Live NSW – Spatial Digital Twin

Unlocking the value of spatial data

Narelle Underwood
Surveyor-General & Executive Director
Spatial Services

Department of Customer Service

9 February 2024

About Spatial Services

We are the spatial leader for NSW Government

We provide land information to individuals, businesses, and government agencies. Our authoritative spatial data provides the foundation to NSW's mapping and spatial information systems and are used across the community, government, industry and environmental sectors.

The products and services we provide help support a vast range of community, business and government activity - everything from tourism and land management, to electoral boundaries and emergency management.

Our spatial data connects locations, people and activities

Through the **Live NSW** program, Spatial Services is leading the development of the **NSW Spatial Digital Twin** (NSW SDT).

The NSW SDT provides an interactive visual representation of the real world in 2D, 3D or 4D (3D over time), including real-time data feeds.

The NSW SDT is used across Government and by end customers. It enables improved customer engagement, and facilitates Government planning, design and decision making.

The NSW SDT is considered a critical enabling capability for other key government programs including Smart Cities, Smart Places and the NSW State Infrastructure Strategy.

4.5 million+ land parcels in NSW
30,000+ new land parcels and **110,000+** new property addresses created

CORSnet-NSW

Achieved **100%** availability

3,820,145 SIX Maps views

1,176,768 SDT Data Portal views

34 government agencies supported with **recovery** and **emergency response** spatial products

Imagery capture program FY22/23

Aerial imagery **888km²**

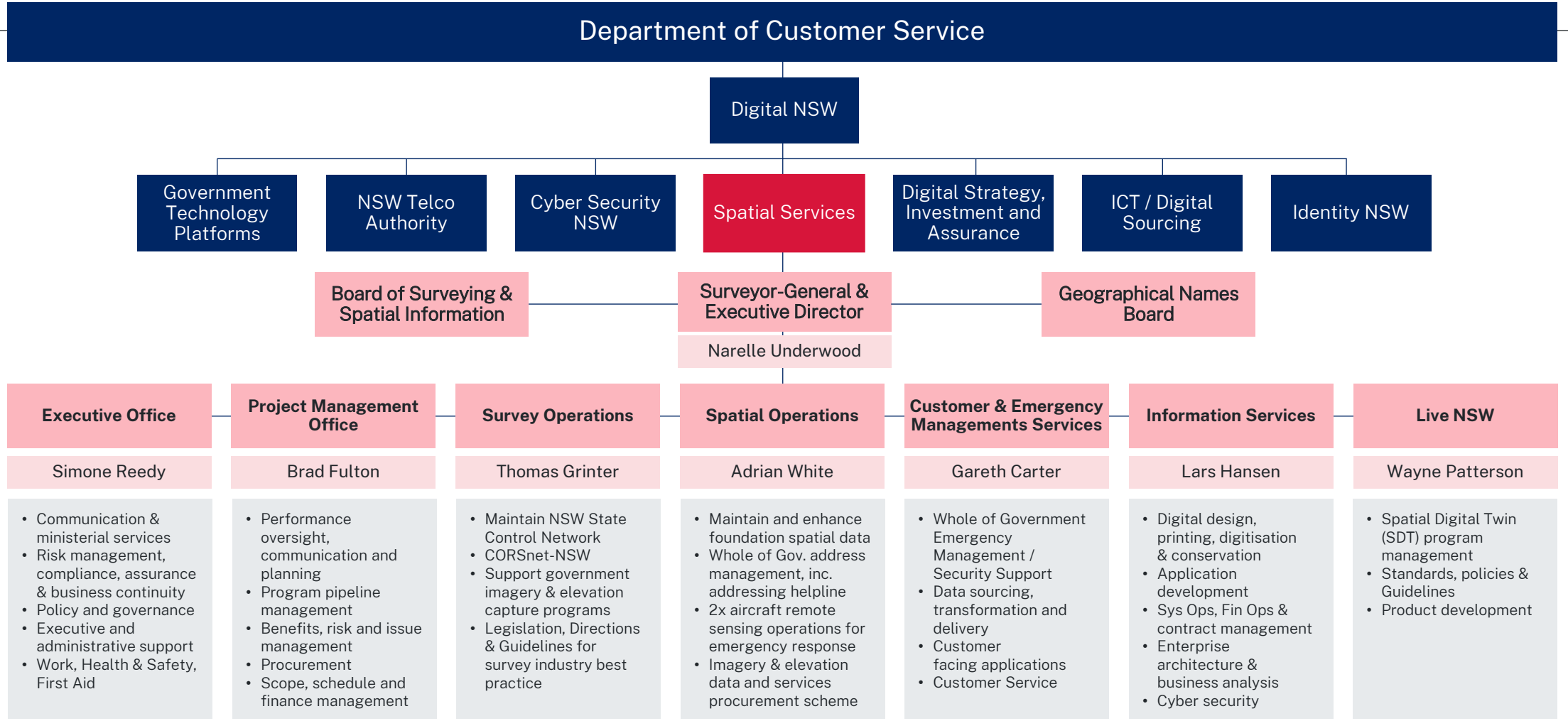
Flood imagery **6,226km²**

LiDAR **24,062km²**

107,350,000+ address validations

12,300+ Responses to enquiries

Our structure



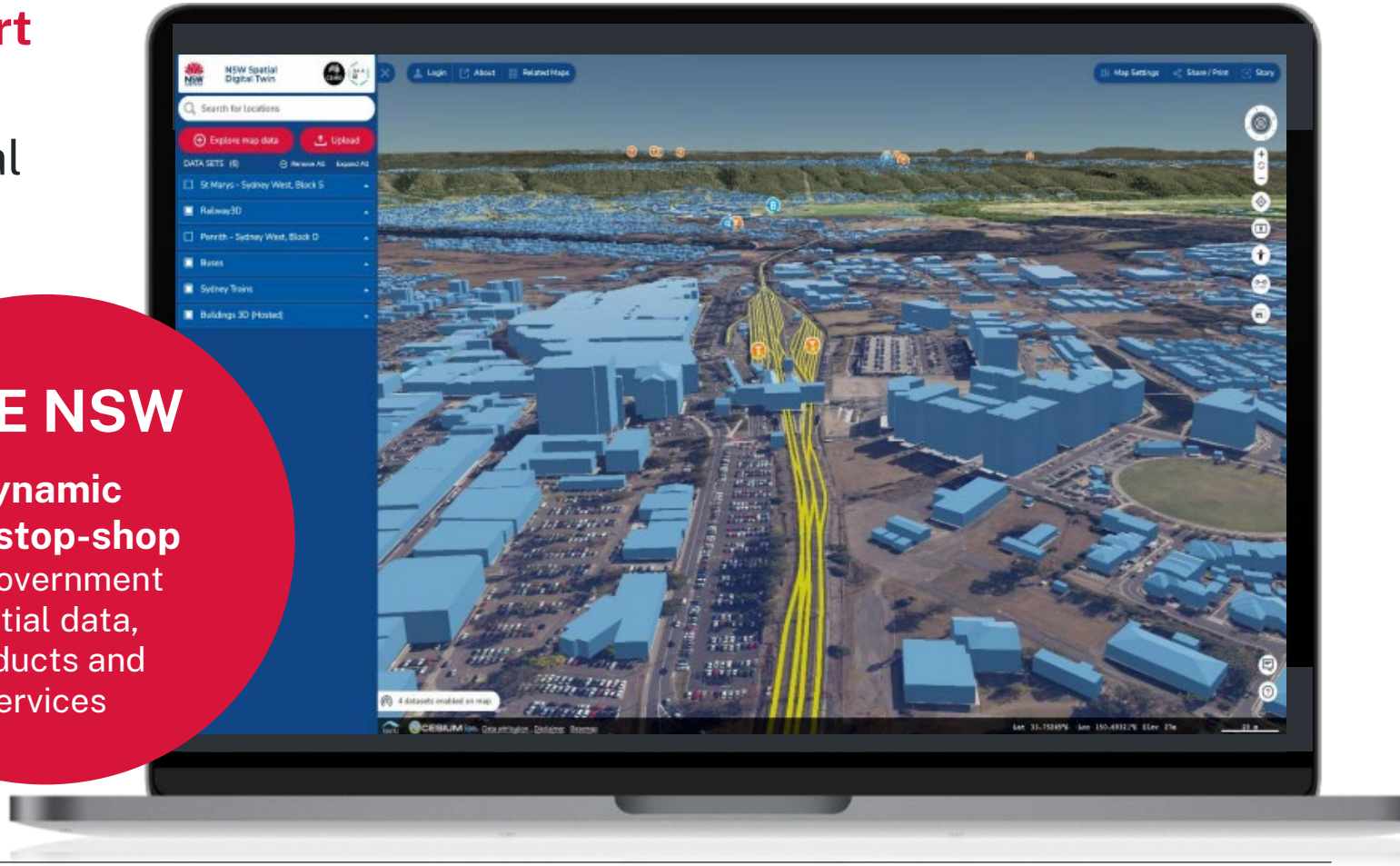
NSW Spatial Digital Twin
powered by the Live NSW program

$40m funding from the Digital Restart Fund to deliver

- Transformation of foundation spatial data, systems and processes
- Statewide gravity model
- Visualisation and customer engagement capabilities

LIVE NSW

Dynamic one–stop-shop for government spatial data, products and services



Products

SDT Explorer

"As a lay user I want an easy way to spatially search, explore and provide feedback on a particular area"

"As an advanced user, I want to be able to model, analyse and report"

SDT Stories

"I want to take a customer through a spatial narrative in order to engage with and, get consumer feedback on, a government initiative or policy that has a spatial element"

Spatial Collaboration Portal

"I want a *one-stop-shop* single front door to be able to search, upload / download / stream government, consumer and industry spatial data that I have access to"

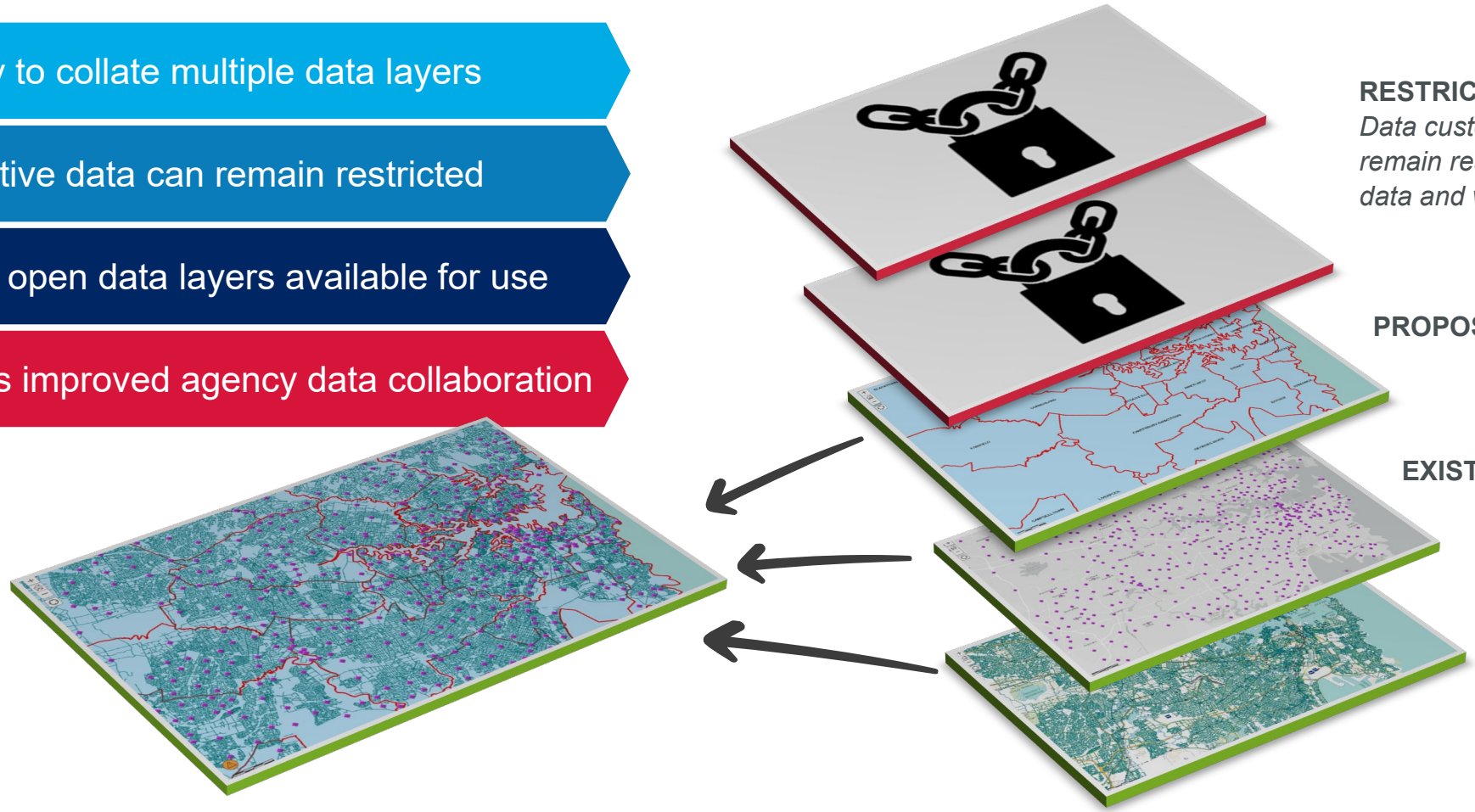
2D Maps/Journeys

3D Maps/Journeys

4D Maps/Journeys

NSW SDT supports open, secure & restricted data

- Ability to collate multiple data layers
- Sensitive data can remain restricted
- Make open data layers available for use
- Allows improved agency data collaboration



