

4th Questionnaire on 3D Land Administration: status December 2022 **Australia NSW**

This questionnaire is an activity of the **FIG Working Group 3D Land Administration 2022-2026**. The purpose of the survey is to make a world-wide inventory of the status of 3D Land Administration Systems/ Cadastres at this moment (2022) and the plans/ expectations for the near future (2026).

This is the first time that the questionnaire 3D-Land Administration is conducted as a successor of the questionnaire on 3D-Cadastres that was conducted three times by the FIG working group on 3D-Cadastres. The first time was in 2010 to document the status in 2010 and expectations back then for 2014. This was followed by second questionnaire in 2014 (with status 2014 and expectations 2018) and the third one conducted in 2018 (status of 2018 and plans for 2022).

The earlier responses have been analysed and reported on [van Oosterom et al. 2011](#), [Karki 2013](#), [van Oosterom et al. 2014](#) and [Shnaidman et al., 2019](#). The results of the three earlier questionnaires are available via the participants pages of the 3D Land Administration Working Group website: <http://www.gdmc.nl/3DCadastres/participants/>.

The purpose of this survey is to make a **world-wide inventory of the status of 3D Land Administration** at the current moment and the plans/ expectations for the near future (2026). By sharing this information, it should be **possible to improve cooperation, learn from each other and support future developments**.

A few notes and suggestions, which shall be helpful when completing the questionnaire, are given below:

- The conceptual model used as background for the 3D Land Administration questionnaire is the **ISO 19152:2012 standard** (ISO, 2012), the **Land Administration Domain Model (LADM)**. A new edition of the LADM is **under further development in ISO/TC 211** and is being developed as multipart standard, comprised by the following parts: **Part 1** – Generic Conceptual Model; **Part 2** – Land Registration; **Part 3** – Marine Georegulation; **Part 4** – Valuation Information; **Part 5** – Spatial Plan Information and **Part 6** – Implementations.
- In this questionnaire the concept of 3D Land Administration with **3D parcels** (or 3D spatial units in LADM terminology) is intended in the **broadest possible sense**. However, what exactly is (or could be) a 3D parcel is dependent on the legal and organizational context of the specific country/ state/ province. Therefore, **3D parcels include land and water spaces**,

both above and below the earth's surface.

- A more **formal definition**: A **3D parcel** is defined as *"the spatial unit against which (one or more) unique and homogeneous^[1] rights (e.g. ownership right, lease or other land use right), responsibilities or restrictions are associated to the whole entity, as included in a Land Administration system."*
- A **3D parcel is a 'legal object'** describing a part of the space. Often there is a relationship with a real world/ physical object, which can also be described in 3D. Please be aware of the difference between these two types of objects and that the focus in the context of 3D Land Administration is on the spaces of the legal objects and not the registration of the physical objects as such.
- As the definition above is quite abstract, at the questions below, more specific and real-world examples are being used. Inspecting some of the completed 2010, 2014 and 2018 questionnaires from other countries might help when formulating the answers for your jurisdiction.
- If a certain question is not relevant or if you have no clue what to respond, do not spend any time on this (and leave the field blank).
- Similar to the earlier Questionnaires on 3D- Land Administration, the completed forms will be made available on website of FIG Working Group on 3D Land Administration.
- Please complete this questionnaire before 15 December 2022 and send it to E.Kalogianni@tudelft.nl (the word document completed, or the link with the google document completed) and state as email subject **"Completed FIG Questionnaire on 3D Land Administration 2022-2026 for xxx"** and at the "xxx" name the country.

The questionnaire follows similar structure with the previous ones, with the difference that each section is permeated twice, once to complete the current status (2022) and once for the expectations on 2026. You can navigate from one section to a previous or a following from the buttons "previous" and "next" respectively. Once you research the last section and you complete your contact information you can submit the form.

The **structure of the questionnaire** is as follows:

1. Section 1 - GENERAL/APPLICABLE 3D REAL-WORLD SITUATIONS - Status 2022
2. Section 2 - GENERAL/APPLICABLE 3D REAL-WORLD SITUATIONS - Expectations 2026
3. Section 3 - INFRASTRUCTURE/ UTILITY NETWORK - Status 2022
4. Section 4 - INFRASTRUCTURE/ UTILITY NETWORK - Expectations 2026
5. Section 5 - CONSTRUCTION/ BUILDING UNITS - Status 2022
6. Section 6 - CONSTRUCTION/ BUILDING UNITS - Expectations 2026
7. Section 7 - COORDINATES - Status 2022
8. Section 8 - COORDINATES Expectations 2026
9. Section 9 - REPRESENTATION OF 3rd DIMENSION: HEIGHT (OR DEPTH) - Status 2022
10. Section 10 - REPRESENTATION OF 3rd DIMENSION: HEIGHT (OR DEPTH) - Expectations 2026
11. Section 11 - TEMPORAL ISSUES (4th DIMENSION) - Status 2022
12. Section 12 - TEMPORAL ISSUES (4th DIMENSION) - Expectations 2026
13. Section 13 - RIGHTS, RESTRICTIONS & RESPONSIBILITIES (RRRs) - Status 2022
14. Section 14 - RIGHTS, RESTRICTIONS & RESPONSIBILITIES (RRRs) - Expectations 2026

15. Section 15 - THE CADASTRAL DATABASE (Digital Cadastral Database - DCDB) - Status 2022
16. Section 16 - THE CADASTRAL DATABASE (Digital Cadastral Database - DCDB)
- Expectations 2026
17. Section 17 - PLANS OF SURVEY - Status 2022
18. Section 18 - PLANS OF SURVEY - Expectations 2026
19. Section 19 - DISSEMINATION OF 3D LAND ADMINISTRATION INFORMATION - Status 2022
20. Section 20 - DISSEMINATION OF 3D LAND ADMINISTRATION INFORMATION
- Expectations 2026
21. Section 21 - STATISTICAL INFORMATION - Status 2022
22. Section 22 - STATISTICAL INFORMATION - Expectations 2026
23. Section 23 - REFLECTION
24. Section 24 - OTHER ISSUES/ CONTACT INFO

The questionnaire has been prepared by Peter van Oosterom, Eftychia Kalogianni, Abdullah Kara, Rod Thompson, Sudarshan Karki, Anna Shnaidman, Alias Abdul Rahman, Hendrik Ploeger, Christiaan Lemmen. The questionnaire is grouped in various blocks. This has no meaning in the sense of priority, and it is often the case that a question could belong to multiple blocks. Please do not feel disturbed by this.

