



FIG Working Week 2024

19-24 May

Accra, Ghana

Your World, Our World:
Resilient Environment
and Sustainable
Resource Management
for All

*Presented at the FIG Working Week 2024,
19-24 May 2024 in Accra, Ghana*

Fit For Purpose 2D Cadastres as the Foundation for 3D Cadastral Modelling and Digital Twins. Comparing Different Solutions from Australia and Indonesia.

Ian HARPER, Australia

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Contents

1. Where we are – Digital Twins
2. Spatial Representation of historical 3D Cadastre across varied jurisdictions using a Fit For Purpose (FFP) strategy to increase production.
3. CASE STUDIES – Utilisation of various data sources for varied FFP outcomes.

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The Current Highway to The Digital Future

BIMs, Digital Twins

”The future is so bright, I gotta wear shades” - (Song by Timbuk 3 -1986)

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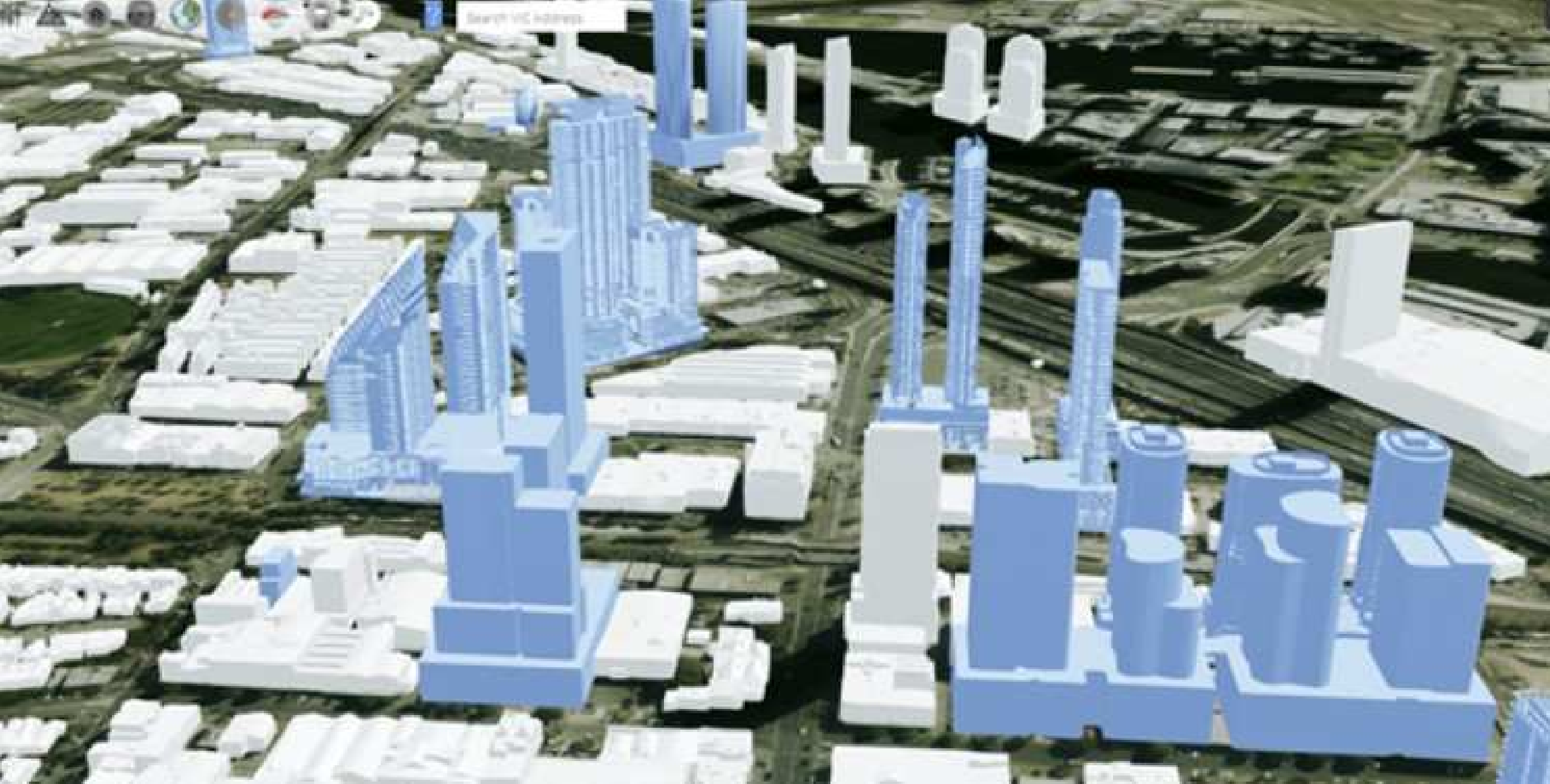


