



**Sustainable Communities**  
**Sharing Knowledge**

Scott Hockly

Environmental Management of an Inner  
City Roding Project



# Overview



- National War Memorial Park (Pukeahu)
- The big picture
- The Alliance

- Constraints
- Memorial Park Empowering Act
- Approach
- Reality







## Changing Buckle St from this...



*28 March 1900: Crowds walk east on Buckle Street to Basin Reserve, on the right, for a Māori carnival. Ellice Street is ahead on Mt Victoria. Source: Alexander Turnbull Library; Ref: PA1-o-127-11.*



**To this...**



Mt Cook Prison  
circa 1910





# To this...



May 1930: Roadworks on Buckle Street with a cannon visible at the barracks gates. Source: Alexander Turnbull Library; Ref: 1/2-075035-F.  
Photo: Evening Post newspaper.



# To this...



Anzac Day, 25 April 1932: 50,000 people stand in silence for the dedication of the Carillon on Mount Cook - the first of the National War Memorial buildings. Source: Alexander Turnbull Library; Ref: 1/1-020293-G; Photo: Sydney Charles Smith 1888-1972





**To this...**





**and finally to this...**







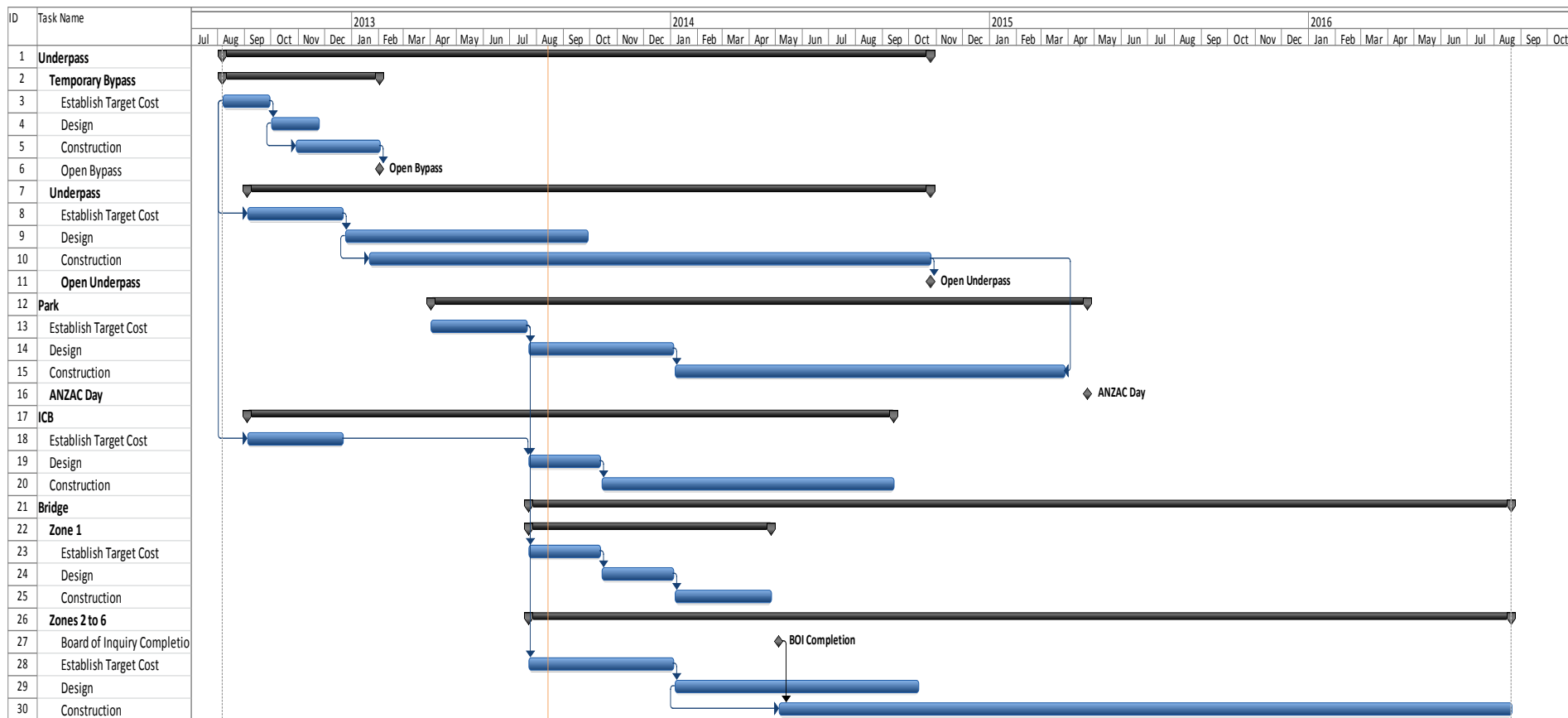


# Constraints

- Time
- Space
- Surrounding buildings and activities
- No disturbance to State Highway 1
- Archaeology
- Services



# Programme




















# Park Act

- Only way to ensure construction underway on time
- Broad consensus across the House
- Grants to NZTA and MCH all resource consents, designations and building consents.
- Facilitates amendments of statutory authorisations granted by this Act
- Allows independent certification of plans and documents required by conditions of the Act

	
<b>National War Memorial Park (Pukeahu) Empowering Act 2012</b>	
Public Act 2012 No 76	
Date of assent 3 October 2012	
Commencement see section 2	
<b>Contents</b>	
