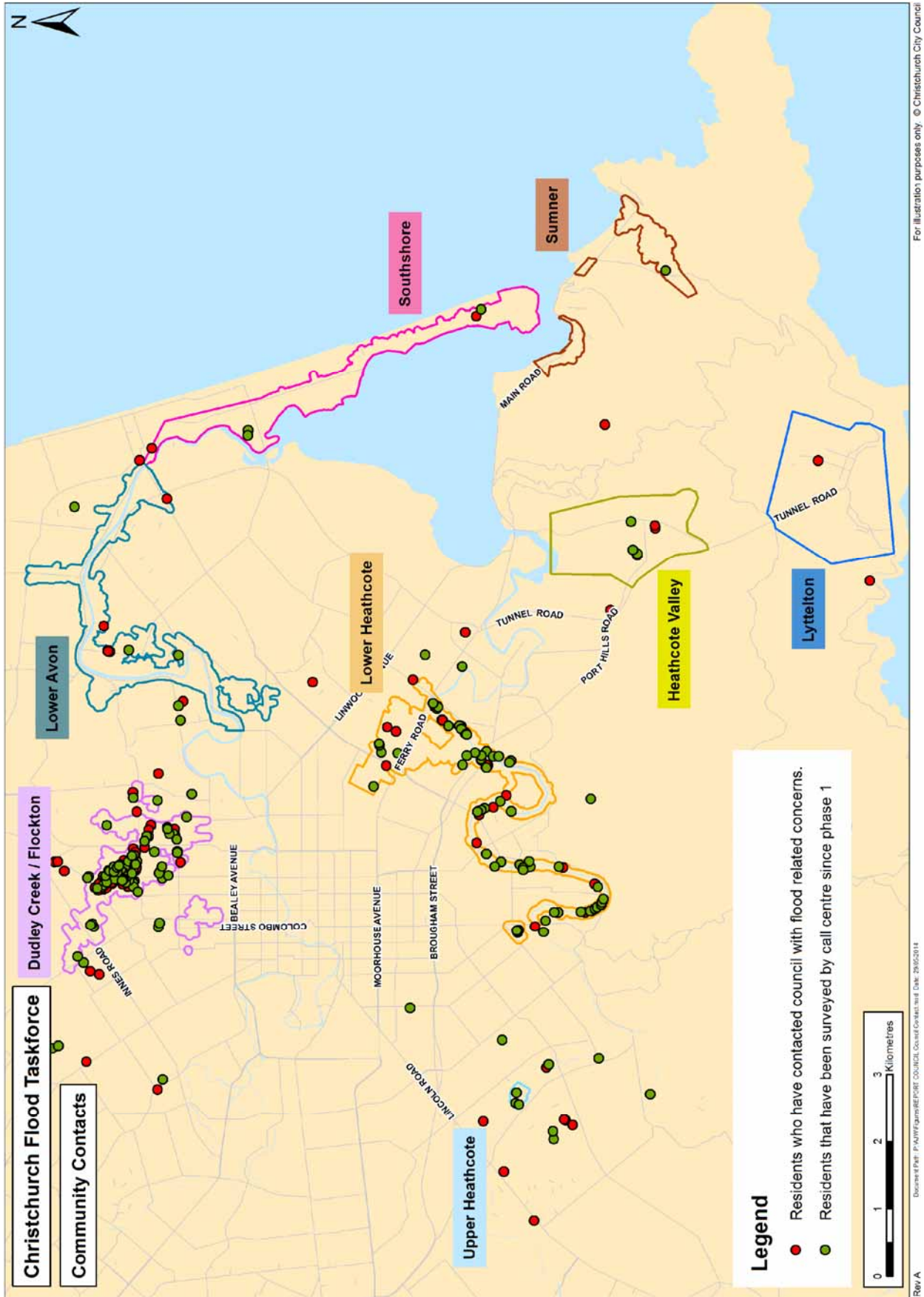


Figure 2 Taskforce flooding contacts and surveys completed to date

Of the 308 surveys completed to date, 214 relate to addresses already identified in Phase 1, and 94 are from addresses not identified in Phase 1.

Of the survey results, approximately 60% of the addresses have been assigned a preliminary vulnerability level (which includes both Phase 1 and new addresses). New addresses are summarised in Table 3 below.

Table 3 Identification of new vulnerable properties to date of publication

No. of houses	Vulnerability Level	Description of vulnerability
10	Level One	Two or more instances of flooding of dwelling floors since the earthquakes
39	Level Two	Two or more instances of flooding under dwellings since the earthquakes
26	Level Three	Two or more instances of flooding restricting resident access to dwellings since the earthquakes
16	-	Only one instance of flooding of any type since the earthquakes

As at the time of writing, the total number of Vulnerability Level 1 addresses identified is currently 81 (excluding Little River). This consists of the 10 new properties and 71 verified Phase 1 properties (which increased from 67 after review). This will continue to change as the community is further engaged and more calls are made to the hotline.

The latest (unverified) numbers of houses in each vulnerability level for each study area are shown in Figure 3 on the following page. This also includes the number of properties yet to be processed.

2.3 Identification of other vulnerable areas

After ensuring all contacts are called back and surveyed, field investigations to verify the data and identify any adjacent vulnerable addresses will take place. This will further develop the understanding of post-earthquake flood vulnerability across the city.

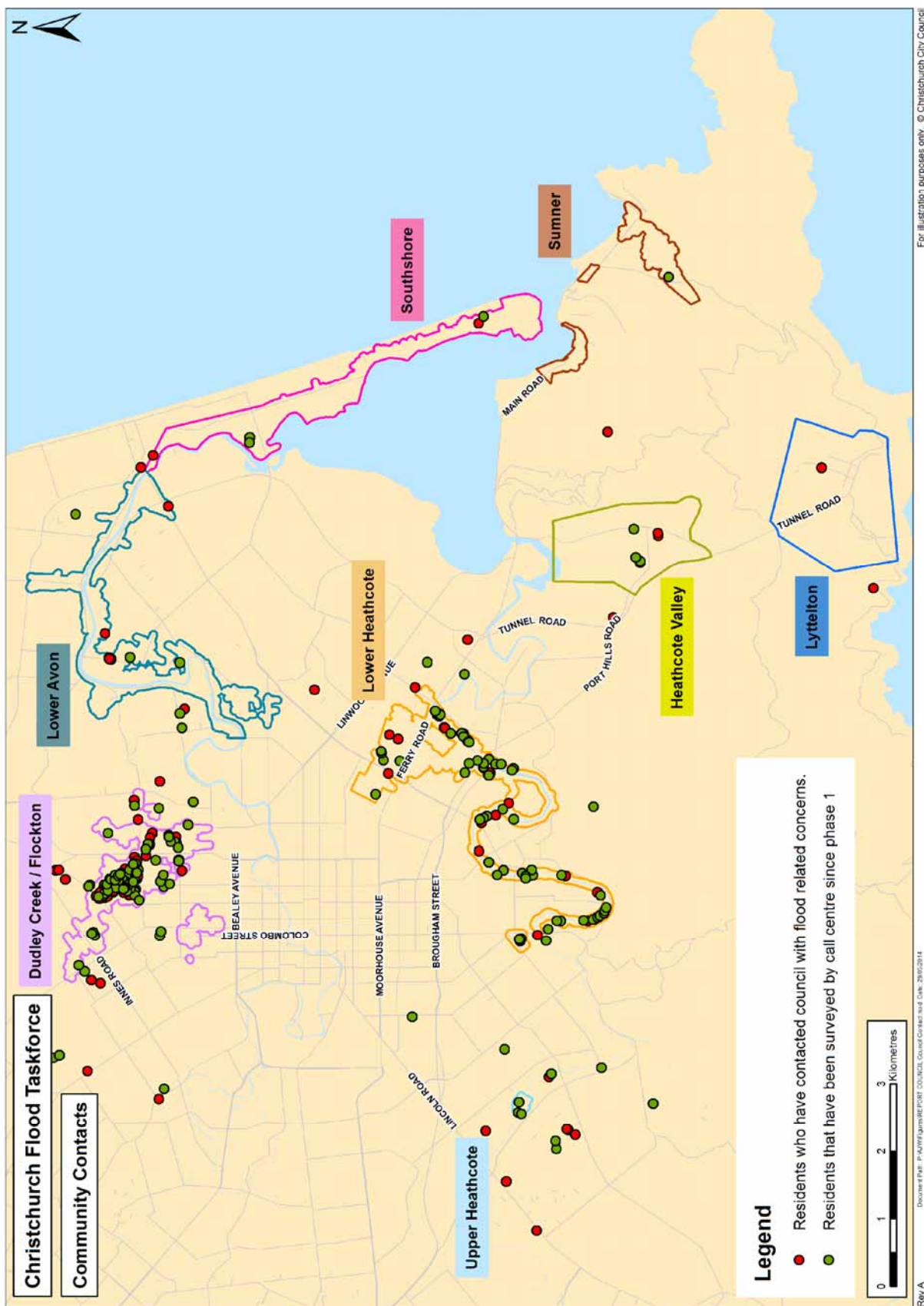


Figure 3 Unverified vulnerable properties at date of publication

2.4 Community engagement

A series of community meetings began on 21 May 2014 in the areas affected regularly by flooding. Residents were invited along to discuss flooding issues that affect their community. These meetings were (or will be) attended by representatives from the Council's Flooding Taskforce and other key agencies. The purpose of the meetings is to present information on the recent flooding events and the flood mitigation work that will be carried out in the coming weeks. The details of these meeting are shown below.