Image source: Department of Environment, Land, Water and Planning, Victoria



Image source: Spatial Services,
Department of Customer Service,
New South Wales



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BIMs/ Digital Twins as the foundation for complete digital land transactions?

1. BIMs are powerful technology tools for architects and builders.
2. Digital Twins are similarly powerful for modelling the real world.
3. The cadastre will be a foundation dataset of a Digital Twin but representing a cadastral dataset in a Digital Twin can be an issue if current representations in a database are not of the highest spatial integrity.

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Jakarta MRT station BIM with Cadastral Property extents identified.



Disusun oleh:
Tim Peneliti (Research Team) Pilot Project Kadaster 3D (Lokasi: MRT Jakarta)

Add Data

DATA SETS [3] Remove All

- Ruang Legal (Legal Space) Blok M
Zoom To Extent About This Data Remove
- Model 3D MRT Blok M
Zoom To Extent About This Data Remove
- Persil Berdasarkan Hak
Zoom To Extent About This Data Split Remove
Opacity: 60 %

Style

simbologi untuk persil berdasarkan jenis wa

- Hak Milik
- Hak Guna Usaha
- Hak Guna Bangunan
- Hak Pakai

Story | Map | Share / Print | Help | Related Maps | About

Jalan Bulungan

Jalan Melawai 5

Give Feedback

CESIUM ION

Disclaimer: This map must not be used for navigation or precise spatial analysis

Lat 6.24575°S Lon 106.79868°E Elev 27m 10 m



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BIMs / Digital Twins as the foundation for complete digital transactions?

1. Accurately representing legal property extents and related Rights, Restrictions and Responsibilities (RRRs) as defined and endorsed by a Licenced/Registered Surveyor for property transactions is a big challenge in a complete digital solution. As part of the due diligence, property Lawyers, etc, would require considerable spatial knowledge or endorsement by other professionals.
2. Whilst this will be possible at some time in the future, FFP stepping stones are needed to introduce achievable pragmatic technical and economic outcomes to immediately progress the digital agenda, particularly 3D.
3. It is also critical to produce benchmark outcomes to satisfy existing and future project funding.



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CASE STUDIES – Utilisation of various data sources for varied FFP outcomes.

DATA SOURCE PRIORITIES WHERE AVAILABLE

1. Critical

a. Best available imagery.

a. Important

a. X, Y, Z datums

b. Digital survey data

b. Useful

a. Historical survey and mapping title and plan records

c. Most used

a. Estimation of dimensions of structures and heights



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Stratum Plan of Subdivision in Sydney to create separate 3D Titles for road tunnels with accurate X,Y, Z.