[1] Homogenous means that the same combination of rights equally apply within the whole 3D spatial unit. Unique means that this is the largest spatial unit for which this is true. Making the unit any larger would result in the combination of rights not being homogenous. Making the unit smaller would result in at least 2 neighbour 3D parcels with the same combinations of rights (ISO19152:2012).

4th Questionnaire on 3D Land Administration: status December 2022



1. GENERAL/APPLICABLE 3D REAL-WORLD SITUATIONS - Status 2022

This part of the questionnaire refers to the **applicable 3D real-world situations to be registered by 3D parcels at the current situation (2022)**. It also addressed the types of 3D geometries, which are considered to be valid 3D representations for these parcels.

1.1. Are all 3D parcels (3D spatial units in LADM terminology) constrained to be within one surface 2D parcel?

Yes – generally 3D parcels are constrained to be within one surface 2D parcel, however exemptions to this requirement may be granted under certain circumstances – e.g. for road/rail tunnel developments.

1.2. Are 2D and/ or 3D ambulatory* boundaries permitted?

[] An ambulatory boundary is a boundary of a land parcel which follows the movements of a natural feature such as a river. Its position determined at points of time (when a survey is carried out), but between such “fixes”, the definition of the property is the position of the real world natural feature.*

Yes for 2D horizontal boundaries.

1.3. Regarding the legal/ physical relation of 3D objects:

(a) Is it allowed to have 3D parcels (spatial units) not related to physical constructs or objects? (e.g. airspace, subsurface volumes)

(b) If 1.3.a positive: approximately what proportion of new 3D parcels (spatial units) would involve such cases (not related to physical object)?

(a) Yes

(b) A small proportion (less than 10%) consisting of stratum plans only.

1.4. Are disconnected parts of a single 3D parcel allowed?

Yes. Plans can have various 3D structures which are not connected to the main structure, such as car parks and exterior buildings adjacent to main building, such as in strata plans.

1.5. Spatial limitations – e.g. the 3D parcel ‘must be’ related to a closed volume or is it allowed to have ‘open’ or unbounded 3D parcels (e.g. towards the sky)?

Stratum can be open or unbounded.

For strata plans, common property is often open or unbounded, but lots in strata plan are bounded 3D parcels.

1.6. Are curved surfaces to bound the 3D parcels allowed?

Structures on a strata plan may be curved, but the structure defines the boundary, not a mathematical representation of a curve.

It is not acceptable to define a stratum boundary by a curve or curves. All boundaries must be horizontal or inclined regular planes.

1.7. Must the curved surfaces (if allowed) be cylindrical sections, or any other constraint?

N/A

1.8. Any other constraints – e.g. all surfaces must be horizontal or vertical?

No

1.9. Is there legislation (law and/or regulations) for 3D descriptions of parcels? If so please, mention law and article(s).

For strata developments: Strata Schemes Development Act 2015, Strata Schemes Development Regulation 2016

For stratum surveys: Surveying and Spatial Information Act and Regulation.

For all plans: Conveyancing General Regulation

1.10. Is the legal text available in original language? For example, professional or scientific papers/reports, which explain and justify the registration of 3D parcels.

Yes. English.

1.11. Is the legal text (relevant part) available in English translation at an official document?

Yes

1.12. Do you have example descriptions of typical 3D parcels; either 'prototype' or 'operational'?

Example of part of a strata lot:

" (A) denotes part lot 1 limited in depth to 3m below and in height to 10m above the upper surface of its respective garage floor".

1.13. Is there a formal model for the 3D parcels (UML style); e.g. based on ISO TC211 series (especially LADM, ISO 19152)?

No

1.14. Are natural resources (groundwater, mining rights, geo-thermal extraction and storage) shown in your land administration?

If yes, are they considered as 3D parcels (spatial units) with RRRs attached? What about mining concessions (could be limited in time)?

Mining rights – minerals reservations and the like are captured on title, and may be shown diagrammatically on survey plans.

They are not considered a 3D parcel, but rather as an interest in a parcel.

1.15. Are legally restricted spaces, above or below the earth's surface, such as polluted areas considered as 3D parcels?

Our cadastral system does not capture this kind of information.

These restrictions are within planning rules and regulations.

1.16. Are spatial plans considered as 3D parcels (so rights or restrictions are related to them)?

Sometimes they are called 'spatial development plans', 'zoning plans' or 'physical plans' (land use, urban, regional, environmental, ...).

No – Local Environmental Plans, State Environmental Planning Policies, Development Control Plans are maintained outside of the land titling system.

1.17. Regarding the Marine Space:

(a) Is there a Marine Cadastre established? And if so, are 3D parcels included in this registration?

(b) Is the IHO Maritime Limits and Boundaries standard (S121) in use or under implementation?

(c) Is there a Marine Spatial Plan established? And if so, are 3D marine parcels included in this registration?

(a) Yes – in some instances stratum parcels have been created.

(b) and (c) unknown.

1.18. Is there any organised legal instrument for the management of common property? For example, does the law, regulations or systems recognize/require a specific right type for common property?

Management Statement – document that accompanies the strata plan.

1.19. Which agency is responsible for the recording of titles information?

NSW Land Registry Services (NSW LRS) on behalf of the Registrar General (RG) under a Concession arrangement.

1.20. Which agency is responsible for recording cadastral transactions?

NSW Land Registry Services (NSW LRS) on behalf of the Registrar General (RG) under a Concession arrangement.

1.21. Are transactions for standard 2D lots and 3D lots done by the same agency or titles office?

Yes

1.22. Are there any 3D storage permissions recorded (e.g. underground storage of CO₂)?

Possibly

1.23 Has there been developed any country profile based on LADM ISO19152[1]?

(a) Does it support 2D spatial units?

(b) Does it support also 3D spatial units?

(c) Is there any provision to include/ align with the new LADM developments of the second Edition of the standard (inclusion of valuation information, marine spaces, spatial plans, interoperability/ reuse of BIM/IFC, ..)?

[1] If yes, is it included at the index presented at the Table 1 of the publication Kalogianni et al. 2021 [Kalogianni, E., Janečka, K., Kalantari, M., Dimopoulou, E., Bydłosz, J., Radulović, A., Vučić, N., Sladić, D., Govedarica, M., Lemmen, C.H.J. and van Oosterom, P.J.M. (2021). Methodology for the development of LADM country profiles, In: Land Use Policy, Elsevier, 105(105380), pp. 1-12, 2021. Available at: http://www.gdmc.nl/publications/2021/LUP_CountryProfile.pdf]

If it is included, are there any further developments/ publications related to it apart from those mentioned at the table? In case there are, could you please provide with a link of a relevant publication?

