

Victorian Digital Cadastral Modernisation Adjustment Project

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Spatial
Vision



The State of Victoria

About our State



6.65 million

Current Victorian population



Top 10 most liveable

Ranked in world's top 10 most liveable cities since the Economist Intelligence Unit's index began in 2002



Second-largest

economy among Australian states



90% residents

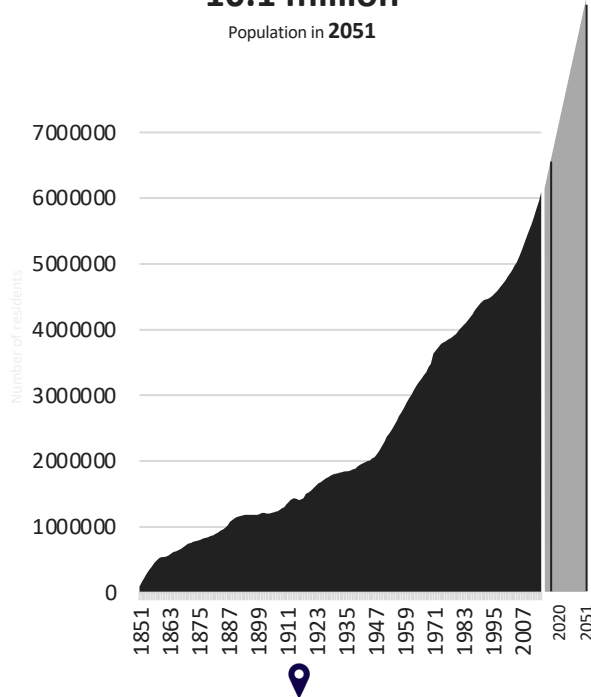
live in cities and towns, making it the most urbanised Australian state

We're experiencing unprecedented population growth...



10.1 million

Population in 2051



ABS, 3105.0.65.001 - Australian Historical Population Statistics, 2016

...which means big business for property



33,800

Houses



8,600

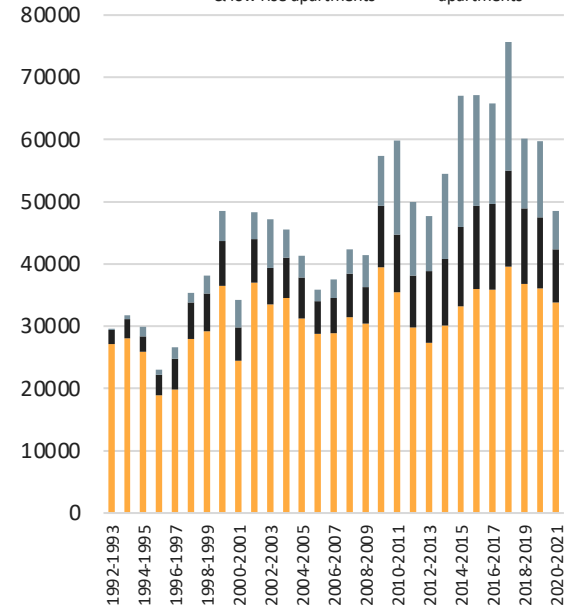
Semi-attached, townhouses
& low rise apartments



6,100

High rise
apartments

3/4
YR



ABS, 8731.23 - Building approvals, Australia, July 2021



The development of housing, transport, environmental and social infrastructure to ensure our sustained economic resilience, liveability and well-being depends on reliable and accurate mapping of land ownership

The Digital Cadastral Modernisation Project

Client:

