

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.

Huntsbury Reservoir - Post Earthquake Reconstruction Ozwater 2013 conference presentation

Story: Huntsbury Reservoir

Theme: Design

A PowerPoint presentation prepared for the Ozwater 2013 conference detailing the story of the damage to, and subsequent repair of, Huntsbury Reservoir.

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



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Huntsbury Reservoir

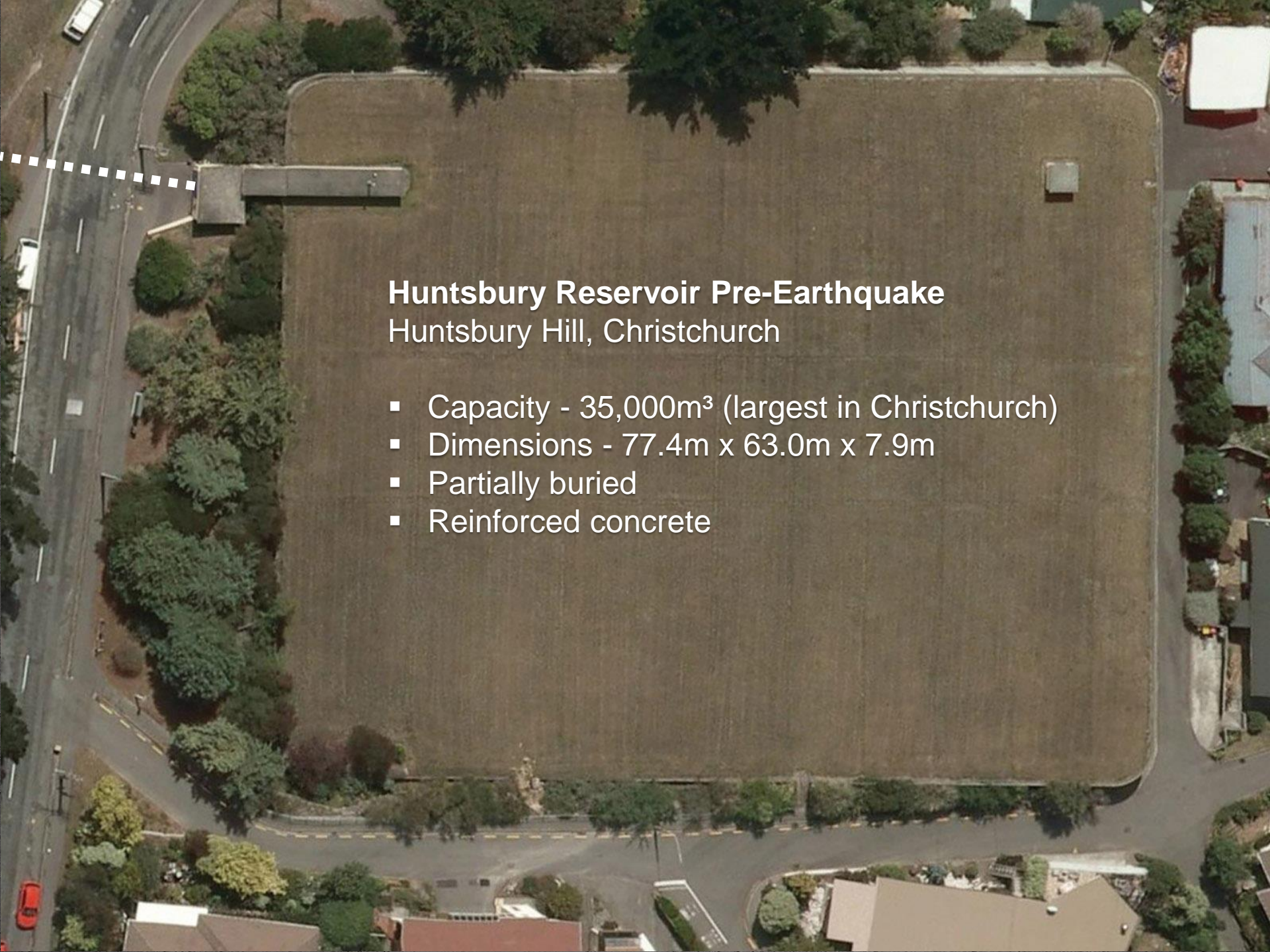
Post Earthquake Reconstruction

Dennis Hunt (Beca) - Design

Robert Clifton (Fulton Hogan) – Construction

Mark Christison (Christchurch City Council) – Operations





Huntsbury Reservoir Pre-Earthquake

Huntsbury Hill, Christchurch

- Capacity - 35,000m³ (largest in Christchurch)
- Dimensions - 77.4m x 63.0m x 7.9m
- Partially buried
- Reinforced concrete

CHRISTCHURCH
CITY RESERVOIR
1954.