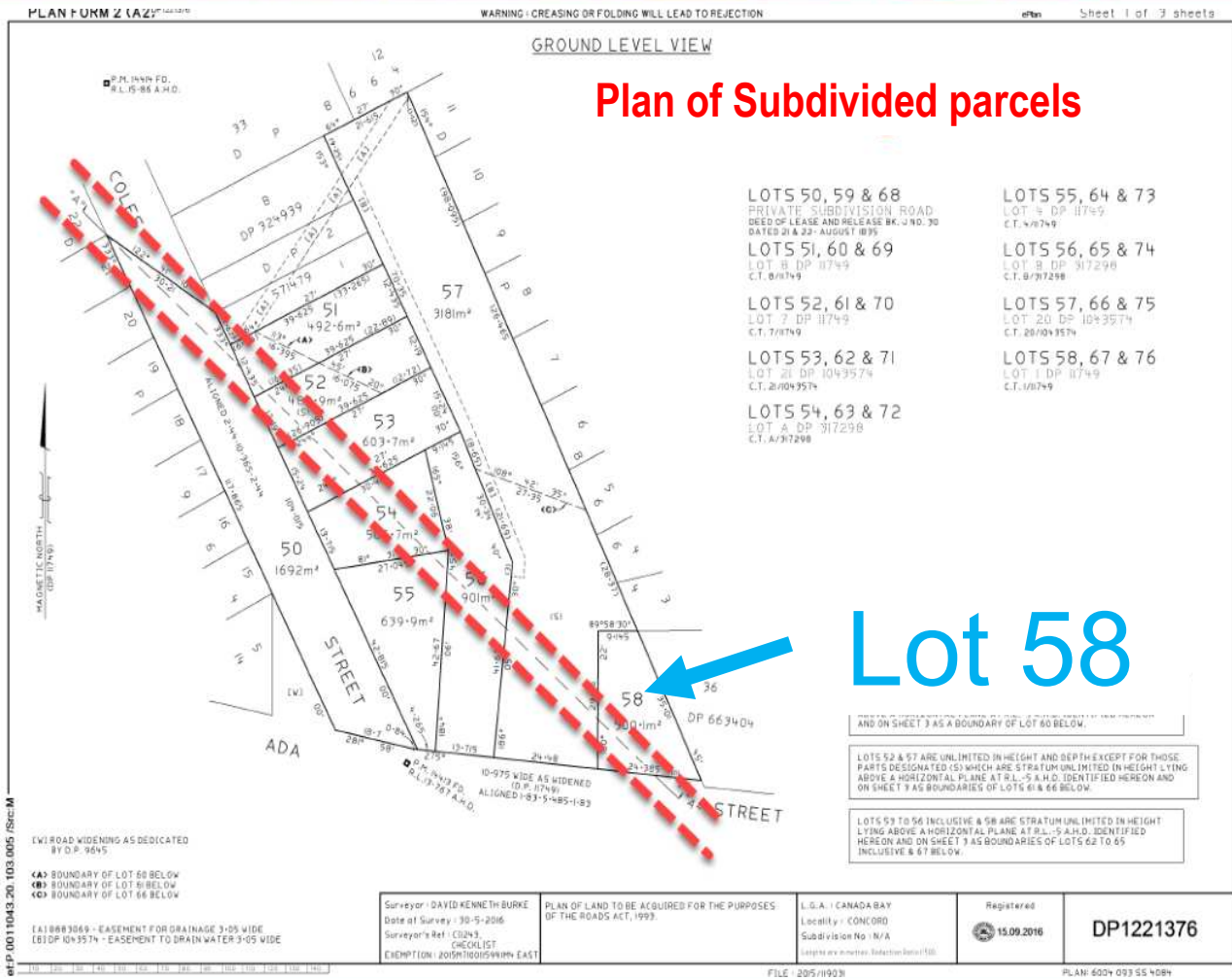




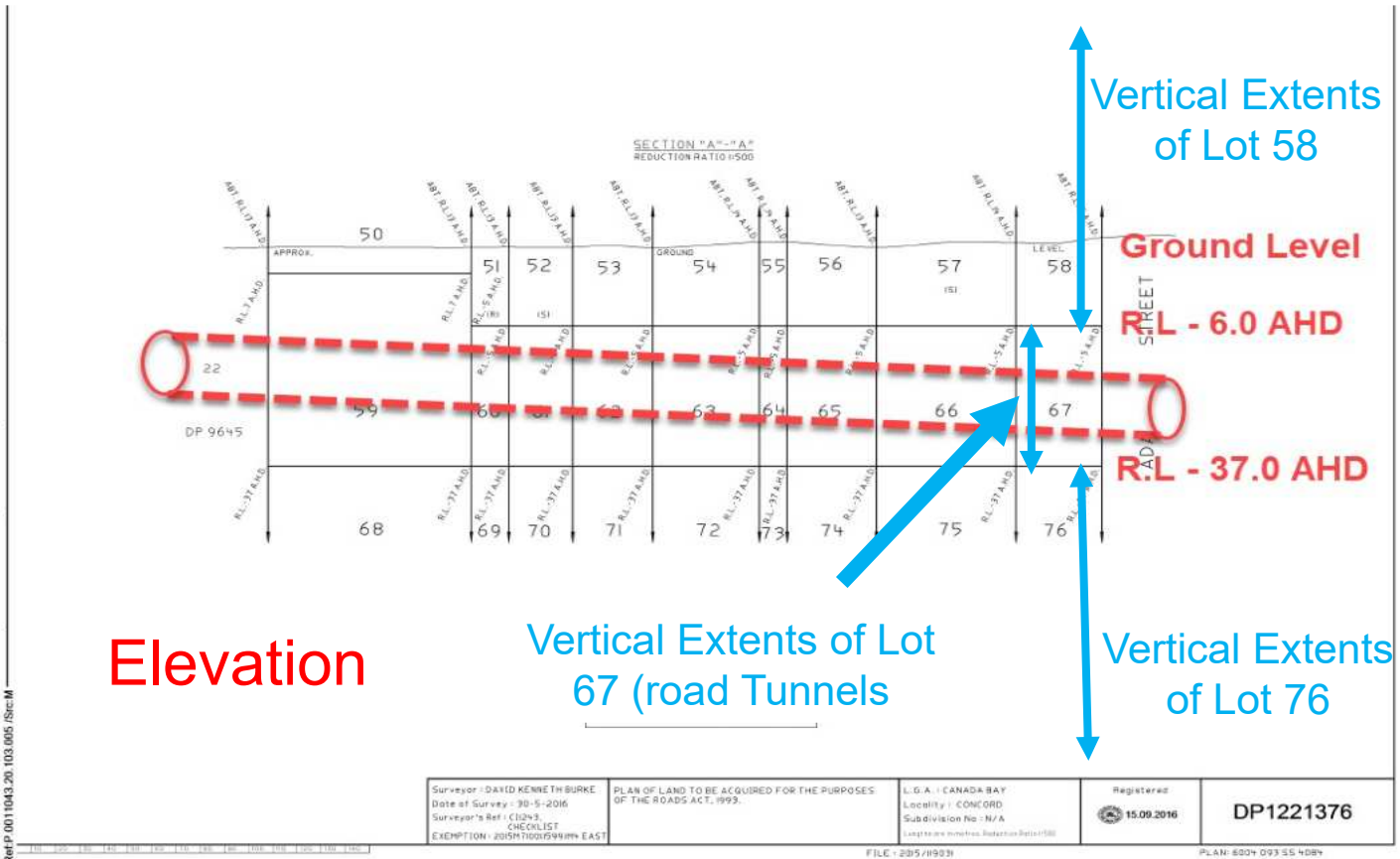
