



# Maintaining and Enhancing Spatial Accuracy in the Digital Cadastre

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# Outline



- SDC Areas
  - Coordinate update scenarios
  - Geodetic coordinate updates
  - Feilding case study – geodetic update
  - Feilding case study – cadastral update
- Non-SDC Areas
  - General update procedure
  - Waikawa Beach case study

# SDC Area Coordinate Updates



Scenario		Coordinates Affected	Frequency
1	Datum re-adjustment	2,300,000	One-off event
2	Geodetic control update	Up to 25,000	3 per month
3	Large deformation event (earthquake)	1,200,000	One-off event
4	Small deformation event	Up to 5,000	1 per year
5	Cadastral area adjustment	Up to 5,000	4 per month

# Geodetic Coordinate Updates – Why?



- Generally only occur with adopted traverse 5<sup>th</sup> Order networks
- Coordinates sometimes generated from older, relatively low accuracy data
- Marks may have physically moved (disturbed or No 2 position)
- Additional higher order control added to network
- Capture errors in geodetic networks
- Often these issues are identified by new Cadastral Survey Datasets (CSDs)

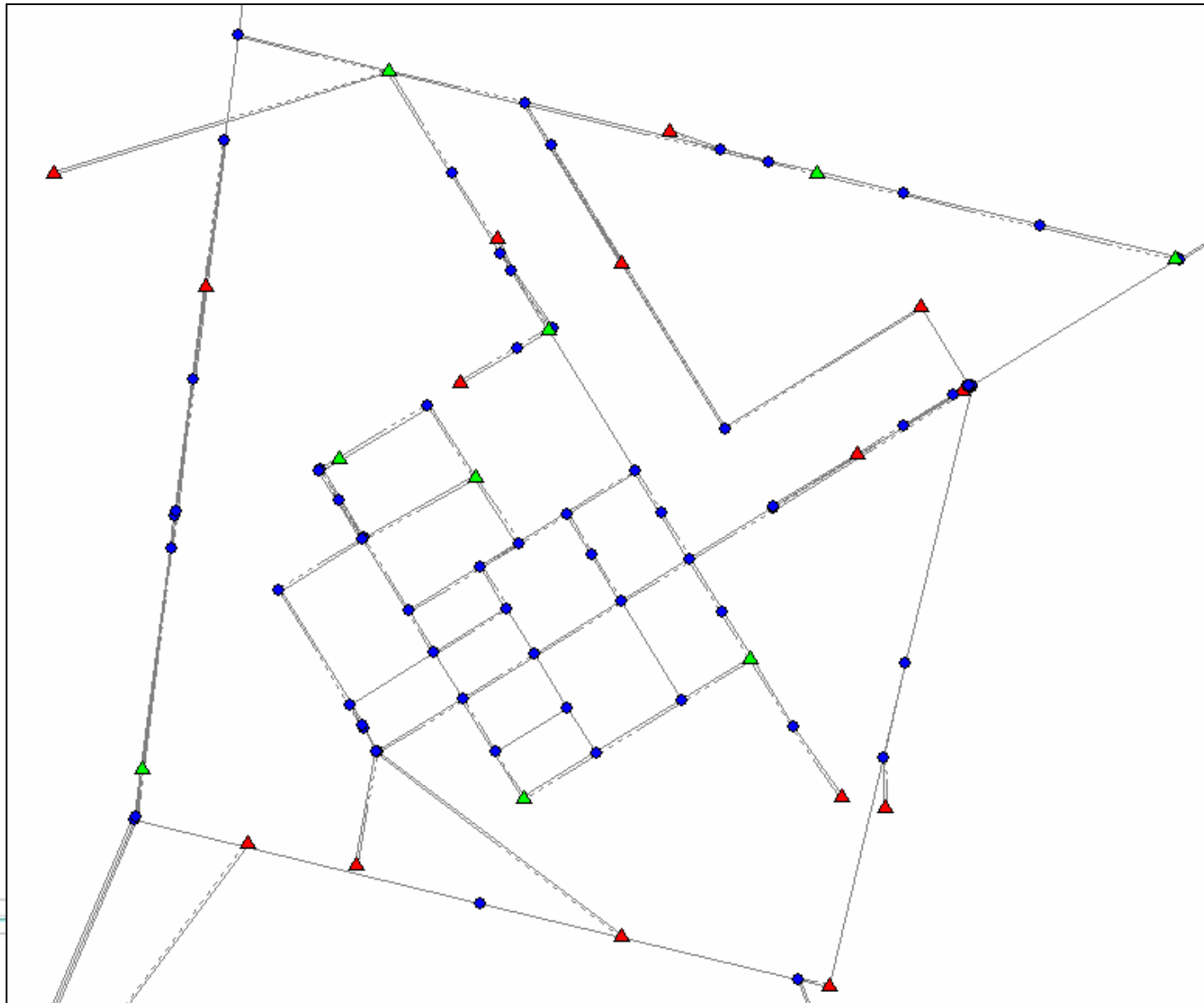
# Feilding Case Study



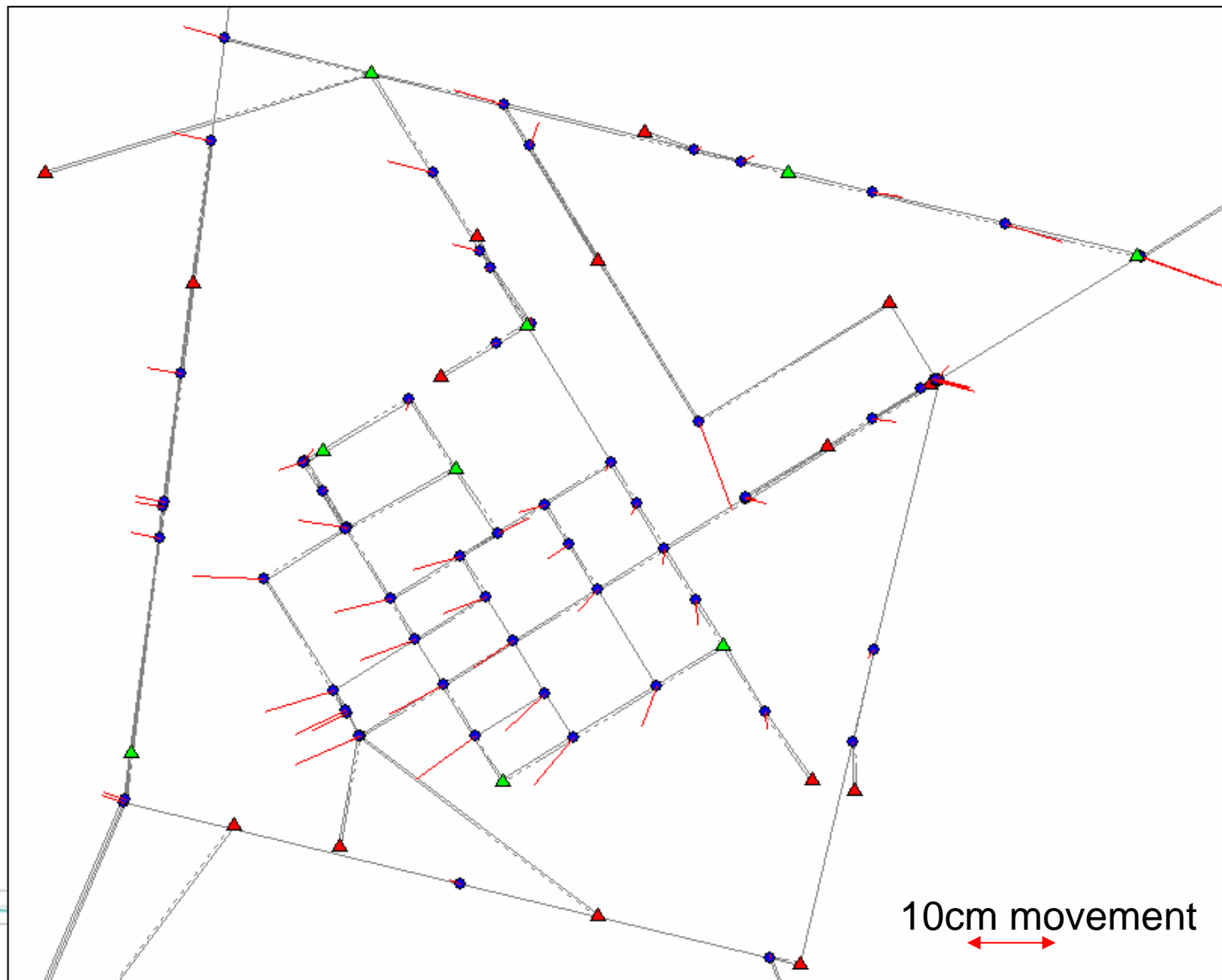
- Most observations from SO 13109 (1899 plan), some from SO 17853 (1923 plan)
- “Measurements are 1.7 links per mile too short” or 0.21m per kilometre (SO 13109)
- Variable OCD to geodetic bearing swings (-23 to -40 seconds)
- Difficulties for surveyors obtaining geodetic origins
- Difficulties for LINZ integrating data