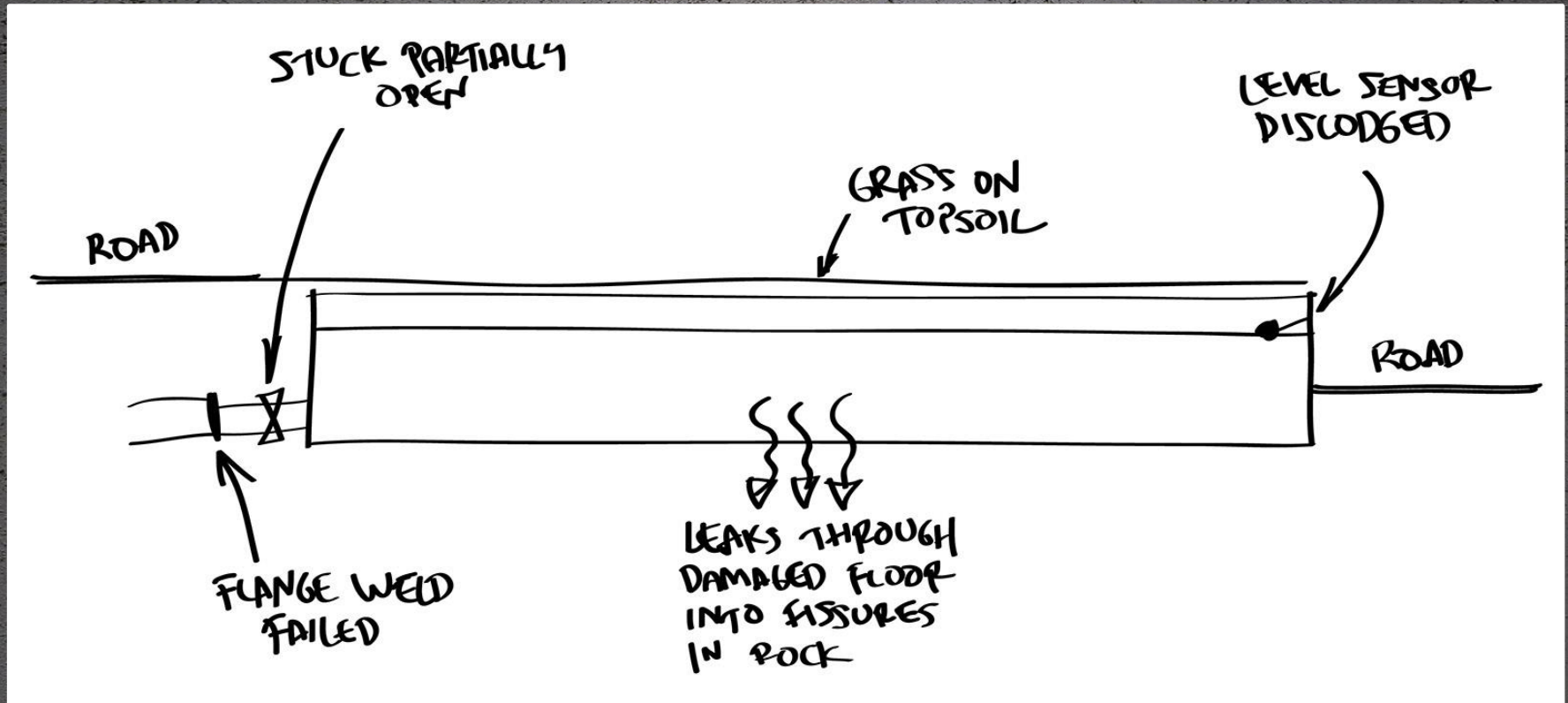
R. M. MACFARLANE C. M. G. M. P.
MAYOR

J. E. JONES J. P.
CHAIRMAN OF WORKS COMMITTEE

E. SOMERS
CITY ENGINEER