Table 4 Taskforce Public Meetings

Location	Time
Area: Little River Venue: Little River Community Centre	Date: Wednesday 21 May 2014 Time: 6pm–8.30pm
Area: Upper and Lower Heathcote Venue: Somerfield School Hall, 42 Studholme Street, Somerfield	Date: Tuesday 27 May 2014 Time: 7pm–9pm
Area: Sumner Venue: Old School Hall, 20 Wiggins Street, Sumner	Date: Thursday 29 May 2014 Time: 7pm–9pm
Area: Flockton/Dudley Creek Venue: Edgware Bowling Club, 6 Forfar Street, Edgware	Date: Tuesday 3 June 2014 Time: 7pm–9pm
Area: Lyttelton Venue: The Top Club, Dublin Street, Lyttelton	Date: Wednesday 4 June 2014 Time: 6pm–8pm
Area: New Brighton and Southshore Venue: South Brighton Community Centre, 74 Beatty Street, South New Brighton	Date: Thursday 5 June 2014 Time: 7pm–9pm
Area: Lower Avon and CBD Venue: Wainoni Methodist Church, 878 Avonside Drive, Wainoni	Date: Wednesday 11 June 2014 Time: 7pm–9pm
Area: Heathcote Valley Venue: St Mary's Church Hall, Corner of Martindales and Truscotts Road, Heathcote	Date: Thursday 12 June 2014 Time: 7pm–9pm

3 Progress on local area schemes

Since the Phase 1 Taskforce Technical Report (Final Draft) was published work has continued to validate the assessment of vulnerability levels in each study area. This has been aided by the call-ins from the public, as well as information gained from public meetings.

This process of data validation is vital for the finalisation of the local area schemes, as it may mean they include or exclude more properties than previously reported. Therefore, the extent (and costs) of many of the local area schemes cannot be confirmed until that process is complete.

Refinement of the design and costs for local area schemes has continued where possible. Further discussions with SCIRT, CERA and EQC have informed the schemes.

Figure 4 shows the design process being followed for each local area and maintenance scheme. The dark arrow shows the stage in the process the majority of the schemes are currently. Once the new call centre data has been checked and added to the GIS system then field validation and review with operational staff will commence.



Figure 4 Local area and maintenance scheme design process

The following sections summarise the current understanding of each local area scheme, including a description of the key scheme components. All of the schemes are still draft, though some are more advanced (e.g. Tay Street Drain pump station) than others. Greater confidence in the designs and vulnerability assessment is required before finalising the schemes. Technical and operational review is also necessary.

3.1 Lower Avon

The Lower Avon catchment had no vulnerable properties outside the RRZ and therefore did not meet the criteria for local area scheme assessment.

Phase 1 recommended maintenance options for the Avondale area. These are covered under existing maintenance contracts and reported on in Section 5. Knights Drain regrading is outside of the existing maintenance contract, but will be put forward for a maintenance task order as explained in Section 5.

3.2 Dudley / Flockton

A local area scheme has been developed for the Dudley catchment, as well as identification of maintenance works.

A technical feasibility investigation for the Tay Street Drain pump station has been completed. The pump station is designed to remove water from Mairehau Drain and Tay Street Drain. Other measures which are more focused on improving conveyance through the system have also been developed further.

Channel improvements are well underway with site works having commenced during the first phase. As part of the improvements, the channel is being enlarged through widening, silt removal and vegetation clearance. Vegetation clearance particularly tree removal is being completed with due arborist consultation.

Other measures to improve conveyance have also been progressed and further investigations of potential bridge removals or temporary replacements have been completed. This confirms where

there are constraints in the network and how they can be addressed. Planning and investigations for these measures is underway.

There may be some residual houses in the Dudley Creek catchment which need individual house defence measures. Site investigations have begun to better understand the feasibility of the proposals.



Figure 5 Maintenance works on Dudley Creek to increase channel capacity

DC-AS-01 Dudley Creek Area Scheme 1

Dudley Creek Area Scheme 1 comprises a package of works that span across St Albans and Richmond. It is intended that the works are implemented in conjunction with each other and whilst they are each considered to be complementary there may also be interdependencies.

Pumping from Tay Street Drain North to Dudley Diversion

Description: Installation of a pump station to divert flow from the Tay Street Drain upstream of the confluence with Dudley Creek and the diversion of flows to the Dudley Creek Diversion. This will result in a partial beheading of the catchment leading to reduced flood flows being discharged into the downstream network. The pump station will reduce frequent flooding, the flood extents during the 1 in 10 year flood will be reduced as will residual flooding depths.

Confidence level: High - The extraction of 1.5 - 2 cumecs from the system will reduce but not prevent flooding. The feasibility of pumping to the Dudley Diversion has been assessed and it is considered viable, the diversion of flows will require a change in the operating regime of PS219 and the Cranford Basin which will require further refinement.

Design Stage Feasibility

Dudley Creek Channel Improvements and Constraint Removal

Description: Minor channel widening, lowering and vegetation clearance through the lower Dudley Creek between North Parade and Banks Avenue, with additional localised widening upstream. Silt removal between Hills Road and North Parade. These works will increase the sectional area of the channel and will improve conveyance, beyond what is considered the existing maintained capacity of the channel.

The channel works will ease conveyance through the channel and provide area wide improvements benefitting the entire Dudley Creek catchment. The effects, whilst real are not readily quantifiable without hydraulic modelling.

DC-AS-01 Dudley Creek Area Scheme 1

Dudley Creek Area Scheme 1 comprises a package of works that span across St Albans and Richmond. It is intended that the works are implemented in conjunction with each other and whilst they are each considered to be complementary there may also be interdependencies.

Confidence level: High - A good knowledge of the hydraulics is established for Dudley Creek and its tributaries.
Design Stage Implementation

Chancellor Street Culvert and Guild Street Footbridge Removal

Description: Removal of the Chancellor Street culvert and Guild Street footbridge which are constraints on conveyance
Confidence level: High - culverts are undersized and have been observed on site during flood conditions to obstruct flow and affect the conveyance.
Design Stage Concept

Flockton Invert Backflow Prevention

Description: Installation of backflow prevention on the Flockton Invert drain to prevent flows from Dudley Creek backflowing through the system.
The installation of backflow prevention will enable the Flockton drain to remain functional for longer during the start of flood events until the Dudley Creek becomes overwhelmed.
Confidence level: High - A good knowledge of the hydraulics is established for Dudley Creek and its tributaries.
Design Stage Concept

Street Protection Pumping

Description: Pumping to discharge ponded rainfall on Harrison Street, Thornton Street, Carrick Street and Speights Street to Mairehau drain.
This pumping will mitigate local drainage from the time the Flockton invert can no longer convey stormwater (once back flow prevention is installed) to the point where Mairehau drain can no longer receive flows because of the risk of overtopping. Once this occurs the pumps will need to be deactivated. Mairehau drain is considered to overtop during a 1 in 10 AEP year event.
Benefits only applicable prior to the overtopping of Mairehau drain.
Confidence level: High - A good knowledge of the hydraulics is established for Dudley Creek and its tributaries.
Design Stage Concept

Westminster Drain Backflow Prevention

Description: Installation of localised backflow prevention on local drains connecting to Westminster Drain directly upstream of the Mairehau Drain confluence
The flood mechanisms associated with the local drainage network reported to exacerbate flooding at 2 properties will be at managed. Alternative flood name
Confidence level: Medium - Local flood mechanism has not been observed firsthand. Proposals based on property owner feedback.
Design Stage Concept

Bridge Removal and Replacement

Description: Demolition and temporary replacement of 2 private access bridges. The bridges are in a very poor condition, currently obstruct flow and if failed could form significant obstructions in the channel leading to significantly increased flood risk.
Confidence level: High - Existing bridges constrict the channel and there is high risk of the bridge failing and causing blockage, replacement would reduce risk.
Design Stage Concept

Boost pumping at 2 culverts between Stapletons Road and North Parade

Description: Installation of a boost pumping equipment to increase conveyance through existing culverts. Boost pumps provide a jet of water that
Catchment-wide benefits, improves conveyance through the network
Confidence level: Medium - hydraulic principles have a high degree of certainty, site testing is required to validate theory
Design Stage Concept

DC-AS-01 Dudley Creek Area Scheme 1

Dudley Creek Area Scheme 1 comprises a package of works that span across St Albans and Richmond. It is intended that the works are implemented in conjunction with each other and whilst they are each considered to be complementary there may also be interdependencies.

House Bunding

Description: Installation of raised defences (bunding) along properties along Stapletons Road to defend against flooding
Raised defences could prevent flooding to 2 properties.

Confidence level: Medium - Functional but potentially difficult to implement and achieve necessary flood protection

Design Stage Concept

3.3 Lower Heathcote

Public meetings have been held to discuss the flooding issues and Phase 1 recommendations for the Lower Heathcote. Recommendations are being progressed and the river is currently being hydraulically modelled to further assess Phase 1 schemes. The recommended local area schemes typically consist of bunding and temporary pumping

Bund heights will be finalised from the model outputs with effects of the bunding on adjacent properties. Maintenance options identified for the Bells Creek area are being undertaken as part of the maintenance contracts with silt removal being proposed in the report. Site visits for the local area solutions are to progress next week.

Dredging is reported on separately in Section 8.1.



Figure 6 Upper Bells Creek – scope to increase channel capacity

Lower Heathcote Area Schemes

Lower Heathcote Schemes are a series of temporary bunds along the Heathcote River. The bunds involve creating a long term temporary stopbank along the river with temporary measures. The area scheme numbers are not continuous as some schemes have not progressed to this stage of design.