# Feilding Geodetic Network



# Geodetic Coordinate Movements



# Geodetic Coordinate Movement



## CWA8: Historical coordinates

### MARK IDENTIFICATION

Code:	<b>CWA8</b>	Country:	<b>New Zealand</b>
Name:	<b>SS VIII SO 13109</b>	Land District:	<b>Wellington</b>
Alternatives:		NZMS270:	<b>S23D</b>
		NZMG:	<b>6105563 2728266</b>

### WANGANUI CIRCUIT 2000 COORDINATES

Northing (m)	Easting (m)	Ell Height	Order	Authorised	Reference
<b>801 627.964</b>	<b>406 567.751</b>		<u><b>5</b></u>	<b>9-Jan-2008</b>	<b>199916404 - Feilding 5a redo_2008-01-07</b>
801 628.014	406 567.819		<u>5</u>	7-Sep-2006	199916404 - Feilding 5a - redo070806
801 628.022	406 567.868		<u>5</u>	19-Jul-2005	199916404 Updating Feilding 5a Control
801 628.032	406 567.871		<u>5</u>	19-Jul-2005	199916404 Updating Feilding 5a control
801 627.867	406 567.778		<u>5</u>	24-Sep-2002	199916404 Feilding 5a Coord Correction
801 627.776	406 567.812		<u>5</u>	19-Sep-2002	199916404 Feilding 5a Coords
801 628.03	406 567.82		<u>8</u>	18-Sep-2002	

# Adjustment Improvements



- Nine additional higher order marks enabled:
  - More realistic errors to be assigned to observations
  - Robust scale error determination (103 ppm)
  - Robust bearing swing determination (-39 and -26 seconds)
  - Propagation of errors to be reduced
- Other improvements
  - Inclusion of data from recent approved CSDs (including GPS observations)
  - Capturing data to additional higher order control marks

# Cadastral Update

- 60 geodetic coordinates in Feilding updated
- Cadastral coordinates need updating to maintain relative accuracy
- These marks cover an area of about 4km<sup>2</sup>
- Cadastral network contains 7,500 marks, 27,500 observations
- Too large to run efficiently as a single adjustment
- But can split into parts



# Feilding Case Study



# Non-SDC Coordinate Updates



- Landonline data in non-SDC areas derived from digitised cadastral record maps
- Cadastre up to 50m out in rural areas
- Strong interest from local authorities and surveyors in having accurate parcel data
- Relative accuracy is often OK, but absolute accuracy may be poor



# Non-SDC General Solution



- Survey geodetic control
- Capture ties from control into boundaries
- Re-adjust “pseudo” (cadastral record map) observations in terms of control
- Improves absolute accuracy
- Full capture improves relative accuracy BUT is far more intensive