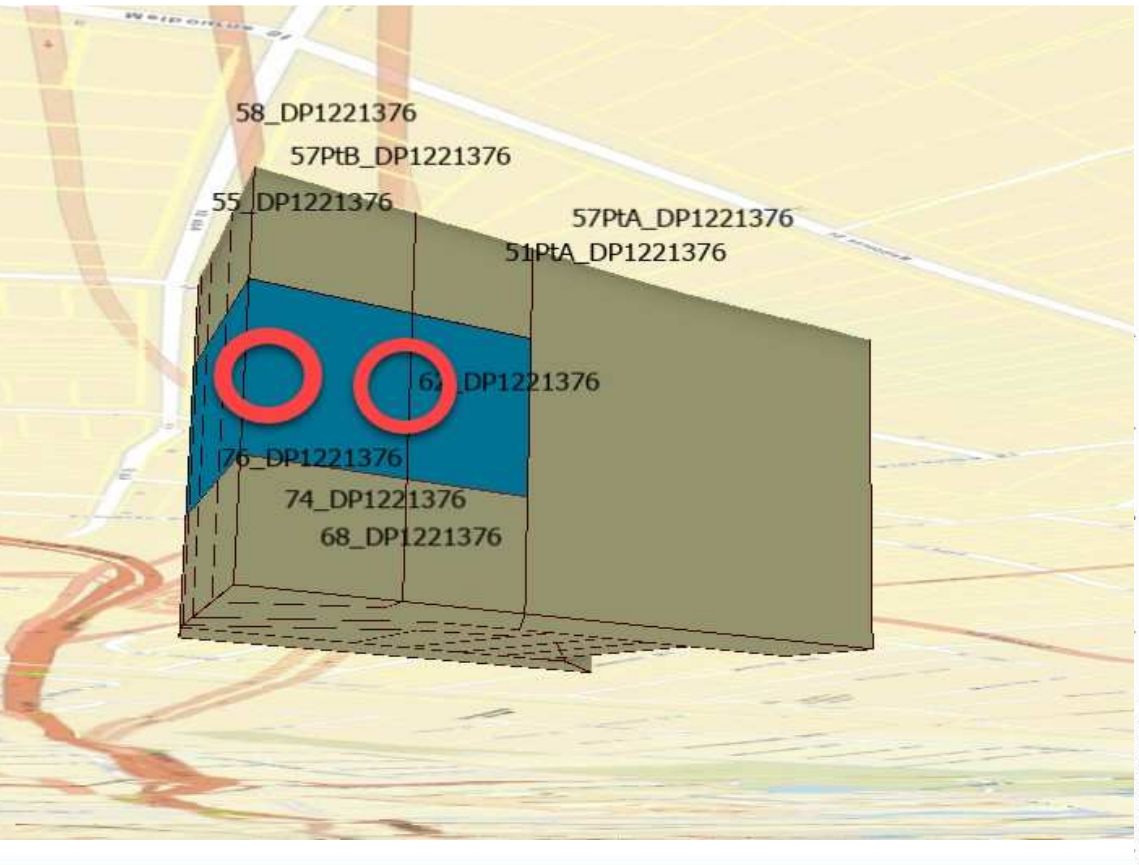
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3 new parcels created vertically aligned with existing cadastral parcel