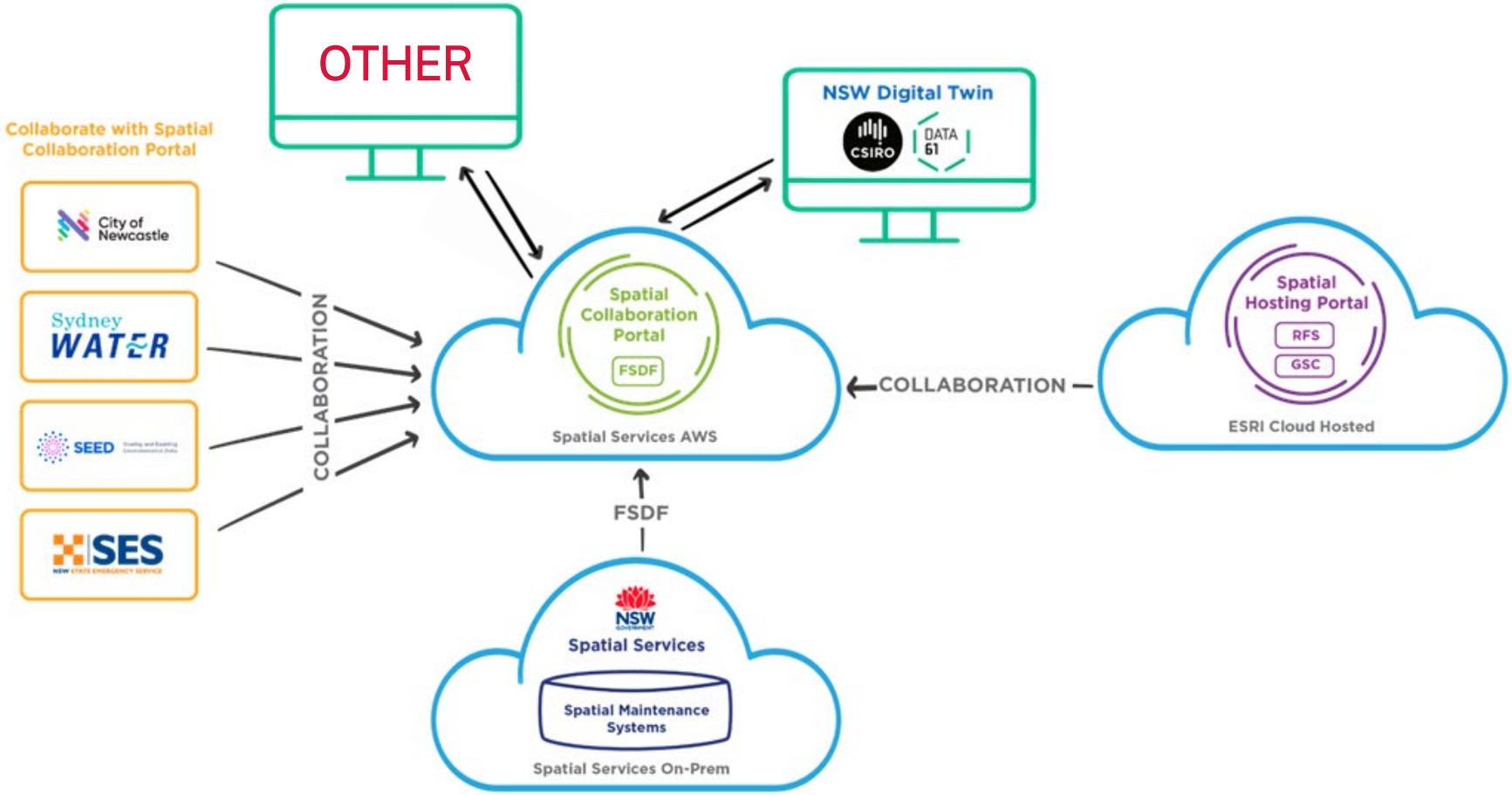
RESTRICTED DATASETS
Data custodians and agencies remain responsible for their data and who has access to it

PROPOSED INFRASTRUCTURE

EXISTING INFRASTRUCTURE

FOUNDATIONAL DATA
Cadastre, Aerial imagery, Zoning, Common Planning Assumptions, Transport and access, Tree coverage, Vegetation, Bushfire zones, Water catchment areas and Flood prone land, utilities, etc.

Collaboration and federation of geospatial data



Modernisation of the FSDF

Spatial data underpins all place-based decision making. It's regarded by the UN as essential for a successful economy, supporting countries to reach their Sustainable Development Goals.

FSDF modernisation = Standards based, 3D/4D, interoperable

Government of South Australia
Department of Environment, Water and Natural Resources