# Waikawa Beach Case Study

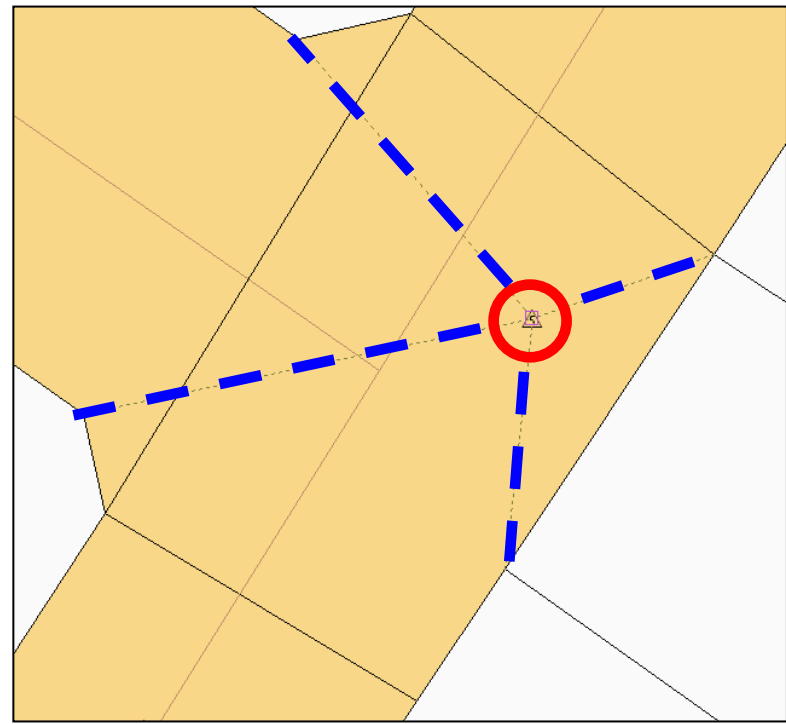
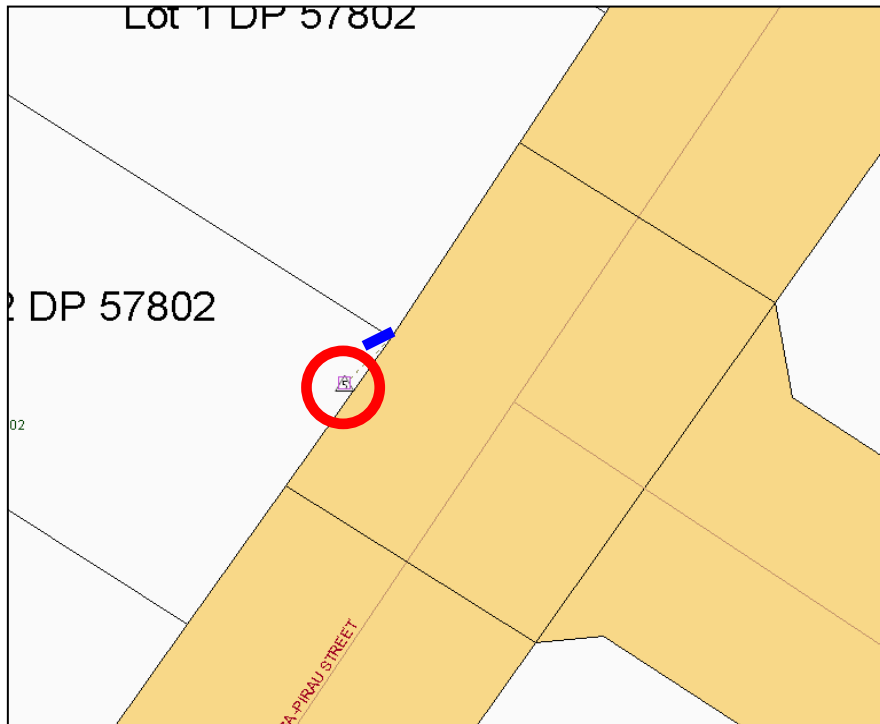


- New 5<sup>th</sup> Order control established at urban density
- Captured ties from control into boundaries
- Adjustment run holding these control marks fixed
- Error ellipses less than 2m at 95% CI – for many GIS users, this level of “visual” accuracy is sufficient



