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Corporate Plan Output: Waterways and Wetlands - Asset Improvements	

The purpose of this report is to advise the Committee of progress with Stormwater System Lifelines work.

BACKGROUND

The Christchurch Engineering Lifelines Project was commenced in 1994 with the following objectives:

- (i) To identify the vulnerability of Engineering Lifelines Services to damage from earthquakes, flooding, tsunami and meteorological hazards.
- (ii) To identify practical engineering strategies for reducing the risk or impact of such damage and providing for reinstatement following such events.
- (ii) To communicate the issues to people involved in the management of these services and to raise the awareness of the public to their importance.

Council Units, particularly City Streets, Waste Management and Water Services are progressing with Lifelines investigations and risk reduction.

HAZARDS AFFECTING THE STORMWATER SYSTEM

Stormwater infrastructure and the rivers and waterways of Christchurch are believed to be at the greatest risk from earthquakes and tsunami.

Earthquakes will affect the stormwater drainage system through both shaking and liquefaction. Liquefaction occurs where unconsolidated sand lying below the water table is shaken around so vigorously that the sand particles (which are surrounded by water) become partly suspended. The sand loses its strength and behaves like a heavy liquid.

During liquefaction a buried structure such as an underground pumping station or a pipe can float, and river banks and stopbanks on liquefiable foundations can slump into the adjacent river.

Shaking will damage stormwater facilities, both above and below ground with effects predominating in older reticulation featuring brick barrels, ceramic pipes and rigid mortared joints. The point of connection between pipelines and structures is another location of vulnerability during seismic events.

The risk from a tsunami to the coastline is well known. However there is also a risk in the major rivers. A sufficiently large tsunami would fill the estuary and flow up the Avon and Heathcote Rivers, spilling over the stopbanks as it progresses upstream.

PROGRESS

The following table lists the significant vulnerabilities and investigative work in place to assess options for mitigation. Funding has been requested in the Unit's 10 year capital works programme and shown in its utility asset management plan. However, noting the uncertainty surrounding possible work and costs the Parks and Recreation Committee has decided to wait for further information before budgeting the funds. Investigations are continuing.

Progress With Stormwater System Lifelines

System Component	Issues	Progress
SEISMIC HAZARD		
Stormwater Pumping Stations in Liquefaction Zones	<ul style="list-style-type: none"> 6 stations likely to encounter liquefaction hazard stations will tilt or shift 	<ul style="list-style-type: none"> investigating strengthening 5 stations, (one to be decommissioned)
Large Pipe Connections to Stormwater Pumping Stations	<ul style="list-style-type: none"> joint at pumping station vulnerable to differential movement 	<ul style="list-style-type: none"> City Design engineers investigating ways to make joints flexible
"Brick Barrel" Pipelines	<ul style="list-style-type: none"> 90-100 yr old pipelines are brittle, likely to collapse in places 	<ul style="list-style-type: none"> videoing of pipelines completed replacement programme being formulated
Liquefaction of Stopbanks	<ul style="list-style-type: none"> Avon River stopbanks downstream of Kerrs Reach generally lie over liquefiable layers Stopbanks will subside and crack in a large earthquake 	<ul style="list-style-type: none"> Areas subject to damage are being mapped with greater accuracy. Initial indications are that preventative measures are very expensive and unlikely to be economic.
	<ul style="list-style-type: none"> Low lying areas (Bexley, Brighton) subject to tidal flooding. Heathcote River stopbanks likely to be similarly affected. 	<ul style="list-style-type: none"> Being considered in Avon Floodplain Management Strategy See above
Stormwater Pumping Station Components	<ul style="list-style-type: none"> Kobe & LA experience suggests components need secure attachment. 	<ul style="list-style-type: none"> Risk assessment initiated

Utility Component	Issues	Progress
OTHER HAZARDS		
River Bank Damage Due to Liquefaction	<ul style="list-style-type: none"> • River banks can move due to “slippery” liquefiable layer beneath. • Roads, pipelines and houses would move too. • Displacement of approx 0.5m within 50m of river bank. • Displacement 0.1-0.2m within 200m of river bank. 	➤ Initial indications are that preventative measures are very expensive and unlikely to be economic
Flooding Due to Tsunami	<ul style="list-style-type: none"> • Preliminary modelling suggests significant stopbank overtopping at Bexley/Brighton from a large tsunami 	<ul style="list-style-type: none"> ➤ Risk will probably always exist ➤ Options being considered under Avon Floodplain Management Plan.
River Stopbank Damage During a Tsunami	<ul style="list-style-type: none"> • Significant stopbank overtopping might cause stopbank damage. 	➤ Damage unlikely
Tsunami Damage to Stormwater Pumping Stations	<ul style="list-style-type: none"> • 4-6 stormwater pumping stations expected to be inundated by sea water during a major tsunami event. 	➤ Risk assessment initiated
Loss of Power Supply	<ul style="list-style-type: none"> • Power supply to pumping stations could be lost in some natural hazard events. • Loss of power more likely during storms. 	➤ Risk assessment initiated

Chairman’s

Recommendation: That the information be received.