LH-AS-01	Lower Heathcote Area Scheme 1 - Richardson Terrace
<i>Description:</i>	Installation of a temporary stopbank on the Heathcote River including traffic management and localised bunding from 156 Richardson Terrace to Ferry Road.
<i>Confidence level:</i>	Medium- Hydraulic modelling is currently being undertaken to assess the height of bunding required for the areas. Modelling is also to assess the effect of bunding on neighbouring properties.
<i>Design Stage</i>	Concept
LH-AS-2	Lower Heathcote Scheme 2 - Clarendon Terrace
<i>Description:</i>	Installation of a temporary stopbank on the Heathcote River including traffic management and localised bunding from 33 Clarendon Tce to Radley Street.
<i>Confidence level:</i>	Medium- Hydraulic modelling is currently being undertaken to assess the height of bunding required for the areas. Modelling is also to assess the effect of bunding on neighbouring properties.
<i>Design Stage</i>	Concept
LH-AS-4	Lower Heathcote Scheme 4 – Clarendon Terrace
<i>Description:</i>	Installation of a temporary stopbank on the Heathcote River including traffic management and localised bunding from 131 Clarendon Tce to Grange Street.
<i>Confidence level:</i>	Medium- Hydraulic modelling is currently being undertaken to assess the height of bunding required for the areas. Modelling is also to assess the effect of bunding on neighbouring properties.
<i>Design Stage</i>	Concept
LH-AS-5	Lower Heathcote Scheme 5 - Richardson Terrace
<i>Description:</i>	Installation of a temporary stopbank on the Heathcote River including traffic management and localised bunding from 168 – 188 Richardson Terrace.
<i>Confidence level:</i>	Medium- Hydraulic modelling is currently being undertaken to assess the height of bunding required for the areas. Modelling is also to assess the effect of bunding on neighbouring properties.
<i>Design Stage</i>	Concept
LH-AS-7	Lower Heathcote Scheme 6 – Ford Road
<i>Description:</i>	Installation of a temporary stopbank on the Heathcote River including traffic management and localised bunding from 150a Ford Road to Opawa School.
<i>Confidence level:</i>	Medium- Hydraulic modelling is currently being undertaken to assess the height of bunding required for the areas. Modelling is also to assess the effect of bunding on neighbouring properties.
<i>Design Stage</i>	Concept
LH-AS-8	Lower Heathcote Scheme 7 - Fifield Terrace
<i>Description:</i>	Installation of a temporary stopbank on the Heathcote River including traffic management and localised bunding from 257 Fifield Terrace to end of Cul-de-sac - .
<i>Confidence level:</i>	Medium- Hydraulic modelling is currently being undertaken to assess the height of bunding required for the areas. Modelling is also to assess the effect of bunding on neighbouring properties.
<i>Design Stage</i>	Concept
LH-AS-9	Lower Heathcote Scheme 8 – Riverlaw Terrace
<i>Description:</i>	Installation of a temporary stopbank on the Heathcote River including traffic management and localised bunding from 258 Riverlaw Tce to Derrett Place.
<i>Confidence level:</i>	Medium- Hydraulic modelling is currently being undertaken to assess the height of bunding required for the areas. Modelling is also to assess the effect of bunding on neighbouring properties.
<i>Design Stage</i>	Concept
LH-AS-10	Lower Heathcote Scheme 9 – Derrett Place
<i>Description:</i>	Installation of a temporary stopbank on the Heathcote River including traffic management and localised bunding from Derrett Place to 9 Esher Place.
<i>Confidence level:</i>	Medium- Hydraulic modelling is currently being undertaken to assess the height of bunding required for the areas. Modelling is also to assess the effect of bunding on neighbouring properties.

Lower Heathcote Area Schemes

Lower Heathcote Schemes are a series of temporary bunds along the Heathcote River. The bunds involve creating a long term temporary stopbank along the river with temporary measures. The area scheme numbers are not continuous as some schemes have not progressed to this stage of design.

Design Stage Concept

LH-AS-11 Lower Heathcote Scheme 11 – Riverlaw Terrace

Description: Installation of a temporary stopbank on the Heathcote River including traffic management and localised bunding from 18 Riverlaw Terrace to Waltham Road & 23-31 Eastern Terrace.

Confidence level: Medium- Hydraulic modelling is currently being undertaken to assess the height of bunding required for the areas. Modelling is also to assess the effect of bunding on neighbouring properties.

Design Stage Concept

LH-AS-12 Lower Heathcote Scheme 12 – Beckenham Loop

Description: Installation of a temporary stopbank on the Heathcote River including traffic management and localised bunding around Beckenham Loop/Waimea/Hunter/Eastern Terrace.

Confidence level: Medium- Hydraulic modelling is currently being undertaken to assess the height of bunding required for the areas. Modelling is also to assess the effect of bunding on neighbouring properties.

Design Stage Concept

3.4 Upper Heathcote

Temporary flood defence measures have been identified for the Upper Heathcote area that comprises a local area scheme that will benefit the general area around Weir Place.

Within Upper Heathcote catchment the phase 1 taskforce identified no Vulnerability Level 1 and five Vulnerability Level 2 properties.

There have been further reports of properties in outside of the phase 1 area through calls-ins from the public that are yet to be validated.

The public meeting held on the 27th May enabled confirmation of the flooding experienced at the head of Weir Place and identified that there may be an issue with the outfall pipe draining this area.

Upper Heathcote Area Scheme

A localised bund forming a stopbank

UH-AS-01 Upper Heathcote Area Scheme 1 – Weir Place

Description: Bunding and capacity enhancement. Construct bund through 13, 15 and 17 Weir Place between high ground of neighbouring properties.

Confidence level: Medium- Hydraulic modelling is currently being undertaken to assess the height of bunding required for the areas. Modelling is also to assess the effect of bunding on neighbouring properties.

Design Stage Feasibility

3.5 Heathcote Valley

The Heathcote Valley catchment identified one Vulnerability Level 1 and eleven Vulnerability Level 2 properties.

Phase 1 recommended maintenance works to ensure that critical inlet and outlet sites to be inspected. This has been carried out and it has been confirmed that these sites are inspected prior, during and after each storm event. The piped network in Martindales Road has been cleaned of silt as well.

Removal of silt from the timbered section of Bridle Path Drain along the west side of the railway embankment over a length of 300m has been completed to increase the capacity of this section of the network. Cut off channels have been put in place on the former Maltworks site to divert site flow into the open water channel on this site.

The contract for the diversion of flow to the east side of the railway embankment has been let which will be completed in 2 – 3 months.

HV-AS-01 Heathcote Valley Area Scheme 1

A combination of in channel works and works within the road corridor.

Tunnel Road

Description: Placing sand bags along kerb and channel at 15 m intervals to trap sediment before entering pipe network.

Confidence level: High

Design Stage Feasibility

Trusscots Road Timbering

Description: Raise height of timbering on carriageway side of existing timbered drain and bund adjacent to contain water within timbered drain to a point downstream of Deavoll Lane

Confidence level: High

Design Stage Detailed

Trusscots Road - High Level By-pass

Description: Construct two high level by-pass areas on Trusscots Road to allow water to flow across the carriageway and berms from the timbered drain to the branch of the Mutuku Waterway.

Confidence level: High

Design Stage Detailed

Pawaho and Stedley Place

Description: Raise height of timbering on property side of timbered drain from Martindales Road for 300 m downstream to towards DN1200 brick barrel culvert. This to stop water overtopping the drain and flowing on to adjacent properties.

Confidence level: High

Design Stage Detailed

HV-AS-02 Heathcote Valley Area Scheme 2

A short bund forming an elevated section of road.

Marsden Road - Bridle Path Road Intersection

Description: Bunding across end of Marsden Road at the Bridle Path Road intersection

Confidence level:

Design Stage Feasibility/detailed

3.6 Lyttelton

The issues identified in Lyttelton in the Phase 1 report were recognised as being different from those in the flatland areas. As such it was resolved at the 12 May 2014 Council meeting to “Urgently review criteria for assessing flood risk and land movement in Lyttelton to improve the analysis of vulnerability and strategic infrastructure”.

Meetings have been held between the Taskforce and geotechnical engineers to better understand the scope of the problem and the issues involved. A separate Project Charter is currently being written to progress this project.

3.7 Little River

A public meeting was held at Little River on 21 May to discuss the causes of flooding in the area. The primary cause appears to be lack of maintenance of the waterways, including clearing of vegetation such as willow trees. The Wairewa Pa Road bridge also restricts flow.

The primary responsibility for maintaining waterways in this area is Environment Canterbury's (ECan) and private landowners. As such the matter has been referred to the joint Council and ECan Stormwater Management Working Party (SWiM) for further.

The flooding cannot be attributed to earthquake effects either.

Due to the considerations above it is considered outside of the scope of the Taskforce at present.

3.8 Southshore

No Vulnerability Level 1 properties and only one Vulnerability Level 2 property identified in Phase 1 report but a number of issues outside the immediate scope of the taskforce were identified. Those include:

- Owles Terrace and Hardy Street Area – blocked and damaged outfalls that will be repaired by SCIRT project being undertaken by Fulton Hogan. Fulton Hogan will manage flooding risk during construction.
- Kibblewhite Street, Falcon Street, Blake Street Bridge Street – blocked and damaged outfalls that will be repaired by SCIRT project being undertaken by Fulton Hogan. The area will remain vulnerable until the new storage basin and pump station are installed in 2015. SCIRT have agreed to changing scope so Fulton Hogan will have pumps on hand manage flooding risk until the new pump station is installed.

Ebbtides Street, Caspian Street Estuary Road - ineffective, broken, blocked off, damaged flap gates and pipes, stop bank and path severely damaged. - Risk Potential breach to existing stop bank effecting homes and access in the vicinity. Ingress of sea water into the waste water reticulation system at the top of estuary road which connects directly to PS37. Also risk where red zone demolition work removing buildings/structures or altering ground contours that would have acted as natural barrier to tidal flooding. Stop bank improvements could be added to SCIRT projects in vicinity. Need to liaise with CERA to ensure that demolition work does not result in increased risk.

3.9 Sumner

For the Vulnerability Level 2 property at Wakefield Ave in Sumner, maintenance and clearing of silt from the adjacent open drains is planned to commence in the coming weeks. Increasing capacity of the road drainage sumps and pipes is being investigated as part of the task force work along with raising of the settled bridge at the end of Van Asch St. Another contributing factor to flooding in the Wakefield Ave/Paisley St area is runoff and silt from the red zone and diversion of runoff caused by the placement of shipping containers on Wakefield Ave. Options for managing this runoff have been identified and will be followed up with CERA.