	<b>Page</b>
1	Title 4
2	Commencement 4
<b>Part 1</b>	
<b>Preliminary provisions:</b>	
3	Purpose 4
4	Interpretation 5
5	Meaning of Park land 7
6	Status of plans in Schedule 9 8
7	Act binds the Crown 9
<b>Part 2</b>	
<b>Statutory authorisations and other matters</b>	
Subpart 1—Resource consents and designations	
<i>Resource consents</i>	
8	Resource consents granted 9
<i>Designation</i>	
9	Designation provided for Agency 10
Subpart 2—Authorities relating to archaeological sites	
10	Authority to destroy, damage, or modify archaeological site 11
1	



# How the Act works

## **Schedule 1**

**Resource consents granted to Agency and conditions applying**

## **Schedule 2**

**Resource consents granted to chief executive of Ministry and conditions applying to them**

## **Schedule 3**

**Designation provided to Agency and conditions applying**

## **Schedule 4**

**Archaeological authorities granted to Agency and conditions applying**

## **Schedule 5**

**Building consents granted to Agency and conditions applying**

## **Schedule 6**

**Building consents granted to chief executive of Ministry and conditions applying**

## **Schedule 7**

**Power of entry and property rights granted to Agency and conditions applying**

## **Schedule 8**

**Power of entry and property rights granted to chief executive of Ministry and conditions applying**

## **Schedule 9**

**Plans**



# Approach to environmental management

## Approach

- Have a Plan
- Keep it simple
- Be flexible

## Objectives

- Minimise adverse effects
- Treat problems at source where possible
- Incorporate environmental management activities into the daily construction process





# Sediment control

- All areas with vehicles movements stabilized
- Avoiding any tracking over the excavation area
- Sweepers to clean up any spill from trucks