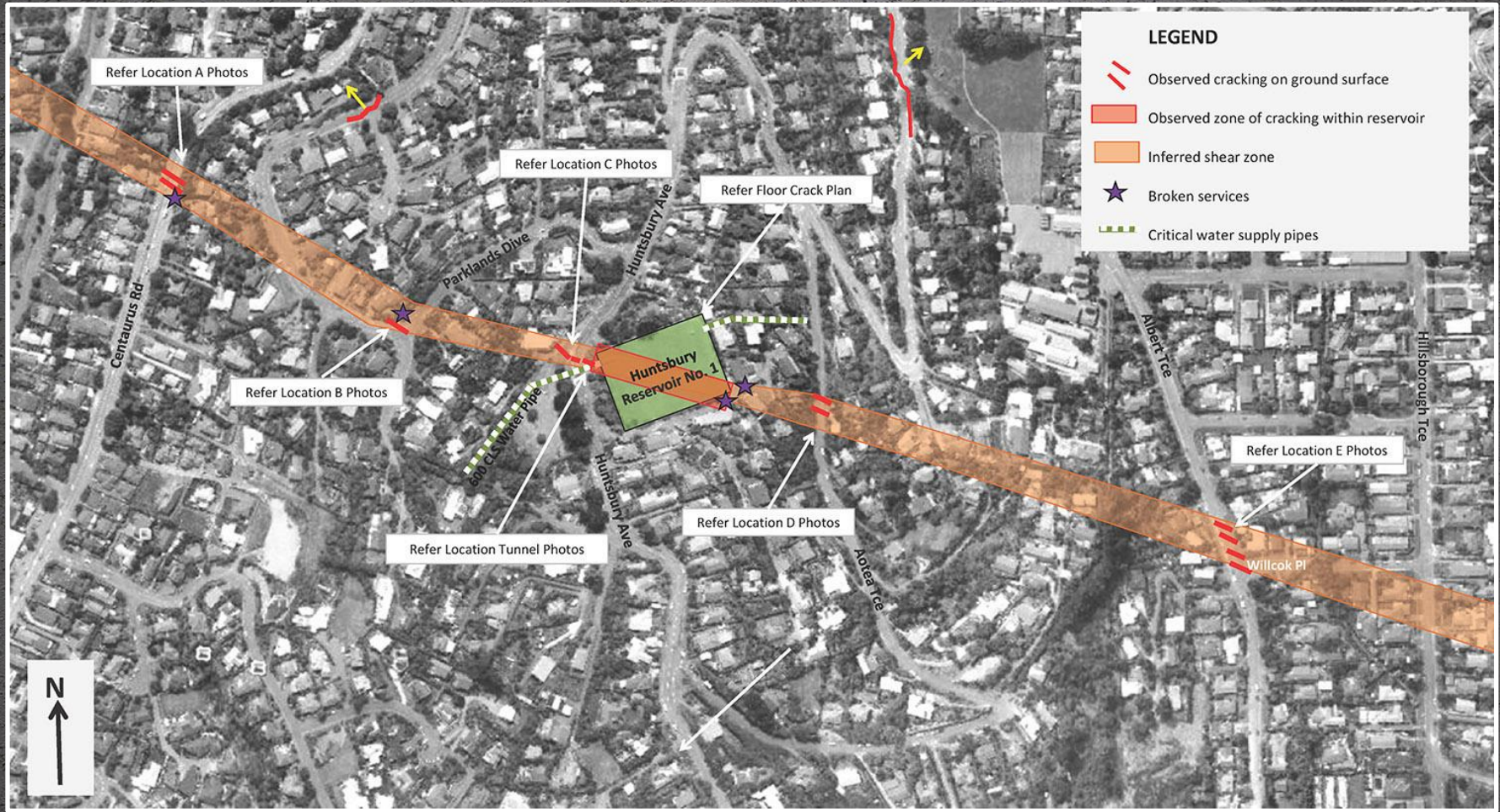
JUL 13 2011

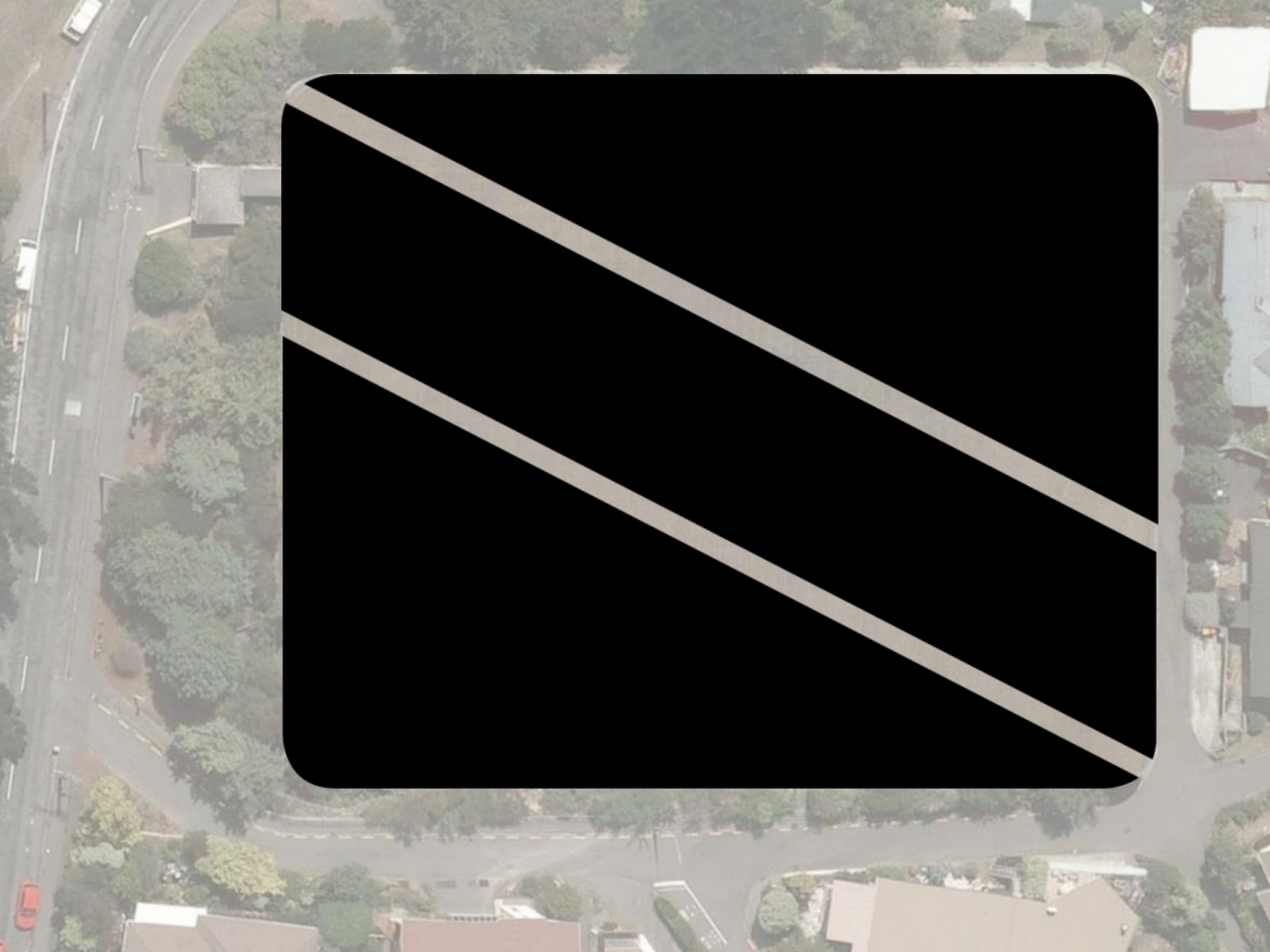
Water loss paths



Time to empty: Not known accurately but a few hours

Inferred location of shear zone





Displacements

B

Predicted relative movements between A & B
Horizontal and Vertical
100 to 150mm in 20 to 50mm increments

