7. STORM 11-13 OCTOBER 2000 FOLLOW UP REPORT

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The purpose of this report is to inform the Committee of and seek support for flood damage reduction measures proposed for the southeast sector of the city following a review of drainage systems carried out since the extreme storm experienced on 11 to 13 October 2000.

The Committee considered a preliminary report on the storm on 30 November 2000 and asked for a report back on measures and costs for mitigating the drainage problems in Sumner, Redcliffs and Heathcote. This report is in response to that request.

Many of the proposed measures identified in the storm report to the November 2000 meeting of the Committee have been implemented and the major capital works have been programmed for the 2001/02 financial year.

FLOOD DAMAGE REDUCTION MEASURES

Hill Waterways

During the October storm the waterways and drainage system suffered little damage necessitating renewals or replacements. However, many drainage improvements described below need to be made in the light of problems experienced during the storm. Fortuitously the catchments where most of the flood damage occurred – Barnett Park/Rifle Range Drain, Redcliffs and Richmond Hill Road waterway, Sumner were already subject to drainage improvement planning and design. Both schemes have been reviewed in the light of information gathered during the October storm.

Richmond Hill Road Waterway and Pipeline Inlet

A new, much larger debris grating will be installed on the Nayland Street inlet to the Richmond Hill catchment pipeline which extends from Nayland Street to Cave Rock. The inlet replacement is part of the joint lower Richmond Hill Road improvements and waterway restoration project managed by City Streets and Parks and Waterways Units. Negotiations are underway with the Sumner Bowling Club to secure additional space at Richmond Hill Road/Nayland Street corner for the inlet structure and debris capture upstream in a naturalised open waterway.

Important ancillary drainage improvement works will include roadside sumps and pipeline connections from Wakefield Avenue west along Nayland Street to the Richmond Hill pipeline and roadside gratings and sumps of generous capacity in Nayland Street and Marriner Street to direct storm overflows back into the pipeline.

Total estimated cost is $235,000 not including waterway restoration upstream from the inlet (Refer to schedule attached).

Richmond Hill Catchment Pipeline and Outlet

Debris blockage of the Richmond Hill catchment pipeline at the inlet was the major cause of flood overflows and flood damage during the October 2000 storm. The pipeline outlet at Cave Rock functioned satisfactorily despite sand build-up in front of the outlet flapgate. Nevertheless, outlet blockage resulting in storm overflows upstream is a possibility that cannot be ruled out.

An operation and maintenance programme of more frequent routine outlet inspections and regular operation of the jetting system at an additional annual cost of approximately $5,000 has been introduced.

Improvements to the outlet mechanism comprising installation of a high pressure main and an overflow slot along the top of the pipeline near the outlet have been allowed for at an indicative capital cost of $35,000. Works will be co-ordinated with the proposed landscaping between the Esplanade and Cave Rock programmed for this calendar year.

The design capacity of the pipeline is 5% AEP (ie 20 year return period) for full catchment development in accordance with present City Plan zoning rules. The issues of additional capacity and/or safe secondary flow paths for storm overflows are discussed under (d) below.

Rifle Range Drain at Barnett Park

Operation and maintenance improvement works to the Rifle Range Drain diversion swale in Barnett Park behind the Scout Den are underway. The works comprising drive on access from the car park, safety fence modification and extension and raising of the inlet quoting are estimated to cost $4,000.

Capital works comprising extra bunding between the inlet and the rear of Wakatu Avenue properties and formation of a shallow ponding area between the scout den and Main Road to detain storm overflows are programmed. Installation of a debris trap in Rifle Range Drain near the end of Bayview Road is also included for a total estimated cost of $50,000.

A Floodplain Management Plan for Sumner

Although the suite of measures described above under a, b, c and e collectively deal with the specific problems which arose in Sumner during the October 2000 storm significant flood damage to private property will recur during extreme storms characterised by high intensity rainfall.

In Sumner urban development has occurred over existing stormwater outfall pipelines. Secondary flow paths to convey overflows safety to the sea generally do not exist. Well-designed inlet structures can be engineered; well-organised storm emergency procedures can be put in place; but without safe secondary flow paths it is inevitable that significant flood damage will recur from time to time.

The Parks and Waterways Unit has embarked on a floodplain management study for Sumner due for completion next year. The study is likely to recommend a suite of planning and engineering measures to reduce future flood damage. Identification and provision of secondary flow paths will be an important part of this study.