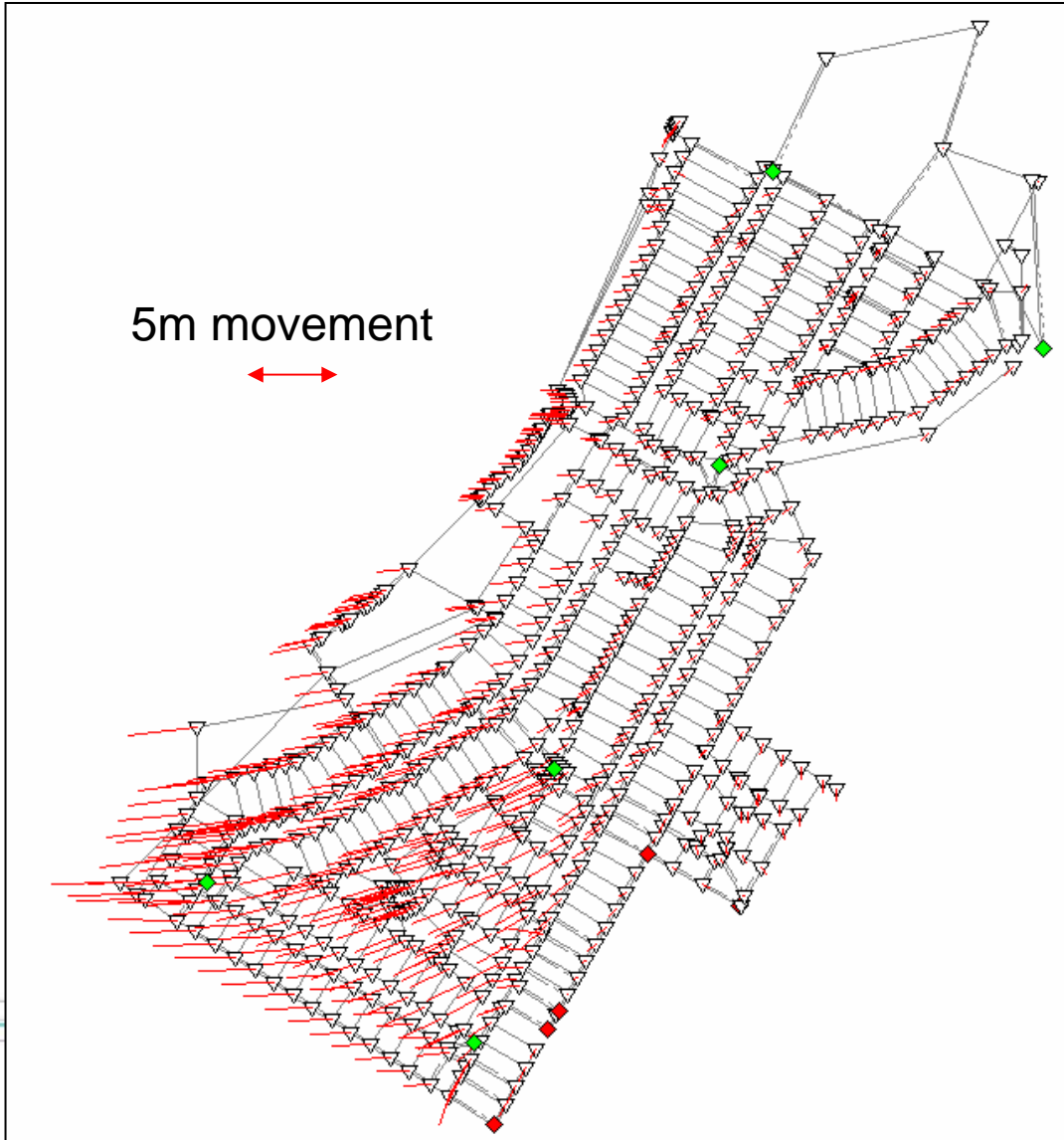
# Waikawa Beach Case Study

## Adopted boundary ties



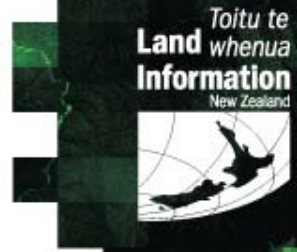
# Waikawa Beach Case Study