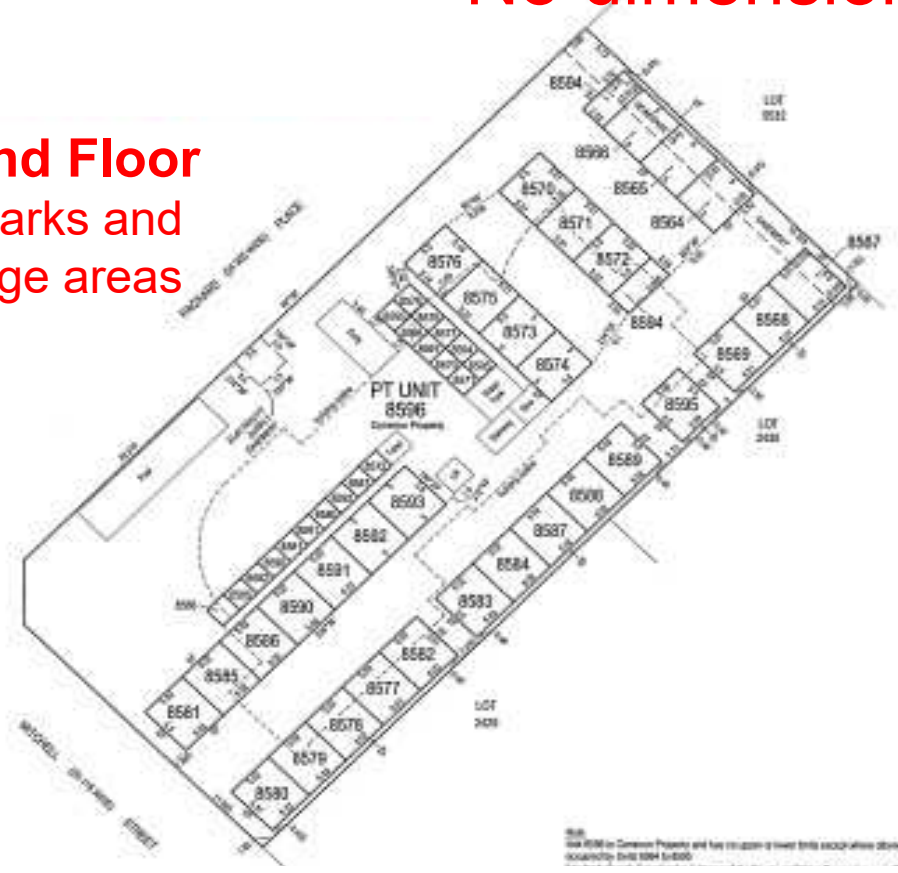




Strata Plan – Darwin, Northern Territory, Australia

No dimensions or heights

Ground Floor
Car Parks and storage areas



1st Floor

Indicative format of millions of Strata Titles across Australia.
Effective solution to manage a complex management arrangement.

<p>1. Richard Stone Plans 15/2/2018 15/2/2018</p>		<p>UNIT TITLES SUBDIVISION - UNIT TITLE SCHEMES ACT</p>	
<p>UNITS 8564 TO 8596 SUBDIVISION OF LOT 8432 TOWN OF DARWIN</p>		<p>SCALE 1:200</p>	
<p>UTS 2012/032B</p>		<p>UNIT TITLES</p>	

Northern Territory – 21/2D Model generated from Strata Plan with no x,y,z data

Floor levels of each parcel nominated and extruded to represent the ceiling.



130.8340645°E 12.4563558°S 25 m Selected Features

Type	StatedArea	Accuracy	Shape_Area	OBJECTID_1	Plan	Lot	Floor_Leve	Ceiling_He	Floor	Lot_Plan
59	81	2	81.259644	11	UTS2014016	9070	23	2.7	First_Floor	9070_UTS2014016
59	155	2	155.180805	15	UTS2014016	9074	26	2.7	Second_Floor	9074_UTS2014016
59	155	2	155.180805	57	UTS2014016	9116	44	2.7	Eighth_Floor	9116_UTS2014016
59	155	2	155.180805	50	UTS2014016	9109	41	2.7	Seventh_floor	9109_UTS2014016



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Case Study to create separate titles for each floor of an office building in Jakarta.





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(a)



(b)



(c)