One important specific issue is the prospect of an extension to the existing living zone on Richmond Hill. Recent computer modelling indicates that the Richmond Hill pipeline from Nayland Street to Cave Rock does not have spare design capacity.

Living zones should not be extended on Richmond Hill unless additional runoff can be conveyed safely to the sea. Any development should contribute towards the cost of conveying secondary flow safely downstream to the sea and meet the full cost of any additional primary drainage capacity required.

Audit of Inlet Gratings and Other Structures

All critical inlet structures, gratings and debris traps on hill waterways have been inspected and a schedule of improvement works prepared (See location plans: Figs 1 and 2 and the schedule attached).

Within the Ferrymead ward minor operation and maintenance works underway and capital works programmed (but not already described under a, b, and c above) are estimated at $4,900 operations and maintenance cost and $15,000 capital cost.

In the Heathcote Ward operation and maintenance improvements estimated to cost $10,000 in total have been identified.

Capital works totalling $30,000 comprising the replacement of Holliss Avenue inlet grating, installation of a debris trap on West Victory Drain, Albert Terrace; and a new inlet grating, double sumps in the street and waterway improvements at Alderson Avenue are planned.

Storm Emergency Procedures

City Care, our drainage contractor, has reviewed wet weather and storm response procedures for critical inlet structures, debris traps and grates on hill waterways. A draft storm response plan that clarifies lines of communication and other procedures has been prepared and discussed with asset managers in the Parks and Waterways Unit.

Adherence to the plan will ensure that during future major storms more staff and machinery will be directed earlier to initial inlet gratings to remove accumulated debris and thus reduce the incidence of blockage and storm overflows.

Local wardens have been appointed by the Parks and Waterways Unit to observe the inlet gratings in Barnett Park and at Richmond Hill Road / Nayland Street corner respectively to provide early warning of potential blockage during storms. A spare key for the Sumner Main Drain outlet tidegate is now available at the Sumner Fire Station for use in emergencies.

All personnel involved in the operation of the Woolston Tidal Barrage have been re-acquainted with the operating procedures for opening and closing the gates.

Heathcote River Middle Reaches

A thorough investigation into the unexpectedly high peak flood levels in the Heathcote River Waimea/ Eastern Terraces reach has been carried out. The conclusion is that the phenomenon was due to the cumulative effect of several factors including:

- A slight overall increase in channel bed height due to siltation.
- Frequent minor bank slumps contributing to bed siltation and bank irregularity.
- A slight overall increase in channel roughness due to longer grass on the banks since maintenance practices were modified 10 years ago and occasional recent planting on the banks.
- Fallen trees across the river removed after the storm from four sites within the reach.

All new planting on the banks of the middle reaches of the Heathcote has been suspended in the meantime. The computer model for this reach is being reviewed using recent flow measurements and revised roughness indices.

The Parks and Waterways Unit recommendations to date for this reach are that:

- New bank planting should not be undertaken at a particular site unless the waterway area is increased to provide compensatory channel conveyance.

- Plans should be prepared identifying critical reaches in terms of channel conveyance and flood-prone properties and a maintenance regime and planting criteria established which maintains or enhances channel conveyance.

- Soil from the toe of bank slumps should be removed from the channel as slumps occur.

- Increase the frequency of river cross-section surveys to monitor channel changes more closely and the frequency of flood gaugings.

These recommendations will be implemented once modelling work in progress has been completed.

Bexley

Within the Christchurch context the risk of flood damage during extreme events is relatively high for Bexley because it is so low-lying and entirely dependent on engineering measures (ie stopbanks and flood pumping) for protection (See Fig 3).

Although the October 2000 storm was an extreme event for the Bexley area with floodwater ponding up to 400mm deep the drainage system performed satisfactorily. Water did not enter any dwellings.

However, extension of the Burwood/Woolston expressway through Bexley during 2001/02 provides the opportunity to improve the drainage level of service by directing runoff from part of Bexley Reserve via a swale along the edge of the expressway to Estuary Drain.

The suite of flood damage reduction measures identified for implementation during 2001/02 comprise:

Sub-catchment diversion to Estuary Drain:

Diversion of runoff from part of Bexley Reserve is being incorporated into the design of the extension to the expressway. The extent of diversion will be determined by expressway profile constraints and retaining an acceptable level of flood protection for the property at 184 Bexley Road.