Victorian Dept of
Environment, Land, Water
and Planning

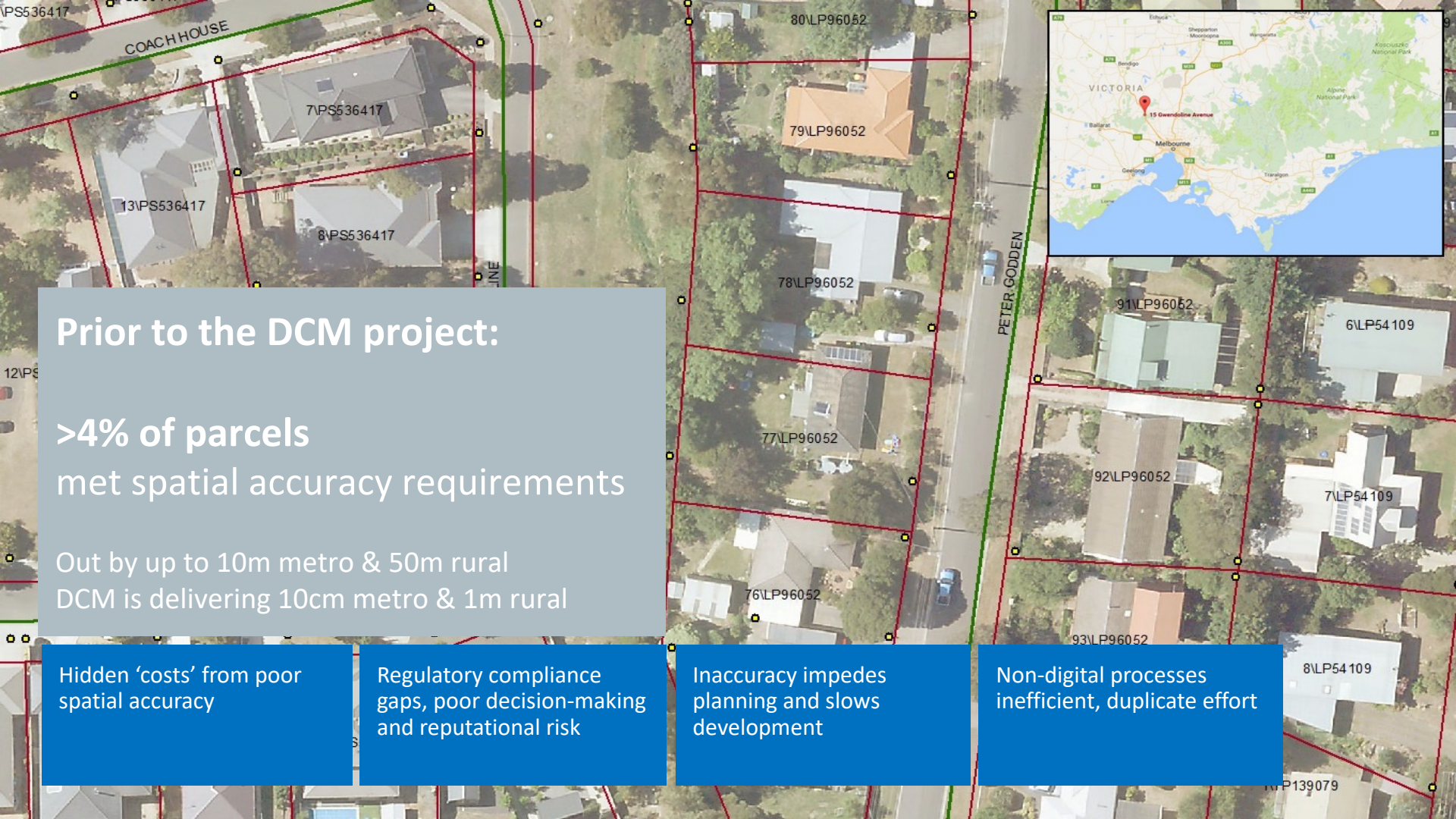
Government Investment:

\$47 million

Scope: the whole
State of Victoria
(3.1 million parcels)

Duration: 3 years





Prior to the DCM project:

>4% of parcels
met spatial accuracy requirements

Out by up to 10m metro & 50m rural
DCM is delivering 10cm metro & 1m rural

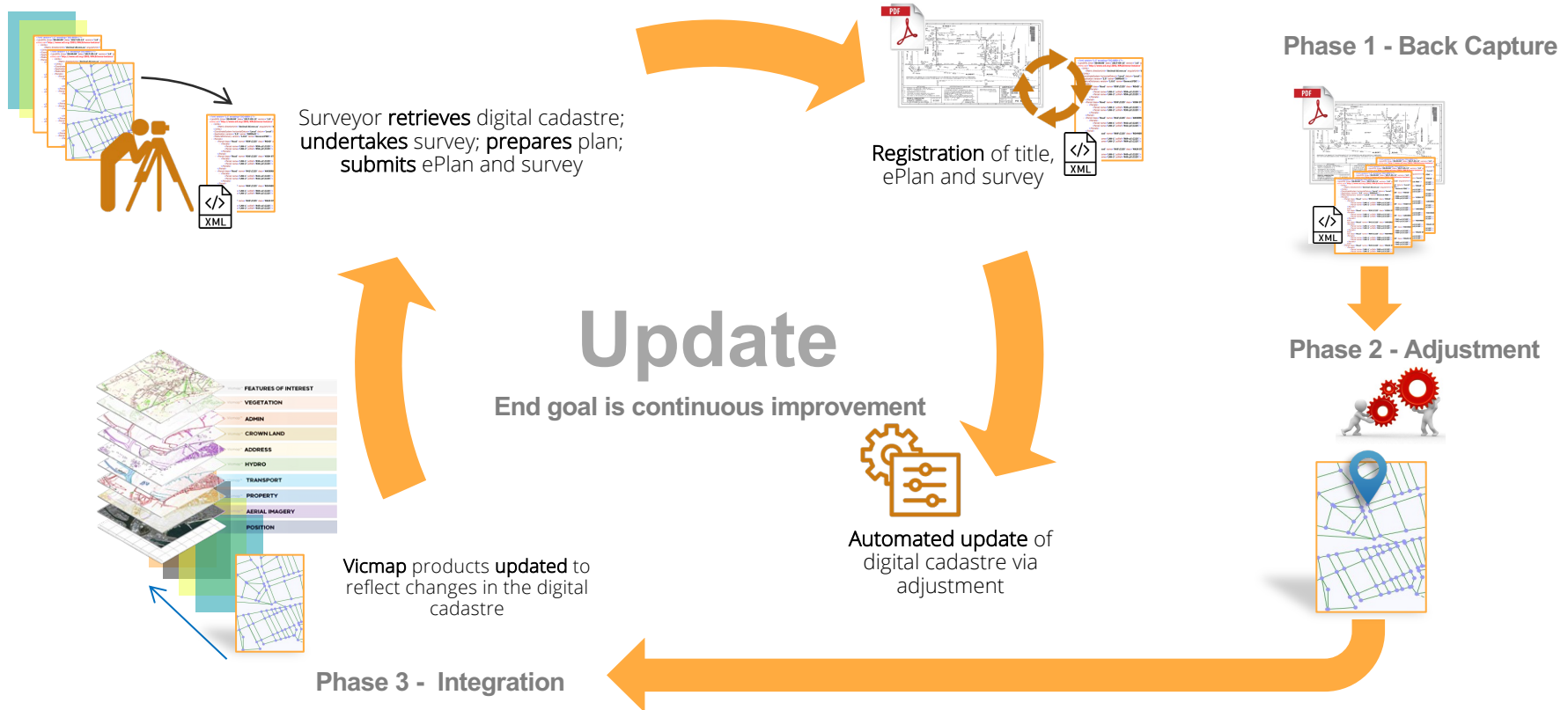
Hidden 'costs' from poor
spatial accuracy