Land Information New Zealand
Toitū te whenua

Australian Government

State Government Victoria
Department of Environment, Land, Water & Planning

Northern Territory Government

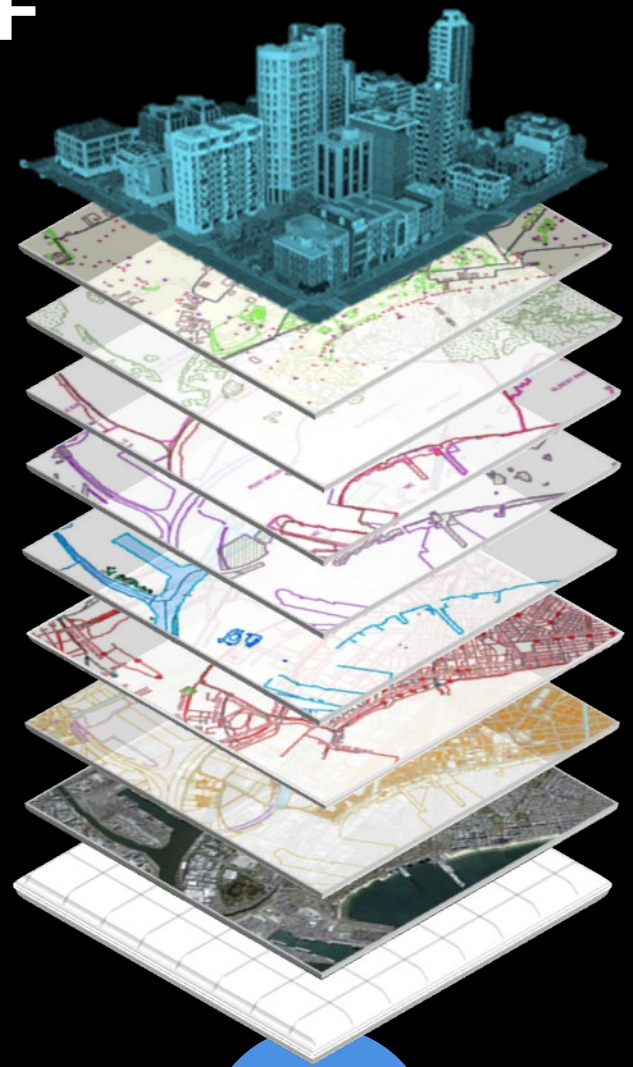
NSW GOVERNMENT

Government of Western Australia
Landgate

Queensland Government

ACT Government

Tasmanian Government



UN GGIM

BUILDINGS & SETTLEMENTS *

PHYSICAL INFRASTRUCTURE *

GEOLOGY & SOILS *

POPULATION

ELEVATION & DEPTH *

PLACE NAMES *

BOUNDARIES

WATER

ADDRESS *

TRANSPORT *

IMAGERY *

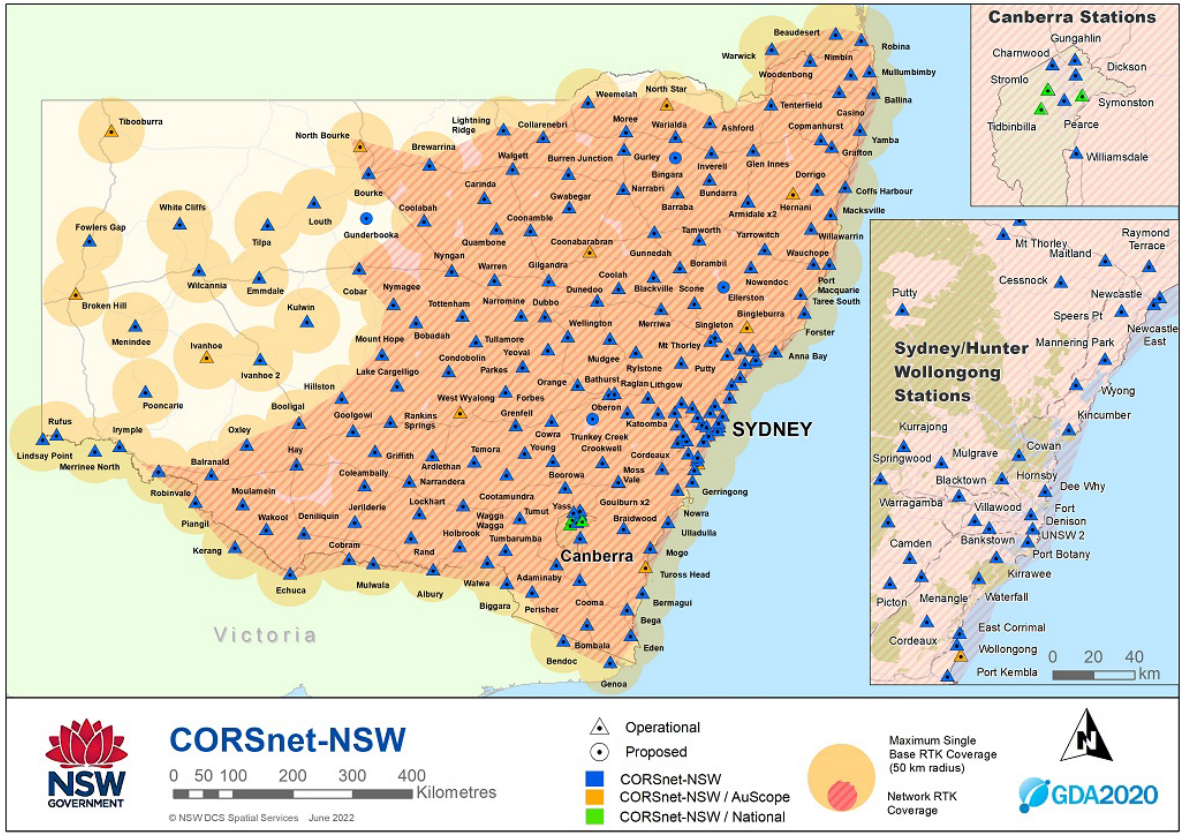
POSITIONING *

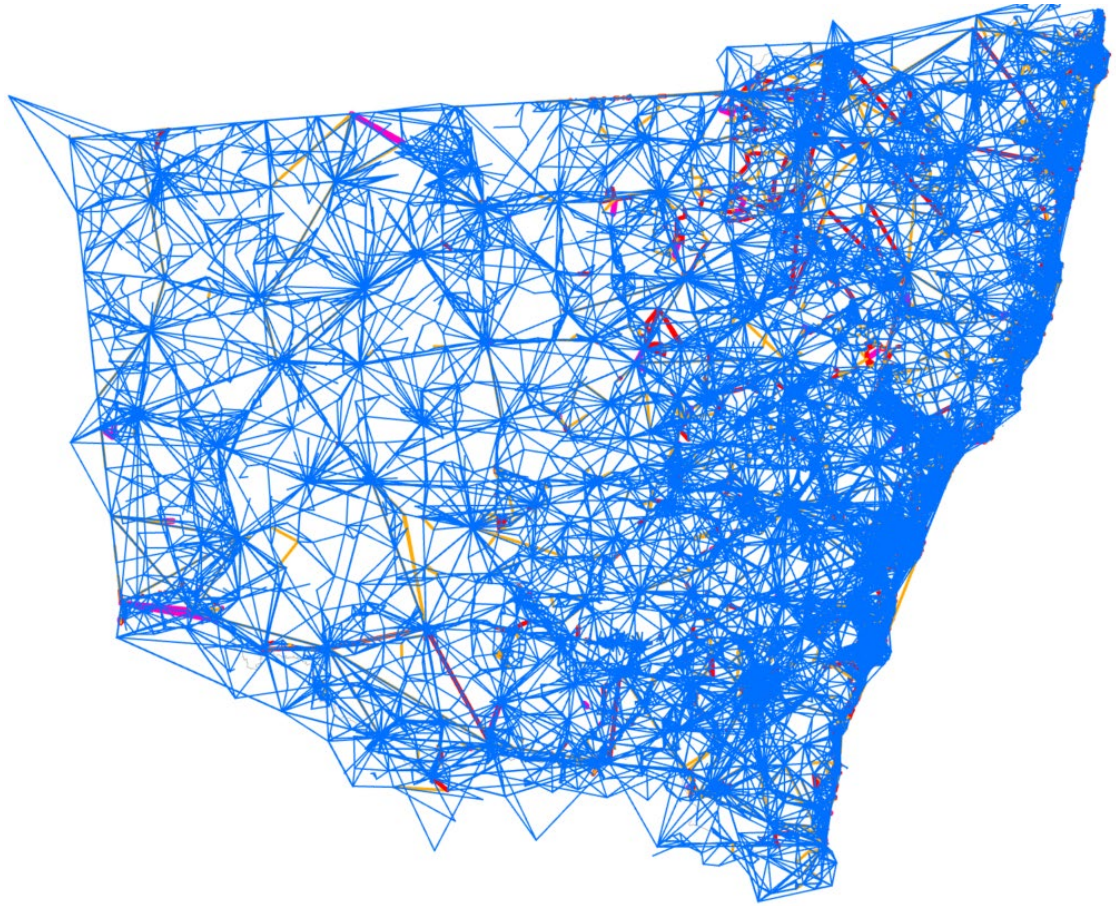
LAND PARCEL & PROPERTY *

LAND USE

New themes; *new strategies or standards underway

Positioning - State control survey



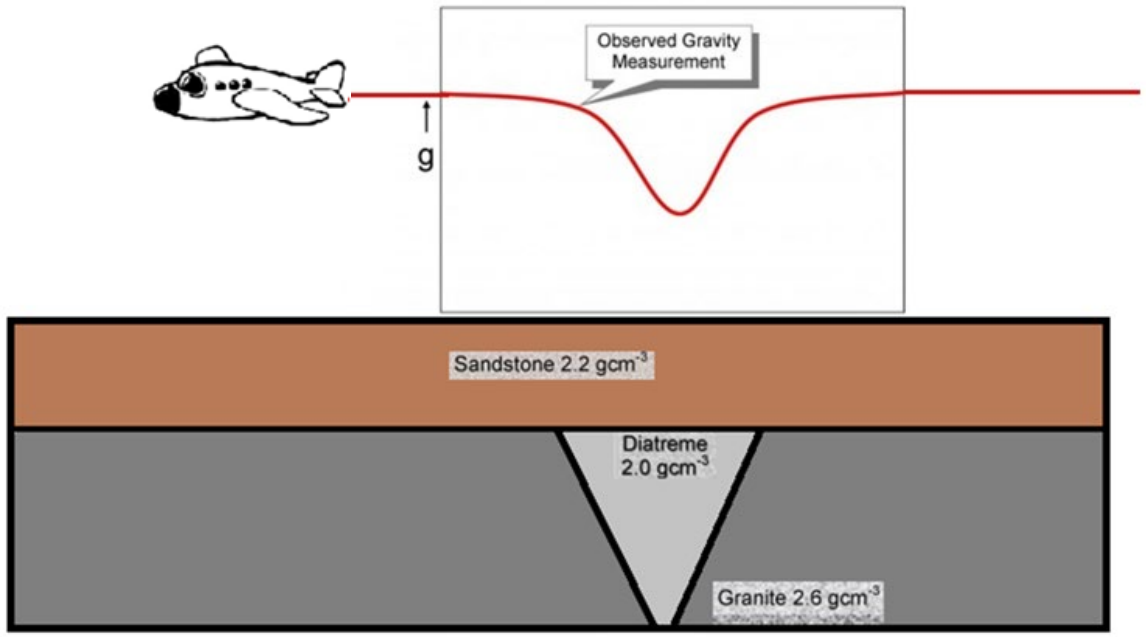


Positioning - Gravity Model

Airborne gravimetry

Measures the total vertical acceleration utilising highly accurate GNSS (GPS) to remove the effect of the aircraft motion to recover a gravity signal.

- Easy to obtain consistent coverage over overwise inaccessible areas (mountains, shallow coastal regions)
- Covers large areas quickly and cheaply compared to terrestrial methods
- Can cover the littoral zone easily where the are large errors in satellite altimetry and terrestrial or shipborne methods aren’t practical.



MinView | Regional NSW | Mini

minview.geoscience.nsw.gov.au/#/?lon=148.9143&lat=-32.65607&z=7&bm=bm1&l=gp101:y:100

MinView

Spatial search | Text search | Draw | Tools | Share | Help | User login

Map layers

Add view

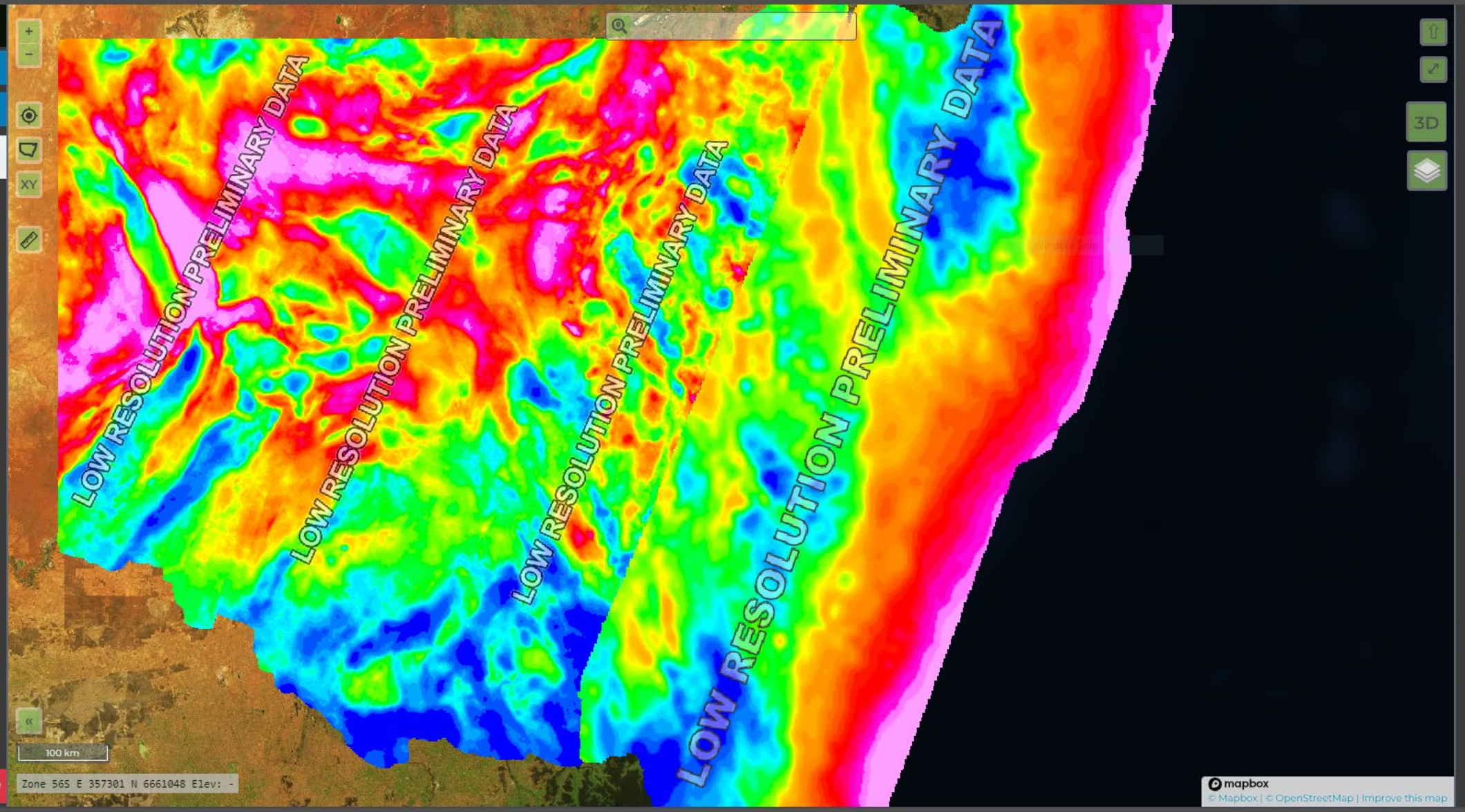
Add layer

Airborne Bouguer grav. (preliminary)

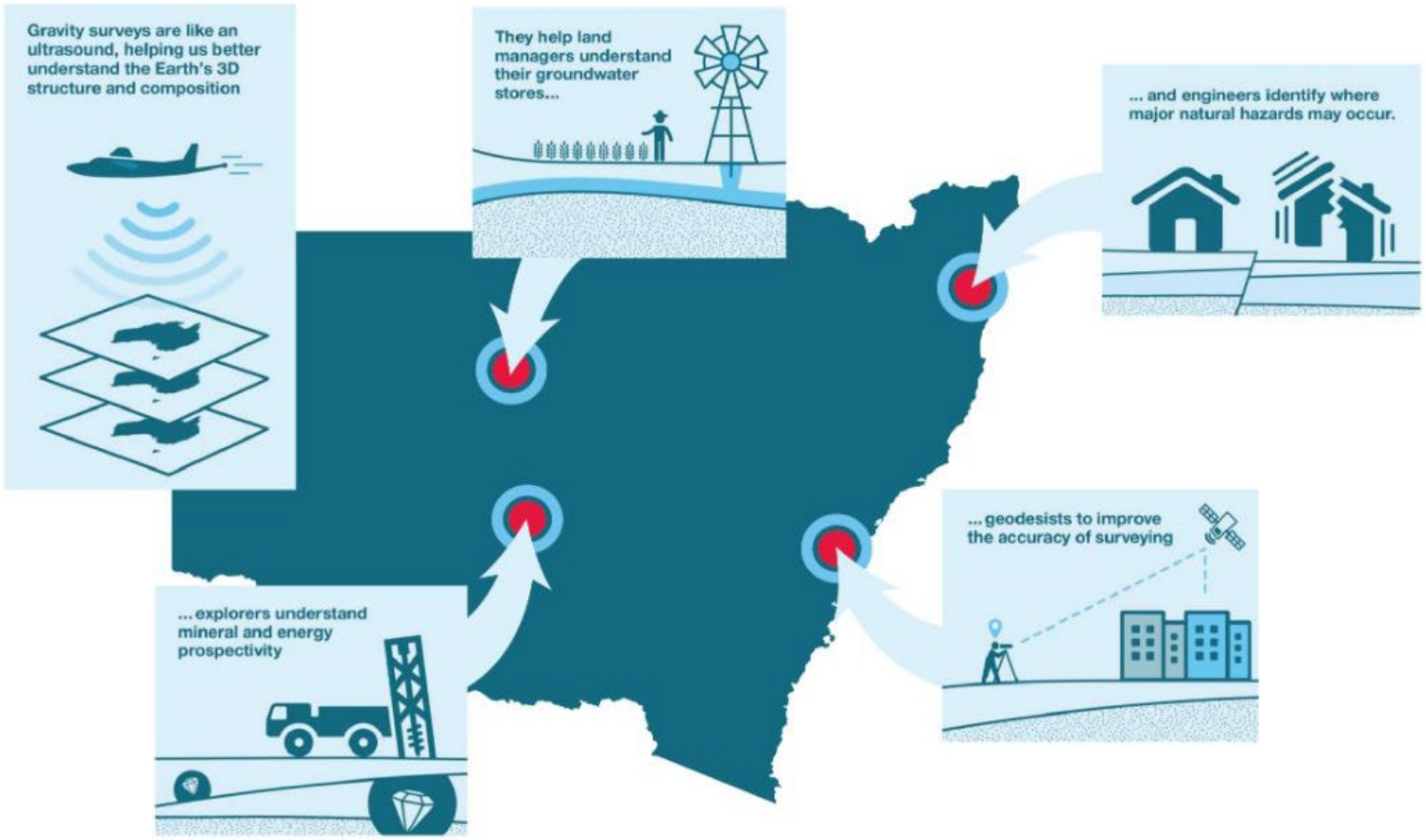
When you have 2 or more layers added:

