

Lessons learned from one of New Zealand's most challenging civil engineering projects: rebuilding the earthquake damaged pipes, roads, bridges and retaining walls in the city of Christchurch 2011 - 2016.

## Fact Sheets about SCIRT

**Story:** Fact Sheets about SCIRT

**Theme:** Communications and Community

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A collection of 10 fact sheets describing SCIRT's work. These were put together at the start of SCIRT's programme with some translated into other languages. These accessible, cost-effective tools were displayed in public places and taken to community meetings.

This document has been provided as an example of a tool that might be useful for other organisations undertaking complex disaster recovery or infrastructure rebuild programmes.

For more information about this document, visit [www.scirtlearninglegacy.org.nz](http://www.scirtlearninglegacy.org.nz)



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Rebuilding earthquake damaged roads,  
water, wastewater and storm water pipes.

## Fact sheets

A range of 10 fact sheets describing SCIRT's work was put together at the start of SCIRT's programme as accessible and cost effective tools to display in public places and take to community meetings. Information posters are updated and included in the specially designed stands with the fact sheets.

**Stronger Christchurch**  
Infrastructure Rebuild Team

Programme funded by  
Christchurch City Council | New Zealand Government

SCIRT: the Stronger Christchurch Infrastructure Rebuild Team is repairing the city's earthquake damaged roads, water, wastewater and storm water pipes.

### Who we are

The Stronger Christchurch Infrastructure Rebuild Team is an alliance between Christchurch City Council, Canterbury Earthquake Recovery Authority (CERA), New Zealand Transport Agency (NZTA), City Care, Downer, Fletcher Construction, Fulton Hogan, and McConnell Dowell Constructors.

SCIRT will be working closely with CERA, the Government agency set up to lead and coordinate the ongoing earthquake recovery, and Christchurch City Council, the owners of the city's horizontal infrastructure.

**The Damage**

- 30km of sewer pipes damaged
- 124km of water mains damaged
- 85km of roads damaged

### Safety

Christchurch will be a hive of construction activity as we work to replace the damaged roads and underground pipes around the city. We all have a role to play in keeping safe around work sites.

Your children may be curious about our work sites. Please keep them at a safe distance and help them understand the dangers. You may need to change your route slightly to find a safer way to walk to school, work or the shops.

Our work zones are well marked and highly visible, but they are not bullet proof! Please be alert and follow instructions and temporary speed limits when driving through our work sites.

**Let's stay safe together**

### Keeping in Touch

The people of Christchurch are at the heart of this infrastructure rebuild programme. We want to keep you informed about the work we are doing so we will provide updates in a range of different ways. Keep an eye on these places:

- Online**  
Watched by us to: [www.strongerchristchurch.govt.nz](http://www.strongerchristchurch.govt.nz) (Twitter) Follow us @SCIRTinfo Email: [info@strongerchch.co.nz](mailto:info@strongerchch.co.nz)
- Sign up to our regular e-newsletter on the website**
- Letterbox**  
Keep an eye on your letterbox. We will deliver a Home Notice to you before we begin work in your street.
- Newspapers**  
Watch out for our updates in local newspapers.
- Community**  
Drop in to your local library/service centre to pick up some written information about SCIRT. The SCIRT team also plans to get out into our communities to talk to people about this project - we will let you know when this is coming up.

You can also get in touch with us directly. If you have any specific queries.

Email: [info@strongerchch.co.nz](mailto:info@strongerchch.co.nz)  
Phone: (03) 941 8999

Logos: Christchurch City Council, CERA, NZ Transport Agency, city care, Downer, Fulton Hogan, McConnell Dowell, Fletcher.

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Rebuilding Infrastructure

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Christchurch City Council | New Zealand Government

### SCIRT Update | June/July 2014

We are **61%** of the way through SCIRT's Central City work

SCIRT infrastructure work in the Central City is now over halfway finished

- Work has ramped up with April, May and June the peak months of our programme
- From July that intensity will reduce so you should experience fewer delays and detours from SCIRT works
- By the end of this year, we're aiming to be around 90 per cent of the way through our Central City programme

We are **47%** of the way through the city-wide SCIRT programme

Follow SCIRT's progress on [www.strongerchristchurch.govt.nz](http://www.strongerchristchurch.govt.nz) and subscribe to our e-newsletters for regular updates. Plan your travel by visiting [www.transportforchristchurch.govt.nz](http://www.transportforchristchurch.govt.nz) for updates and to help find your way around the city.

**THE CENTRAL CITY IS OPEN FOR BUSINESS DURING THE REBUILD. BE PART OF IT.**

Logos: Christchurch City Council, CERA, NZ Transport Agency, city care, Downer, Fulton Hogan, McConnell Dowell, Fletcher.



Above: An eye catching SCIRT brochure stand with an information poster and the SCIRT 'fact sheets' on display in a community library area. The stands are regularly visited, tidied and restocked by SCIRT Communication Team members.

Above: Information posters are regularly updated to display with the information sheets in the stands. In the first two years the posters focused on reinforcing who SCIRT was and what SCIRT did (top). From the third year of recovery, and in response to market research that found most respondents knew who SCIRT was, the posters (bottom) moved focus to showing 'positive progress'. This was also in response to wellbeing research around the importance of the community feeling a sense of progress and looking forward.



FULL LIST OF FACT SHEETS AVAILABLE:

WHO WE ARE AND  
WHAT WE ARE DOING

1

- 1 Who we are and what we are doing
- 2 Keeping in touch
- 3 Safety
- 4 Environmental management
- 5 Repairing underground services
- 6 Temporary traffic management
- 7 Prioritising the rebuild
- 8 Underground pipes
- 9 Bridges
- 10 Retaining walls

Email: [info@scirt.co.nz](mailto:info@scirt.co.nz)  
[www.strongerchristchurch.govt.nz](http://www.strongerchristchurch.govt.nz)



### **What we're here for:**

*"Creating resilient infrastructure that gives people security and confidence in the future of Christchurch".*

SCIRT is rebuilding the city's earthquake damaged roads, fresh water, wastewater & stormwater pipes.