# Treatment tools

- DEBs
- Filter socks
- Silt fences
- Sump bags
- Impoundment
- Settlement tanks



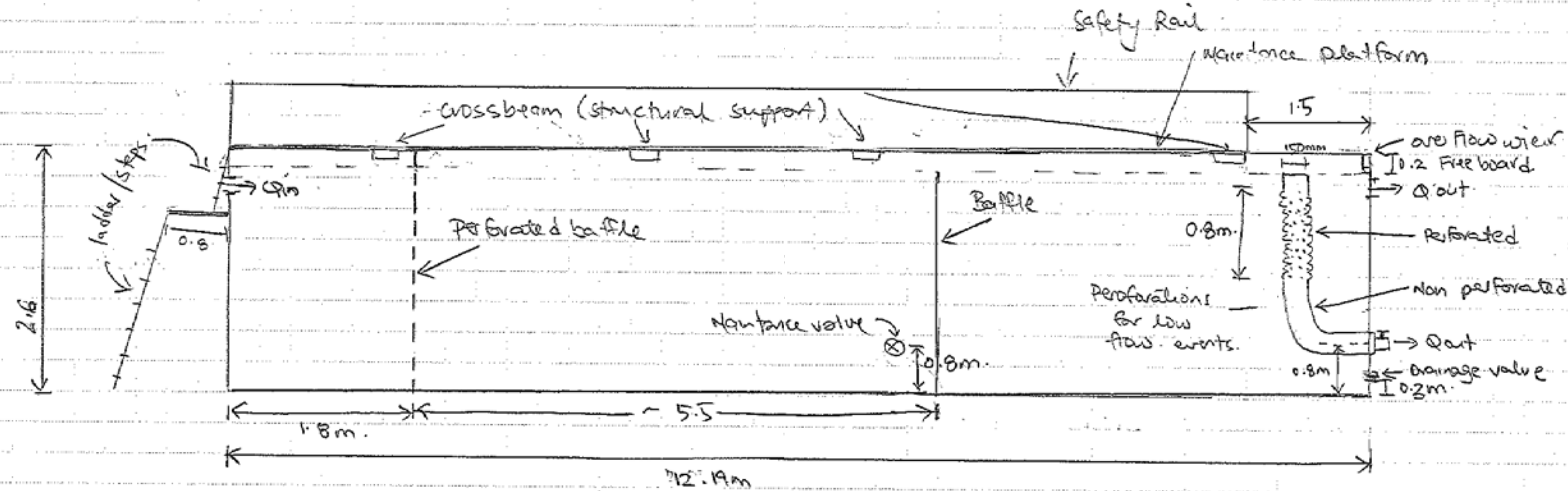


# Settlement tanks

- Theory
- All water contained within underpass excavation
- Pumped to tanks via filter gallery to settlement tank (capacity 40 l/s)
- Tank provides opportunity for settlement (capacity 120m<sup>3</sup>)
- Discharged to stormwater (in batches if necessary and flocculated if required)