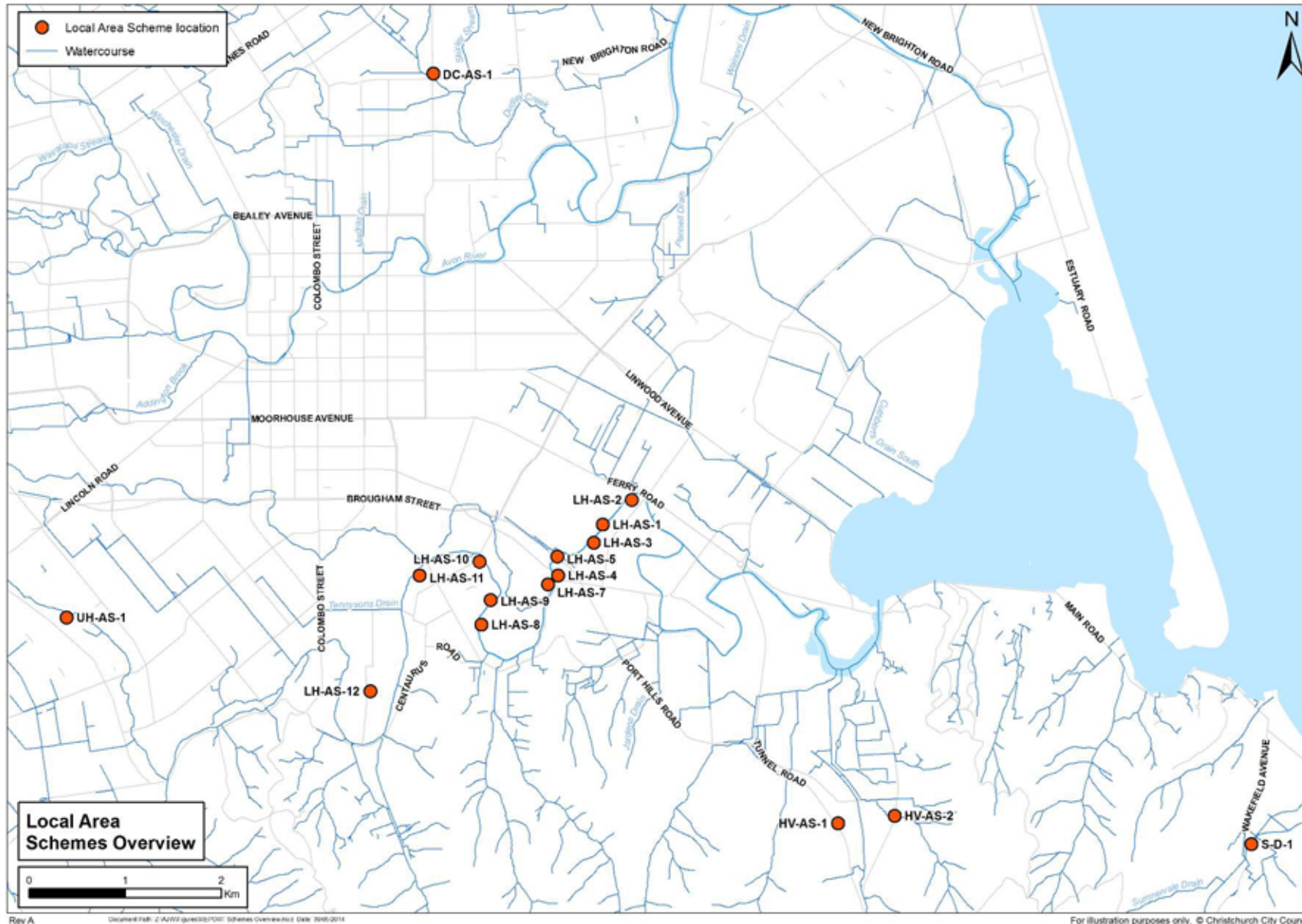


Figure 7 Location of potential local area schemes (capital works schemes only)

4 Progress on temporary flood defence measures

4.1 House defence

House defence (property level protection) measures that were developed during phase 1 were based on assumptions around foundation and cladding type. During phase two, development of more detailed specifications for 12 house / foundation combinations has allowed the taskforce to refine costs estimates in addition to providing more clarity of lead in time and the supply chain. The property level protection schemes have been developed in conjunction with the catchment schemes so that the taskforce is not providing 'over' protection. If a catchment scheme is shown to alleviate flooding in a particular area, that area will not receive property level protection. House raising options are continuing to be explored as well.

4.2 Bridging

Taskforce engineers completed site specific investigations of the private and council owned bridges identified in Phase 1 of the Taskforce work which restricted the discharge of storm water. These investigations identified two Council structures and six privately owned bridges that require immediate work to mitigate their impact on the Dudley Creek watercourse, two Council structures on the Cross/Wairapa Drains and one structure at Little River. The remedial work required and the concept solutions identified are in addition to any works included in the SCIRT programme of works. Cost estimates for the remedial works and concept solutions are being developed together with a programme for implementation.

4.3 Dredging of major waterways

Work has continued evaluating the feasibility of dredging. Vulnerability Level 1, 2 and 3 properties within the Lower Heathcote River may benefit from dredging. The Lower Avon River was not considered in detail as no Vulnerability Level 1 or 2 properties were identified in this area. Other watercourses have not been considered applicable for this study.

At the beginning of May modelling was undertaken to determine the effect dredging of the Lower Heathcote from Colombo Street to the Woolston Cut. This was based on dredging these reaches to 1990 river channel levels and modelled using the March event. The Taskforce reviewed this data which showed some reduction in flood level could occur but was not conclusive in how many properties would benefit. Therefore to better understand the effect of dredging on vulnerable properties the Taskforce Phase 2 engineers decided to undertake further modelling. Council data on river sections from 1990 and 2011 were compared and concluded that the river channel has changed substantially between Aynsley Terrace and the Heathcote Tow Path with an increase in sedimentation and bed heave by an estimated 130,000 m³. This change in river profile may be contributing to capacity and flow issues. Modelling of this section at dredged 1990 bed profiles is currently being undertaken and run for the March 2014 event and the Easter 2014 flood event. This modelling is expected to be completed by Friday 30th May. This data will then be assessed by comparing flood extent post dredging with known flood events exhibited in these events. To facilitate this, surveys of Finished Floor Levels (FFL) of Level 1 and 2 properties has been undertaken by the Council survey team. This will allow the number of properties that would benefit from this technique to be quantified.

Cost estimates for dredging of the Lower Heathcote River between Aynsley Terrace and Woolston Cut have been undertaken, as well as estimates for pilot study areas between Radley Street and Catherine Street and also just the Woolston Cut area.

In addition to the above tasks the Taskforce has undertaken some consultation with other local authorities and some dredging contractors to obtain information on dredging techniques and practical experiences. Taskforce engineers attended the Upper and Lower Heathcote Community meeting on Tuesday 27th May and explained the work to date on the feasibility of dredging and answered questions by the public on specific dredging issues and concerns.

At this stage it is not possible to comment on whether dredging will reduce the flood extent or not, and this is the next phase of the work.

5 Progress on maintenance

A number of immediate and ongoing maintenance activities were identified in Phase 1. The recommendations were not validated against existing maintenance programmes and operations staff experience. This validation is being progressed in Phase 2. A Taskforce team member has been allocated the task of operations team liaison. A summary of the Phase 1 recommendations, operation team response and future work are provided in Appendix B.

Where identified maintenance activities fall within existing contractual arrangements, task orders will be generated and delivered utilising standard maintenance procedures. Areas where maintenance activities have already been initiated are: Sumner Main Drain, Heathcote Valley pipe work and flap gates, and Dudley Creek.



Figure 8 Maintenance works on Dudley Creek to increase channel capacity

6 Liaison with other agencies

Liaison with other agencies had been ongoing in the second phase taskforce. Those agencies include: EQC, CERA, CDHB and ECan.

6.1 EQC

EQC are currently very active in communicating their methodology of assessing increased flood vulnerability (IFV) and their ongoing process for resolving claims. The taskforce engaged with EQC policy staff and hydraulic modelling advisors on the issues of IFV, messaging / communications and the nature of the taskforce flood defence measures. EQC technical advisors also began considering the technical work supporting Dudley Creek Feasibility Options

6.2 CERA

CERA policy staff engaged with the taskforce. They provided advice on mechanisms for land purchase and previous funding approaches. The taskforce provided information about proposed flood defence measures.

6.3 CDHB

Engagement with CDHB has canvassed potential health issues resulting from flooding. Discussions with CDHB are ongoing.

6.4 ECan

Engagement with ECan is planned for the coming weeks on the subjects of dredging, consenting and mechanisms for land use changes.

6.5 Insurance Council

The Insurance Council has been contacted, and engagement is planned in the coming weeks to ensure that they are aware of the work of the Taskforce.

7 Programme of actions and costs

7.1 Methodology

Phase 1 of the Taskforce identified a number of local area schemes to provide temporary flood defence measures for affected properties within the study areas. Due to the short timeframe available for Phase 1 it was recognised that further work was required to better define the costs and implementation programme.

Phase 2 of the Taskforce began by reviewing each local area scheme to confirm that the local area scheme fit within the flood mitigation measure selection process developed in Phase 1 (included in Appendix A). Effectively the flood mitigation measure selection process focused on identifying schemes that fell within Vulnerability Levels 1 and 2 (and Level 3 properties were addressed incidentally only).

The costs of each scheme were then standardised and a potential implementation programme constructed.

7.2 Programme

The high level programme is shown in Figure 9 below. This is **preliminary only** and needs further analysis to confirm available resources and prioritisation of projects.