There has been some preliminary mapping to LADM as part of the 3D Cadastral Survey Data Model project.

1.24. Any other geometric issues related to 3D parcels?

Limitations in the Australian Height Datum (AHD) and access to local benchmarks have been identified as issues for the surveying industry.

1. GENERAL/APPLICABLE 3D REAL-WORLD SITUATIONS - Expectations 2026

This part of the questionnaire refers to the **applicable 3D real-world situations to be registered by 3D parcels**. It also addressed the types of 3D geometries, which are considered to be valid 3D representations for these parcels.

1.1. Are all 3D parcels (3D spatial units in LADM terminology) constrained to be within one surface 2D parcel?

No changes expected.

1.2. Are 2D and/ or 3D ambulatory* boundaries permitted?

[] An ambulatory boundary is a boundary of a land parcel which follows the movements of a natural feature such as a river. Its position determined at points of time (when a survey is carried out), but between such “fixes”, the definition of the property is the position of the real world natural feature.*

No changes expected.

1.3. Regarding the legal/ physical relation of 3D objects:

(a) Is it allowed to have 3D parcels (spatial units) not related to physical constructs or objects? (e.g. airspace, subsurface volumes)

(b) If 1.3.a positive: approximately what proportion of new 3D parcels (spatial units) would involve such cases (not related to physical object)?

No changes expected.

1.4. Are disconnected parts of a single 3D parcel allowed?

No changes expected.

1.5. Spatial limitations – e.g. the 3D parcel ‘must be’ related to a closed volume or is it allowed to have ‘open’ or unbounded 3D parcels (e.g. towards the sky)?

No changes expected.

1.6. Are curved surfaces to bound the 3D parcels allowed?

No changes expected.

1.7. Must the curved surfaces (if allowed) be cylindrical sections, or any other constraint?

1.8. Any other constraints – e.g. all surfaces must be horizontal or vertical?

.....

1.9. Is there legislation (law and/or regulations) for 3D descriptions of parcels? If so please, mention law and article(s).

No changes expected.

.....

1.10. Is the legal text available in original language? For example, professional or scientific papers/reports, which explain and justify the registration of 3D parcels.

.....

1.11. Is the legal text (relevant part) available in English translation at an official document?

.....

1.12. Do you have example descriptions of typical 3D parcels; either 'prototype' or 'operational'?

.....

1.13. Is there a formal model for the 3D parcels (UML style); e.g. based on ISO TC211 series (especially LADM, ISO 19152)?

Working with jurisdictions across Australia and New Zealand to develop a 3D cadastral survey data model.

1.14. Are natural resources (groundwater, mining rights, geo-thermal extraction and storage) shown in your land administration?

If yes, are they considered as 3D parcels (spatial units) with RRRs attached? What about mining concessions (could be limited in time)?

There will potentially be changes to how such information is shown on survey plans.

1.15. Are legally restricted spaces, above or below the earth's surface, such as polluted areas considered as 3D parcels?

No changes expected.

1.16. Are spatial plans considered as 3D parcels (so rights or restrictions are related to them)?

Sometimes they are called 'spatial development plans', 'zoning plans' or 'physical plans' (land use, urban, regional, environmental, ...).

No changes expected.

1.17. Regarding the Marine Space:

(a) Is there a Marine Cadastre established? And if so, are 3D parcels included in this registration?

(b) Is the IHO Maritime Limits and Boundaries standard (S121) in use or under implementation?

(c) Is there a Marine Spatial Plan established? And if so, are 3D marine parcels included in this registration?

.....

1.18. Is there any organised legal instrument for the management of common property? For example, does the law, regulations or systems recognize/require a specific right type for common property?

.....

1.19. Which agency is responsible for the recording of titles information?

.....

1.20. Which agency is responsible for recording cadastral transactions?

.....

1.21. Are transactions for standard 2D lots and 3D lots done by the same agency or titles office?

.....

1.22. Are there any 3D storage permissions recorded (e.g. underground storage of CO₂)?

1.23 Has there been developed any country profile based on LADM ISO19152[1]?

(a) Does it support 2D spatial units?

(b) Does it support also 3D spatial units?

(c) Is there any provision to include/ align with the new LADM developments of the second Edition of the standard (inclusion of valuation information, marine spaces, spatial plans, interoperability/ reuse of BIM/IFC, ..)?

[1] If yes, is it included at the index presented at the Table 1 of the publication Kalogianni et al. 2021? If it is included, are there any further developments/ publications related to it apart from those mentioned at the table? In case there are, could you please provide with a link of a relevant publication?

LADM development will continue to be monitored.

1.24. Any other geometric issues related to 3D parcels?

Potential improvements to height model based on state-wide aerial gravity survey and evaluation of the Australian Vertical Working Surface.

2. INFRASTRUCTURE/UTILITY NETWORKS - Status 2022

This refers to the situation where an **infrastructure network** is considered to be **defined within the land administration**. For example, in some jurisdictions, an underground network might be privately constructed for the purpose of leasing space in it for other organisations to run cabling. In this case, a network, or part of that network may be considered to be a real estate object.

2.1. Do you register utility networks as an entity in the land administration? (e.g. subterranean conduit networks)

Yes, easements for utility services over land titles are recorded. Not usually recorded in a road corridor.

2.2. If so, then:

- (a) can the network structure be viewed graphically in the land administration?
 - (b) can the network structure be traced in the database(s)?
 - (c) are networks registered by means of a cadastral identifier (such as a 'parcel number')?
 - (d) are RRRs and parties attached to these network objects?
 - (e) in which format are usually the utility networks submitted for registration (i.e. CityGML Utility ADE, IFC, MUDDI, shp, ...)?
- (a) We only record easements for major transmission lines through the DCDB.
 - (b) Not in a useful way.
 - (c) No.
 - (d) Yes, through statutory or bespoke terms and conditions in the creating instrument.
 - (e) PDF format.

2.3. Does the jurisdiction have private networks? If so please, mention law and article(s).

Yes for private networks and utilities.

2.4. If so, are they registered as 3D property parcels (spatial units)?

Easements not registered as a parcel, but an interest on title, which may be limited in height/depth.

2.5. Is the text of relevant laws or regulations (question 2.3) available in original language? If so, give references to relevant document(s).

Yes – English.

2.6. Is the text of laws and regulations (relevant part) available in English translation of an official document?

Yes

2.7. Do you have example descriptions of typical 3D parcels (spatial units) for networks; either 'prototype' or 'operational'?

N/A

2.8. If the network (legal) objects break at the surface parcel, how do you deal with intersecting networks or vertically parallel networks?