Regulatory compliance
gaps, poor decision-making
and reputational risk

Inaccuracy impedes
planning and slows
development

Non-digital processes
inefficient, duplicate effort

Cadastral Data Improvement – intended lifecycle



Perceived barriers

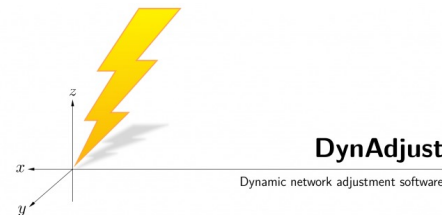
COMPLEXITY

- Disparate data quality
- Data preparation and management
- Computing environment
- Adjustment software
- Resolution of problematic adjustments
- Maintaining cadastral intent
- Analysis and interpretation of results
- Quality assurance

INEFFICIENCY

- Data compilation and cleansing
- Data volumes
- Computational demands

Practical solutions

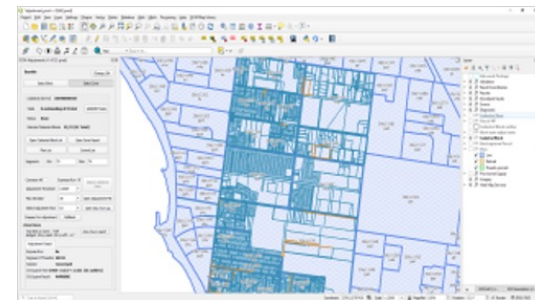
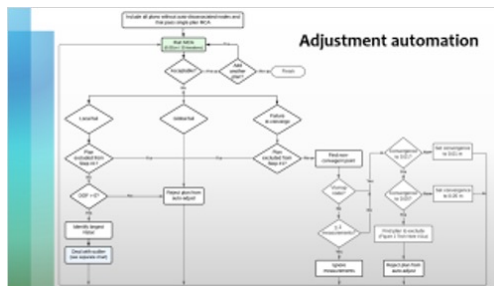