Programme funded by

Christchurch  
City Council



New Zealand Government

The head contractual agreement within SCIRT is an alliance between Christchurch City Council, Canterbury Earthquake Recovery Authority (CERA), New Zealand Transport Agency (NZTA), City Care, Downer, Fletcher Construction, Fulton Hogan, and McConnell Dowell.

Alliances are a proven way of getting the best results on major infrastructure projects. They encourage innovative solutions and value for money decision-making. All organisations involved are committed to working closely together to achieve the best outcome for the city.

The five contractors were appointed following the 4 September 2010 earthquake because they had a proven track record of working on Christchurch City Council projects, understood the city and its infrastructure and had the project and construction management capability to manage large-scale contract works.

SCIRT will be working closely with CERA, the Government agency set up to lead and coordinate the ongoing earthquake recovery. We will also work closely with the Christchurch City Council, the owners of the city's horizontal infrastructure.



The earthquakes caused major damage to Christchurch's roads and underground services. Repairs or replacements are needed to hundreds of kilometres of roads, underground services (water, wastewater and storm water pipes), water reservoirs, and foot and road bridges.

### Did you know?

**More than 500 km of wastewater pipes were damaged of 1700 km total - close to 30%.**

This is one of the largest and most complex civil engineering projects ever in New Zealand.

The cost to repair this infrastructure is estimated to be around \$2 billion. Work will be underway throughout the city for several years. Repairs are well underway.

Broken wastewater and water networks have been temporarily repaired to allow services to be restored to homes and businesses. Permanent repairs are also being carried out and strategic planning is underway to ensure the permanent rebuild of all of the city's earthquake damaged roads and wastewater and water networks will deliver the greatest value per dollar spent.



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FULL LIST OF FACT SHEETS AVAILABLE:

KEEPING IN TOUCH

2

- 1 Who we are and what we are doing
- 2 Keeping in touch
- 3 Safety
- 4 Environmental management
- 5 Repairing underground services
- 6 Temporary traffic management
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The people of Christchurch are at the heart of this infrastructure rebuild programme. SCIRT wants to keep you informed about the work we are doing, so will provide updates in a range of different ways.

*SCIRT is rebuilding the city's earthquake damaged roads, fresh water, wastewater & stormwater pipes.*

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### Online (Website)

Information about the SCIRT programme of work, including Works Notices for current works, will be updated on our website:  
[www.strongerchristchurch.govt.nz](http://www.strongerchristchurch.govt.nz)

### Email (e-newsletter)

We are publishing regular updates about our work in our Stronger Christchurch e-newsletter. You can subscribe to this on our website.

### Letterbox

We will deliver a Works Notice to you before we begin work in your street. (Unless it's short term emergency or investigation works).

### Twitter

Follow us on Twitter @SCIRT\_info to receive daily updates about the infrastructure rebuild.

### Community

Drop in to your local City Council service centre to pick up some written information about SCIRT.

Translated brochures are also available at:

- Rewi Alley Education and Cultural Centre (32 Matipo Street)
- Aranui Community Trust (35-45 Hampshire Street - in block of shops)
- The Christchurch Migrants Centre (166 St Asaph Street)

### Newspaper

We will be placing regular updates in newspapers to keep you informed about our work.



Email: [info@scirt.co.nz](mailto:info@scirt.co.nz)  
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## Let's stay safe together

We all have a responsibility to keep safe around work sites. Safety is SCIRT's number one priority and it can be yours too.

Slow down through road works

Follow all onsite traffic management signs



**Email:** [info@scirt.co.nz](mailto:info@scirt.co.nz) or phone 941 8999

**Check:** [www.transportforchristchurch.govt.nz](http://www.transportforchristchurch.govt.nz)

**Catch a bus:** [www.metroinfo.co.nz](http://www.metroinfo.co.nz) or 366 8855

**Works Maps:** [www.strongerchristchurch.govt.nz](http://www.strongerchristchurch.govt.nz)

### FULL LIST OF FACT SHEETS AVAILABLE:

### SAFETY

3

- 1 Who we are and what we are doing
- 2 Keeping in touch
- 3 Safety
- 4 Environmental management
- 5 Repairing underground services
- 6 Temporary traffic management
- 7 Prioritising the rebuild
- 8 Underground pipes
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### Safety is our number one priority.

SCIRT plans all our activities to safeguard our staff, our communities and the environment. We have a culture of zero harm which means safety is something we think about and act on all the time.

*SCIRT is rebuilding the city's earthquake damaged roads, fresh water, wastewater & stormwater pipes.*

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We understand it can be fascinating to watch what is happening around our work sites, especially when it is in your neighbourhood. However, work areas can involve the use of large machinery, increased construction traffic and in some areas large excavations.

### Our Safety Measures

Some of the ways we help to reduce risks are:

- Using fencing, barriers and traffic cones to define our work area and to separate our works from traffic, pedestrians and property.
- Reversing beepers and flashing lights on construction vehicles to increase awareness.
- Reducing speed limits around works. Using traffic controllers to direct traffic around works areas.
- Before work begins each day, workers meet for a pre-start safety briefing. This covers the activities that will occur and any potential hazards so these can be removed or controlled. All our workers must also wear personal protective equipment when working on site. As a minimum this includes safety glasses, a hard hat, steel-capped boots, long sleeve shirts, long trousers and a high visibility vest. Sometimes other equipment is also needed, such as gloves and earmuffs.

### Minimum PPE Gear *(Personal Protective Equipment)*



### Your Safety Measures:



#### Stay clear and stay alert.

Christchurch will be a hive of construction activity as we work to replace the damaged roads and underground pipes around the city. We will do everything we can to prevent risk to our communities but we also need your help. We all have a role to play in keeping safe around work sites.

Your children may be curious about our work sites. Please keep them at a safe distance and help them understand the dangers. You may need to change your route slightly to find a safer way to walk to school, work or the shops.