Common scenario – overlapping easements simply shown as such on a plan, may have stratum limits unique to each.

2.9. Any other geometric issues related to the registration of networks?

No, however we do not capture the physical location of assets, rather the easement within which the asset is located.

2. INFRASTRUCTURE/UTILITY NETWORKS - Expectations 2026

This refers to the situation where an **infrastructure network** is considered to be **defined within the**

land administration. For example, in some jurisdictions, an underground network might be privately constructed for the purpose of leasing space in it for other organisations to run cabling. In this case, a network, or part of that network may be considered to be a real estate object.

2.1. Do you register utility networks as an entity in the land administration? (e.g. subterranean conduit networks)

No changes expected.

2.2. If so, then:

- (a) can the network structure be viewed graphically in the land administration?
- (b) can the network structure be traced in the database(s)?
- (c) are networks registered by means of a cadastral identifier (such as a 'parcel number')?
- (d) are RRRs and parties attached to these network objects?
- (e) in which format are usually the utility networks submitted for registration (i.e. CityGML Utility ADE, IFC, MUDDI, shp, ...)?

Regarding item (e) – working towards greater adoption of digital survey plans which would include easement creation (LandXML).

2.3. Does the jurisdiction have private networks? If so please, mention law and article(s).

2.4. If so, are they registered as 3D property parcels (spatial units)?

No changes expected.

2.5. Is the text of relevant laws or regulations (question 2.3) available in original language? If so, give references to relevant document(s).

2.6. Is the text of laws and regulations (relevant part) available in English translation of an official document?

2.7. Do you have example descriptions of typical 3D parcels (spatial units) for networks; either 'prototype' or 'operational'?

2.8. If the network (legal) objects break at the surface parcel, how do you deal with intersecting networks or vertically parallel networks?

2.9. Any other geometric issues related to the registration of networks?

3. CONSTRUCTION/ BUILDING UNITS - Status 2022

This refers to 3D properties that are related to **constructions and apartment (condominium) buildings**. The individual units are often defined by the actual walls and structure of a building, rather than by metes and bounds, e.g. *"unit 5 on level 6 of ... building"*.

3.1. Do you register legal spaces for 3D construction/ building units (separate from the land)?

Yes. Strata titles.

3.2. If so, what are the conditions for doing so, and what are the most important types? E.g. apartment units (at least 2 or more in building), or also other buildings or even more general constructions (infra related; such as bridge, tunnel or even other, such as windmills, ...)

The strata plan is a subdivision of a parcel of Real Property land into separate lots and common property

Conditions are:

* all lots are defined as a cubic space and must be limited in height and depth.

every strata plan must have a building on the parcel.

the lots are defined on the floor plan by the building or other permanent structures within the parcel.

everything within the parcel which does not form part of a lot is common property.

it is the responsibility of the owners corporation to maintain and repair common property.

the owners corporation is a body corporate of all of the lot owners in a scheme.

each lot in a strata plan is allocated a unit entitlement based upon its value relative to the other lots in the scheme. The unit entitlement represents that lot's share of the common property.

3.3. Does the jurisdiction have construction/building units? If so please, mention law and article(s).

Strata Schemes Development Act 2015, Strata Schemes Development Regulation 2016

3.4. Is the legal text available in original language?

Yes. English.

3.5. Is the legal text (relevant part) available in English translation at an official document?

Yes

3.6. Do you have example descriptions of typical 3D parcels; either 'prototype' or 'operational'?

Yes – see item 1.12 above

3.7. Regarding the boundaries' definition:

(a) What would be typical 3D boundaries in an apartment complex: i) middle of the wall and floor/ceiling, ii) interior/ exterior of the wall or iii) walls, floor/ceiling as neutral/ shared 3D space?

(b). Is it mentioned in any legislation or is it the convention?

a) Typical strata boundaries are:

Structural

- upper surface of floor
- face of wall (vertical boundary)
- lower surface of roof
- centreline of line of columns

Generally, the material of the structure is common property – part of the scheme.

Linear

- Lines that are prolongations of a structure or perpendicular from a structure

b) Yes, in legislation – Strata Schemes Development Act 2015

3.8. Is common property inside the building registered? If so, how?

Yes – everything not defined as part of a lot is common property, and given a folio identifier.

3.9. Who owns the common property inside the building?

The owners corporation, consisting of owners of the strata scheme.

3.10. Who owns the land on which the apartment is built?

The owners corporation, consisting of owners of the strata scheme.

3.11. Do you allow sub-division of apartments or apartment blocks?

Yes

3.12. Can the land on which the building is built be sub-divided or sold or mortgaged without the consent of majority of the apartment owners?

No

3.13. What is the numbering convention for apartments (please specify in terms of cadastral parcel as well as street addressing)

- (1) Each lot in a strata plan must be numbered consecutively in whole numbers without gaps and starting from 1.
- (2) Each lot in a strata plan of subdivision or a strata plan of consolidation must be numbered consecutively in whole numbers without gaps and starting from the number that is 1 greater than the highest number of any existing lot in the strata scheme.
- (3) A building alteration plan must not renumber any lot.

3.14. Are there any mandates* that set specifications on the delivery of design/ construction drawing of properties in BIM-based format, when registering new 3D parcels (from design)?

**That arise through legislation or from the procurement process.*

No, however legislation has recently been introduced that requires declared design and declared as-constructed drawings (PDF) to be submitted to the relevant authority.

3.15. Are there any operational or in prototype stage platforms. implementations that reuse BIM information from design as cadastral/ land administration input?

Yes – NSW Spatial Digital Twin

3.16. Any other geometric issues?

Yes – we do not record height of strata units, making 3D visualisation challenging.

3. CONSTRUCTION/ BUILDING UNITS - Expectations 2026

This refers to 3D properties that are related to **constructions and apartment (condominium) buildings**. The individual units are often defined by the actual walls and structure of a building, rather than by metes and bounds, e.g. *“unit 5 on level 6 of ... building”*.

3.1. Do you register legal spaces for 3D construction/ building units (separate from the land)?

3.2. If so, what are the conditions for doing so, and what are the most important types? E.g. apartment units (at least 2 or more in building), or also other buildings or even more general constructions (infra related; such as bridge, tunnel or even other, such as windmills, ...)

.....

3.3. Does the jurisdiction have construction/building units? If so please, mention law and article(s).

.....

3.4. Is the legal text available in original language?

.....

3.5. Is the legal text (relevant part) available in English translation at an official document?

.....

3.6. Do you have example descriptions of typical 3D parcels; either 'prototype' or 'operational'?

.....