A second tidal flapgate will need to be installed upstream from Estuary Drain to reduce the risk of backflow from the Avon River.

The effect of this diversion during the October 2000 storm would have been to reduce the maximum depth of street ponding of 400mm by up to 100 mm and to reduce the duration of ponding.

The preliminary cost estimate of additional drainage works associated with the expressway is $40,000.

Also, the Bexley Reserve inlet to the Rowses Road piped stormwater system can be improved and the gas cutoff drain around the perimeter of the Reserve intercepted so that storm secondary flows from the Reserve into the Knights Drain system do not occur.

Increase Pumping Capacity

The Bexley Residents Association have requested an increase in pumping capacity at the Waitaki Street pumping station for a number of years. Greater pumping capacity at either pumping station would have reduced the depth of ponding during the October 2000 storm. For example, for an increase of 300 l/s capacity at Waitaki Street the maximum street ponding depth of 400mm would have been reduced by approximately 100 mm and duration of ponding would have been reduced.

A comprehensive risk assessment of the two pumping stations and their operation during extreme storms has been commissioned. Improving station operational reliability may prove to be more effective than committing approximately $100,000 now to pumping capacity increase at Waitaki Street.

The question of pumping capacity will be reconsidered in light of the risk assessment to be completed this year.

Minor Measures

The lip of the Waitaki Street pumping station discharge chamber has been 140mm lower than the Avon River stopbank crest since stopbank raising following the August 1992 snow storm. Although there is a tidal flapvalve on the discharge pipeline to the river the chamber lip should be raised to reduce the small risk of backflow through the chamber from the Avon River. The lip can be raised without adversely affecting the operation of the existing pumps.

Inspection and maintenance schedules for pipe outlets to the Avon River have been reviewed and appropriate modifications made.

A debris grille will be installed immediately downstream from the wetland on Knights Waterway at the time of expressway construction to reduce the amount of litter and debris reaching Waitaki Street pumping station. The grille will be added to the “critical” list for maintenance purposes.

An existing 225mm diameter pipe along Pages Road entering the two sub-catchments will be severed to eliminate this preferred path for storm secondary flows.

City Plan Variation

The proposal City Plan variation to set minimum development levels in coastal areas including Bexley and floodplains will reduce flood damage in the long term if adopted. The variation seeks to set minimum floor levels for new buildings at RL 11.8m which is expected to provide a high level of protection in the face of rising sea levels.

Waterway Piping

The remaining life in the timber lining on Knights Waterway between the Burwood/Woolston expressway corridor is 5 years or less. Lining replacement by piping is programmed for 2002/03 (Preliminary estimate $130,000). Although waterway piping is not specifically a flood damage reduction measure it will assist in flow regulation to the Waitaki St pumping station.

Summary

The October 2000 storm was an extreme event in the south-east sector of the city. Critical stormwater pipe inlet structures were blocked by debris causing overflows which resulted in water above floor level in some 20 dwellings and commercial premises in Redcliffs and Sumner.

The suite of remedial measures identified in this report address the problems which occurred during the October storm. The estimated cost of the operations and maintenance measures identified is $23,900 and capital works are estimated at $415,000. Provision has been made in the 2001/02 Parks and Waterways draft budget to fund the capital works listed in the attached schedule.

A floodplain management study for Sumner is underway which will identify long-term flood damage reduction measures.

Living zones should not be extended on Richmond Hill until issues associated with any additional storm runoff and safe secondary flow paths downstream have been resolved.

In Bexley the opportunity to divert part of the catchment into Estuary Drain should be taken.

Pumping capacity will be reviewed after the pumping stations risk assessment has been completed.

Community Board Feedback

Individual reports to the Hagley/Ferrymead, Spreydon/Heathcote and Burwood/Pegasus Community Boards were presented to their July meetings.

Community Board feedback from these meetings will be provided at the Parks and Recreation Committee July meeting.

Recommendation: That the Committee

1. Support the suite of measures described in this report to be implemented in response to the October 2000 storm.

2. Recommend to the Resource Management Committee that living zones not be extended on Richmond Hill until issues associated with any additional storm runoff and safe secondary flow paths downstream have been resolved.

Deputy Chairman's Recommendation: That the above recommendation be adopted.