Sediment  
control unit

Memorial Park  
Alliance

A Buzzi members



City of San Francisco



Department of Public Works

URS  
Engineering & Construction

URS



# The E&SCP

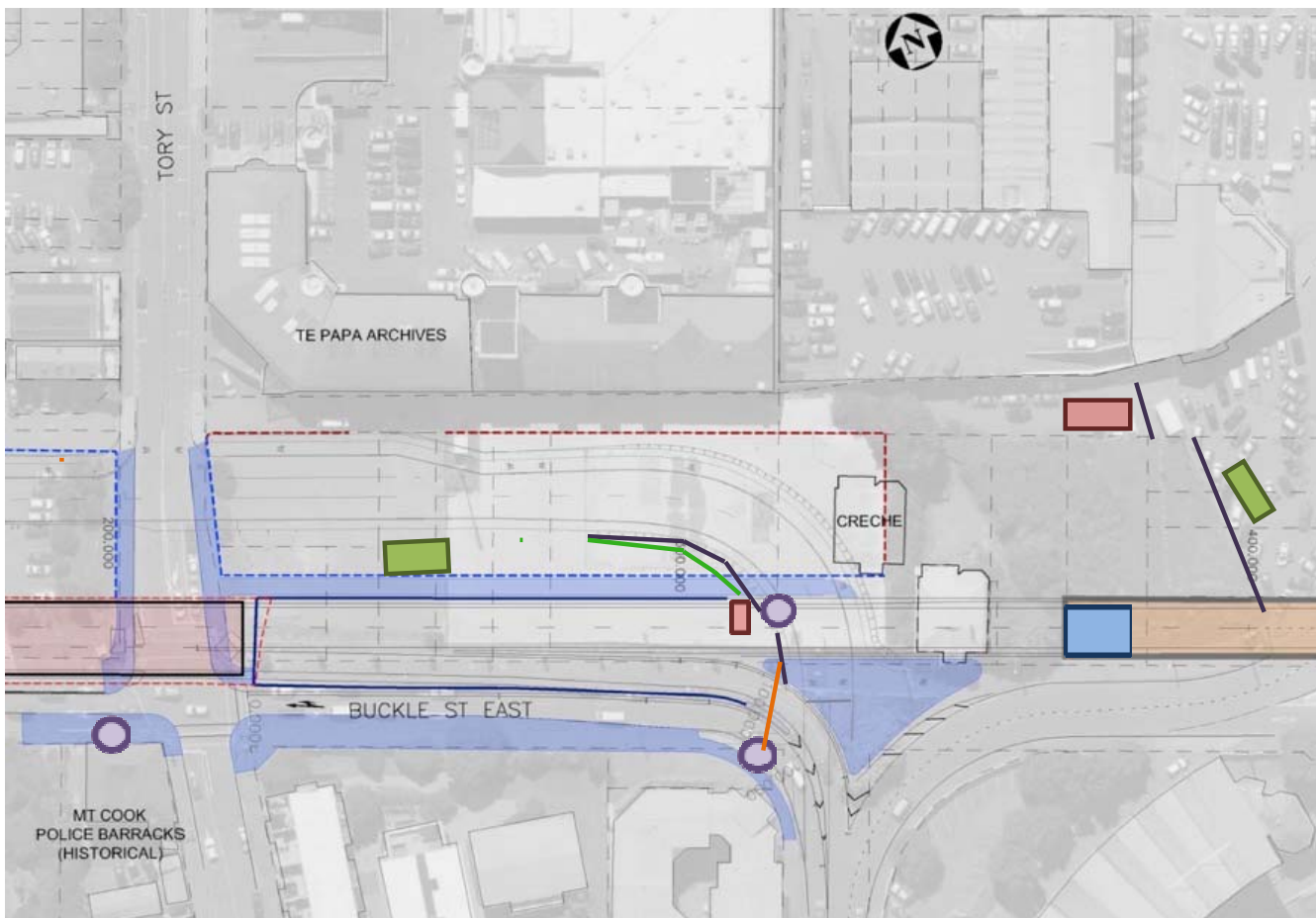


- A succinct document identifying responsibilities and methods
- A simple drawing showing the location of E&SC measures.
- To be updated in response to construction activities
- A second drawing covered actions prior to wet weather also regularly updated





# ESCP Summary Plan



Period 1/2/14 to 1/4/14  
Eastern half  
PREPARED EDB & BM

## Key:

- Silt Fences
- Treatment Unit
- Grit traps
- Bio sock
- Stabilised entrances
- Sumps
- Collector drains