Our work crews are well trained and highly visible, but they are not bullet proof. Please be alert and follow instructions and temporary speed limits when driving through our work sites.



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FULL LIST OF FACT SHEETS AVAILABLE:

ENVIRONMENTAL  
MANAGEMENT

4

- 1 Who we are and what we are doing
- 2 Keeping in touch
- 3 Safety
- 4 Environmental management
- 5 Repairing underground services
- 6 Temporary traffic management
- 7 Prioritising the rebuild
- 8 Underground pipes
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SCIRT is committed to protecting the environment as we repair the city's earthquake damaged infrastructure. This brochure explains how we manage the potential impacts of our work.

*SCIRT is rebuilding the city's earthquake damaged roads, fresh water, wastewater & stormwater pipes.*

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### Managing noise

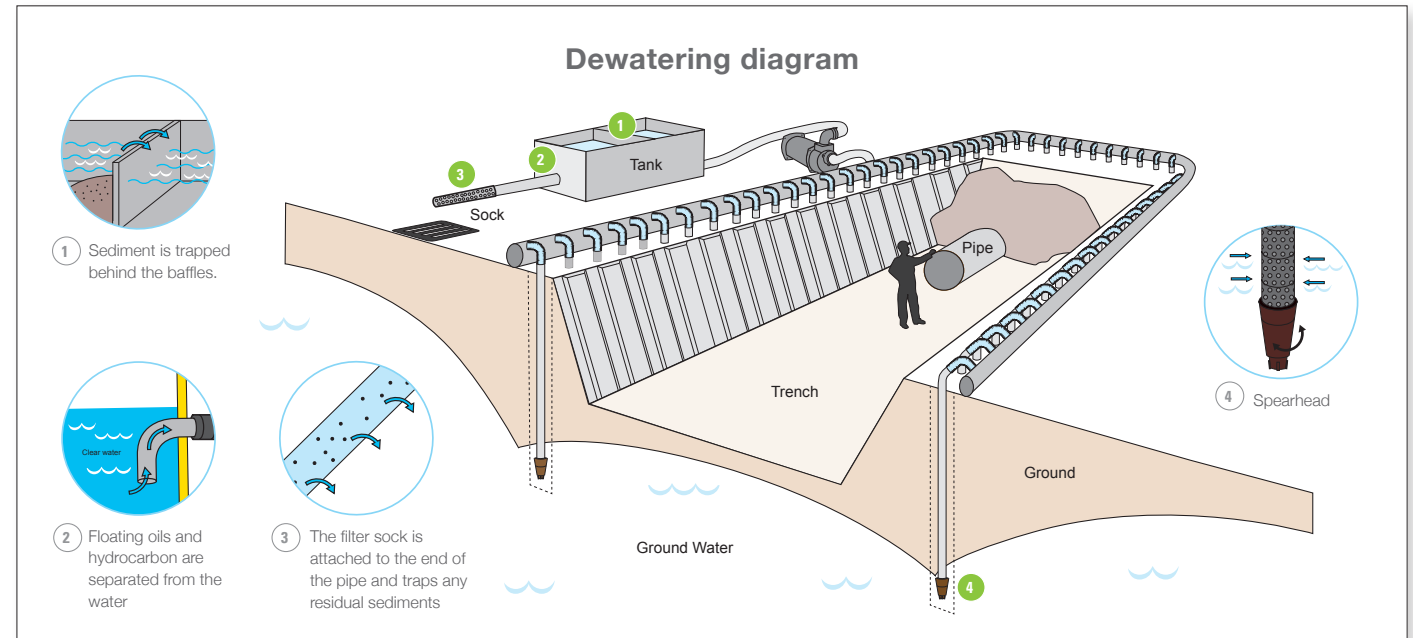
Repair works can increase background noise levels from time to time. We will advise residents and businesses located close to potentially noisy work before work begins, so people can be better prepared for any disruption. We will reduce noise from our sites by using exhaust mufflers and sound proofing on machinery and use other noise reduction measures wherever possible.

### Managing vibration

Levels of vibration will vary depending on the type of work being carried out. The equipment and techniques that SCIRT uses will meet the requirements of the New Zealand construction standards. When we are planning our works, we consider the impact of vibrations. SCIRT is committed to ensure residents and businesses are aware of the possible effects that this kind of work may have on them.

### Managing dust

Our priority is to prevent dust generation. We will manage dust by spraying water on unsealed areas and covering loads on windy days.



### Dewatering

Works to underground services sometimes include a dewatering technique, which removes unwanted water. There are strict protocols in place for managing the removal and disposal of this waste ground water. We will ensure water is treated using settlement tanks and filtration devices.

### Stockpiling

It is sometimes necessary to temporarily stockpile materials needed for the rebuild works. This will be done to ensure we minimise the effect of runoff.

### Emergency incidents

We take great care to prevent harm to our environment. We have robust processes in place and our people are well trained, to manage any emergency situations that may arise.

### Environmental monitoring and auditing

As well as carrying out our own internal auditing, independent audits may be carried out by Christchurch City Council and Environment Canterbury.