AUTOMATION

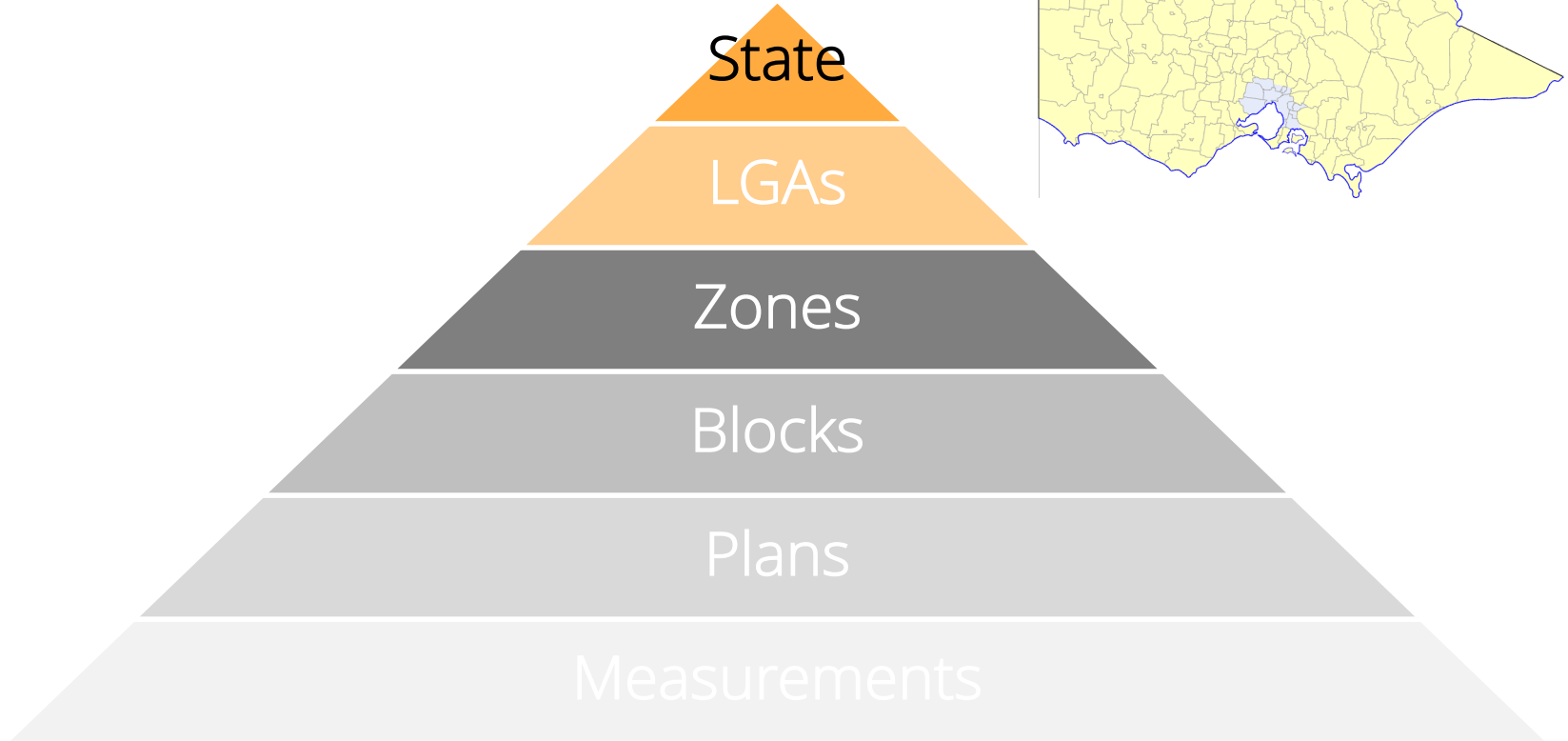
- Data segmentation
- Phased approach
- Detection/correction of association errors
- Adjustment
- QA of adjustment results
- Post-adjustment node association/validation

SYSTEM DESIGN

- AWS-based cloud computing
- Multi-thread processing
- Purpose built QGIS adjustment/data editing interface and data management system

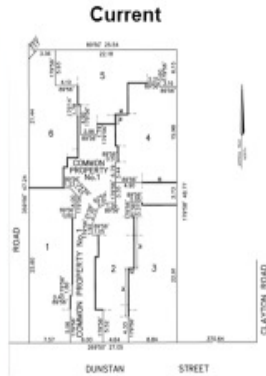
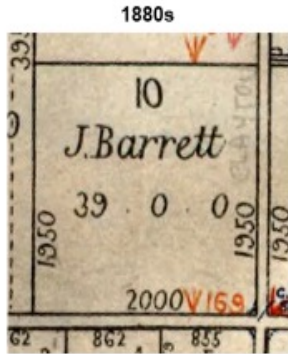


Data Hierarchy

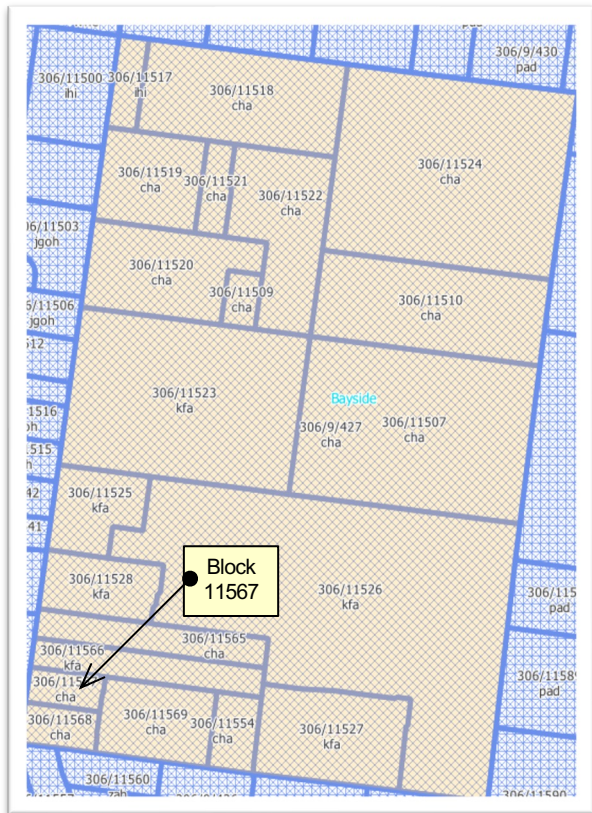


Survey plans to blocks

- Successful least squares adjustment of cadastral measurements requires an understanding of cadastral surveying legislation, policies and practices over 150 years.