A

Damage

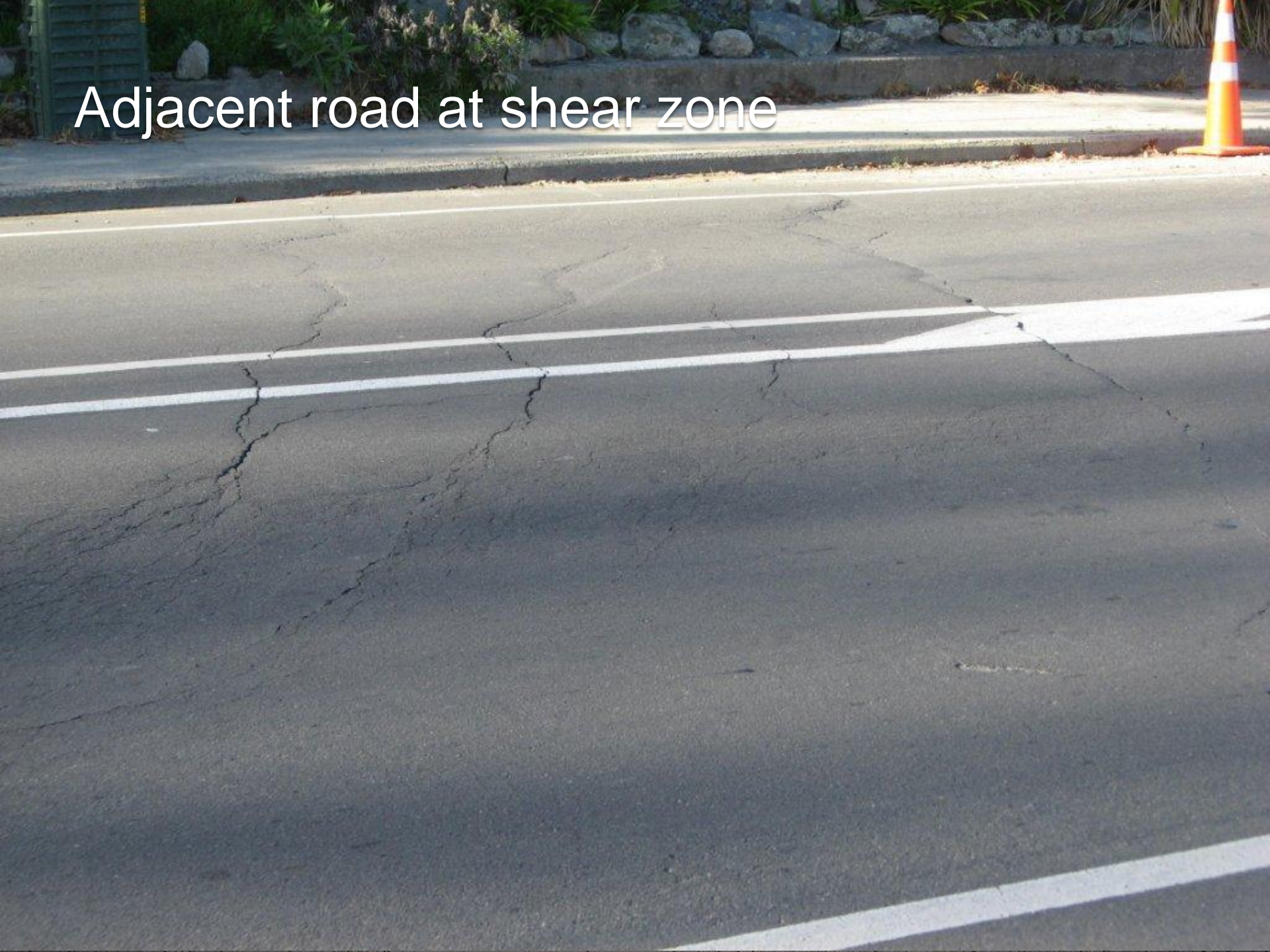
Adjacent road at shear zone



Huntsbury Avenue at shear zone



Adjacent road at shear zone

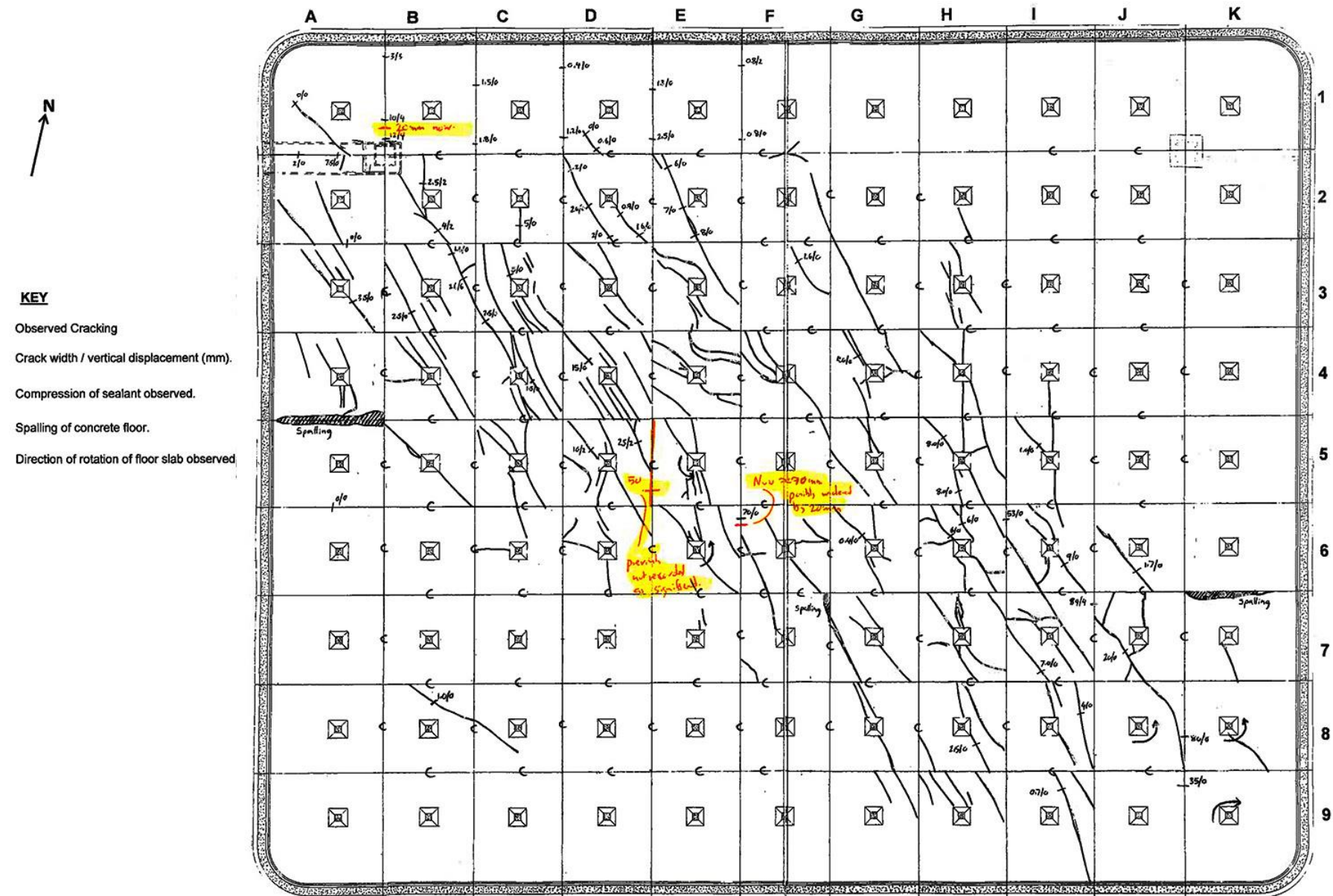


Pipe tunnel collapse



Pipe tunnel





Inspection undertaken on the 3rd and 4th of March 2011

Inclined borehole drilling through shear zone



Floor slab damage





Roof damage at column head

Roof damage at construction joint



Design

HUNTSBURY AVE

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Damaged structure zone

Stage 2 reservoir –
completed December 2012

Margin from shear zone

Margin from shear zone

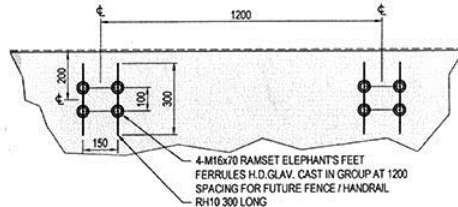
Stage 1 reservoir –
completed December 2011