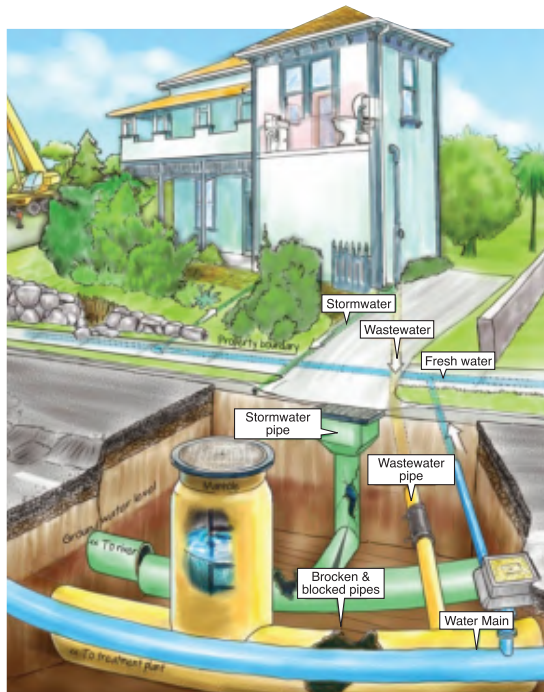
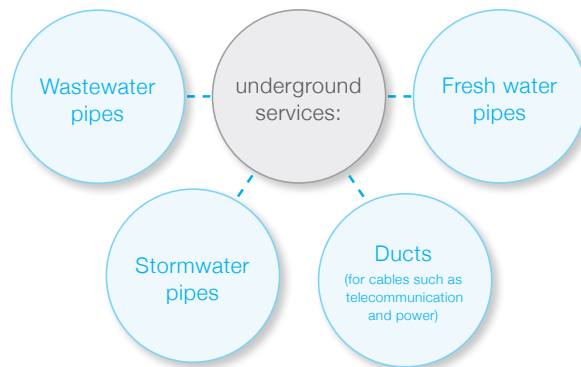
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*There are many essential services located underground, often situated below the surface of the road.*



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- 1 Who we are and what we are doing
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- 3 Safety
- 4 Environmental management
- 5 Repairing underground services
- 6 Temporary traffic management
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- 8 Underground pipes
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## REPAIRING UNDERGROUND SERVICES

5



There are a number of services under the road including freshwater, wastewater, and stormwater pipes.

This brochure provides an overview of some of the construction processes involved in repairing underground pipes.

*SCIRT is rebuilding the city's earthquake damaged roads, fresh water, wastewater & stormwater pipes.*

Programme funded by

Christchurch  
City Council



New Zealand Government

### Impacts on our communities:

Our goal is to minimise impacts on our communities. However, when works are happening in your area there will be some impacts. We will contact you before any works begin to explain what is going to happen.

### Some typical impacts include:

**Increased noise** - some activities generate noise, for example, saw cutting through the road surface and compaction activities.

**Traffic changes** - for safety reasons, some sections of road may be temporarily detoured or blocked off to carry out works.

**Changes to property access** - it will sometimes be necessary to temporarily cut across driveways to carry out essential works to repair services. This means businesses and residents may occasionally need to park elsewhere. Where possible we will provide temporary access and allocate parking to minimise disruption.

**Disruptions to water supply, sewer and/or mains power** - these services may be temporarily disrupted to enable repairs. This could be for as little as a few minutes or as much as a full day for major works.



### How do we go about replacing underground pipe?

**STEP 1:** Set up traffic management so that the work area is separated from vehicles and people.

**STEP 2:** Saw cut the road and remove the old road surface - sometimes the road base can be collected and reused.

**STEP 3:** Dewater the area if necessary - for example, if the water table is too high, water will be pumped out and the water table will be carefully lowered in the area immediately around the works so piping can be laid at the correct gradient.

**STEP 4:** Install safety shields - some underground services are located deep underground and trenches are needed for access. Dirt, sand and other material can be unstable, so metal sheet

piling or other temporary shields may be needed to prevent material slipping into the trench and for the safety of on-site workers.

**STEP 5:** Lay the base for the pipe - this is usually fine road gravel which ensures the stability of the pipe

**STEP 6:** Lay the pipe - lasers are used to make sure the pipes are perfectly straight and at the required gradient.

**STEP 7:** Backfill the trench using fine gravel and remove any supports and ground water pumps. The site is then compacted.

**STEP 8:** Construct a temporary road pavement over the works and seal it in preparation for road surfacing. Permanent road surface may be reinstated at a later date.

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# QUIZ

How well do you know your traffic signs?



1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
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9. \_\_\_\_\_
10. \_\_\_\_\_
11. \_\_\_\_\_
12. \_\_\_\_\_
13. \_\_\_\_\_

ANSWERS: 1. Follow the detour signs 2. Stop Go person/manual Traffic Controller ahead 3. Temporary traffic lights 4. Road works ahead 5. Gravel surface 6. Speed limit is 30kph temporarily 7. No parking 8. Traffic reduced to one lane, you have right of way 9. Road closed to all vehicles 10. Keep right 11. Keep left 12. Stop and wait 13. Go

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- 4 Environmental management
- 5 Repairing underground services
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## TEMPORARY TRAFFIC MANAGEMENT

6



Most SCIRT work sites are situated on the road and will affect the flow of traffic.

To keep our workers safe and ensure that traffic keeps flowing around the city, SCIRT implements traffic management plans at its work sites.

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## Keeping you informed

We will try to give you as much notice as possible about upcoming changes to traffic conditions. Our aim is to ensure that all major work sites are well advertised so you can make decisions about how, when and where you travel. We need your help to keep things safe around road works, and to help us get the work done efficiently.

**Stay informed** - Check out the SCIRT website, listen to radio information, and keep an eye out for advertisements in the newspaper.

SCIRT is working with Christchurch City Council and New Zealand Transport Agency have developed a website with an interactive map that shows the location of major works sites and their effects on traffic flow so travellers can make informed choices about travel. See [www.transportforchch.govt.nz](http://www.transportforchch.govt.nz)

### SCIRT:

03 941 8999

[www.strongerchristchurch.govt.nz](http://www.strongerchristchurch.govt.nz)

[info@scirt.co.nz](mailto:info@scirt.co.nz)

@scirt\_info

## How do we manage traffic around our work sites?

We design and implement a traffic management plan for each work site. Traffic management plans aim to strike a balance between safety and convenience.

While safety around our work sites is our number one priority, it is also important to minimise disruption to residents near the work site and other road users that are travelling through.

We do everything we can to minimise the inconvenience to road users while we carry out our works. This includes coordinating with other work



sites to minimise the combined effects of traffic changes and striving to ensure our operations allow for cars, trucks, and buses, and the more vulnerable users of the roads - pedestrians and cyclists.

## Putting a traffic management plan in place

Signs, cones, and vehicles and other equipment are essential tools for traffic management. They are used to direct, warn and guide motorists through work sites.