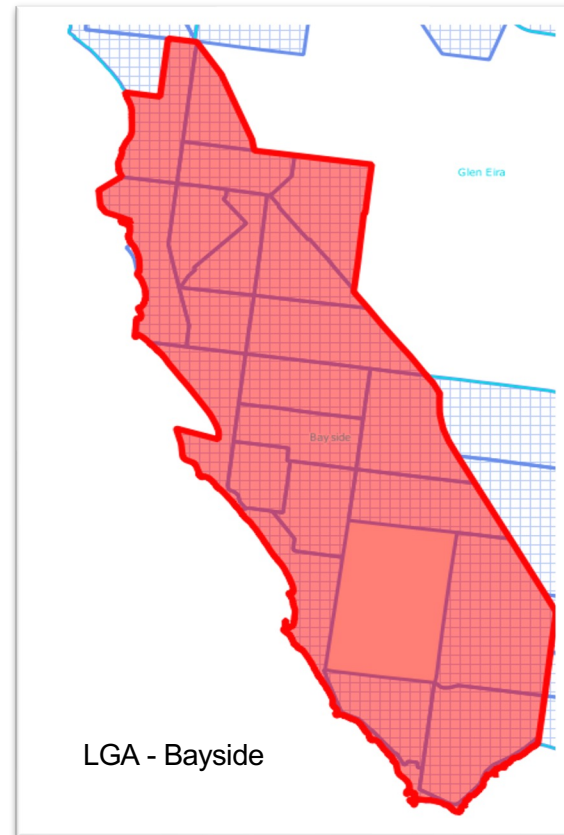
Blocks to zones to LGA



21 Blocks in **Zone 427**

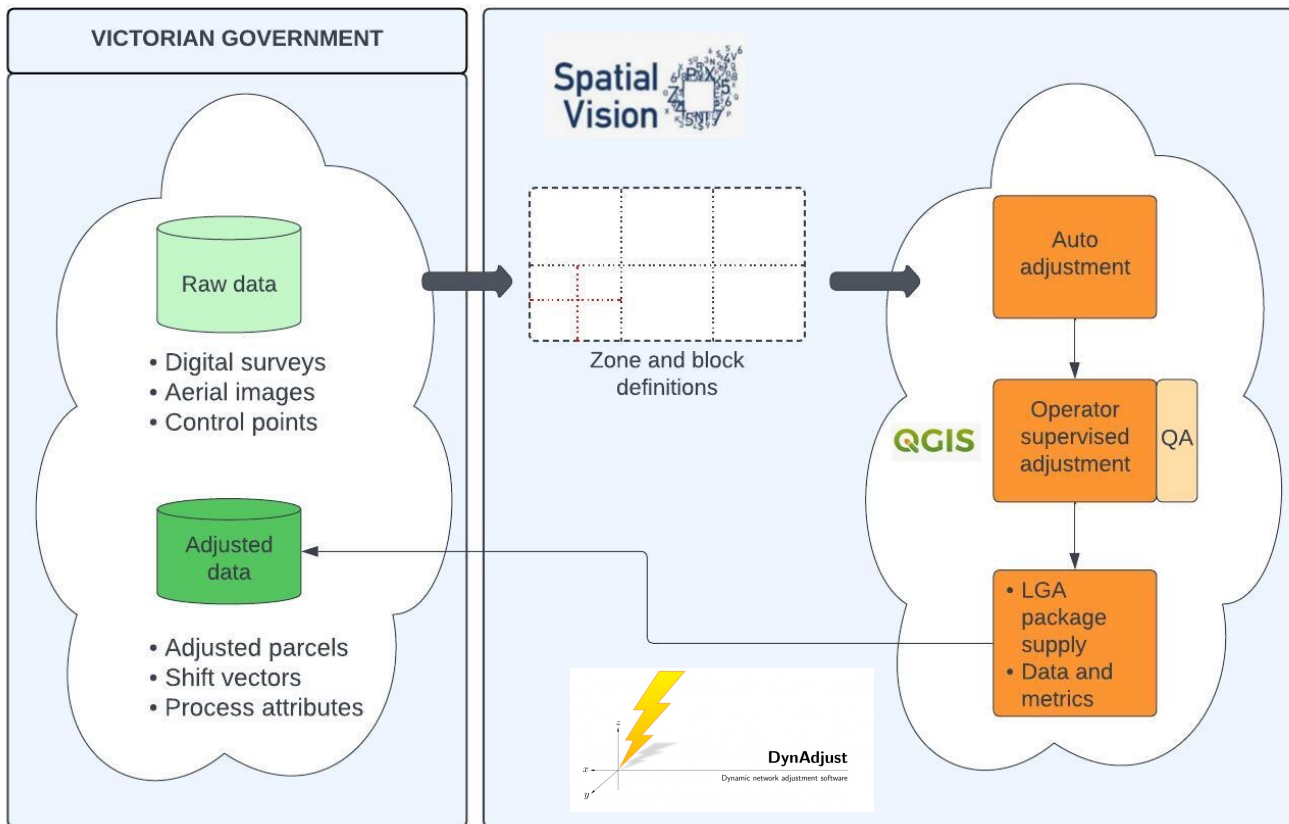


22 Zones



LGA - Bayside

DCM Production System – high level workflow



DCM Production System – customised QGIS operator interface

Amazon WorkSpaces

Amazon WorkSpaces View Settings Support

*adjustment_prod — QGIS [prod]

Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh Processing Help DCM Map Library

DCM Adjustment (v1.4.144-prod)

Moynie

Change LGA

Select Block Select Zone

Cadastral Block Id 354000020181

Status Done Multi-Block? ☐

On-hold No

Tasks 0 outstanding of 0 total Add/Edit Tasks

Why

Comments

Selected Plans 76/77

Control constraints 46/50

Open Plan List Open Control List

Open Block Report Set On-hold

Constrain All ☐ Express Run ☒ Adjust Cadastral Block

Adjustment Threshold 0.0005

Max Iteration 30 Open Adjustment File

Select Adjustment Run 127 Open Adj. Run Log

Reopen For Adjustment Rollback

Block and zone times

Tool time on block: 00:33 / 01:24

Budget: 51.2, Used: 18.0, Left: 33.2

Zone hours report

Adjustment Result

Express Run No

Degrees Of Freedom 924

Solution Converged

Chi Square Test: 0.854 < 0.121 < 1.160 (0 outliers)

Chi Square Result WARNING

DCM Edit (v1.3.29-prod)

Bulk Ignore Selected

Observation

Edit (Active) Cancel

Update

Plan	purpose	Block	rotation	radius
1 PS508376W	normal	354000020181	NULL	NULL
2 TP022745L	normal	354000020181	NULL	NULL

getplanfile

1 / 1 100% + -

ROBERTSONS LANE

UND LANE

Coordinate 657953,578283 Scale 1:13880 Magnifier 100% Rotation 0.0 ° Render EPSG:7854

Quality Assurance - Block QA System Form

Constrain All ☐ Express Run ☒ Adjust Cadastral Block

Adjustment Threshold 0.0005

Max Iteration 30 Open Adjustment File

Select Adjustment Run 172 Open Adj. Run Log

Rollback

Block and zone times

Tool time on block: 00:50 / 01:15
Budget: 48.4, Used: 37.0, Left: 11.4

Zone hours report

Adjustment Result

Express Run: No
Degrees Of Freedom: 832
Solution: **Failed to converge**
Chi Square Test: 0.846 < 0.419 < 1.169 (7 outliers)
Chi Square Result: WARNING

Adjustment incomplete

Adjustment statistically successful

Constrain All ☐ Express Run ☒ Adjust Cadastral Block

Adjustment Threshold 0.0005

Max Iteration 30 Open Adjustment File

Select Adjustment Run 88 Open Adj. Run Log

Rollback

Block and zone times

Tool time on block: 00:02 / 00:48
Budget: 29.6, Used: 17.0, Left: 12.6

Zone hours report

Adjustment Result

Express Run: No
Degrees Of Freedom: 871
Solution: **Converged**
Chi Square Test: 0.830 < 0.129 < 1.189 (0 outliers)
Chi Square Result: WARNING

But Mandatory Test pass in AutoQA failed, needs actions

Validation (v2.1.126) - Block 354000020345

Auto QA Shift checks Detail checks Fit for purpose

Block status: Under Adjustment

Run Auto QA

Required test results ✖

Test	Outcome	Result
1 Status	Under Adjustment	✓
2 Discarded plans no reason	6	✖
3 SCN/SMES discarded no reason	0	✓
4 Last adjustment run was full run	Yes	✓

Warning tests

Test	Outcome	Result
1 Convergence	Converged	✓
2 Global result	WARNING	✓
3 At least 2 control points applied	8	✓
4 Live plans with primary parcels exc...	5	⚠
5 Outliers	0	✓
6 Primary parcels not building and n...	0	✓
7 Primary parcels not building - non...	6	⚠
8 SCN not applied	0	✓
9 Near nodes not associated (at 0.01...	4	⚠
10 Overlaps	8	⚠
11 Gaps	3	⚠
12 Average VM shift	2.310	⚠
13 Median VM shift	1.083	⚠
14 Maximum VM shift	37.290	⚠
15 PQ with diagnostic reason	0	✓
16 PQ with tight SD - wrong reason	0	✓
17 PQ with tight SD - approved reason	0	✓

Complete QA form

Validation (v2.1.126) - Block 354000020308

Auto QA Shift checks Detail checks Fit for purpose

Type: Near points

Generate

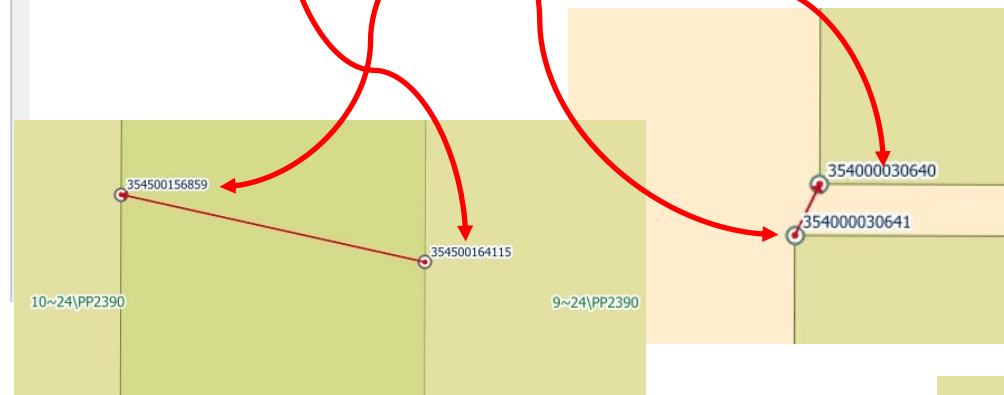
Threshold (m)