3.7. Regarding the boundaries' definition:

(a) What would be typical 3D boundaries in an apartment complex: i) middle of the wall and floor/ceiling, ii) interior/ exterior of the wall or iii) walls, floor/ceiling as neutral/ shared 3D space?

(b). Is it mentioned in any legislation or is it the convention?

.....

3.8. Is common property inside the building registered? If so, how?

.....

3.9. Who owns the common property inside the building?

.....

3.10. Who owns the land on which the apartment is built?

.....

3.11. Do you allow sub-division of apartments or apartment blocks?

.....

3.12. Can the land on which the building is built be sub-divided or sold or mortgaged without the consent of majority of the apartment owners?

.....

3.13. What is the numbering convention for apartments (please specify in terms of cadastral parcel as well as street addressing)

.....

3.14. Are there any mandates* that set specifications on the delivery of design/ construction drawing of properties in BIM-based format, when registering new 3D parcels (from design)?

**That arise through legislation or from the procurement process.*

.....

3.15. Are there any operational or in prototype stage platforms. implementations that reuse BIM information from design as cadastral/ land administration input?

Greater utilisation of the NSW Spatial Digital Twin.

.....

3.16. Any other geometric issues?

.....

4. COORDINATES - Status 2022

This refers to the use of **x, y coordinates** and the relevant issues.

4.1. Do the plans of survey guarantee X/Y coordinates? (and are they relative or in an absolute spatial reference system?)

No, however surveys are required to be connected to the NSW survey control network (SCIMS).

4.2. Are the cadastral database coordinates authoritative?

No

4.3. If not, what is the authoritative source of X/Y coordinates?

NSW survey control network

4.4. Do you have parcels defined by the walls of a building (with no recorded geometry)?

Parcels can be defined by structures in both Deposited Plans (DPs) and Strata Plans.
DPs do have recorded geometry.

4.5. What is the spatial reference system for X/Y Coordinates? (Please , provide the EPSG)

EPSG:7844 - GDA2020

MGA 2020 –

Zone 54 EPSG:7854,

Zone 55 EPSG:7855,

Zone 56 EPSG:7856,

Zone 57 EPSG:7857

4.6. When owners receive or purchase a copy of the plan what can they see on the plan to help them identify their parcel/lot

(e.g. bearings and distance, identifying corners or recovery marks, neighbouring lots, coordinates etc.)?

- * Parcel geometry, drawn to a nominated scale
- * Lot number
- * Street address and administrative areas
- * Bearings and distances
- * Connections to survey control and boundary/reference marks
- * Adjoining information – roads, lots, relevant structures, other features

4.7. Have there been any changes, w.r.t. the spatial reference system, made in the way cadastral information is recorded and represented from a historical point of view?

Yes – changes in survey legislation over time, changes in policies and guidelines, changes in units of measurement, datum modernisation.

4.8. Any other X/Y coordinate issues?

Australia experiences shifting coordinates over time, shifting (7 cm per year N/E), necessitating periodic updates of our local coordinate system to align with ITRF

4. COORDINATES - Expectations 2026

This refers to the use of **x, y coordinates** and the relevant issues.

4.1. Do the plans of survey guarantee X/Y coordinates? (and are they relative or in an absolute spatial reference system?)

All plans on MGA (based on Geocentric Datum of Australia 2020)

4.2. Are the cadastral database coordinates authoritative?

4.3. If not, what is the authoritative source of X/Y coordinates?

4.4. Do you have parcels defined by the walls of a building (with no recorded geometry)?

4.5. What is the spatial reference system for X/Y Coordinates? (Please , provide the EPSG)

4.6. When owners receive or purchase a copy of the plan what can they see on the plan to help them identify their parcel/lot

(e.g. bearings and distance, identifying corners or recovery marks, neighbouring lots, coordinates etc.)?

4.7. Have there been any changes, w.r.t. the spatial reference system, made in the way cadastral information is recorded and represented from a historical point of view?

.....

4.8. Any other X/Y coordinate issues?

.....

5. REPRESENTATION OF 3rd DIMENSION: HEIGHT (OR DEPTH) - Status 2022

This section refers to the representation and registration of the **third dimension**.

5.1. Are the height values of 3D parcels relative to local ground?

No, but may be relative to a local structure.

.....

5.2. Are height values reduced to a standard datum (absolute)? If so, what is the spatial reference system for this 3rd ordinate?

Yes, Australian Height Datum (AHD71)

.....

5.3. In principle, is it possible to store both relative and absolute height/ depth values?

Yes, in principle it is possible.

.....

5.4. Is the earth surface (elevation) explicitly stored (in the DCDB or other accessible register)?

Yes – digital surface model available through the NSW Spatial Collaboration Portal.

5.5. What is the source of height values for the 2D surface parcel?

NSW survey control network (SCIMS)

5.6. How is elevation information recorded in the cadastral plan or database?

On the cadastral plan, contained within height schedule and height difference schedule for survey control marks.

AHD values indicating height and depth limitations for lots noted on plan where applicable.

Not recorded in DCDB except where a parcel is flagged as 'hasStratum=true'

5.7. Do you expect the elevation recorded in cadastral plans to be used for any other purpose

(e.g. development of 3D city models or civil constructions etc.)?

Yes – see NSW Spatial Digital Twin

5.8. Are there any 3D City Model/ Digital Twin developments carried out at a national or city level that can be used for orientation or reference purposes?

We have NSW Spatial Digital Twin, but cannot be used for orientation or reference purposes.

5.9. Any other 3rd dimension ordinate value issues?

No.

5. REPRESENTATION OF 3rd DIMENSION: HEIGHT (OR DEPTH) - Expectations 2026

This section refers to the representation and registration of the **third dimension**.

5.1. Are the height values of 3D parcels relative to local ground?**5.2. Are height values reduced to a standard datum (absolute)? If so, what is the spatial reference system for this 3rd ordinate?****5.3. In principle, is it possible to store both relative and absolute height/ depth values?****5.4. Is the earth surface (elevation) explicitly stored (in the DCDB or other accessible register)?**

May be incorporated into the 3D cadastral survey data model for Australia and New Zealand.

5.5. What is the source of height values for the 2D surface parcel?

.....

5.6. How is elevation information recorded in the cadastral plan or database?

Continued development of 3D cadastre.

.....

5.7. Do you expect the elevation recorded in cadastral plans to be used for any other purpose

(e.g. development of 3D city models or civil constructions etc.)?

.....

5.8. Are there any 3D City Model/ Digital Twin developments carried out at a national or city level that can be used for orientation or reference purposes?

.....