A lot of thought goes into the development and implementation of temporary traffic management. There are standards that govern how plans are implemented and the development and implementation of all traffic management must be carried out by a qualified Site Traffic Management Supervisor. Careful thought is given to the location and visibility of equipment and staff to maximise visibility and safety. Factors that can impact on the location of equipment include normal travel speeds, curves in a road, bridges, slopes or the availability of space on the road.

Depending on the amount of traffic using the road, one small utility vehicle used with signs on the back of it may be sufficient. For heavier traffic, up to three specialist vehicles, including trucks fitted with crash attenuators or electronic arrow signs may be needed.

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Because this task is so large, some work is taking priority over others. Determining what comes first is complex and it is important that there is a well thought out planning process in place to drive the work programme.

### SCIRT's prioritisation process

#### Operational prioritisation

e.g. reducing wastewater flows to rivers

#### Interdependencies

e.g. repairing downstream wastewater lines before upstream ones

#### Key services

e.g. maintaining access to medical, emergency, education facilities and major transport routes

#### External factors

e.g. plans of power companies

#### Constraints

e.g. availability of resources and materials

#### Sense check

e.g. review the decision and consider whether it makes common sense

To find out more about SCIRT's work, including all works completed and underway, visit [www.strongerchristchurch.govt.nz](http://www.strongerchristchurch.govt.nz)

### FULL LIST OF FACT SHEETS AVAILABLE:

- 1 Who we are and what we are doing
- 2 Keeping in touch
- 3 Safety
- 4 Environmental management
- 5 Repairing underground services
- 6 Temporary traffic management
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### PRIORITISING THE REBUILD

7



The rebuild is a huge task and not everything can be done at once. SCIRT has a robust prioritisation process in place to drive the programme of SCIRT works.

SCIRT is rebuilding the city's earthquake damaged roads, fresh water, wastewater & stormwater pipes.

Programme funded by

Christchurch  
City Council



New Zealand Government

This task is one of the largest and most complex civil engineering programmes of work ever undertaken in New Zealand. It's expected to cost in the order of \$2 billion and will take around five years to complete.



Retaining walls are being rebuilt throughout the five years of the rebuild.

You can find out about SCIRT's programme of works by going to [www.strongerchristchurch.govt.nz/](http://www.strongerchristchurch.govt.nz/) and clicking on the Road to Recovery button:

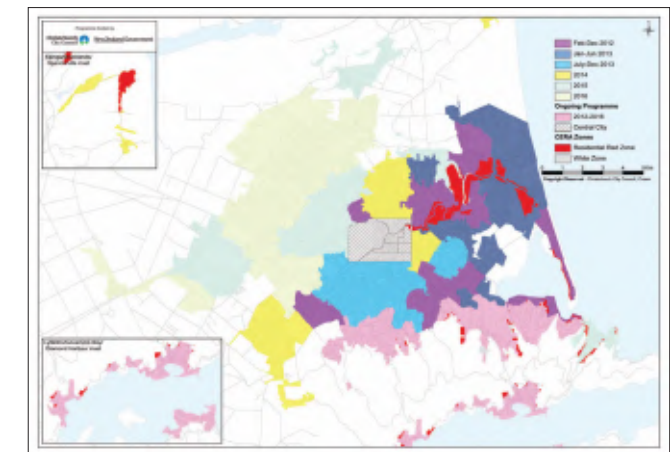


SCIRT's 6 month schedule lists specific projects that are underway or expected to take place within the next six months.

In addition to the six month schedule, SCIRT has a Rebuild Map which gives a broad indication of when works will be carried out across the city. This can be viewed on the website.

The schedule is revised every quarter.

SCIRT 6 Month Work Schedule



SCIRT Rebuild Map

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FULL LIST OF FACT SHEETS AVAILABLE:

UNDERGROUND PIPES

8

- 1 Who we are and what we are doing
- 2 Keeping in touch
- 3 Safety
- 4 Environmental management
- 5 Repairing underground services
- 6 Temporary traffic management
- 7 Prioritising the rebuild
- 8 Underground pipes
- 9 Bridges
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Underneath Christchurch are extensive networks of infrastructure, the city's veins and arteries. Pipes and pumps carry fresh water to our homes and businesses and take away wastewater. There are also storm water pipes, which channel the rain water that falls on roof-tops and roads to streams and rivers.

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**These engineering channels provide the core civic services that allow us to get a drink from the tap, turn on the washing machine, flush the toilet, have a shower, and live in a street that doesn't flood every time it rains hard.**

### **Wastewater fixed first**

Because wastewater management is crucial to a healthy city, replacing broken wastewater pipes is a high priority.

More than 500 km of wastewater pipes were damaged of 1700 km total - close to 30%. About 100 wastewater pumping stations need to be rebuilt or repaired.

Many of the city's wastewater pipes were made of earthenware. These were easily broken when the ground shook and silt, as a result of liquefaction, forced its way in. This created blockages and more damage. These pipes are also likely to be buried the deepest, so have to be re-laid first. Before the earthquakes, gravity was the main way to get wastewater from homes to the trunk sewer collecting point. This meant some pipes would be buried several metres deep before the wastewater was pumped up again.

Taking into account ongoing aftershocks, gravity is now a less reliable system, especially around the rivers, due to ground conditions. These areas will be getting pressure sewer systems which are a more resilient wastewater system. Other areas will get an enhanced gravity system, with plastic or PVC pipes and more lift stations, pumping gravity-piped wastewater to a higher level along the route. These also reduce the need to dig increasingly deep trenches for gravity wastewater mains.



### **Fresh water - less damage**

Fresh water supply pipes are much less damaged than wastewater pipes. This is largely thanks to a Christchurch City Council programme of upgrading and replacement with plastic or PVC pipes which started years before the earthquakes. The current assessment is that around 50 km of fresh water pipes are damaged. Fresh water is piped into houses under gravity pressure from Port Hills' reservoirs or holding tanks.