0.01

Auto fix

3 records found

	Cluster#	From node	From plan(s)	To node	To plan(s)	ID
1	1	354000030641	TP817981R	354000030640	PS333856E	1206377
2	2	354700613135	LP122231	354000045607	LP200484A,PS5...	1206378
3	3	354500164115	TP311456H	354500156859	TP063202V	1206379



Validation Tools

Validation (v2.1.126) - Block 354000020308

Auto QA Shift checks Detail checks Fit for purpose

Type: Gaps

Generate

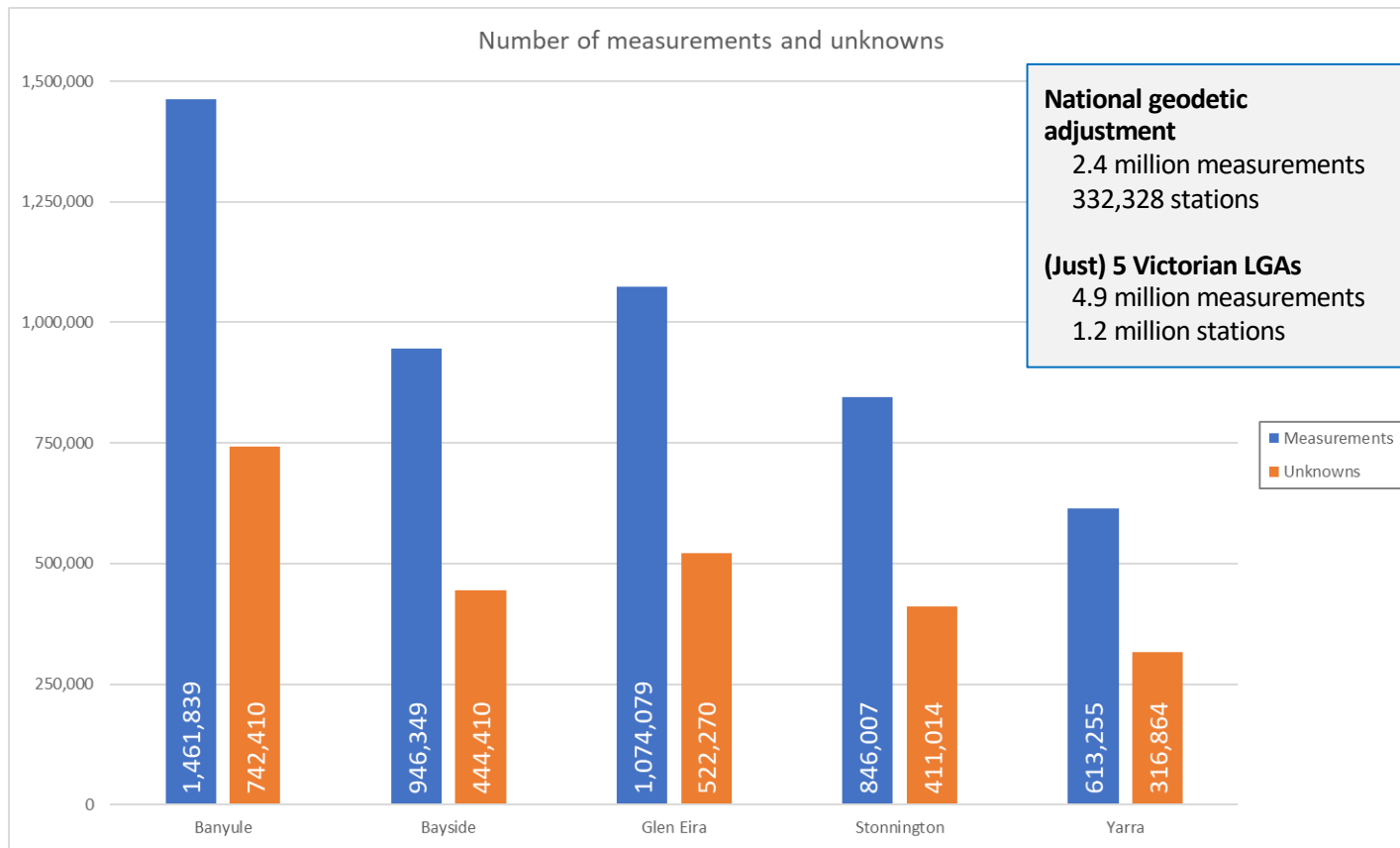
9 records found

	SPI 1	SPI 2	Gap Area
1	3~A\PP2835	3\PS601753	41.3293
2	2\PS601753	5\TP843774	15.4614
3	2\PS601753	4\TP843774	29.5864
4	2\PS601753	3\TP843774	26.078
5	2\PS601753	3~A\PP2835	78.2569
6	2A~4\PP2835	3\TP843794	72.2062
7	1B~4\PP2835	3\TP843794	93.9549
8	1B~4\PP2835	2A~4\PP2835	49.3364
9	1A~4\PP2835	2A~4\PP2835	42.1313