5.9. Any other 3rd dimension ordinate value issues?

.....

6. TEMPORAL ISSUES (4th DIMENSION) - Status 2022

This section refers to the representation and registration of the **fourth dimension**.

6.1. Are temporal limits part of the definition of a parcel (2D or 3D)?

Yes for leasehold title.

6.2. Are moving parcels allowed?

Not in principle, however ambulatory water boundaries may change in accordance with legal doctrine of accretion and erosion.

6.3. Are there any limitations on the range of temporal limits?

(e.g. only on 3D apartments).

For certain types of leases there are limits on duration, set out in various pieces of legislation.

6.4. Is there any attempt to integrate 3D space and temporal representations, into a single 4D space/time representation?

Yes – the NSW Spatial Digital Twin allows users to view the digital cadastre at any point in time since around 2003.

6.5. In the case of tidal boundaries, what happens to the 3D ambulatory parcel if the 2D land parcel changes extent due to the movement of High Water Mark?

We do not have 3D ambulatory boundaries.

6.6. In case 3D Marine Cadastre is present and moving boundaries are allowed, how is this represented?

e.g. using 4D geometry and topology.

N/A

6.7. Can time bound rights be created and extinguished in the title? (e.g. temporary titles created for a period and when the time is up it can be extinguished)?

Yes, easements and interests on title can be time bound. For strata scheme developments there is an initial period which restricts actions of the developer.

6.8. Is it possible to identify all the changes made by any operator to the cadastral plans or database and to rollback if there is an error made?

Yes, all changes are recorded and can be reviewed and rectified.

6.9. For Cadastral transactions, how far in time do buyers need to make a search to ensure the title or deed is legal?

Most land in NSW is Torrens Title – government guarantees title. No prior search necessary. Where title contains a qualification, good root of title is considered to be 30 years.

6.10. Are there object classes in the registration that require both real-world (or valid) times and database load (or system) times, i.e. bi-temporal support?

Yes – example is date of survey, and SCIMS coordinates to be valid within 6 months of date of survey.

For upload of plan documents into the e-plan system, time stamp verifies currency of lodged document.

6.11. Any other temporal issues?

As part of Digital Plans reform, NSW is looking to improve coordination across the surveying industry by tracking the progression of plans prior to them being lodged.

6. TEMPORAL ISSUES (4th DIMENSION) - Expectations 2026

This section refers to the representation and registration of the **fourth dimension**.

6.1. Are temporal limits part of the definition of a parcel (2D or 3D)?

6.2. Are moving parcels allowed?

6.3. Are there any limitations on the range of temporal limits?

(e.g. only on 3D apartments).

.....

6.4. Is there any attempt to integrate 3D space and temporal representations, into a single 4D space/time representation?

.....

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.....

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6.10. Are there object classes in the registration that require both real-world (or valid) times and database load (or system) times, i.e. bi-temporal support?

.....

6.11. Any other temporal issues?

.....

7. RIGHTS, RESTRICTIONS AND RESPONSIBILITIES (RRRs) - Status 2022

This section refers to the **RRRs and their registration at the LA system**. At a vast majority of the countries, the restrictions and the responsibilities are not registered at the LAS.

7.1. Please provide the range of RRRs on 3D parcels. If there is an online depository, provide the link.

Same as 2D parcels plus stratum limits.

Easements, restrictions on use of land, profit a prendre, positive covenant

See RG Guidelines

7.2. Are there any limitations on the range of rights related to 3D spatial units? (e.g. subterranean parcels must be owned by Govt).

Not specifically

7.3. Are there any limitations on the range of restrictions or responsibilities related to 3D spatial units? (i.e. currently in use and related to 2D spatial units, but that would not be applicable to 3D).

Not specifically

7.4. Are there RRRs that are only allowed in 3D (and not valid for 2D)

No

7.5. Is there specific legislation (laws, regulations) defining 3D RRR types? If so, provide details, e.g. references to documents/ articles.

Yes – Surveying and Spatial Information Act and Regulations, Conveyancing Act, many other pieces of legislation.

7.6. Can 3D sub-surface/above-surface parcel be owned by someone other than the person owning the land parcel?

Yes – e.g. tunnels, bridges, other stratum lots on a site.

7.7. What applications do you foresee for 3D land administration?

Asset management.

Smart Cities.

Urban Planning.

Disaster and recovery.

Modelling.

Visualisation.

Liveability measures.

7.8. Are the administrative source documents (source of RRRs) title or deed based?

Title (Torrens register) except where still described in an Old System deed and not carried forward to title (small minority of cases)

7.9. Who is responsible for the correctness of the specified 3D boundaries in spatial source documents (which authority)?

Shared responsibility between the Registered Surveyor who defined the boundaries and the Registrar General.

7.10. Is registration of 3D parcels done inside the cadastral mapping agency, the land registry or elsewhere?

NSW Land Registry Services (NSW LRS) on behalf of the Registrar General NSW.

7.11. Are 3D registrations handled by the same organisation that handles traditional (2D) land administration?

Yes

7.12. Do you supply paper-based titles or deeds or proof of ownership? If yes, does this contain depictions of the 2D or 3D parcel?

Titles are no longer issued in paper but are electronic.

Title itself does not contain depiction, but refers to 'title diagram' which is the survey plan defining that lot.

7.13. Is the 3D registry separate or integrated with the 2D registry?

Integrated

7.14. Any other RRR issues?

Many ongoing issues under discussion, too many to list.

RRRs are always a point of contention.

7. RIGHTS, RESTRICTIONS AND RESPONSIBILITIES (RRRs) - Expectations 2026

This section refers to the **RRRs and their registration at the LA system**. At a vast majority of the countries, the restrictions and the responsibilities are not registered at the LAS.

7.1. Please provide the range of RRRs on 3D parcels. If there is an online depository, provide the link.

7.2. Are there any limitations on the range of rights related to 3D spatial units? (e.g. subterranean parcels must be owned by Govt).

7.3. Are there any limitations on the range of restrictions or responsibilities related to 3D spatial units? (i.e. currently in use and related to 2D spatial units, but that would not be applicable to 3D).

7.4. Are there RRRs that are only allowed in 3D (and not valid for 2D)

7.5. Is there specific legislation (laws, regulations) defining 3D RRR types? If so, provide details, e.g. references to documents/ articles.

7.6. Can 3D sub-surface/above-surface parcel be owned by someone other than the person owning the land parcel?

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.....

7.13. Is the 3D registry separate or integrated with the 2D registry?

.....

7.14. Any other RRR issues?

.....