Some reservoirs were damaged by the earthquakes but can still be used. In the long term, they need to be restored.

Of 175 fresh water wells, 22 were so damaged they could not be used. All but 64 wells, the sources of the city's pure and deep artesian water, require some repairs.

### **Storm water pipes – least damage**

Storm water pipes are largely functional with more damage in the city centre and eastern suburbs. However, broken sumps and hollows along streets will reduce storm water draining away quickly. This won't be fixed until the road is repaired. In general, SCIRT is repairing and replacing storm water systems to get the level of protection that existed before the earthquakes, and where justified, also making them stronger and easier to maintain.

### **Road repairs – the final icing on the cake**

Once all the pipes under the road are replaced or repaired and wherever possible, once the telecommunications lines are also in place, the road will be repaired or permanently rebuilt. Until everything is fixed, and no more digging is anticipated, roads will be temporarily mended and patch-fixed.

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**SCIRT**  
Rebuilding Infrastructure



An example of how the ground has sunk near a section of the Avondale Bridge.



A damaged section of the Fitzgerald Avenue bridge over the Avon.



A damaged section of Bridge Street bridge.

- 1 Who we are and what we are doing
- 2 Keeping in touch
- 3 Safety
- 4 Environmental management
- 5 Repairing underground services
- 6 Temporary traffic management
- 7 Prioritising the rebuild
- 8 Underground pipes
- 9 Bridges
- 10 Retaining walls

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There are approximately 225 bridge structures (including road and foot bridges, and larger culverts) in the city. Of these about 140 require some level of repair from minor works, such as repairing cracks, through to major repair work.

*SCIRT is rebuilding the city's earthquake damaged roads, fresh water, wastewater & stormwater pipes.*

Programme funded by

Christchurch  
City Council



New Zealand Government

The bridges around Christchurch have been checked by engineers to make sure they are safe for traffic and pedestrians after the earthquakes. The bridges around the city are also checked after each significant earthquake to make sure they remain safe to use.

Where the bridge is deemed to be unsafe it is closed. Temporary works were also undertaken on some bridges to allow them to remain open. Some bridges may have weight or speed restrictions which limits the impact of vehicles crossing the bridge (e.g. the faster or heavier the vehicle is travelling, the greater the impact on the bridge).

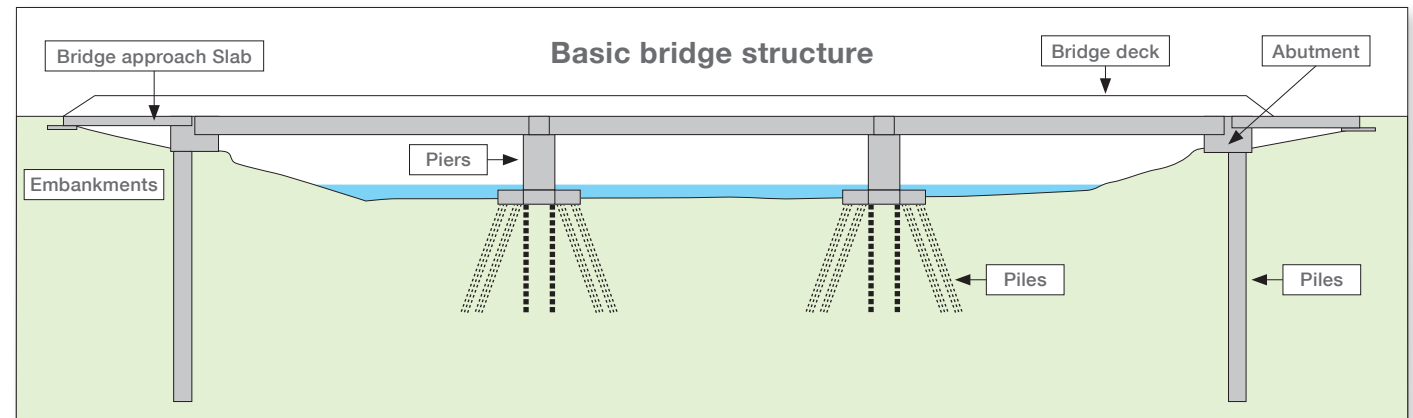
#### How are the bridges being prioritised?

The bridges are prioritised based on four factors:

- The level of earthquake damage
- The traffic volume (the busiest bridges have priority)
- Weight restrictions
- Road bridges versus foot bridges (foot bridges have lower priority)

#### Will the bridges be replaced or repaired?

Each of the bridges is subject to a robust investigation and design process. The decision on whether a bridge is repaired or replaced is based in the level of damage to both the bridge, and the surrounding land. Bridges are significant pieces of infrastructure, and most can be safely repaired rather than replaced.



#### How is SCIRT making bridges more resilient?

- Bridge approach slabs can be built into the abutments to reduce the 'ski jump' effect if there is any further land settlement.
- Piles may be drilled deep into the embankments in order to reach stable ground.
- In many cases the rigid pipes that run under the bridges (carrying other services) caused damage to the bridge approaches. These pipes can be replaced with flexible PVC (polyvinyl chloride) or PE (polyethylene) pipes.
- For some bridges there needs to be ground improvements in order to protect the piles at either side from lateral spreading and liquefaction. Possible design solutions include injecting the surrounding soil with grout to reduce the impact of future liquefaction.

#### How will this work impact on traffic?

As with all of our rebuild work, safety is our number one priority. We need to ensure the safety of our work crews and road users, and also keep traffic flowing and minimise disruption to affected communities.

In order to work safely on the bridges, some will have to be reduced to one-lane of traffic or closed. There may need to be temporary detours, traffic lights, and other traffic management in place over the next four or five years.

These detours and traffic changes will affect thousands of people throughout the city. Unfortunately this is an unavoidable part of these vital rebuild works. SCIRT will do what it can to minimise these effects, wherever possible.