You can re-arrange the layers by dragging to set the drawing order of the layers on the map.

Remove all

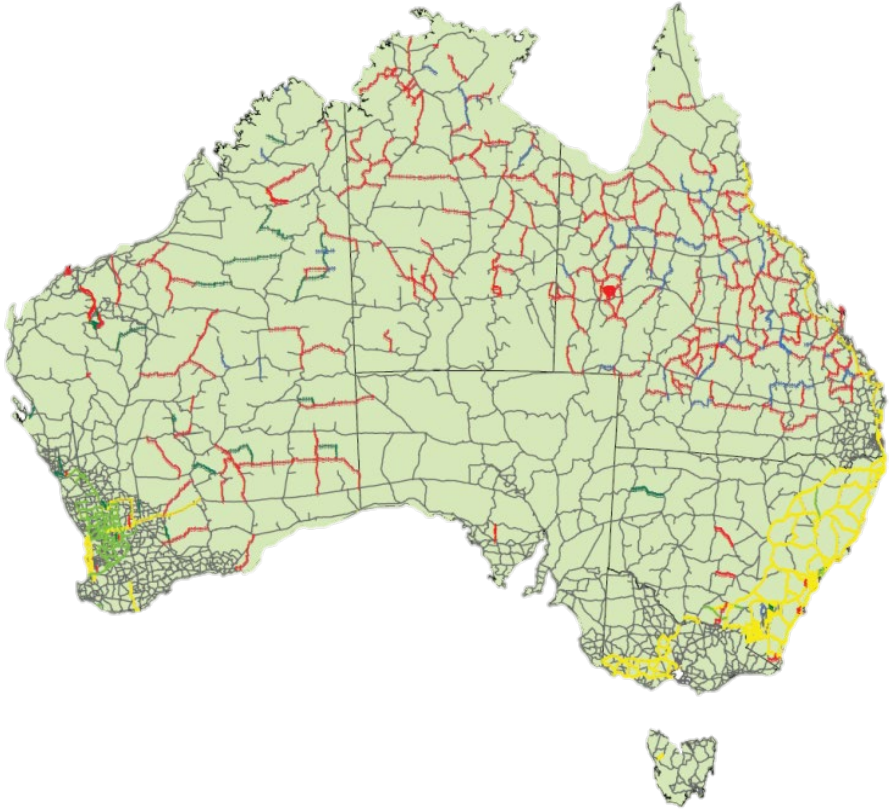


Positioning – NSW Gravity Model - Benefits

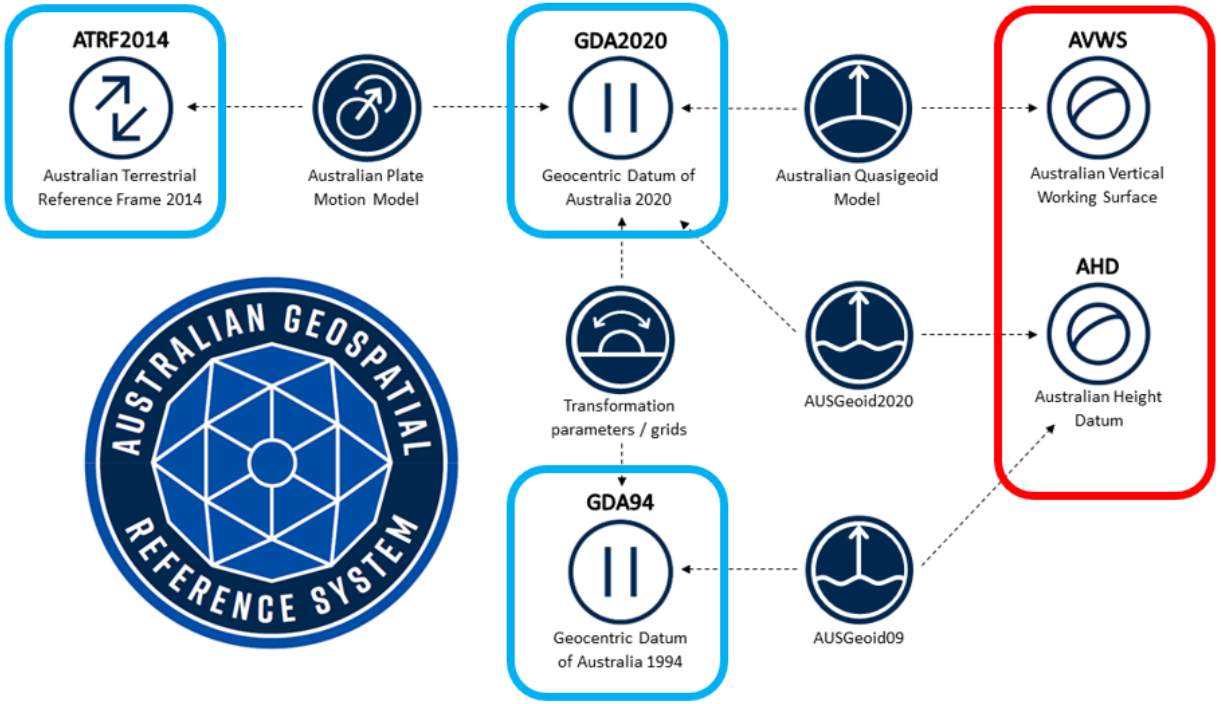


Positioning - Height Datum

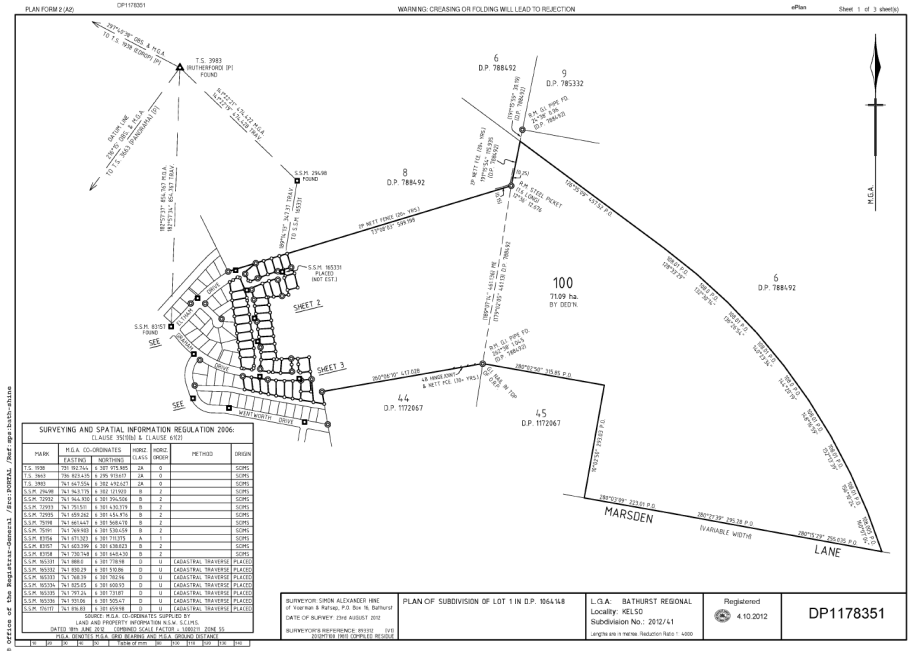
Australian National Levelling Network (AHD)



Australian Vertical Working Surface (AVWS)



Positioning – State Control Survey
LandXML to SCIMS (LX2S) Pilot

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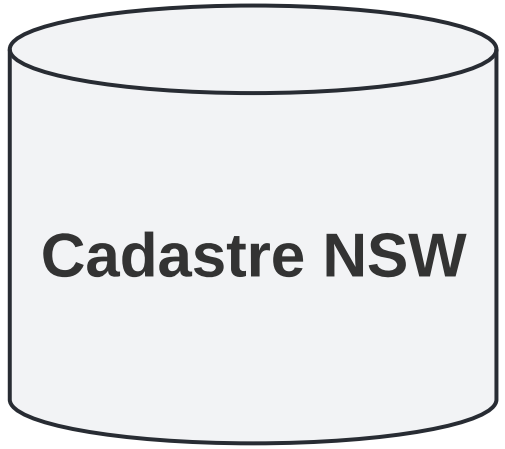
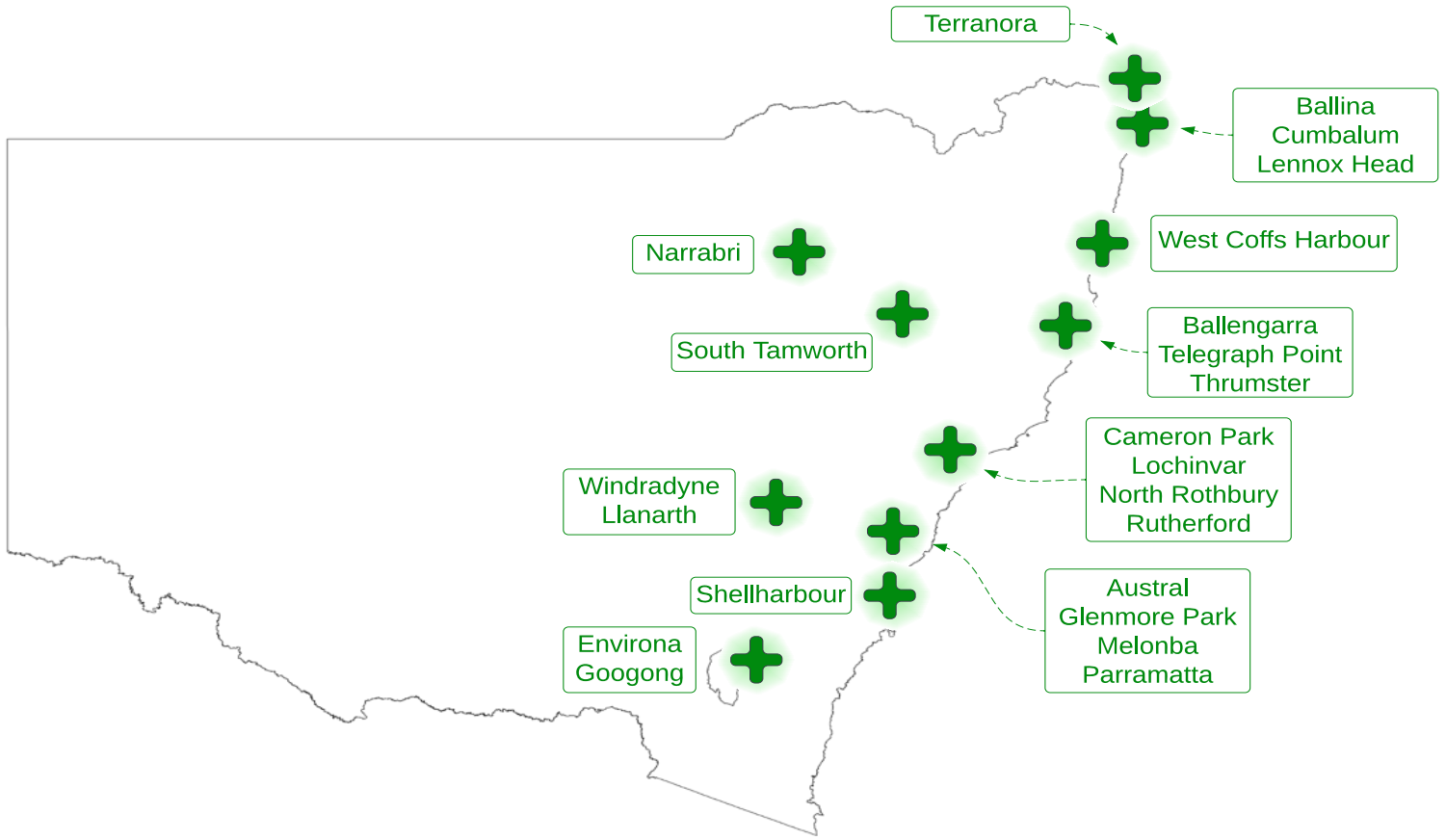