## Mark Movements



# Waikawa Beach Case Study

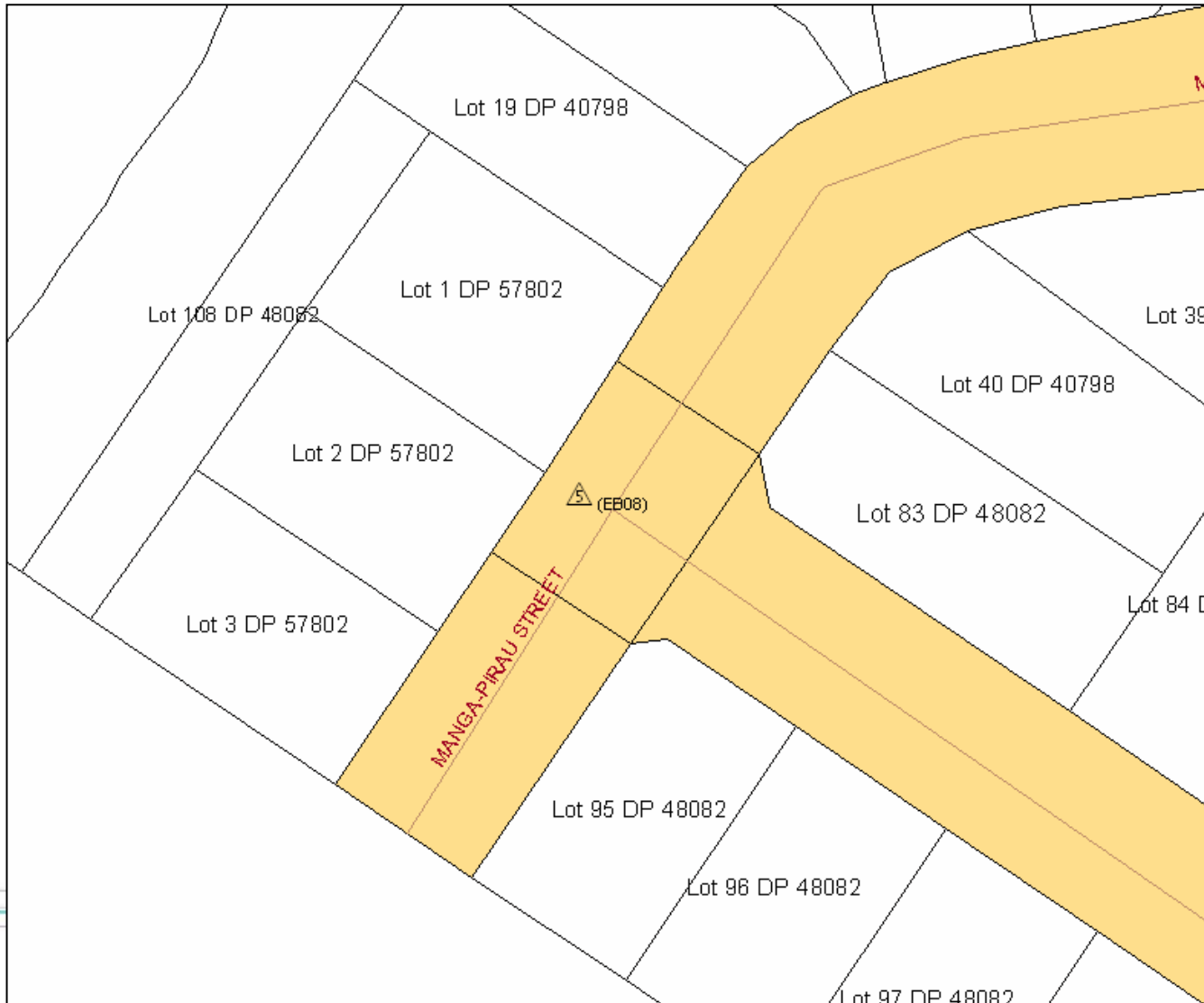
## Control Mark Before





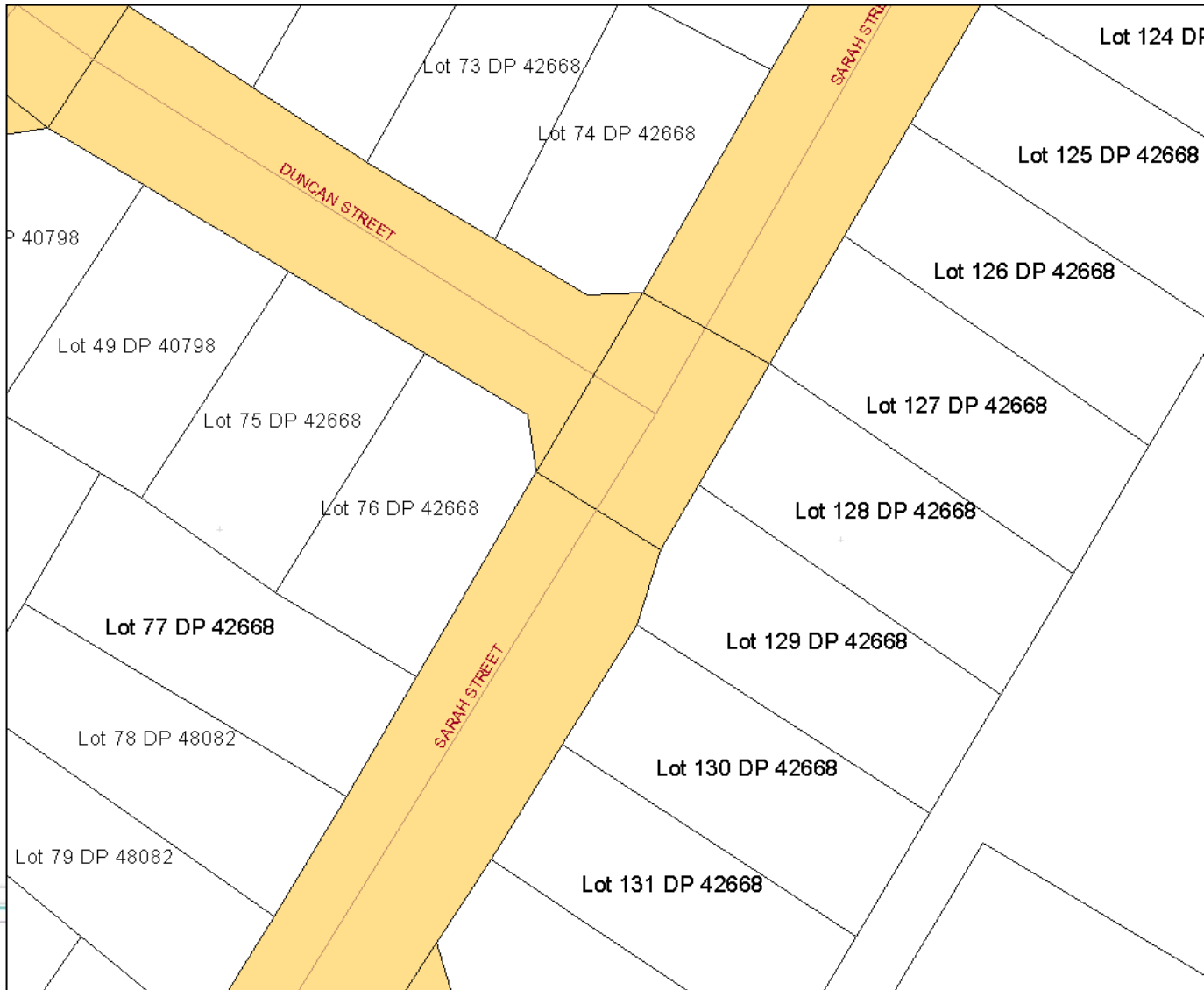
# Waikawa Beach Case Study

## Control Mark After



# Waikawa Beach Case Study

## Road Alignment Before





# Waikawa Beach Case Study

## Road Alignment Afterwards



# Questions?