8. THE CADASTRAL DATABASE (Digital Cadastral Database - DCDB) - Status 2022

This section refers to the **structure and functionalities of the cadastral database**.

8.0. Is the database schema LADM based?

No

.....

8.1. Does the DCDB contain representation of 3D parcels (in any form)?

Indicated by plan type in 2D representation. Attribution value used to identify the 3D nature of the parcel by identifying "strata" or "stratum".

.....

8.2. If so, how are they represented (in the DCDB)?

As 2D object, stratum level indicated under attribution in database.

8.3. If so, how are they presented on cadastral “maps” (including screen presentations)?

If a stratum or strata lot exists, a notation is recorded in the titling system against the relevant ground parcel, and appears as a highlight over that parcel through a cadastral records enquiry search.

8.4. Are there possibilities to store geometry of 3D parcels in the DCDB?

Not currently.

8.5. Is it possible to manage a 3D topological structure in the DCDB?

Not currently.

8.6. Are constraints/rules defined for valid 3D objects (closed volume, no overlap, no gap in 3D)? What about rules for a mix of 2D and 3D representations?

Not currently.

8.7. How can internal and external user query and visualize the 3D content supporting rotating, slicing, transparency, perspective (3D web/view service, 3D pdf documents, ..)?

Not currently in operation

8.8. What Spatial DBMS software do you use? Any 3D capabilities included and used?

Informix DBMS.
Esri Geodatabases.

8.9. Do you have any validation rules for 3D representation in the database?

Not currently.

8.10. What (GIS/CAD) software is used for updating, editing, analysis, and visualization of the cadastral data? Any 3D capabilities included and used?

* Esri ARCGIS
* QGIS
* FME
* Cesium

8.11. What web software is used for remote data access/distribution and visualization? Any 3D capabilities included and used?

Testing and prototyping of 3D development includes.

* Esri Online Portal
* Cesium/TerriaJS

Both contain 3D capabilities.

8.12. Is your DCDB organised as Multi-Layers or Object Oriented or some other data model?

Multilayers

8.13. How do you query 3D objects in your DCDB?

Only as 2D representation

8.14. Is it possible to query neighbourhood parcels to a 3D object, vertically as well as horizontally?

Horizontal only (2D)

8.15. Any other DCDB issues?

Accuracy improvements to be made.

8. THE CADASTRAL DATABASE (Digital Cadastral Database - DCDB) - Expectations 2026

This section refers to the **structure and functionalities of the cadastral database**.

8.0. Is the database schema LADM based?

8.1. Does the DCDB contain representation of 3D parcels (in any form)?

Digitisation of registered strata plans and visualisation in 3D is underway.

8.2. If so, how are they represented (in the DCDB)?

.....

8.3. If so, how are they presented on cadastral “maps” (including screen presentations)?

.....

8.4. Are there possibilities to store geometry of 3D parcels in the DCDB?

See item 8.1 above. Also dependent on the 3D cadastral survey data model project.

8.5. Is it possible to manage a 3D topological structure in the DCDB?

.....

8.6. Are constraints/rules defined for valid 3D objects (closed volume, no overlap, no gap in 3D)? What about rules for a mix of 2D and 3D representations?

.....

8.7. How can internal and external user query and visualize the 3D content supporting rotating, slicing, transparency, perspective (3D web/view service, 3D pdf documents, ..)?

Currently in prototyping and piloting solutions in the NSW Spatial Digital Twin.

.....

8.8. What Spatial DBMS software do you use? Any 3D capabilities included and used?

Redevelopment of maintenance and delivery systems may change this.

8.9. Do you have any validation rules for 3D representation in the database?

8.10. What (GIS/CAD) software is used for updating, editing, analysis, and visualization of the cadastral data? Any 3D capabilities included and used?

3D capabilities of GIS tools are being used for 3D cadastre development testing, analysis and visualisation.

8.11. What web software is used for remote data access/distribution and visualization? Any 3D capabilities included and used?

8.12. Is your DCDB organised as Multi-Layers or Object Oriented or some other data model?

8.13. How do you query 3D objects in your DCDB?

8.14. Is it possible to query neighbourhood parcels to a 3D object, vertically as well as horizontally?

.....

8.15. Any other DCDB issues?

Further progressing digital cadastre modernisation for NSW.

.....

9. PLANS OF SURVEY (INCLUDING FIELD SKETCHES) - Status 2022

This section poses questions about the data acquisition process and **cadastal survey plans**.

9.1. Do the survey plans carry 3D parcel representations?

Yes where required.

.....

9.2. If so, how are they represented?

In Deposited Plans (including stratum) – reference to Australian Height Datum, with plan diagrams and cross sections as required.

In Strata plans, through textual stratum statements.

.....

9.3. Is there specific legislation (regulations) describing the requirements for Plans of Survey in 3D? This could cover:

- (a) accuracy/ quality,
 - (b) 3D survey method,
 - (c) conceptual information model survey plan,
 - (d) portrayal rules for graphic representation,
 - (e) format or encoding for submission.
- If so, please give link to the relevant documents.

Strata Schemes Development Act 2015 No 51

Strata Schemes Development Regulation 2016

Surveying and Spatial Information Regulation 2017 (current regs)

9.4. Is sketch level allowed (low geometric quality, but in principle enough to indicate the 3D object)?

Yes – occasionally used in diagrams to explain complex situations in stratum plans or part strata plans.

9.5. Is it possible to define a 3D parcel by referring to other 3D real world objects/ topography (and not specifying coordinates)?

Yes for strata lots. Stratum must be related to height datum and shown by measurements.

9.6. In what format are the 3D parcels submitted for registration; attached to legal document in a single pdf (which has good 3D capabilities) or in an extension of (city) GML for 3D parcels, or....?

PDF image (plan)

9.7. Are the 3D parcels somehow checked for spatial validity; e.g. volume is closed, does not overlap with neighbour volume (and also no unwanted 3D gaps)?

Volumes are not registered.

However from a titling perspective, we do not allow overlaps or gaps in titles.

9.8. Do you have examples of (prototype or production) 3D survey plans available?

Yes (prototype)

9.9. Are any reference objects visible on the survey plan (e.g. real buildings, roads, that is 3D topography)?

Yes –plans may contain reference to building features and structural features.

9.10. What form of 3D data acquisition is used (CAD, terrestrial surveying, sketches, stereo/oblique images, laser scanning, ...)?

Terrestrial surveying, laser scanning, and levelling.

9.11. What software do you use for creating and processing survey plans? Any 3D capabilities included and used?

Various CAD products.

Many are listed in this link:

NSW LRS Digital Survey Plans

Many have 3D capabilities.