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**SCIRT**  
Rebuilding Infrastructure

FULL LIST OF FACT SHEETS AVAILABLE:

RETAINING WALLS

- 1 Who we are and what we are doing
- 2 Keeping in touch
- 3 Safety
- 4 Environmental management
- 5 Repairing underground services
- 6 Temporary traffic management
- 7 Prioritising the rebuild
- 8 Underground pipes
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SCIRT is rebuilding publicly owned retaining walls. There are hundreds of retaining walls in the Port Hills. The damage ranges from minor repair to major rebuild.

*SCIRT is rebuilding the city's earthquake damaged roads, fresh water, wastewater & stormwater pipes.*

Programme funded by

Christchurch  
City Council



New Zealand Government

**What are ground anchors and why do you need to use them to hold the walls in place?**

A ground anchor is a metal bar that is inserted into a pre-drilled hole and encased in a cement grout. One end of the anchor goes into the embankment and the other end is fixed to the retaining wall. Ground anchors provide strength and make retaining walls more resilient.

At times, ground anchors need to travel beneath private property. In this instance SCIRT will contact the property owner.

**What impact will this work have on my property?**

The details of how construction may impact each property will depend on the site conditions and construction methodology. SCIRT will contact property owners before works begin on adjoining retaining walls.



Sumner Road, Lyttelton

Important considerations for retaining wall prioritisation are current condition, safety of the wall in relation to the public, adjacent properties and potential damage to wastewater pipes, water mains, footpaths, properties and the road.

#### SCIRT's prioritisation process

##### Operational prioritisation

*e.g. reducing wastewater flows to rivers*

##### Interdependencies

*e.g. repairing downstream wastewater lines before upstream ones*

##### Key services

*e.g. maintaining access to medical, emergency, education facilities and major transport routes*

##### External factors

*e.g. plans of power companies*

##### Constraints

*e.g. availability of resources and materials*

##### Sense check

*e.g. review the decision and consider whether it makes common sense*



Sumner Road, Lyttelton

#### Rebuild timeframes

Due to the number of walls requiring rebuild, it will take up to five years to repair them all.

Each wall is unique and construction times will vary depending on the access to the site, ground conditions, the height of the wall and services behind the wall e.g. water, wastewater, utilities. Some walls may take up to 10 months to rebuild, while others will be finished in a few months.

If the wall is deteriorating and poses a safety risk, temporary works will be undertaken to stabilise it until the permanent repair can be started.

#### Making the new walls more resilient

Many of the damaged 'walls' provided surface protection to the underlying soil surface, whereas the new walls are being designed and constructed to withstand future seismic activity. The structural walls will be rebuilt using several construction techniques and will be designed to the current Building Code and New Zealand standards including the revised hazard factor for Christchurch.

The design of retaining walls aims to provide the most resilient, cost effective solution.

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Rebuilding Infrastructure



# Stronger Christchurch

Infrastructure Rebuild Team

1  
O AI MATOU A'O A FOI MEA O  
LE A MATOU FAIA

## LAUPEPA O FAAMATALAGA 1 O AI MATOU A'O A FOI MEA O LE A MATOU FAIA

O le afaigaluega mo le toe fauina ma le faamalosia o Kalaisitete (SCIRT) o le a toe faaleleia auala ua fa'aleagaina i le mafui'e i le taulaga, vai sapalai, ma alavai o otaota leaga, ma paka.

O le SCIRT o se sootaga fa'apa'aga ma fa'aauunaga ile va o kamupani ma matagaluega a le Christchurch City Council, Canterbury Earthquake Recovery Authority (CERA), New Zealand Transport Agency, City Care Ltd, Downer Construction, Fletcher Construction, Fulton Hogan, ma le McConnell Dowell Constructors.

O nei sootaga fa'apa'aga o se auala maualā ina ia maua ai ni faaiuga lelei i luga o fuafuaga i totonu o matagaluega tu faapitoa. Latou te lagolagoina ni taumafaiga fou ma ina ia fa'aaoga tatauina le tupe i le faiga o faaiuga. O matagaluega uma o loo au ai ia taumafai e galulue faatasi ina ia maua ai se faiga lelei mo le taulaga.

O Sootaga faakonokalake sa tofiina ina ua uma le mafui'e i le Aso 4 o Setema 2010 ona o latou ia e iai a latou pine faamau i galuega fuafua a le konesula taulaga a Kalaisitete, e malamalama i le taulaga ma ana lala tutotonu ma sa i ai ni a latou fuafuaga ua uma ona faatinoina ma le tomai faapitoa i le fuafuaina o le fauina o galuega i konokalate tetele.

O le SCIRT o le a galulue faatasi ma le CERA, o se matagaluega a le malo na faatuina e taitai'a ma fuafuaina le faaleleia o auala ma meatotino na fa'aleagaina ile mafui'e. O le a matou galulue foi ma le Konesula Taulaga a Kalaisitete, ma pule o lala tutotonu o le taulaga atoa.

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Ala upega fesootai [www.strongerchristchurch.govt.nz](http://www.strongerchristchurch.govt.nz)



Asiasi i le matou upega fesootai ma saini e maua ai le matou tusi mo tala fou.

Faafesootai mai matou luga o le Twitter @SCIRT\_info

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O le afaigaluega mo le toe fauina ma le faamalosia o Kalaisitete (SCIRT) o le a faaleleia auala sa faaleagaina i le mafui'e i totonu o le taulaga, vai fou, vai o otaota leaga ma paipa o vai mai le afa.



Sa faamatua faaleagaina auala i Kalaisetete ma isi auaunaga i lalo o le eleele. O le faaleleiga mo le toe suiga o le a manaomia i le selau o kilomita o auala, auaunaga mo lalo o le eleele (vai, vai leaga ma paipa o vai o le afa), paka, tane vai, ma auala laupapa e savavali ai ma feoi ai taavale.

- **300 kilomita o paipa o vai leaga ua faaleaogaina**
- **124 kilomita o paipa o vai lelei ua faaleaogaina**
- **895 kilomita o auala ua faaleaogaina**

O se tasi leni o fuafuaga faaleinisini mo le lautele e pitosili ona tele ma faigata i Niu Sila. O le tau e toe fauina ai leni lala tutotonu pe tusa o le \$2.0 piona tala. Galuega o le a faatinoina ile taulaga atoa mo le tele o tausaga.