LX2S Pilot - Results



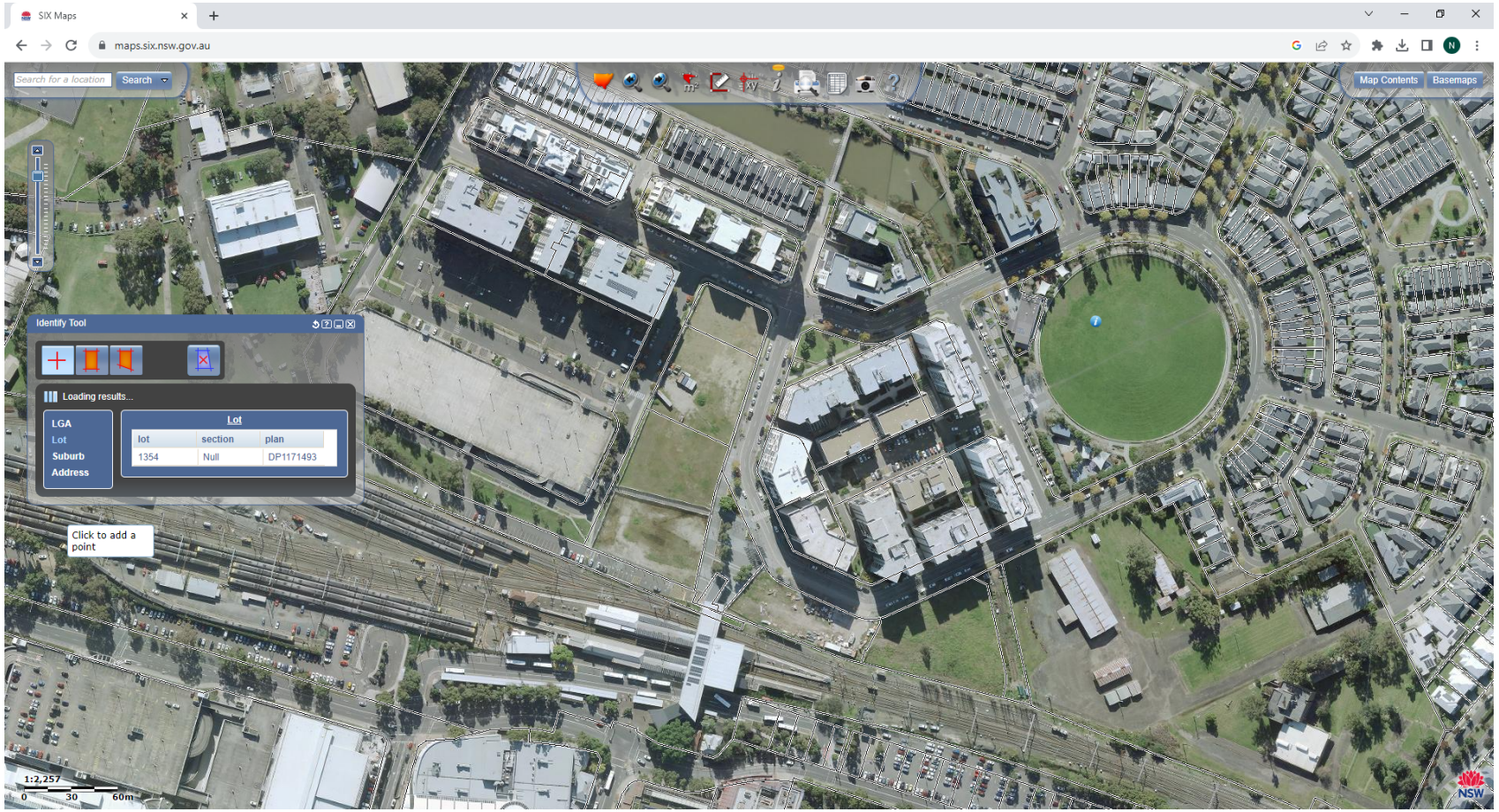
11 Pilot regions

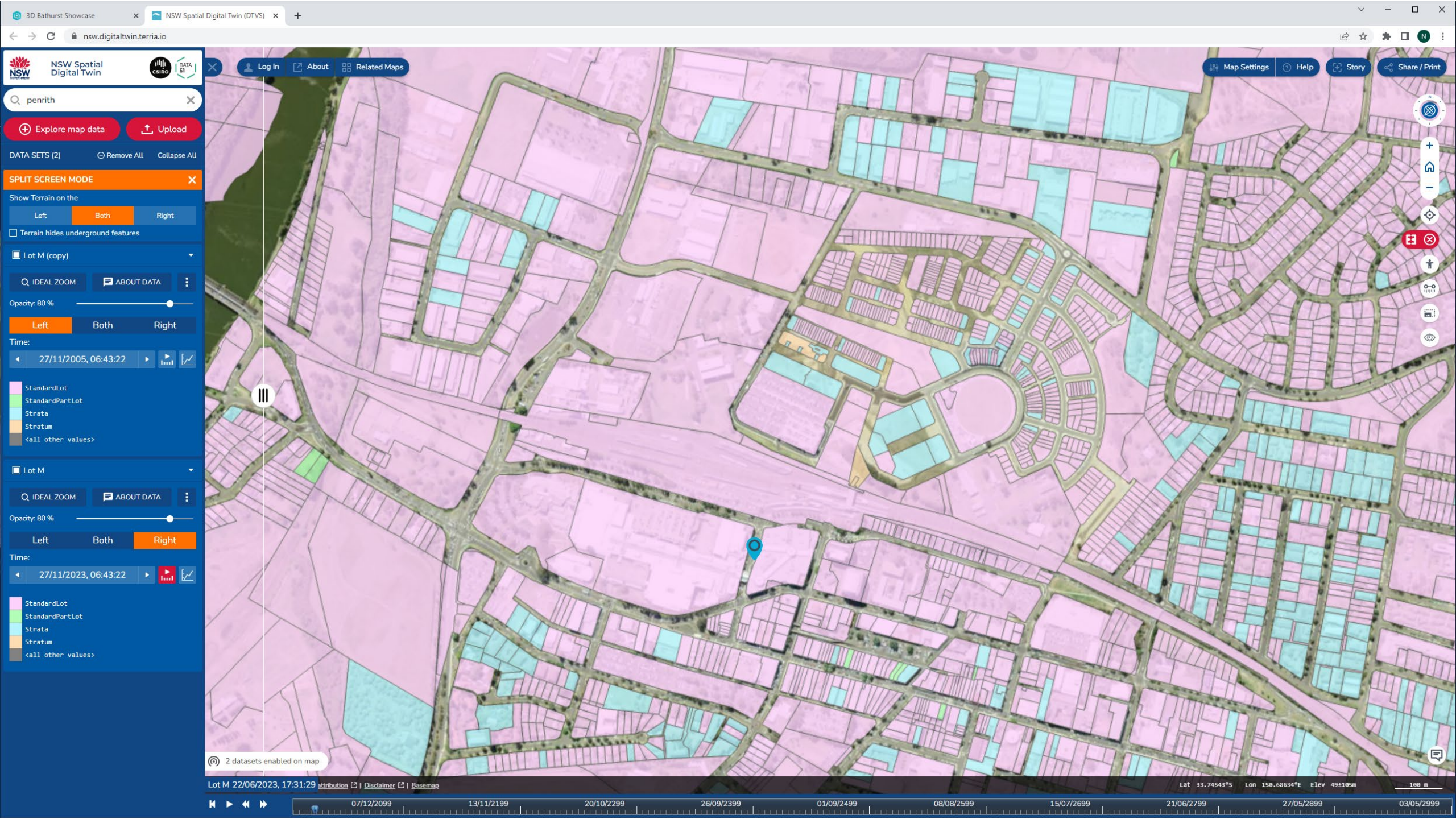
4,188 survey marks updated

7,099 Deposited Plans retrieved

3,3981 measurements extracted & analysed

Land parcel and property




3D Bathurst Showcase
NSW Spatial Digital Twin (DTVS)
nsw.digitaltwin.terria.io
NSW Spatial Digital Twin
penrith
Explore map data
Upload
DATA SETS (2)
Remove All
Collapse All
SPLIT SCREEN MODE
Show Terrain on the
Left
Both
Right
Terrain hides underground features
Lot M (copy)
IDEAL ZOOM
ABOUT DATA
Opacity: 80 %
Left
Both
Right
Time:
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StandardPartLot
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Stratum
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IDEAL ZOOM
ABOUT DATA
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Both
Right
Time:
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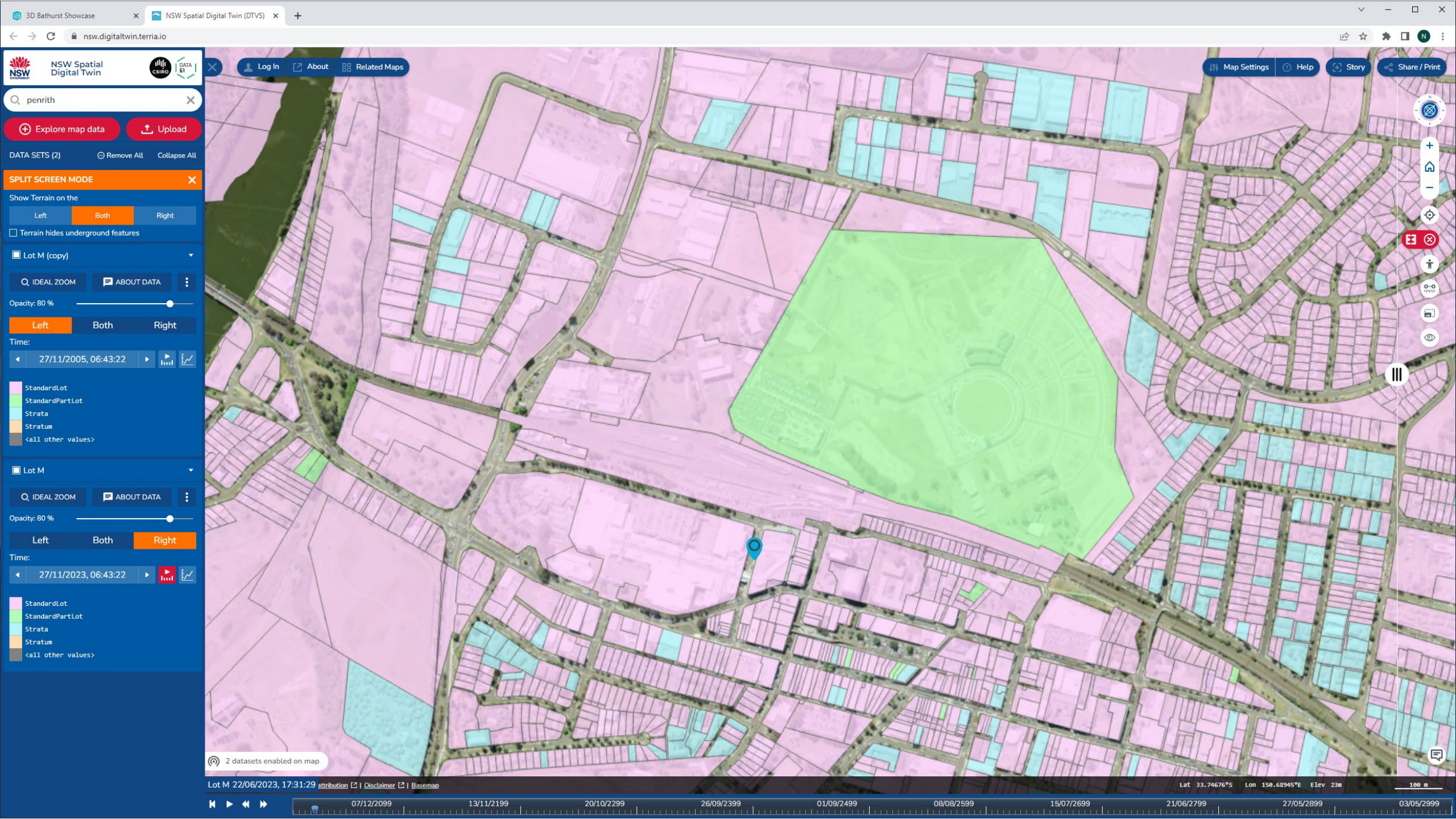
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Map Settings
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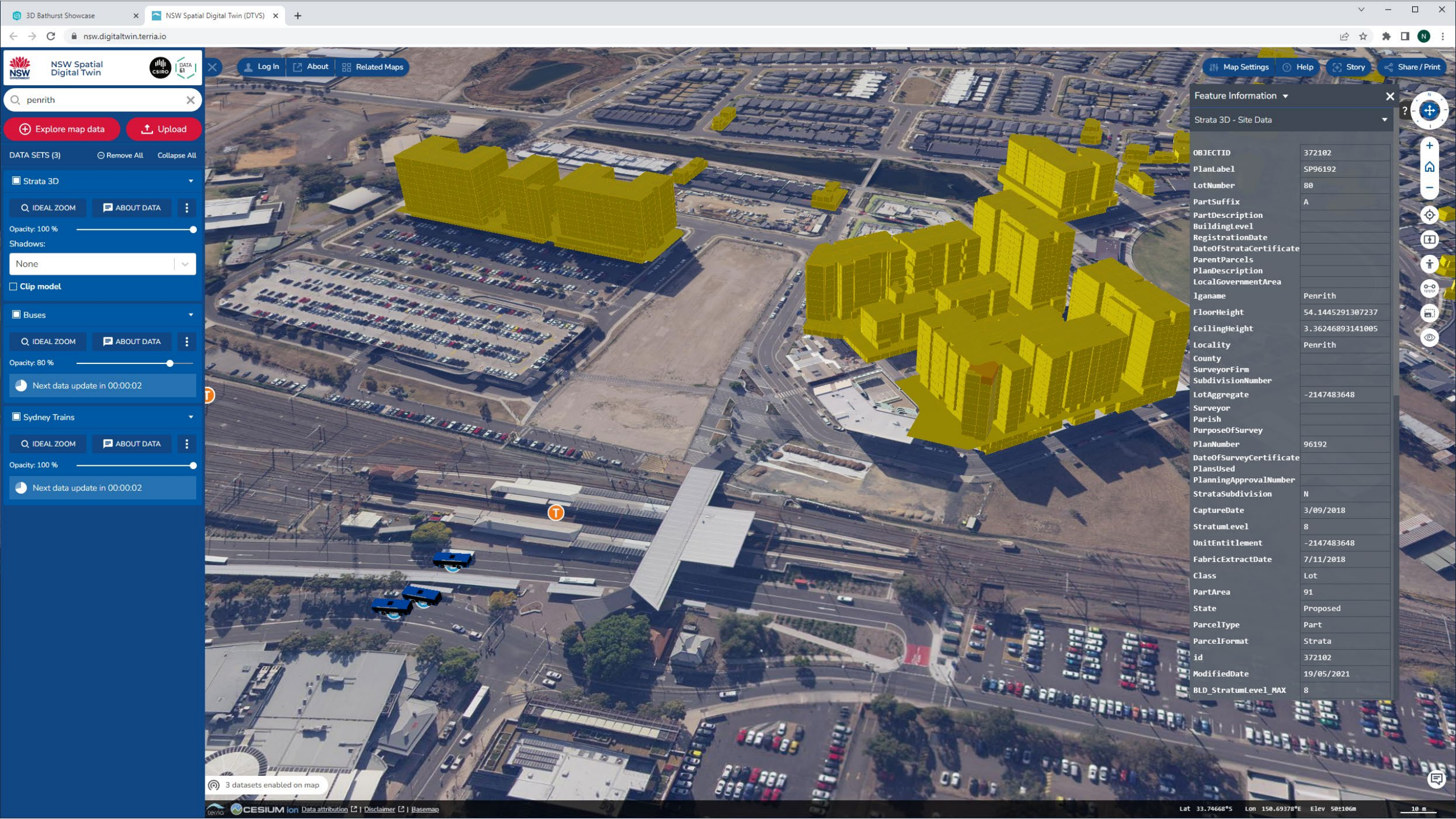
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Upload
DATA SETS (3)
Remove All
Collapse All
Strata 3D
IDEAL ZOOM
ABOUT DATA
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Shadows:
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Clip model
Buses
IDEAL ZOOM
ABOUT DATA
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Sydney Trains
IDEAL ZOOM
ABOUT DATA
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Log In
About
Related Maps
Map Settings
Help
Story
Share / Print
Feature Information
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ParentParcels