**Mayoral Flooding Taskforce - Programme and Implementation Timeframe:
Draft for Approval 31st May 2014**

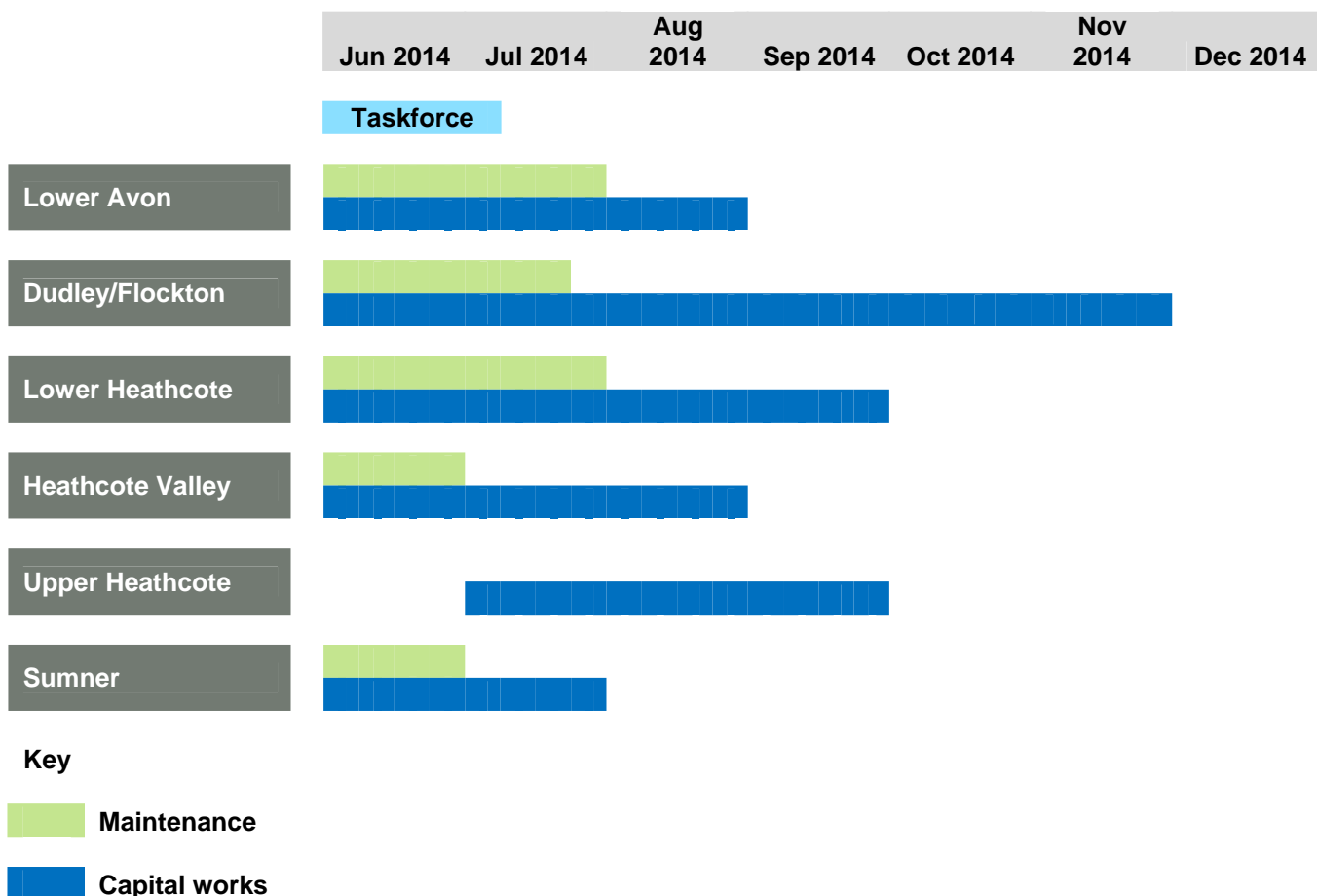


Figure 9 Preliminary implementation programme

7.3 Costs

The total cost estimated for the physical works to protect Level 1 and Level 2 houses within the six priority areas is currently \$16M CAPEX (+/-30%) and \$1.5M OPEX (+/-30%) (\$17.5M total +/-30%). At present the confidence level in these costs has not been established as the verification process is only partially complete.

The Phase 1 report indicated a total cost of \$20.4M +/- 30%. However, that total included Lyttelton, Little River and removing these items reduces the total to \$17.5M, or the same as the current Phase 2 figure.

Key assumptions in developing the Phase 2 total cost estimate include:

- Properties that are not serviced by a local area scheme can be tanked / wrapped, except for 10 houses in the Dudley area scheme. This may be un-conservative as these properties may be uninhabitable and therefore not be suitable for tanking. The more conservative approach would be to include the cost of purchasing the properties (as is done for Dudley/Flockton)
- Dependencies and resourcing have not yet been investigated so the programme forecast assumes that the works are delivered concurrently
- The CAPEX/OPEX split has not been verified

There are additional assumptions relevant to each local area scheme.

There are also a number of exclusions in developing the cost estimate. No costs have been included for:

- Little River (identified in the Phase 1 report as having \$235,000 of works)
- Lyttelton (identified in the Phase 1 report as having \$2.7M of works)
- Southshore (no cost assigned in Phase 1 or Phase 2)
- Maintenance already programmed (e.g. under existing maintenance contracts)
- Dredging is not included in the cost estimate. The current cost estimates put the cost of dredging in excess of \$18M.
- Any newly identified houses and associated flood defences
- Modification to the wastewater network for Phase 1 recommendations

These need to be quantified and added to the total cost estimate when more data is available.

8 Further work

The taskforce plans to further work in a number of areas, including: dredging, wastewater, house protection, bridging, Lyttelton, feasibility, finalising the Phase 1 report and liaison with other agencies.

8.1 Dredging

Following receipt of the hydraulic model results an assessment will be made against recently captured floor levels for Level 1 and Level 2 properties. The number of properties that will benefit by dredging will be quantified.

Options for utilising the dredged material for contained bunds (silt bags) as temporary stopbanks will be considered. This may limit the quantity of material going to waste.

8.2 Wastewater

Phase 1 of the flood taskforce identified options which could reduce wastewater contamination of floodwaters. Several options were investigated with three options recommended. Three preferred options were:

- Reduce floodwater inflows into the wastewater network through installation of removable non return valves on gully traps at property level and seal vented manholes in the worst flood hit areas
- Reduce visible wastewater solids in floodwaters through the installation of baffle plates and inverted siphons at wastewater overflows
- Until longer term solutions are in place, council should consider offering flooding clean-up / decontamination of properties facing large insurance excesses.

Further work is being undertaken to determine how to progress the recommended options and how these will be funded. A meeting with key decision makers and stakeholders has been set up for 6 June. This meeting will allow the next steps in the decision making process to be determined, in particular when and how the identified options will be implemented.

8.3 House protection

To fully test the proposed solution in the field before it is implemented the Taskforce proposes a trial house tanking. It has identified a pilot site in the Residential Red Zone. Pending CERA approval (negotiations are well advanced) it is proposed to 'wrap' the house and then build a moat around it using bunding technology. The moat will then be flooded to test the tanking. This serves several purposes:

- To showcase a fully functional wrapped house. Given that the technology is new to NZ, it will give the public an opportunity to understand the finished product allowing a more informed decision when debating the final solutions.
- To showcase the latest bunding technologies that can be applied to catchment level solutions.
- To test the performance of the technology in NZ conditions
- To provide an opportunity for publicity

After the pilot study has been implemented, the results will be used to further refine the design to ensure correct technology / construction type combinations are applied in the field. In addition, given the interest in the approach, the data will be shared nationally.

The house defence designs have been developed to concept stage. Detailed surveys of each property will be required before works commence so that any property specific issues can be addressed to provide a water tight solution. These include but are not limited to:

- Heat pump units located at ground level
- Cable entry points
- Decking and Patio locations
- Landscaping to property frontage

8.4 Bridging

The bridging team will be researching existing legislation and requirements for necessary consents under the RMA and the Building Act in relation to the removal or replacement of the privately owned structures; the Council's powers under the Land Drainage Act and the Christchurch District Drainage Act; and Council's policy on structures on roads or within the Special Road Reserve.

8.5 Lyttelton

A separate project charter is being written for Lyttelton. This will involve geotechnical engineers working with drainage engineers to determine

8.6 Local area scheme feasibility

The feasibility of each local area scheme will be assessed over the coming weeks. This will involve field verification of extent and identification of any constraints, as well as incorporation of any newly identified vulnerable houses adjacent to identified local area schemes.

8.7 Items outside of Taskforce scope

There are a few items that the Taskforce have identified would reduce flood risk which fall outside of the scope of the Taskforce, existing maintenance contracts or long-term projects.

These items could be collated and a strategy worked out to pass these to the appropriate agencies.

8.8 Finalising Phase 1 Technical Report

The Phase 1 Technical Report was issued as a final draft. It is currently being reviewed by senior Council engineers, policy and legal staff.

Once this review is completed then the report will need to be finalised and re-issued. It is not intended to update the numbers in this report to reflect the updated data as it is considered that this would best be done through an addendum update.

8.9 Liaison with other agencies

Ongoing liaison will be required across a number of agencies. Particular issues that need to be progressed are:

- Communication and messaging on the different assessment methods and responsibilities of EQC (increased flood vulnerability) and Council (vulnerability levels)
- Identification of potential funding mechanisms (EQC and CERA)
- Potential mechanisms for existing land use change (permanent buy-out) with ECan and CERA

8.10 Delivery of physical works

The project lifecycle which is normally one of:

- Initiate
- Investigate
- Design
- Build
- Commission

The decision processes on progressing local area schemes through the project lifecycle need to be worked through at the Programme Control Group level. Issues of funding, detailed design and delivery resourcing all need further consideration.