O le galuega toe faaleleia ua leva ona faagasolo. O vai o otaota leaga ua papa ma isi lala ma magavai sa faaleleia mo se taimi puupuu e faagaga mo auaunaga ina ia toe maua i nofoaga ma pisinisi. O faaleleiga maumaututu ua uma foi ona faagasolo ma fuafuaga faataatia o loo faagasolo pea ina ia mautinoa le mausali umi o le toe faaleleia o paka na faaleagaina e le mafui'e i le taulaga, auala ma vaileaga ma galuega tau vai o loo faagasolo mo se tau e pito sili ona lelei le tau mo tupe faaoga.



1  
我们是谁和我们在做什么

**Stronger  
Christchurch**  
Infrastructure Rebuild Team

## 简情通报 ①

### 我们是谁和我们在做什么

**“更坚固的基督城基础设施重建组”**  
(The Stronger Christchurch Infrastructure Rebuild Team, 简称SCIRT) 正在修复本市在地震中受损的道路、供水和污水排放系统以及公园。

SCIRT是由基督城市政府、坎特伯雷震后重建局 (Canterbury Earthquake Recovery Authority, 简称CERA)、新西兰交通局 (New Zealand Transport Agency)、城市养护有限公司 (City Care Ltd)、道纳建筑公司 (Downer Construction)、弗莱彻建筑公司 (Fletcher Construction)、福通厚根公司 (Fulton Hogan)、以及麦克内尔 道维尔建筑公司 (McConnell Dowell Constructors) 联合组成。

联合方式是一种业已被证明在重大基础设施项目中能够取得最佳效果的方式。联合方式鼓励创造性的解决方案和注重效益的决策过程。所有参与的机构都承诺密切协作以取得对本市最好的结果。

联合承包商是在2010年9月4日地震之后被任命的，因为他们有为基督城市政府项目施工的成功业绩，了解本市和本市的基础设施，并且具有项目和管理能力能够管理大型承包工程。

SCIRT将与政府设立的领导和协调当前震后重建工作的CERA密切协作。我们还将与本市道路、桥梁和涵洞等基础设施的业主——基督城市政府密切协作。

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**“更坚固的基督城基础设施重建组” (SCIRT) 正在修复本市在地震中受损的道路、淡水、污水和雨水管道。**



地震对基督城的道路和地下设施造成重大损坏。数百公里的道路和地下设施（供水、污水和雨水管道）、公园、水库、步道和公路桥都需要修理或更换。

- 300公里的污水管道受损
- 124公里的供水主管道受损
- 895公里的道路受损

这是新西兰有史以来最大和最复杂的土木工程项目。基础设施修理费用预计为20亿新西兰元。施工工作将在本市全市持续数年。

修复工作已经在进行中了。对被损坏的污水与供水网络已经进行了临时修补以使对家庭和企业提供的这些服务得以恢复。永久性的修复工作也在进行中，战略规划已在进行，以确保在本市地震中所有受损的公园、道路和污水及供水系统的永久性重建工作上花出的每一元钱都带来最大的效益。



# Stronger Christchurch

Infrastructure Rebuild Team

SCIRT 소개

1

## 안내 자료 ① SCIRT 소개

SCIRT(Stronger Christchurch Infrastructure Rebuild Team)는 지진으로 파손된 크라이스트처치 도로와 상하수관, 공원의 복구 작업을 하고 있습니다.

SCIRT는 크라이스트처치 시청, 캔터베리 지진 피해 복구청(CERA), 뉴질랜드 교통국, 시티 케어(City Care Ltd), 다운너 건설(Downer Construction), 플레처 건설(Fletcher Construction), 풀톤 호간(Fulton Hogan), 맥코넬 도웰 건설(McConnell Dowell Constructors)이 공동으로 참여한 제휴 연합체(alliance)입니다.

제휴 연합체는 대규모 인프라 프로젝트에서 최상의 결과를 얻기 위한 입증된 방식으로, 혁신적 해결책을 도모하고 비용 효율적인 의사결정을 활성화합니다. 또 모든 참여 기관이 긴밀한 상호 협조 하에 크라이스트처치를 위한 최상의 성과를 내고자 노력합니다.

SCIRT의 시공업체들은 크라이스트처치 시청의 발주 프로젝트를 수주한 실적이 있고 크라이스트처치와 크라이스트처치의 인프라에 대해 잘 알 뿐 아니라 대규모 공사를 처리할 프로젝트 관리 및 시공 역량이 있는 업체를 중심으로 2010년 9월 4일 지진 발생 후 선정되었습니다.

SCIRT는 지속적인 지진 복구 활동의 주관 및 조율을 위해 설립된 정부기관인 캔터베리 지진 피해 복구청과 긴밀한 협조체제를 유지하게 될 것입니다. 또한 저희는 크라이스트처치의 수평적 인프라를 소유하는 시청 측과도 긴밀히 협조하게 됩니다.

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저희 웹사이트에서 등록을 하면 최신 정보가 담긴 전자 뉴스레터를 받아보실 수 있습니다. 트위터 @SCIRT\_info로 저희 SCIRT를 팔로잉 하세요.

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지진 때문에 크라이스트처치의 도로와 지하 기반시설에 큰 피해가 발생했습니다. 그래서 수백 km에 이르는 도로와 지하 기반시설(상하수관, 빗물 배수관), 공원, 저수장, 다리를 보수하거나 복구해야 합니다.

- 300km의 하수관 파손
- 124km의 상수관 파손
- 895km의 도로 파손

이것은 뉴질랜드의 역대 최대 규모이자 가장 복합적인 도시공학 프로젝트의 하나입니다. 파손된 인프라를 복구하는 데 총 20억 달러가 들어갈 것으로 추산되며 여러 해 동안 시 전역에 걸쳐 공사가 진행될 것입니다.

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