PlanDescription
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Locality Penrith
County
SurveyorFirm
SubdivisionNumber
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PlanningApprovalNumber
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PartArea 91
State Proposed
ParcelType Part
ParcelFormat Strata
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3 datasets enabled on map
CESIUM ion
Data attribution
Disclaimer
Basemap
Lat 33.74668°S
Lon 150.69378°E
Elev 50±106m
10 m

NSW Spatial Digital Twin (DTVS) | CadNSW Dashboard_Testing

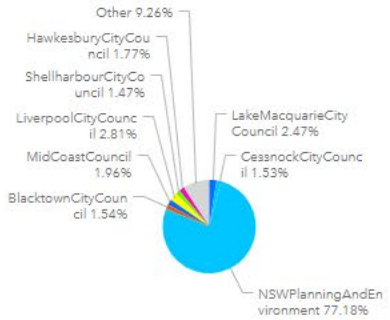
portal.spatial.nsw.gov.au/portal/apps/opsdashboard/index.html#/af7a0ca300c9491e8d7d2f0b64976449

CadNSW Dashboard_Testing

71,615

Last update: a few seconds ago

Source



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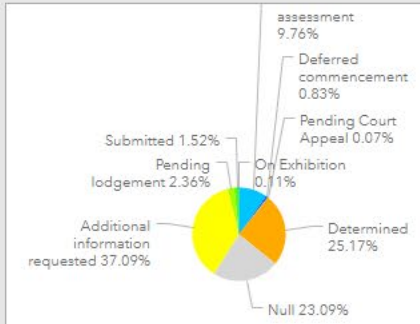

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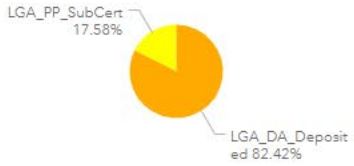
Case Status Everything

Purpose



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1 of 100

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source	NSWPlanningAndEnvironment
ePlanningNumber	CFT-373228
clientRefId	CFT-373228
class	Lot

Last update: a few seconds ago

Map | Created Month | Created Date

Wollongong

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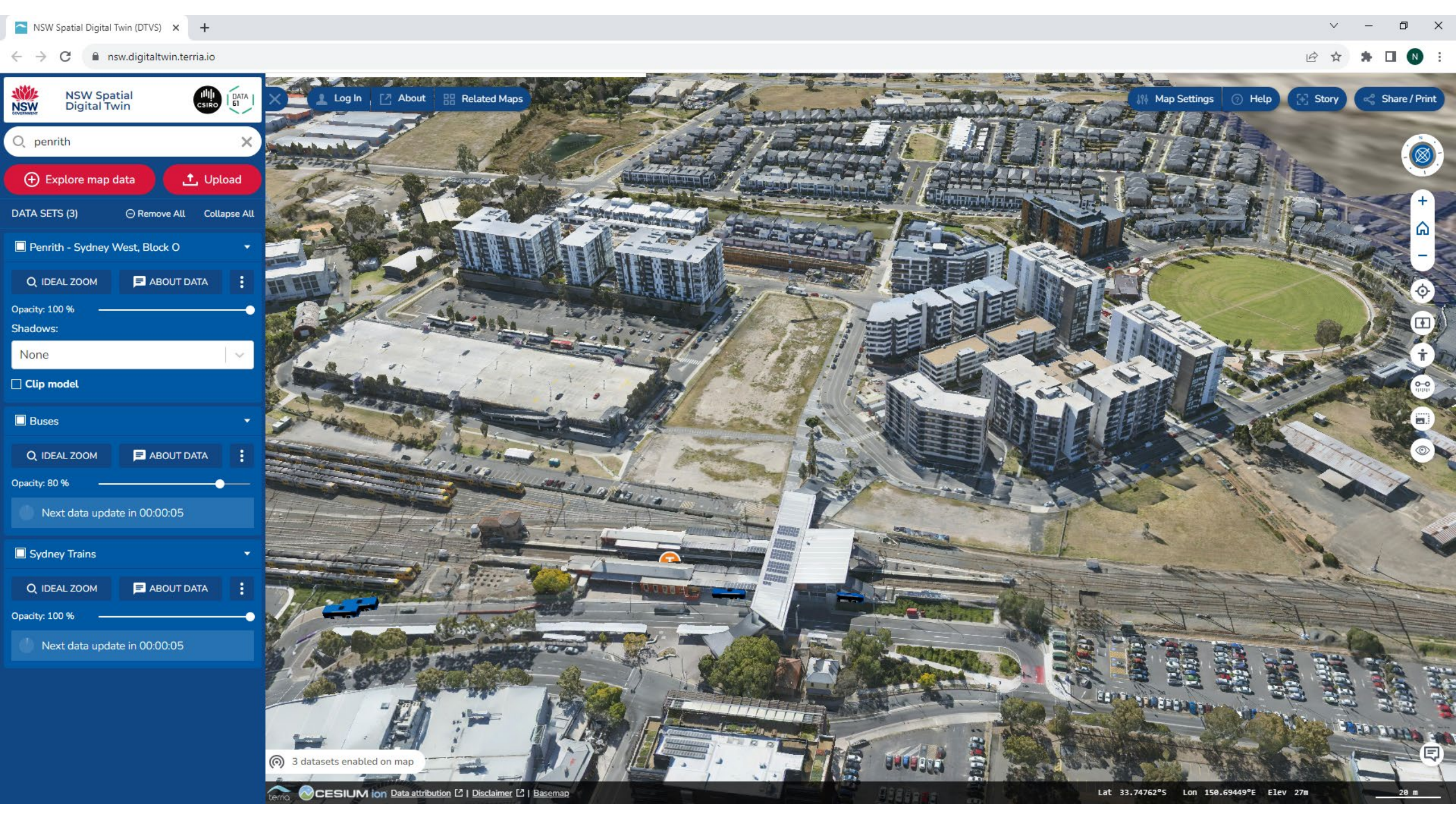
BuildingLevel	Level 8 Floor Plan
State	Proposed
PlanLabel	PAN-115851
Class	Lot
LotNumber	140
ParcelType	Part
PartSuffix	A
ParcelFormat	Strata
DEM_Value	39.607
Surveyor	MATTHEW PLOWMAN
PlansUsed	
LocalGovernmentArea	Wollongong
Parish	
County	
Locality	Wollongong
SurveyorFirm	
PlanDescription	PLAN OF SUBDIVISION OF LOT 1 IN DP