Appendix A Decision Making Framework

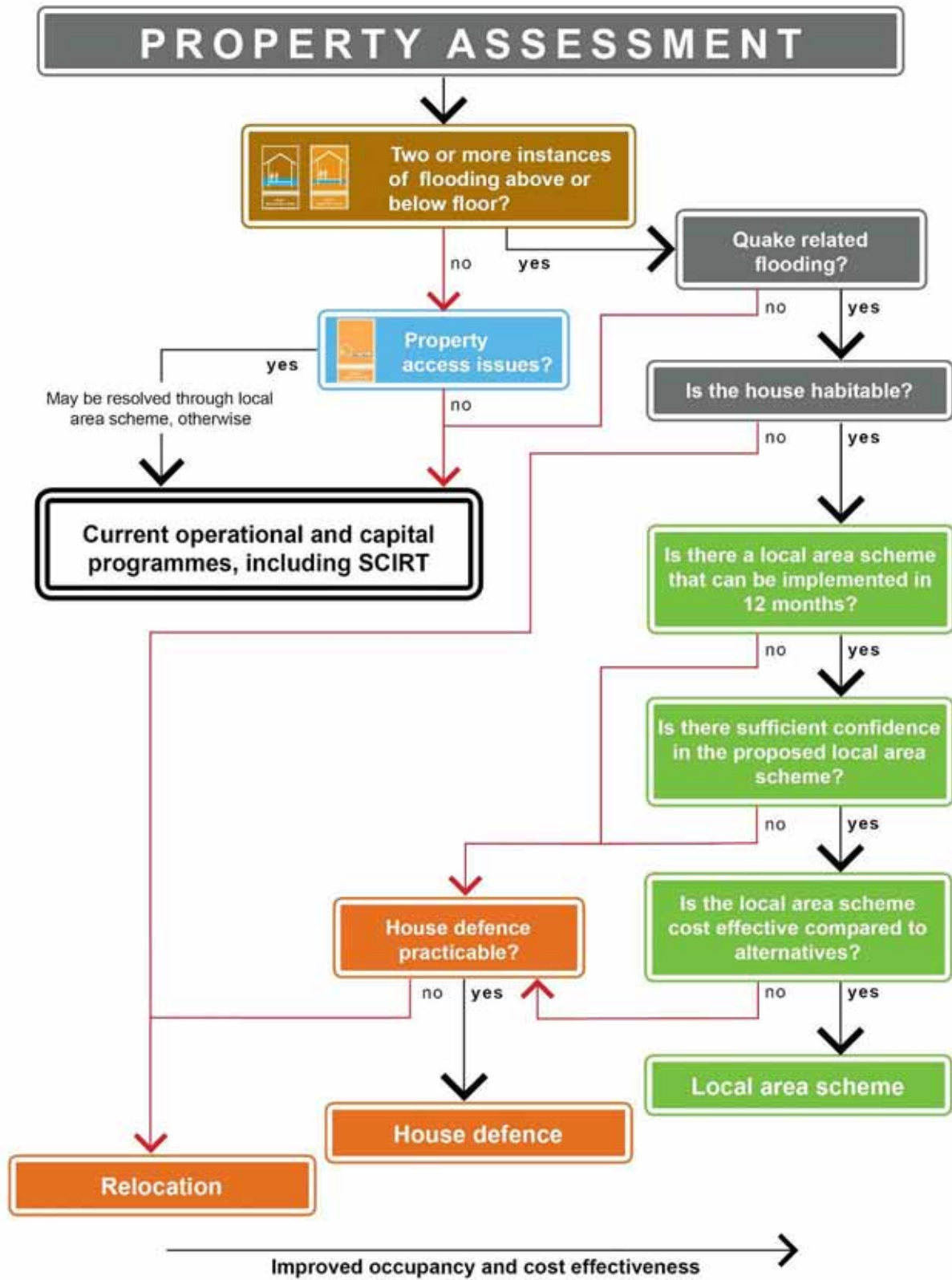


Figure 10 Flood mitigation measure selection process

Appendix B Progress on Maintenance

Location	Phase 1 Maintenance Recommendation	Operations Team Response	Progress and future work
Lower Avon: river stopbanks	Ongoing monitoring and maintenance of the emergency stopbanks is required. They need to be regularly surveyed and topped up as identified by the survey. In particular, the Owles Terrace boat ramp is a gap in the network which requires filling. This could be temporarily sand bagged before an event or bunded at a gentle grade to allow use of the ramps by vehicles to be maintained.	There is an annual survey of stopbanks carried out, with the latest survey just completed. Any areas that require topping up are attended to immediately.	Continue current operational regime
Lower Avon: Avondale area	The existing flap gate at Pump Station 220 should be replaced. All flap gates long Avonside Drive and Hulverstone Drive should be checked, repaired or replaced as required.	Red Zone implications. Replace gate or install inline Wastop valve. Approx \$30 - \$50k. Needs further investigation. Flap gates are checked on a weekly or monthly cycle.	Need SCIRT to provide notification of which flap gates are now in service to update maintenance list. Investigate option of Installing a check valve in the DN300 line near Niven Street to stop backflow into low area of catchment.
Lower Avon: Brittans Drain area	Immediate removal of a large tree blocking Brittans Drain would relieve the foundation level flooding experienced. Clearance of all constrictions in Brittans Drain is recommended immediately and on a regular basis. Street and sump clearing is also a common customer request and would mitigate nuisance localised flooding. Current maintenance activities may therefore need to increase in frequency.	Clearance of constraints and vegetation is carried out 3 times a year with the invert cleared 12 times a year.	Identify where the tree is and put in task request to remove. City Streets maintenance contract covers sump cleaning. Confirmation of when network was last cleaned.
Lower Avon: Knights Drain area	Regrading of Knights Drain invert Repairs to the timber lined length of the drain Removal of trees and vegetation within the waterway	It has been identified as more than a maintenance activity. There are issues with access to enable repairs.	A review of how this site is to be managed needs to be undertaken.
Dudley Creek	Mairehau Drain – During site visits, the drain was observed to have some vegetation growth, so at a minimum this should be cleared. It is also not	Council has initiated the works along Dudley Creek and is making good progress	

Location	Phase 1 Maintenance Recommendation	Operations Team Response	Progress and future work
	<p>known what the design depth of the drain is, so it is suggested that the drain is dug to determine this and assess whether it should be further excavated.</p> <p>Lower Dudley Creek – A site walk over identified opportunities to enhance the capacity of the network through minor works and maintenance activities. Council has initiated this.</p>	<p>along identified sections that are owned by CCC. Access approval through private and Red Zone property is underway to enable the completion of these works.</p>	
<p>Lower Heathcote; riverside properties</p>	<p>Maintenance contracts may not yet be aligned with the increased numbers of outfalls found with recent survey work.</p> <p>Recommendations include the inspection and, regular maintenance of flapgates</p>	<p>Current valves work and valves are inspected weekly or monthly.</p>	<p>The number of valves noted during site inspection needs to be forwarded to City Care to ensure all valves are on the inspection list.</p>
<p>Lower Heathcote: Bells Creek catchment</p>	<p>Undertake inspections and maintenance of sumps and pipework in the area.</p> <p>Clear silt from drains to try and restore capacity.</p> <p>Monitor area post maintenance during rainfall and mobilise sand bags and pumps if needed.</p>	<p>Drain is cleared of constraints and slit 3 times a year.</p> <p>Long term options for Bells Creek are being looked at under the Land Drainage Recovery Program.</p>	<p>City Streets maintenance contract covers sump cleaning. Confirmation is required of when network was last cleaned.</p>
<p>Lytelton: stormwater drainage network</p>	<p>Monitor and clear important pipe entries during storms.</p> <p>Education of maintenance contractor and an operating protocol for Lyttelton inlets.</p> <p>In the longer term ensure vehicle access to all inlets. This will involve creating vehicle access across private property, on a hillside, to the Cressy St inlet</p> <p>Sufficient crews in Lyttelton to monitor and clear 8 grates</p>	<p>Each critical site is checked prior, during and at after storm event. Improvements to one inlet grill is underway.</p> <p>Maintenance work is currently outside of the Maintenance Contract and paid on dayworks rates. It is in the process of being included into the contract.</p>	
<p>Southshore</p>	<p>Emergency localised pumping solutions can be developed with the SCIRT Delivery Teams. These can be included within the Temporary Works program for the individual SCIRT Projects and managed through the ECI (Early Contractor Involvement)-SCIRT process.</p> <p>A maintenance contract is already in</p>	<p>Limited maintenance work is carried out until SCIRT area project is completed and handed over.</p> <p>Flap gates that can be located are inspected.</p> <p>Awaiting handover</p>	

Location	Phase 1 Maintenance Recommendation	Operations Team Response	Progress and future work
	<p>place between Christchurch City Council and City Care, a more robust process for repair, clearing and monitoring is required to ensure storm water outlets function properly.</p> <p>Local area solutions to investigate and address the stop bank issues in and around Ebbtide Street should be undertaken. There is a current risk of a breach should it fail. This is the one of two main links providing emergency access from South Shore to South New Brighton in the event of a tsunami or other natural disaster and is therefore an important evacuation route.</p> <p>A full survey is required along the foreshore to highlight any potential ingress points in the high tide situation.</p>	<p>data of in service flap gates.</p>	
<p>Sumner: Sumner Village</p>	<p>Removal of sediment from Sumner Stream/SMD and vegetation obstruction in Campbell Street culvert in conjunction with removal of private bridges to Red Zone properties crossing the Sumner Stream in Wakefield Street where feasible. Consultation with CERA is required regarding access bridges and proposed demolition timeframes to Red Zone properties on Wakefield Street.</p> <p>Notification to CERA for sediment control of Red Zone properties and monitoring of slope stability including sediment control fences around properties and removal of sediment in downstream sumps, kerb and channels</p> <p>Removal of sediment and debris from SFRP and SMD outfalls. Design review of Cave Rock, Burgess Street and SFRP outfalls in order to mitigate operational issues related to sand and marine deposits blocking these structures</p> <p>Develop and implement emergency response plan to ensure that key outfalls are able to operate effectively prior to a forecasted storm event. This requires comprehensive documentation of key outfalls and</p>	<p>Removal of vegetation and obstructions is underway along with sectional removal of sediment from drain invert. should be completed in approximately three weeks.</p> <p>This work is carried out 4 times a year.</p> <p>SFRP is clear of sediment. Has been clean twice since earthquakes.</p> <p>In place.</p>	<p>Discuss with CERA to determine how long term sediment controls are to be managed.</p> <p>Discussions on whether current Emergency Response Plans require amending along with documentation updates.</p>

Location	Phase 1 Maintenance Recommendation	Operations Team Response	Progress and future work
	inlets		
Sumner: Moncks Bay	<p>Removal of sediment and debris from stormwater pipes including the DN1200 and DN1350 on Main Road upstream of the Rifle Range Drain outfall and Beachville outfall where tidal inundation has caused silt deposits within these pipes</p> <p>Maintenance of Rifle Range Drain weir. Reforming of open drain upstream of Rifle Range Drain weir to increase the cross sectional area and prevent high level flooding from the drain migrating down Bay View Road</p> <p>Widening of the access point through the chain fence to allow vehicles/machines to enter into area to complete regular or emergency maintenance and cleaning of inlet structure,</p>	<p>Pipes are clear apart from a section in the Augusta Street system where there is some sediment deposited. Attempts by SCIRT to clean have been unsuccessful.</p> <p>Further investigation is required to determine suitable access points, bunding and secondary flow paths routes can be located.</p>	
Heathcote Valley	<p>Inspect and maintain clear entry to inlet structures and outlets at critical sites.</p> <p>Inspect DN675 along Martindales Road remove silt. Check pre and post events.</p>	<p>In place as part of Emergency Response Plan.</p> <p>Pipe has been cleaned. Needs to be checked after each storm event and cleaned as required.</p>	

EARTHQUAKE RECOVERY COMMITTEE OF THE WHOLE 5. 6. 2014

10. TAY STREET AND FLOCKTON DRAIN PUMP STATION

		Contact	Contact Details
Executive Leadership Team Member responsible:	(Acting) General Manager, City Infrastructure Group	N	
Officer responsible:	Unit Manager, Transport and Greenspace	N	
Author:	Mike Gillooly, Land Drainage Operations Manager	Y	Mike Gillooly, DDI 941 8179

1. PURPOSE AND ORIGIN OF REPORT

1.1 This report presents to the Committee a third option which has arisen as part of the task force investigation into flooding in the Flockton area. It delivers partial relief to the more regular flooding in this area and is based on a pumping station in the Tay Street Drain area to reduce flood risk in the Flockton Basin. This option is not a complete solution to flood risk although it will provide significant relief. It should be considered as early implementation of a permanent solution that will integrate with the two earlier options presented in March this year.