1A~4\PP2835

2A~4\PP2835

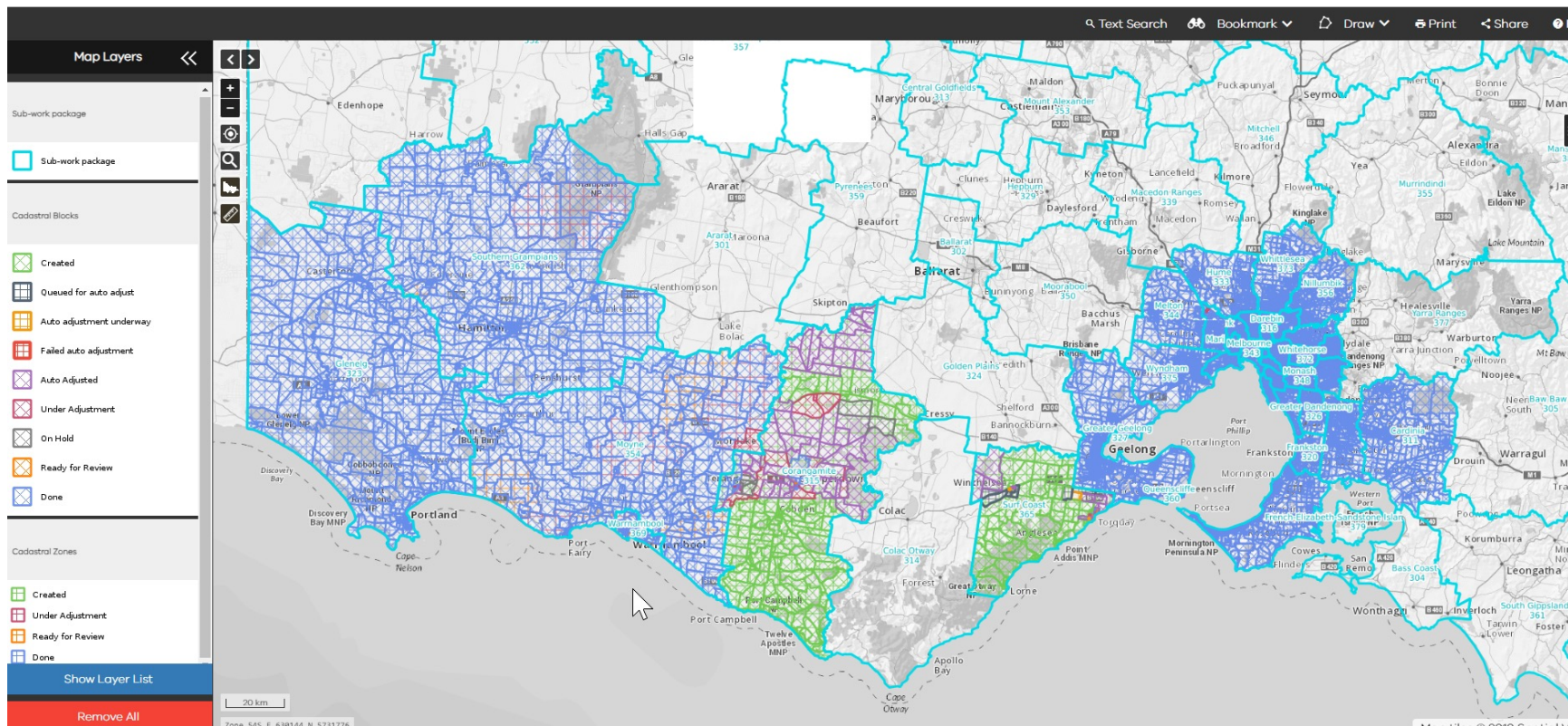
Data volumes (per LGA)



DCM Production System - monitoring and reporting

DCM2x2 Vista Management

Spatial Vision



Key outcomes

- Project will deliver 3.3 m adjusted parcels
- High level of productivity/efficiency achieved
- Optimal use of available data
- Cadastral intent maintained
- Validated statistical quality estimates
- Valuable by-products (e.g. shift vectors)

Spatial Vision has developed highly scalable and automated system/workflow – based on an open source tech stack.

***Talk to us about how we can help you with
your cadastral improvement project.***

Digital Cadastre Transformation



[spatialvision.com.au/
digital-cadastre-transformation/](https://spatialvision.com.au/digital-cadastre-transformation/)

Spatial Vision