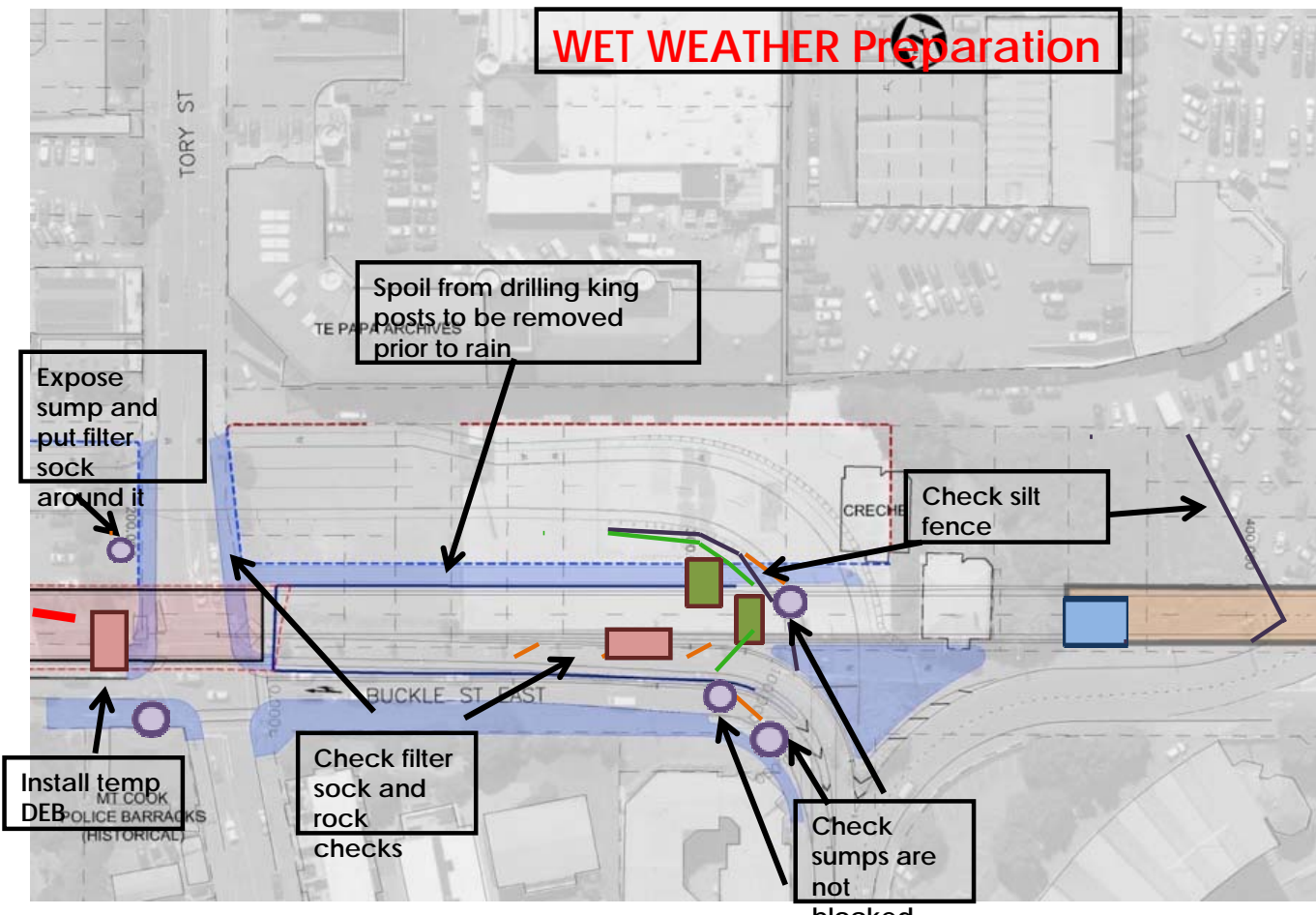


# ESCP Summary Plan



## WET WEATHER Preparation

Period 13/5/15 to 13/5/22  
Eastern half  
PREPARED EDB & BM



### Key:

- Silt Fences
- DEB
- Grit traps
- Bio sock
- Stabilised entrances
- Sumps
- Collector drains



# Reality



- The E&SC was prepared in advance investigations and design being completed
- 558 ground anchors had to be installed using 16,000 bags of cement
- 7500m<sup>3</sup> of concrete placed
- pH values up to 14.5 measured in settlement tanks
- Sediment not a problem











# Solution

Initially used magnesium sulfate in solution to lower pH

- this was labour intensive
- Slow
- hazardous

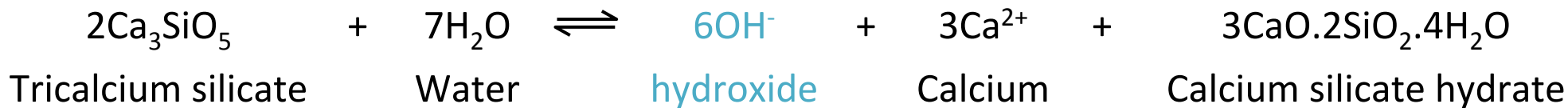
Replaced by using CO<sup>2</sup> gas

- Quick
- safe

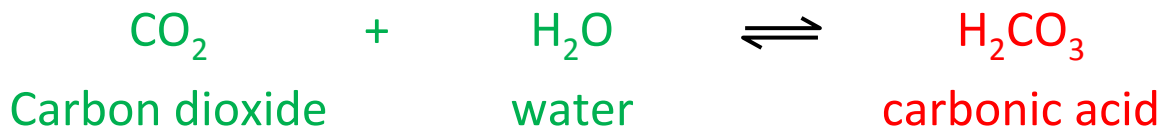


# CO<sub>2</sub> treatment of high pH stormwater

**Cement produces caustic hydroxide in water:**



Some of the carbon dioxide bubbled through the water dissolves, forming carbonic acid



Carbonic acid neutralises the hydroxide released by the grout











## CO<sup>2</sup> Process

- The CO<sup>2</sup> was bubbled a low level in the settlement tank at low pressure via a leaky irrigation house
- This produce the discharge of small bubbles of CO<sup>2</sup>
- pH levels were monitored at all at the top of the tank and at the base
- When pH levels were blow 8.0 the treated water was released
- The tanks needed regular emptying of sediment using jet vaccing





# Process vs Outcome

- You need both
- They are interrelated
  - you need a plan
  - you need a measureable outcome
- Balance is required
- You need to have flexibility to respond to site conditions







# Questions

?