1.2 The Council resolutions of 27 March 2014 refer to the engineering options required.

Staff continue to finalise the cost estimates for each option, identify any funding issues and possible options to address these."

1.3 Further to that resolution 5.4.2 from the stage one task force report to the Council required staff to:

5.4.2 provide a recommended programme of actions and costs to implement urgent solutions in each catchment: (a) noting that this should include a temporary pumping solution in Flockton, the repair of flap gates in the Avon and Heathcote rivers, the dredging of the Heathcote River and the removal of debris and improved maintenance regime.

1.4 This report satisfies in part those two resolutions.

2. EXECUTIVE SUMMARY

2.1 One of the Mayoral Flood Taskforce objectives was to identify ways of achieving a rapid reduction of flood risk in Flockton.

2.2 Tay Street Drain pump station was identified in Phase 1 of the Taskforce as an option which significantly contributes to that objective. Following the presentation of the Phase 1 report, the Taskforce continued to assess the feasibility of the pump station.

2.3 Feasibility was confirmed and it was found that the pump station will reduce the number of floor levels flooded in the more frequent events such as the August 2012, June 2013 and April 2014 storms. However, it does not remove the risk of flooding entirely and there will still be floor levels flooded in similar events.

2.4 The following table summarises the change in floor levels at risk during an event with an average return interval of 10 years (similar to the storms listed above).

10 year ARI analysis	Number of floor levels at risk
Pre-earthquake	3
Post-earthquake	28
2000 l/s pump – pumping north to Dudley Diversion	9

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- 2.5 The project is estimated to cost \$4.35 million. Delays in implementation may result in increased costs.
- 2.6 The pump station is expected to become fully operational with a nominal two cubic metre per second (m^3/s) capacity within four months. Within two months approximately $0.5 \text{ m}^3/\text{s}$ pump capacity could be available in a temporary manner using rental skid-mount pumps.
- 2.7 With the pump station diverting two m^3/s from the catchment there will be an immediate reduction in the flood risk within the Dudley Creek catchment. It will also assist the long-term solution and may reduce the cost of this.
- 2.8 The pump station will also provide a strategic long term benefit as it integrates the Dudley Creek stormwater system with Cranford Basin enabling optimisation of the storage available there.
- 2.9 In terms of delivery, a fast-track approach can result in a quick reduction in flood risk.

3. BACKGROUND

- 3.1 The Taskforce started work on 1 May and the objective of Phase 1 of the Taskforce was to recommend potential short-term solutions to regular flooding exacerbated by damage from the earthquakes. These were reported to a special meeting of the Council on 12 May 2014.
- 3.2 The Phase 1 report detailed a package of measures that could assist the most vulnerable households in Christchurch cope in the short-term with the increase in regular flooding due to earthquake land damage.
- 3.3 Phase 2 of the Taskforce was begun through a series of Council Resolutions at an Extraordinary Council meeting on 12 May 2014. One of these resolutions (5.4.2) was to "provide a recommended programme of actions and costs to implement urgent solutions in each catchment: (a) noting that this should include a temporary pumping solution in Flockton...".
- 3.4 A feasibility report entitled "Tay Street Drain Pump Station Feasibility Report – Draft", 26 May 2014, was prepared by Jacobs SKM for Council to address that resolution.
- 3.5 This report summarises the proposal identified in the feasibility report.

4. PROPOSED PUMP STATION DETAILS

- 4.1 A pump station with approximately two m^3/s is proposed to be constructed adjacent the Mairehau Library. This will draw water from the Tay Street drain, the stormwater pipe coming from Philpotts Road and flows from the Mairehau drain fed from Westminster Street.
- 4.2 The proposed arrangement of the pump station and rising main is shown in Figure 1 on the following page.
- 4.3 Locating the pump station as shown reduces the length of rising main to a minimum, while still maintaining access to flood waters. The preferred arrangement for the rising main is to upgrade the 675 millimetre diameter running beneath the private property in Patrick Street, from the northern end of the Mairehau Drain to Patrick Street. This enables the pump station to be located in the Patrick Street cul-de-sac which provides good operational access. The alternate arrangement is to construct this in the road or road berm in Kensington Avenue. Both options will achieve similar capacity and benefit.
- 4.4 A new 900 millimetre rising main will be installed along Kensington Avenue, across Innes Road then along Philpotts Road and into the Dudley Diversion just north of Ranger Street.
- 4.5 The pump station is expected to become fully operational with a nominal $2.0 \text{ m}^3/\text{s}$ capacity within four months, with approximately $0.5 \text{ m}^3/\text{s}$ pump capacity available in a temporary manner using rental skid-mount pumps within two months.



Figure 1 Tay Street Drain Pump Station and Rising Main

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- 4.6 The pump station would operate once water levels in the Tay Street Drain or Mairehau Drain reach a pre-determined height, turning on at reduced capacity (say 1.0 m³/s) then increasing up to a maximum of two m³/s until water levels receded below trigger levels.
- 4.7 Monitoring within the Dudley Diversion would indicate if that system was approaching capacity and activate an operational response, initially slowing the Cranford Pump station pumps, then turning off one pump, then if required turning off two pumps. The Tay Street Drain pump station could also be slowed if required. The exact operational sequence would be developed during detailed design and commissioning, in conjunction with implementing increase remote observation of flows in the Dudley Creek and Dudley Diversion systems.
- 4.9 At times when the Cranford pump station is slowed or pumps turned off, flows will go to flood storage within the basin. This is the intended purpose of this area, however it will activate more frequently than at present. It is expected that over time, Council will investigate how to optimise performance and use of the flood storage capacity in the Cranford Basin.

5. **BENEFITS**

- 5.1 Removal of two m³/s from the Dudley Creek system has significant benefits. The majority of benefits are achieved in the Flockton area.
- 5.2 Figure 2 on the following page identifies the reduced flood extents and residual flooding depth resulting from the implementation of the Tay Street Drain pump station. The area indicated as yellow represents the reduced flood extents during a one in 10 average return interval event following commissioning of the pump station. Residual flooding and depths are also shown. It should be noted that these results are based on historic modelling of a pump station in an alternative location, however the resulting flood risk is considered to be comparable with the extents shown.
- 5.3 The reduction in houses vulnerable to flooding above floor level was determined by hydraulic modelling undertaken as part of the initial Flockton long-term options assessment report in November 2013. This identified the following change in floor levels at risk during an event with an average return interval of 10 years (similar in size to the August 2012, June 2013 and April 2014 storms):

10 year ARI analysis	Number of floor levels at risk
Pre-earthquake	3
Post-earthquake	28
2000 l/s pump – pumping north to Dudley Diversion	9

- 5.4 As noted above, the effect of the proposed Tay Street pump station has not been specifically modelled. However, it is anticipated that a similar level of improvement to that identified in the November 2013 Options Report will be achieved.
- 5.5 Note that the pump station will not return flood risk to pre-earthquake levels and a broader catchment project will still be required.
- 5.6 In addition to reducing flood extent and depth, pumping out of the catchment reduces the design flows required to pass through the catchment. The two m³/s removed from the Dudley Creek catchment is approximately 40 percent of the total capacity increase sought to restore flood risk to pre-earthquake levels. This reduces the scale of long term upgrade works required.