ZOOM TO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Explore map data
Upload
DATA SETS (3)
Remove All
Collapse All
Penrith - Sydney West, Block O
IDEAL ZOOM
ABOUT DATA
Opacity: 100 %
Shadows:
None
Clip model
Buses
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Opacity: 80 %
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Sydney Trains
IDEAL ZOOM
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Log In
About
Related Maps
Map Settings
Help
Story
Share / Print
3 datasets enabled on map
CESIUM ion
Data attribution
Disclaimer
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Lon 150.69449°E
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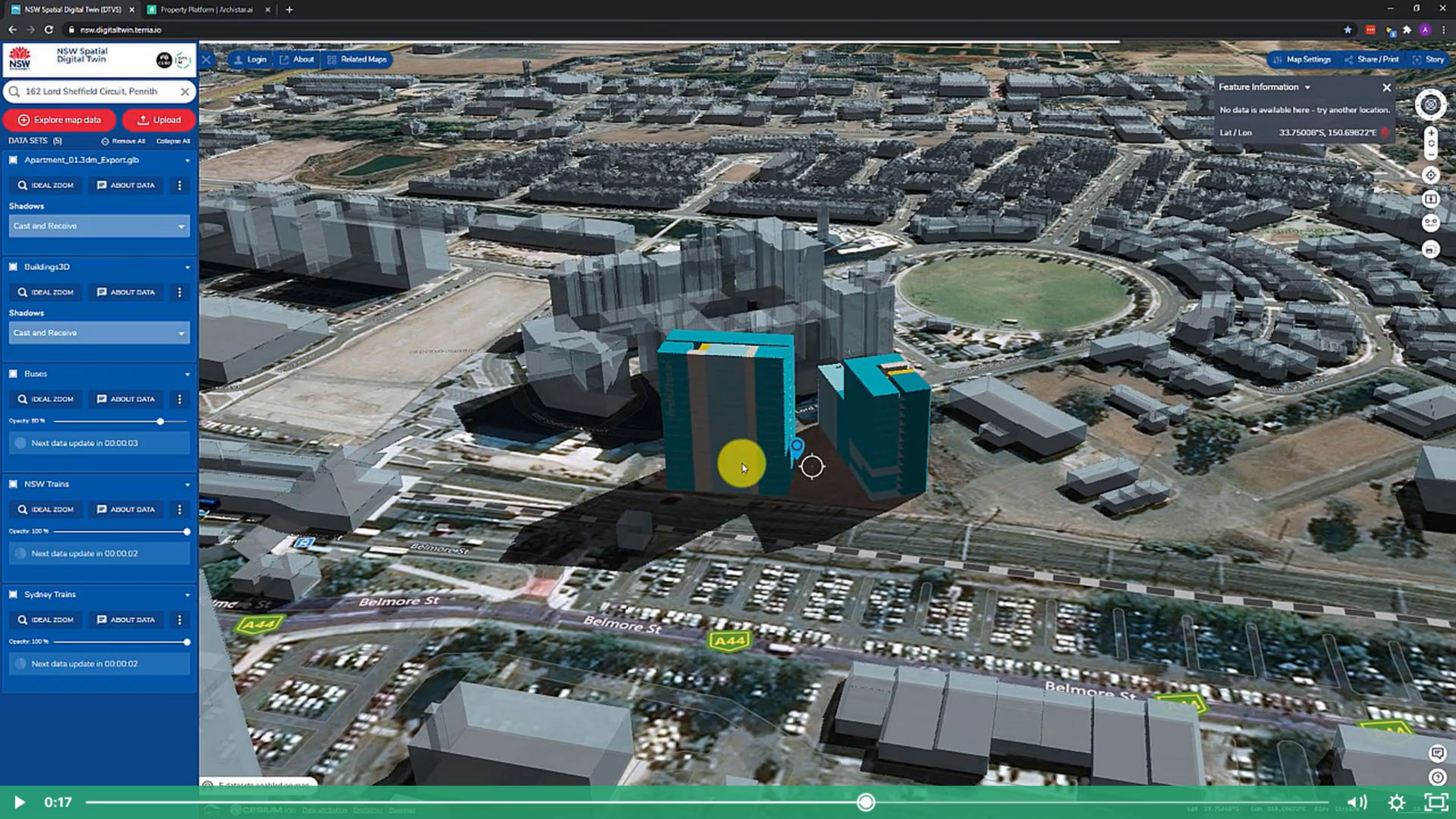
NSW Spatial Digital Twin (DTVS)
Property Platform | Archistar.ai
nsw.digitaltwin.terria.io
NSW Spatial Digital Twin
162 Lord Sheffield Circuit, Penrith
Explore map data
Upload
DATA SETS (5)
Remove All
Collapse All
Apartment_01.3dm_Export.glb
IDEAL ZOOM
ABOUT DATA
Shadows
Cast and Receive
Buildings3D
IDEAL ZOOM
ABOUT DATA
Shadows
Cast and Receive
Buses
IDEAL ZOOM
ABOUT DATA
Opacity: 80 %
Next data update in 00:00:03
NSW Trains
IDEAL ZOOM
ABOUT DATA
Opacity: 100 %
Next data update in 00:00:02
Sydney Trains
IDEAL ZOOM
ABOUT DATA
Opacity: 100 %
Next data update in 00:00:02
Login
About
Related Maps
Map Settings
Share / Print
Story
Feature Information
No data is available here - try another location.
Lat / Lon
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Belmore St
Belmore St
Belmore St
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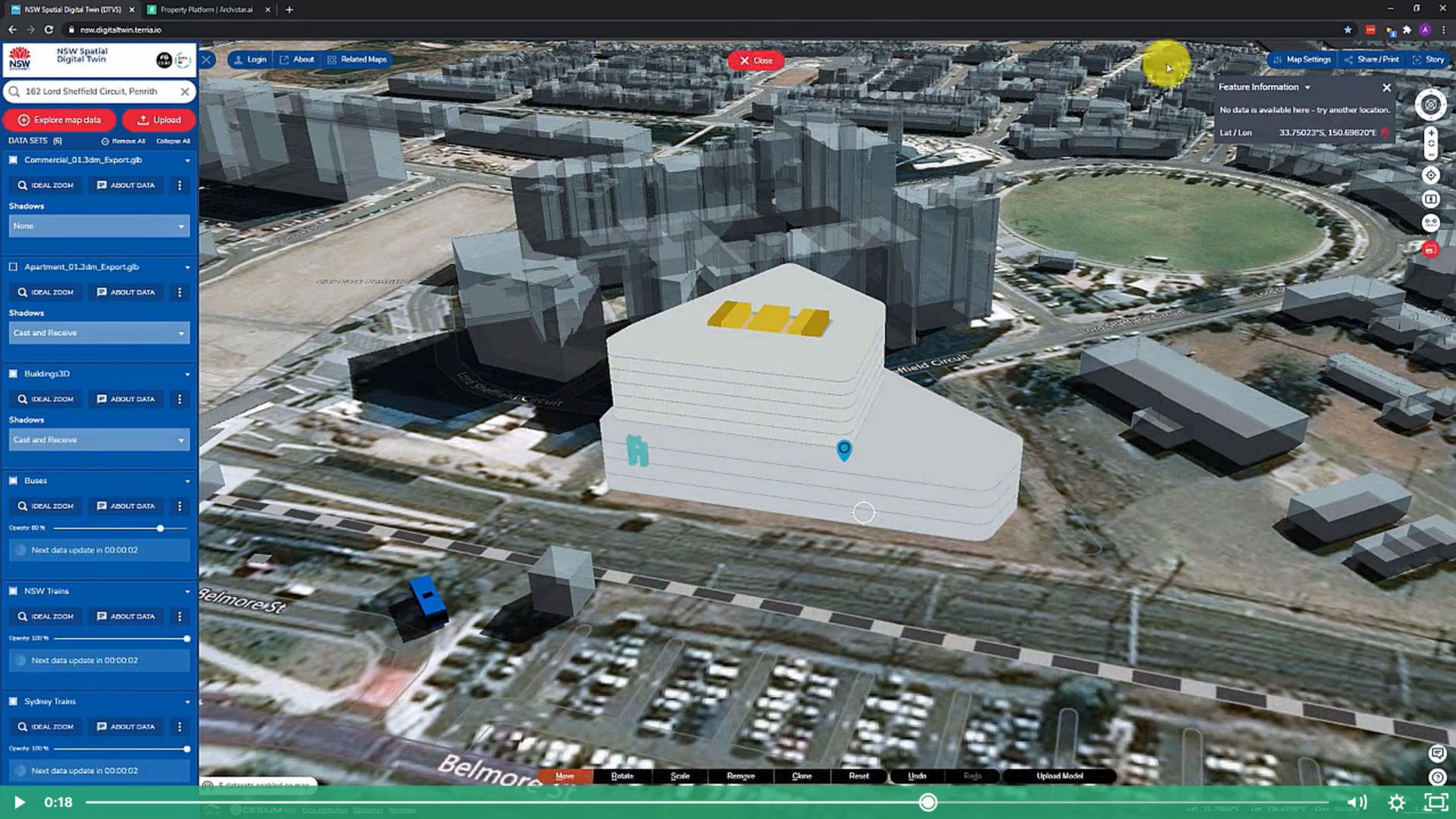
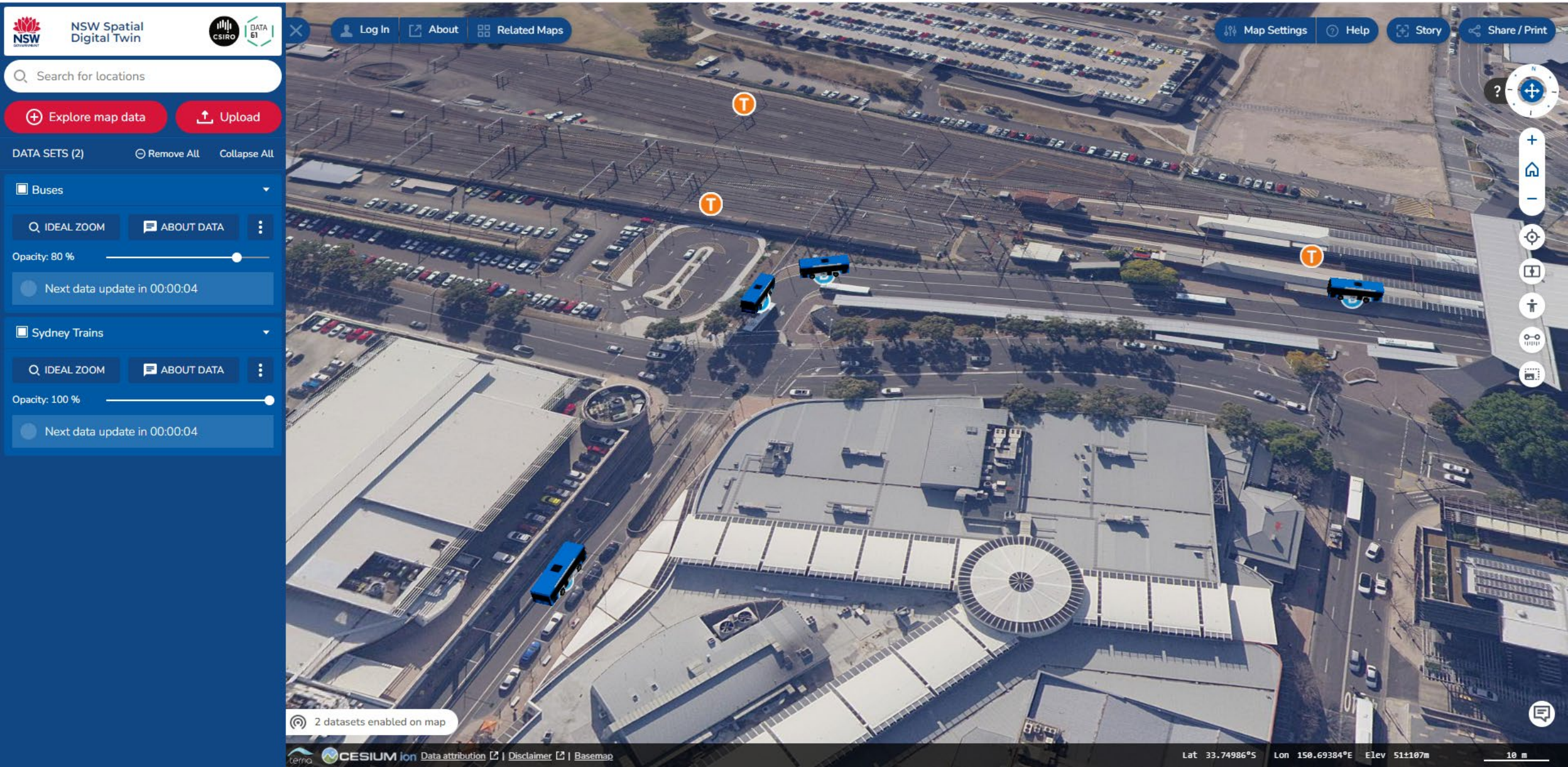
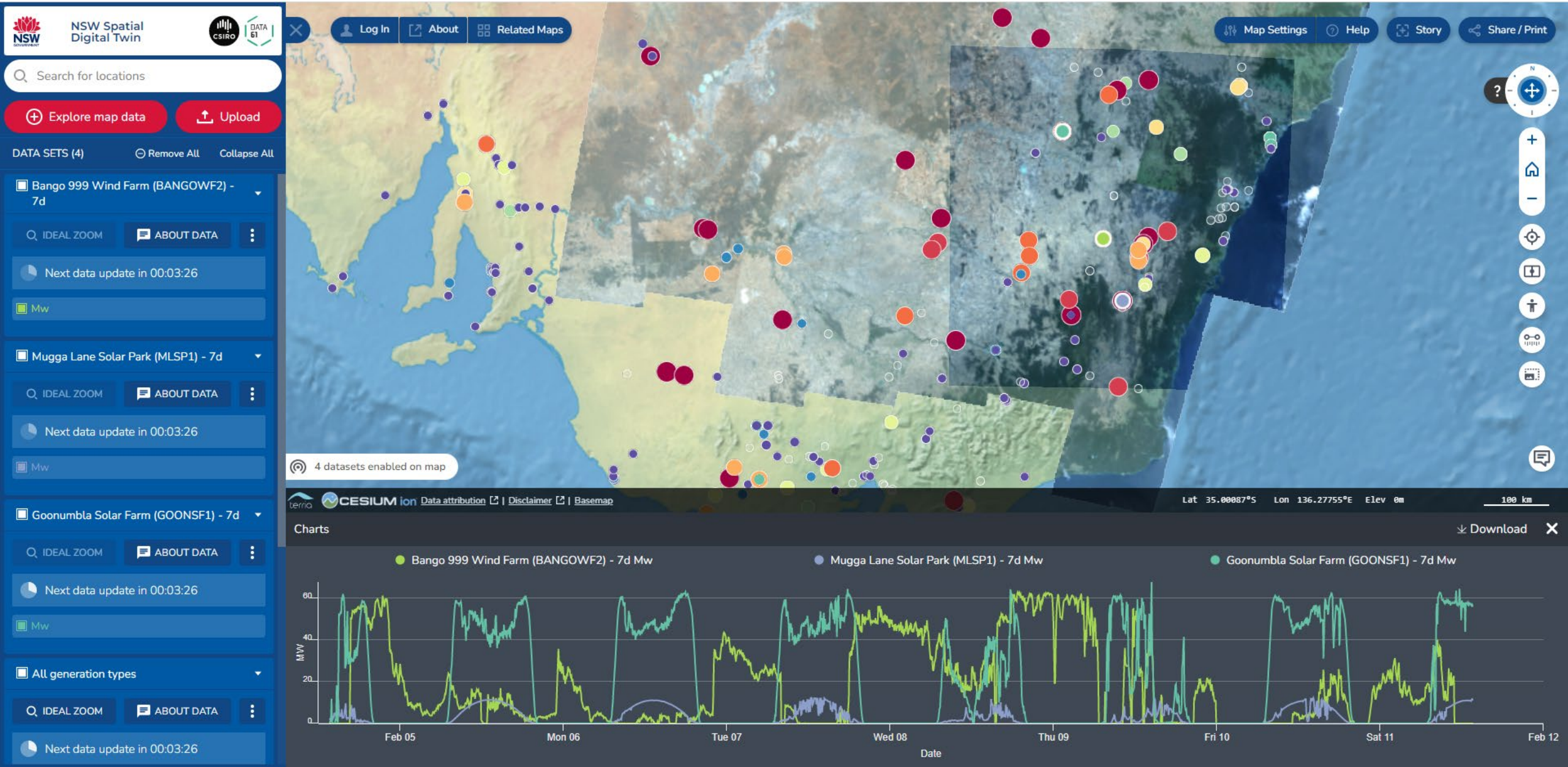
A44
0:17