Damaged structure zone

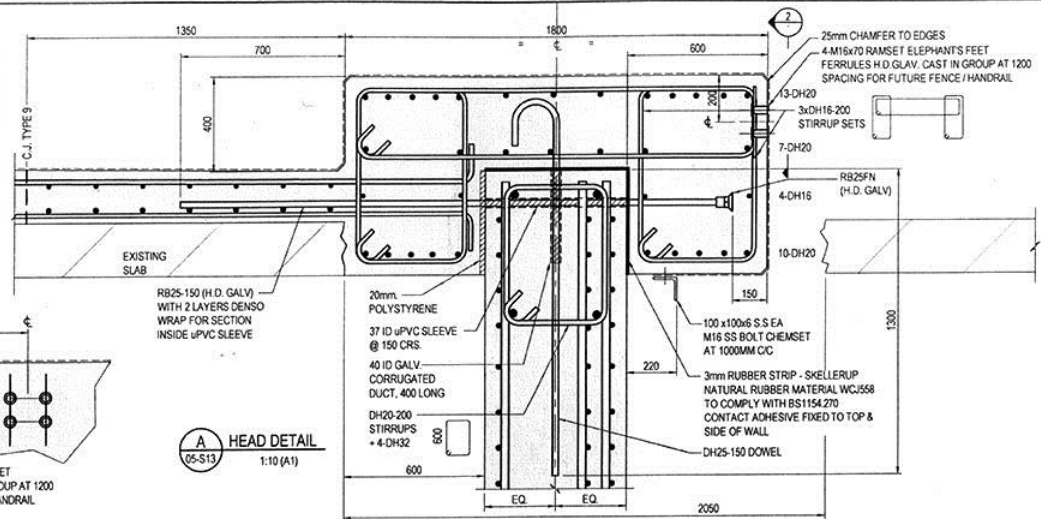
Reinstated reservoir footprints

NOTE:
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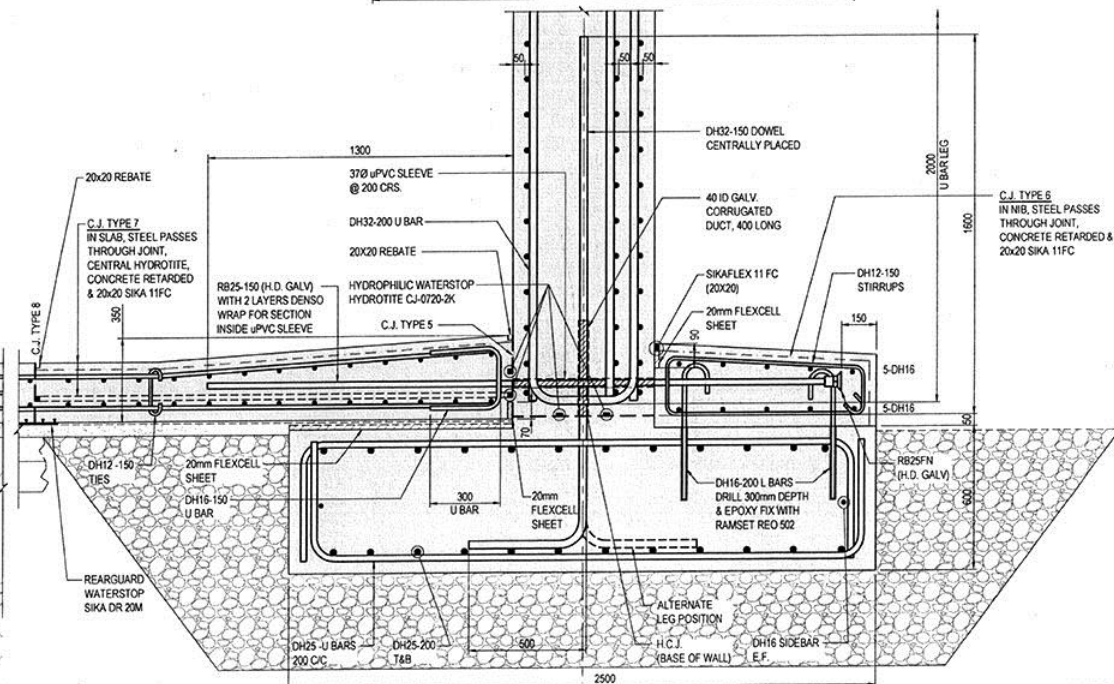
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2 SECTION
1:10 (A1)



A HEAD DETAIL
05-S13 1:10 (A1)



B BASE DETAIL
05-S13 1:10 (A1)

DISCARD ALL PREVIOUS COPIES OF THIS DRAWING

Drawings to	Re
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3382958-05-S18

AS	AS BUILT	JA	JPV	DWH	04.12
No.	Revision	By	Che	App'd	Date

Stronger Christchurch
Infrastructure Rebuild Team

Original Scale (A) AS SHOWN	George	J.P. VERAHO	15.08.11	Approved For Construction D.M. HUNT
	Orsen	A.J. PONTON	15.08.11	
Revised Scale (B)	Dag Hunter	D.M. HUNT	15.08.11	Date: 15.08.11
	Dag Creek	R.D. BURRIDGE	15.08.11	

Christchurch City Council 
CAPITAL PROGRAMME GROUP

HUNTSBURY No.1. RESERVOIR
STAGE 1
PN 10821

WALL DETAILS
SHEET 2

DO NOT SCALE

Construction

Initial access into
the reservoir
confined space



Construction Access



Slot for wall construction
roof strengthened for mobile crane



Stage 1
floor slab
overlay, column
bases and wall
construction



Pump Station in nearby park



Stage 2 reservoir – under construction



Temporary propping Stage 2



Wall construction Stage 2



Wall joint



Operations

Stage 1 reservoir operational December 2011
Landscaped area across shear zone



Stage 2 reservoir – landscaping in progress
1 May 2013



Management

- CCC consultation with local community
- Established working relationship CCC, Beca, Fulton Hogan
- Temporary facilities
 - CCC in suburban library
 - Beca in converted motel
- Environment of on-going earthquakes and damage
- Design and construct approach
- Individuals clear on responsibilities
- Flexibility required by all involved

People



Dennis Hunt



Rob Clifton



Mark Christison



Ian Billings



Nicholas Charman



Ash Pointon



Juvenal Verano



Doug Stirrat



Marcus Gibson



Ann Williams



Graeme Aitken

Conclusion

- Teamwork and prompt decision making essential
- Resilience required in design and detailing
- Importance of having stored water available after a major earthquake