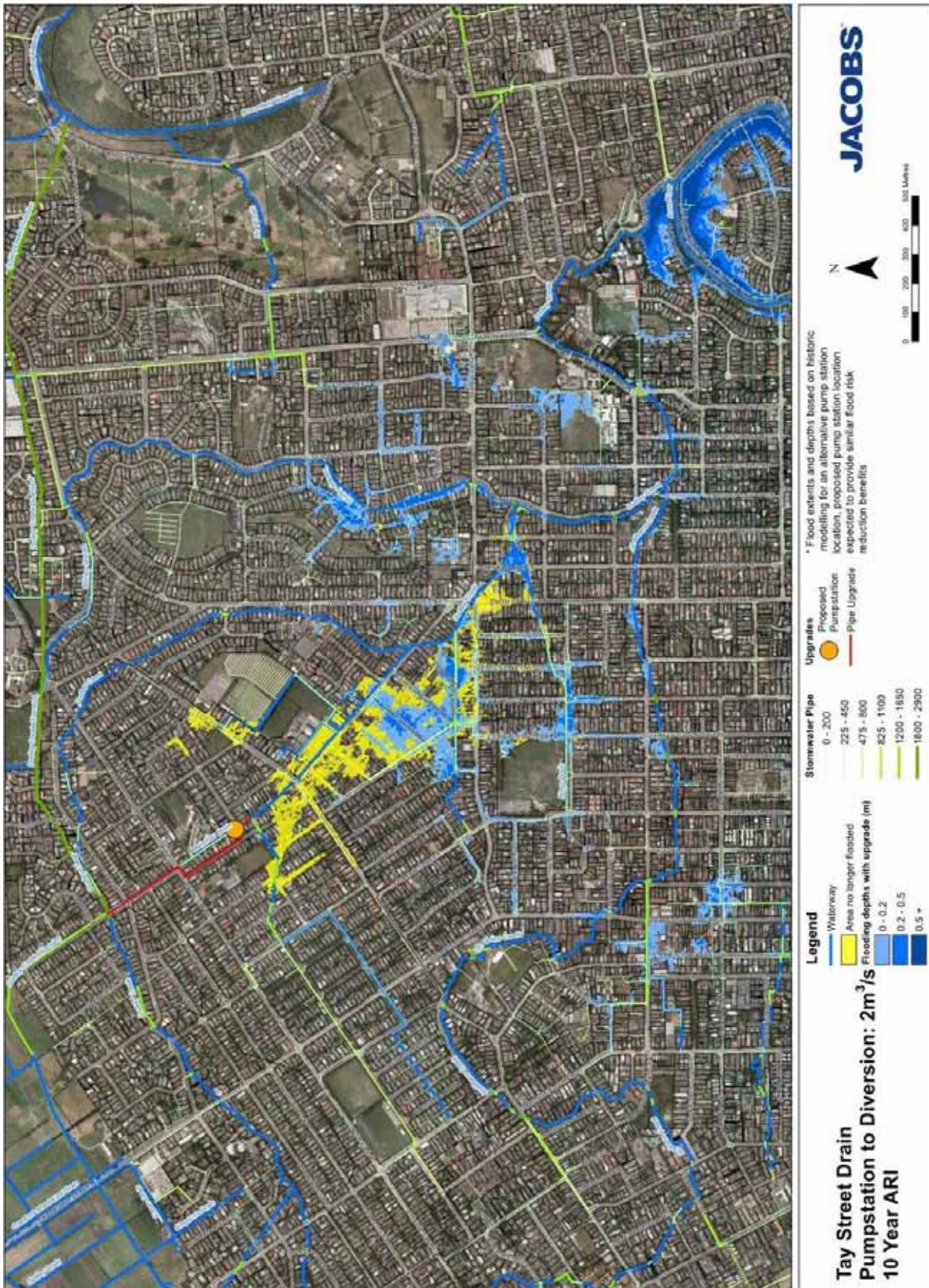


Figure 2 Area of benefit

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5.7 There are a number of factors influencing confidence including:

5.7.1 Hydraulic certainty – the hydraulic model developed as part of the broader Dudley Creek project has benefited from calibration of the various flood events that have occurred and the modelled outcomes therefore have a high level of confidence. The hydraulic model for the Dudley Diversion has a lower level of calibration and therefore certainty, however the range of operational controls and potential storage capacity within Cranford Basin give a high level of confidence that any adverse impacts can be managed.

5.7.2 Benefited properties – there is a high level of confidence that there will be a significant reduction in number of floors at risk of flooding, however predicting the exact number has less confidence due to variability in storms compared with modelled among other factors.

5.7.3 Technical feasibility – the assessment has been undertaken by experienced senior pump station and pipe designers, with input from City Care and benefitting from services pothole data, geotechnical testing near the pump station site, quotations from materials and equipment suppliers. In this context, there is a high level of confidence in the feasibility of the pump station and rising main design.

5.7.4 Cost – Quotations have been sought and current work production rates applied with a resulting good level of cost confidence achieved. Cost risks pertain mainly to delayed materials and equipment ordering and slower than predicted productivity. A 20 percent contingency has been applied within the project budget. The resulting confidence in cost is good.

5.7.5 Pump station location – no consultation has been undertaken and this will be a priority item upon commencement. If the preferred site is not available then the pump station can be constructed entirely within Road reserve. There is therefore high confidence that a feasible pump station site is achievable.

6. EFFECT ON LONG TERM SOLUTIONS

6.1 The current long term options before Council will need to be reviewed and modified to reflect the benefits achieved by the Tay Street Drain pump station. However, the pump station is complementary to the long term solutions, and optimisation between the pump station and long term solutions will need to be investigated further. The Council has been investigating capacity upgrade options since 2012 and in 2013, two preferred options were identified in the 27 March 2014 report on Dudley Creek Post Earthquake Flooding Remediation Options. Those two options were:

- Option 1 - Major upgrading of the waterway capacity – utilising gravity.
- Option 2 - Pump station, gravity piped diversion and lesser upgrading of the waterway capacity – utilising a combination of pumping and gravity.

6.2 In summary the feasibility design and assessment process determined that:

- Option 1 and Option 2 both achieve the specified hydraulic performance objectives, however for both options; there will be residual street and private property flooding.
- Option 1 and Option 2 have comparable preliminary all-inclusive implementation budgets of \$50 million and \$53 million at confidences of +30/-10 percent and +40/-20 percent respectively.
- Option 1 and Option 2 have differing implementation risk and performance resilience profiles.

6.3 The work on Dudley Creek remediation options is complementary to the work being done by the joint Council and CERA Flood Management Steering Group which is working across multiple agencies on flood risk issues

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7. FINANCIAL IMPLICATIONS

- 7.1 A project budget of \$4.35 million has been determined. The temporary pumping solution is seen as earthquake related works and therefore should be applied against the stormwater projects which are part of the Cost Share agreement. The Director of CCDU would need to agree to this. Any shortfall or betterment would need to be funded via the Building Infrastructure Improvement Borrowing Allowance.

8. PROCUREMENT

- 8.1 There is an immediate need to investigate and action the emergency procurement of professional services and contract works for this option which will include the installation of temporary pumps and pipelines and associated professional services.
- 8.2 There are two guiding documents which determine the Council's ability to undertake emergency procurement, namely the:
- (i) Auditor General's - Procurement guidance for public entities (OAG), and
 - (ii) The Council's Procurement Policy.
- 8.3 The Council's Procurement Policy as it applies to emergency procurement is largely an extract from the OAG; the following methodology is therefore based on a review of both documents (the policy documents).
- 8.4 The policy documents acknowledge that it may not be possible to satisfy the principle of open and effective competition in an emergency situation. The Council may therefore dispense with some parts of the procurement process if it needs to react to a genuinely unforeseen event. The policy documents provide criteria to assist in determining an emergency, these include where:
- Life, property or equipment is immediately at risk; or
 - Standards of public health, welfare or safety need to be re-established without delay.
- 8.5 On the basis that all but the [loss of] "life" criteria have been satisfied, utilising the emergency procurement provisions is appropriate in the context of the Flood Taskforce.
- 8.6 With the criteria satisfied, the policy documents provide that the Council:
- Must still act lawfully and with integrity
 - Account for all emergency procurements
 - Act within delegated authority
 - Limit the procurement to what is necessary to cope with the emergency
 - Manage quality assurance
 - Undertake self review, considering areas such as:
 - The staff used in the procurement appropriately qualified
 - The prescribed procedures followed
 - The outcomes satisfactory

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- Lessons learnt identified
 - Council's management systems adequate in identifying the procurement requirements.
- 8.7 Since the flooding of April 2014 the Council has directly appointed:
- Jacobs New Zealand Ltd (Designer) and;
 - City Care Limited (Contractor).
- 8.8 The total expenditure to date for the suppliers listed above is approximately \$75,800.
- 8.9 Within the next three months, the Council estimates it will use the emergency procurement provisions to procure consultants, contractors, materials and equipment (such as pipe, pumps, etc). Expenditure on these supplies is estimated at \$4.35 million.
- 8.10 The proposed Tay Street Drain Pump Station is the largest project currently contemplated by the Flood Taskforce.
- 8.11 To meet the requirements of the policy documents and manage the Council's risk, Council is implementing procedures to manage the emergency procurement.
- 8.12 The procedures set out the methodology for the emergency procurement, considering the above, plus:
- The skill sets, supply and benchmarking available from:
 - Existing Council panel, supply and maintenance agreements;
 - Council's approved vendors;
 - SCIRT and CERA.
 - The process for direct appointment.
 - Delegated authority to procure.
 - Support staff (Legal Services Unit, Procurement, Capital Delivery Unit, Finance) available to assist the Flood Taskforce with:
 - Forms of contract.
 - Contract models.
 - Cost basis - maintenance contracts vs SCIRT rates.
 - Benchmarking profit, P and G, etc.
 - QS cost management - validation of: unit price, productivity, value for money (main and sub-contractors).

9. IMPLEMENTATION

- 9.1 The programme to achieve full operation within four months requires the commitment of Council, the Contractor and the Designers working together and assumes direct appointment of both Contractor and Designer. The programme to achieve the same outcome using a conventional procurement approach is probably between eight and 10 months.

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- 9.2 IPLEX in Australia are currently manufacturing 800 mm (ID) glass reinforced plastic pipe and advised that an order had to be received by 12pm 30th May for delivery 7th July. If ordered after that date, there would be at least a 3 week delay. After taking advice from procurement and technical staff the decision was made to proceed with the purchase of the pipe and that emergency procurement was appropriate under delegated authority by the CEO, Mayor and Chair of the Environment Committee. That delegation was by resolution of Council dated 12 May 2014.
- 9.3 IPLEX in Australia are currently manufacturing 800 millimetre (ID) glass reinforced plastic pipe and advised that an order had to be received by 12pm 30 May for delivery 7 July. If ordered after that date, there would be at least a three week delay. After taking advice from procurement and technical staff the decision was made to proceed with the purchase of the pipe and that emergency procurement was appropriate under delegated authority by the CEO, Mayor and Chair of the Environment Committee. That delegation was by resolution of Council dated 12 May 2014.
- 9.4 The proposed fast-track implementation will result in significant programme benefits and the short construction programme will assist with cost management.

10. STAFF RECOMMENDATION

That the Committee:

- 10.1 Give approval to proceed with Tay Street Drain pump station design and construction under urgency up to an estimated cost of \$4.35 million.
- 10.2 Direct the Acting Chief Executive to initiate discussions with the Director of the Christchurch Central Development Unit to consider whether this proposal fits within the stormwater projects in the cost share, noting that it may replace other projects.
- 10.3 Note that any shortfall in funding would come from the Building infrastructure Improvement borrowing allowance.
- 10.4 Confirm direct appointment of both City Care Limited and Jacobs New Zealand Limited as Contractor and Designer respectively.
- 10.5 Implement the methodology for emergency procurement as detailed above.
- 10.6 Notify the Office of the Auditor General of the steps taken.
- 10.7 Retrospectively authorise \$300,000 order placement of the rising main pipe through IPLEX, Australia.
- 10.8 Undertake private property and libraries consultation and confirm pump station location.