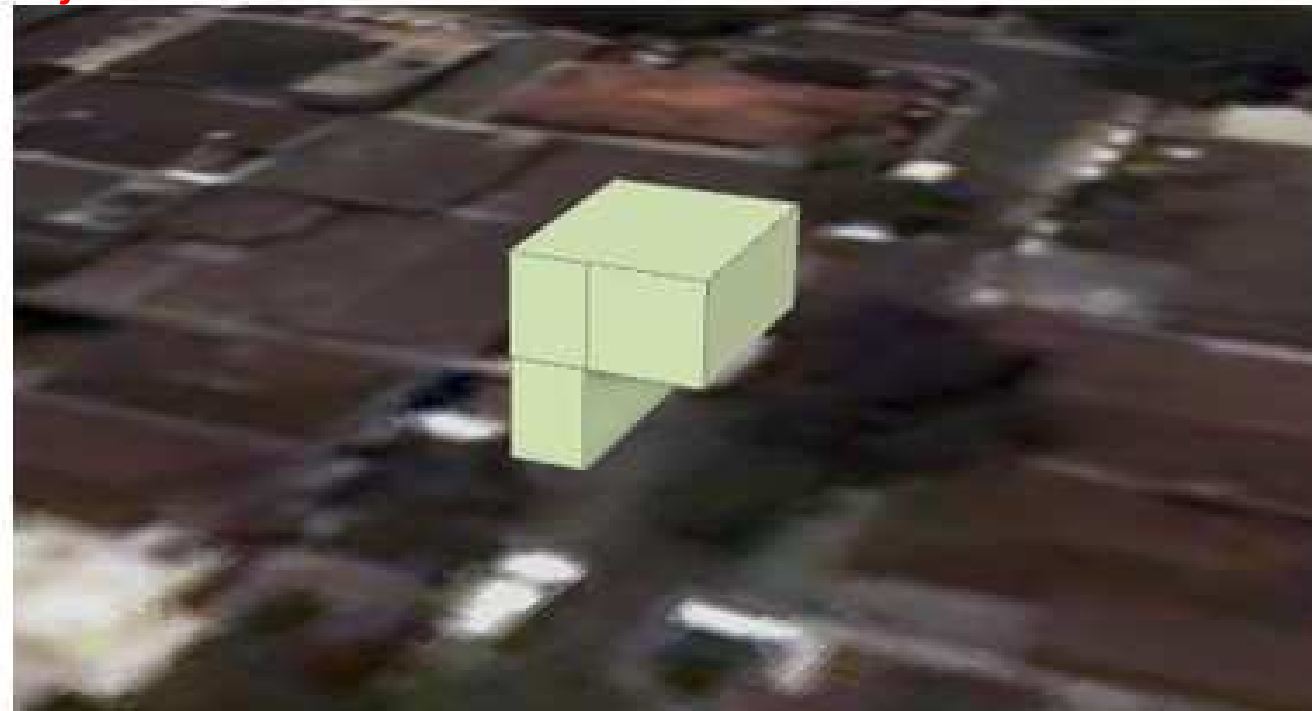
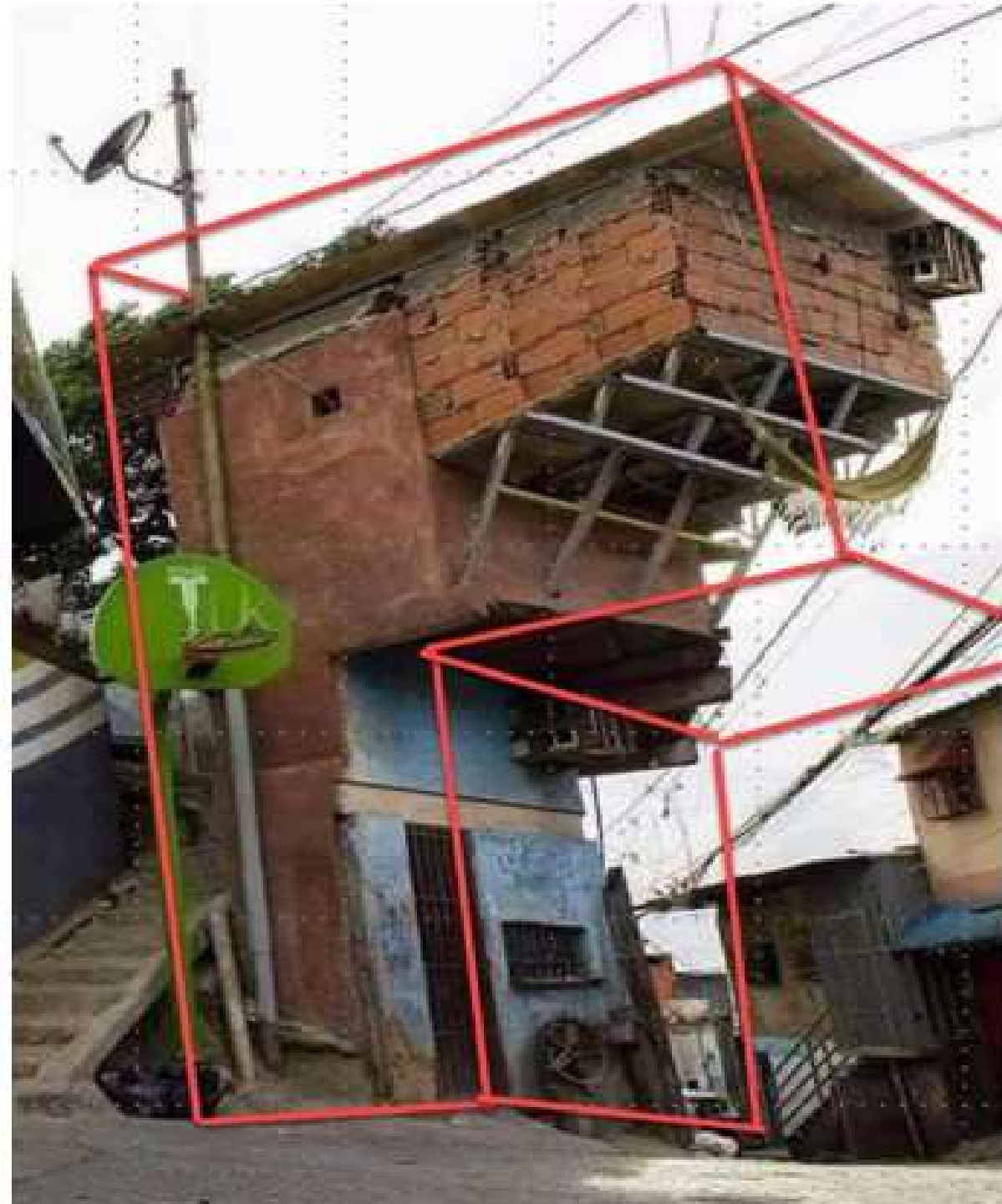
Field Work Image : (a) GNSS CORS, (b) Total Station Reflectorless, (c) UAV Lidar



The field survey data provides accurate data to generate a 3D representation of the individual titles using a basic “2 1/2 D” method of extruding floor plans to represent a ceiling height

FIT FOR PURPOSE DIGITAL TWIN

- A basic FFP model of any 3D cadastral entity can be represented by simple shapes that allow inclusion in a Digital Twin for land administration.
- This 3D representation is generated by a desktop approximation of dimensions and located from imagery.
- There is no standard height datum available so ground level is set at 0.0m and imagery is applied at the same level.
- As better data becomes available these heights can be adjusted.



A FFP DIGITAL TWIN

The process of generating desktop 3D models using those basic shapes and approximating heights can be expanded across a wide area to produce a Digital Twin for land administration purposes.





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Outcomes/Benefits of a FFP 3D Strategy

1. The value of FFP for land administration over the last 10-15 years is immense.
2. Adopting a FFP approach to the capture of existing 3D property extents into a usable Digital Twin model will continue that success.
3. Standards and scalability.
4. Technology can support future complexity when needed and budgets are available.

Simplicity is the key

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SUSTAINABLE DEVELOPMENT **GOALS**

International Federation of Surveyors supports the Sustainable Development Goals

Commission 7

Cadastre and Land Management

Serving Society for the Benefit of People and Planet

Thank You

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