NSW Spatial Digital Twin (DTVS)
Property Platform | Archistar.ai
nsw.digitaltwin.terria.io
NSW Spatial Digital Twin
162 Lord Sheffield Circuit, Penrith
Explore map data
Upload
DATA SETS (6)
Remove All
Collapse All
Commercial_01.3dm_Export.glb
IDEAL ZOOM
ABOUT DATA
Shadows
None
Apartment_01.3dm_Export.glb
IDEAL ZOOM
ABOUT DATA
Shadows
Cast and Receive
Buildings3D
IDEAL ZOOM
ABOUT DATA
Shadows
Cast and Receive
Buses
IDEAL ZOOM
ABOUT DATA
Opacity: 80 %
Next data update in 00:00:02
NSW Trains
IDEAL ZOOM
ABOUT DATA
Opacity: 100 %
Next data update in 00:00:02
Sydney Trains
IDEAL ZOOM
ABOUT DATA
Opacity: 100 %
Next data update in 00:00:02
Login
About
Related Maps
Close
Map Settings
Share / Print
Story
Feature Information
No data is available here - try another location.
Lat / Lon
33.75023°S, 150.69820°E
Belmore St
Move
Rotate
Scale
Remove
Clone
Reset
Undo
Redo
Upload Model
0:18

Live data sharing – transport (State Government)



Live data sharing – power generation (Federal Gov)



Live data sharing – people movement (Local Gov)

Communities, industry and government all benefit from the NSW SDT

Case Study: School Infrastructure NSW (SINSW)

Problem:

- SINSW is responsible for the delivery and management of a **portfolio of 2,200+ schools**
- SINSW developed over **80 business cases in 2020 alone**
- Compared with construction, the business case phase can take up to **twice as long to complete**

Opportunity:

- Combined with other technologies, the Live NSW Spatial Digital Twin (SDT) program will support the **digitisation and automation of the business case process**
- SINSW estimates that this will lead to a **45% reduction in time** to deliver a strategic business case

Benefit:

- SINSW **estimates savings of $202m over 10 years**, in avoided strategic business case costs
- This benefit will be generated by the SDT and realised by SINSW

Extract from NSW Spatial Digital Twin Program Final Business Case
Prepared by DCS Spatial Services and Ernst & Young (2021) Approved by ERC October 2021

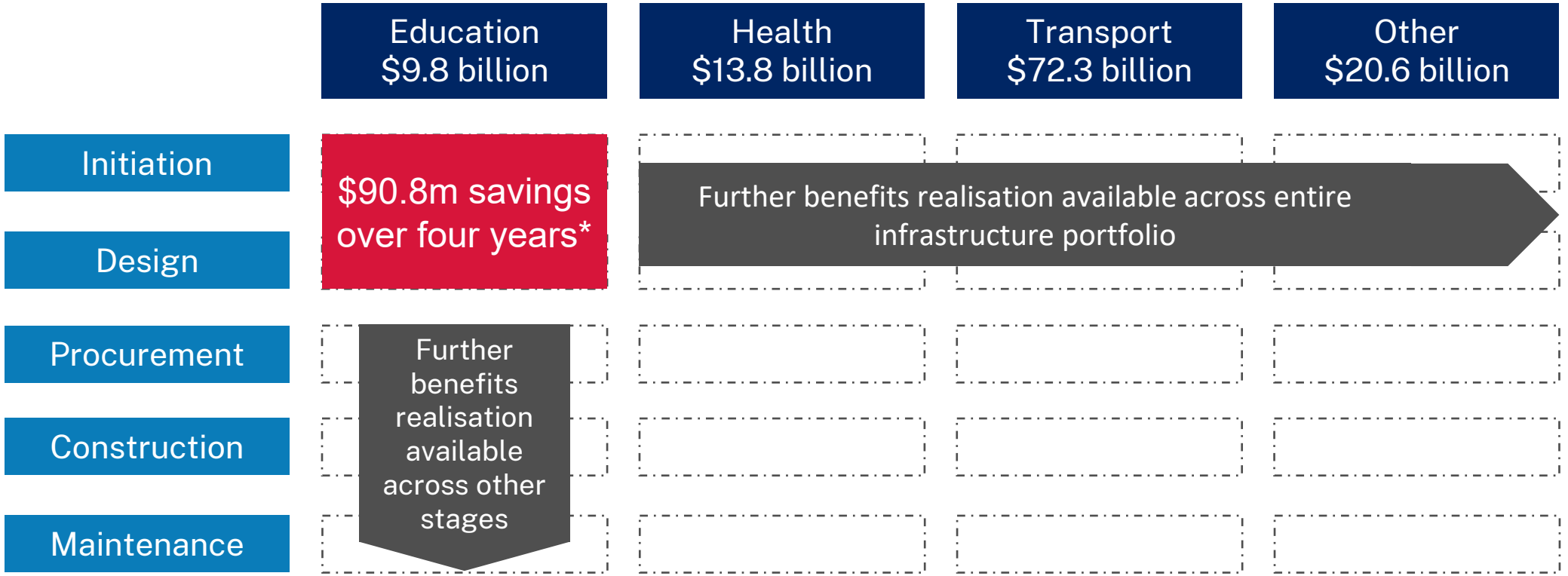
Case Study: NSW School Infrastructure due diligence pilot

Utilising the data and capabilities provided by the Live NSW Spatial Digital Twin a standardised approach to due diligence was developed and piloted with NSW School Infrastructure on **473 sites in 4 weeks**

The productivity benefits and avoided costs in this pilot alone are an **estimated $4.4m**

- ✓ Reduction in the number of procurements and consultants required
- ✓ Clear, well-informed procurement scopes to reduce scope creep
- ✓ Project information identified, developed and converted to asset management information to support a complete project process
- ✓ Supporting the development of project documentation and implementation of modern methods of construction
- ✓ Focusing our consultants on the issues/risks rather than 'the doing'

NSW SDT – key enabler to efficiently deliver NSW's infrastructure portfolio



A 1% efficiency saving across infrastructure portfolio = $1.1b savings potential

*Real discounted $ extracted from NSW Spatial Digital Twin Program Cost Benefit Analysis Prepared by Ernst & Young (2021) Approved by ERC October 2021

Use of AI/ML for flood extent mapping

- Collaborated with Charles Sturt University, AWS and Deloitte to investigate the use of artificial intelligence and machine learning (AI/ML) for spatial data capture, object detection and maintenance.
- Successful outcomes from student-led initiatives on flood extent detection and natural language processing.
- Also identifying high-value target datasets for AI/ML development to support change detection and feature extraction (e.g. building footprints and roads).
- Operationalised the capability and used AI/ML to generate flood extents for imagery captured in 2021 and 2022. We are now testing this capability on imagery captured by third party and commercial providers.

Use of the elevation model and the cadastre to identify safe sites for storage and temporary accommodation

- The process of adding slope and aspect data to the cadastre involves bringing together our state-wide Digital Elevation Model (DEM) data and the lot layer of the Cadastre.
- Part of the product suite for the state-wide DEM is a slope and aspect dataset. When we bring the three datasets (slope, aspect, cadastre) together we calculate the average, minimum and maximum slope for each land parcel. We also calculate the average aspect (slope direction) of each parcel. These attributes are then added to the existing attribution for each cadastral lot to create the final product.
- The data was supplied to the Department of Planning and Environments, who was then easily able to determine, based on the attribution, the most suitable sites available for temporary housing.


NSW
GOVERNMENT