9.12. Can 3D parcels be subdivided, consolidated or nullified?

Yes

9.13. Is there any existing technical circular or directive to assist Surveyors in 3D data collection in the field?

Yes – publications include:

* Surveyor General's Directions

* Guideline – Terrestrial Laser Scanning (TLS) for Cadastral Surveys published by the Board of Surveying and Spatial Information

9.14. Are the surveyors required to undertake a field survey for 3D cadastral data?

Yes – all principles of cadastral boundary survey definition followed, with addition of measurements to define height as required.

Measurement of structures defining 3D spaces to confirm lot areas and stratum limits.

9.15. Are building construction plans used to compile 3D cadastral information for apartments?

Yes – surveyors rely on architectural plans for buildings to initially compile strata plans, and confirm final as-built lot layouts, areas, dimensions, height limits etc by survey measurement.

9.16. Is 2D/3D field survey done by private licensed surveyors or by government surveyors?

2D – majority of registered plans by private licensed surveyors, minority by government.

3D – as above, however strata almost exclusively by private licensed surveyors.

9.17. Are plans of survey created for each new 2D/3D parcel or are they updated in an index map or a cadastral database.

A plan is created for each change in cadastral parcels resulting in creation or removal of 2D/3D parcels.

The registration of these plans results in updates to the DCDB being made.

9.18. Do you show dimensions or isometric views of 3D parcels on survey plans (do you also store this in a database)

No – representation purely 2-dimensional, consisting of plan view and cross sections in stratum or part strata lots.

9.19. Do the cadastral survey plans differentiate between different types (e.g. volumetric plans, building plans and standard 2D plans)?

Yes – differentiation is as follows:

Deposited Plan – for 2D land development (subdivision, consolidation, redefinition, acquisition, etc) and creation of 3D stratum parcels/interests.

Strata Plan – for creation of 3D strata lots and common property.

9.20. What are the usual elements shown on the plan (e.g. North Arrow, Marks table, Observation table, Administrative data, Plan face and dimensions etc.?)

All plans:

North Arrow

Description of land subject of the survey

Administrative data

Lot labels and areas

Affecting interests/easements

Stratum statements (as applicable)

Unique to Deposited Plans (not shown on Strata Plans):

Datum line (orientation of survey) and adopted datum

Schedule of permanent survey marks and coordinates

Height schedule and schedule of height differences (as applicable)

Dimensions – bearings and distances

Reference marks and boundary corner marks (may be shown in a schedule)

Other measurement validation comparisons as required.

9.21. Are authoritative cadastral surveys carried out by government surveyors or private licensed surveyors or both?

Both – vast majority by private surveyors.

Authoritative cadastral surveys carried out by government surveyors include:

- Plans by transport or water authorities
- plans by local government or NSW public works authorities
- Other land administration agencies including Crown Lands

9.22. What is the legal description of a cadastral boundary (e.g. coordinates or bearing and distance or lines on plan or any other)?

Monuments and measurements – that is, by bearing and distance connections shown relative to survey marks or fixed structures as shown on the plan. Not by coordinates.

9.23. How much time does it usually take for a subdivision process to complete?

3-12 months.

9.24. What is the legal source for cadastral representation (e.g. cadastral plans, or DCDB or index plans or descriptive sketch/text etc.?)

The title diagram – the title refers to the registered survey plan that describes the land, or to the last recorded manual folio of the register bearing a description of the land, or to a depiction of the deed description of Old System (common law) land.

9.25. What is the positional accuracy of the cadastral plans (e.g. boundaries may be accurate but may not be referenced in datum properly)?

Most modern plans are connected to the NSW survey control network, however accuracy issues remain for older survey plans which are not.

9.26. Any other survey plan issues?

Many issues ongoing, too many to list here.

9. PLANS OF SURVEY (INCLUDING FIELD SKETCHES) - Expectations 2026

This section poses questions about the data acquisition process and **cadastral survey plans**.

9.1. Do the survey plans carry 3D parcel representations?

9.2. If so, how are they represented?

.....

9.3. Is there specific legislation (regulations) describing the requirements for Plans of Survey in 3D? This could cover:

- (a) accuracy/ quality,
 - (b) 3D survey method,
 - (c) conceptual information model survey plan,
 - (d) portrayal rules for graphic representation,
 - (e) format or encoding for submission.
- If so, please give link to the relevant documents.

Updates to the various Strata Scheme Acts and Regulations

.....

9.4. Is sketch level allowed (low geometric quality, but in principle enough to indicate the 3D object)?

.....

9.5. Is it possible to define a 3D parcel by referring to other 3D real world objects/ topography (and not specifying coordinates)?

.....

9.6. In what format are the 3D parcels submitted for registration; attached to legal document in a single pdf (which has good 3D capabilities) or in an extension of (city) GML for 3D parcels, or....?

Development of 3D cadastral survey data model

9.7. Are the 3D parcels somehow checked for spatial validity; e.g. volume is closed, does not overlap with neighbour volume (and also no unwanted 3D gaps)?

9.8. Do you have examples of (prototype or production) 3D survey plans available?

9.9. Are any reference objects visible on the survey plan (e.g. real buildings, roads, that is 3D topography)?

9.10. What form of 3D data acquisition is used (CAD, terrestrial surveying, sketches, stereo/oblique images, laser scanning, ...)?

9.11. What software do you use for creating and processing survey plans? Any 3D capabilities included and used?

.....

9.12. Can 3D parcels be subdivided, consolidated or nullified?

.....

9.13. Is there any existing technical circular or directive to assist Surveyors in 3D data collection in the field?

.....

9.14. Are the surveyors required to undertake a field survey for 3D cadastral data?

.....

9.15. Are building construction plans used to compile 3D cadastral information for apartments?

.....

9.16. Is 2D/3D field survey done by private licensed surveyors or by government surveyors?

.....

9.17. Are plans of survey created for each new 2D/3D parcel or are they updated in an index map or a cadastral database.

.....

9.18. Do you show dimensions or isometric views of 3D parcels on survey plans (do you also store this in a database)

.....

9.19. Do the cadastral survey plans differentiate between different types (e.g. volumetric plans, building plans and standard 2D plans)?

.....

9.20. What are the usual elements shown on the plan (e.g. North Arrow, Marks table, Observation table, Administrative data, Plan face and dimensions etc.?)

.....

9.21. Are authoritative cadastral surveys carried out by government surveyors or private licensed surveyors or both?

.....

9.22. What is the legal description of a cadastral boundary (e.g. coordinates or bearing and distance or lines on plan or any other)?

.....

9.23. How much time does it usually take for a subdivision process to complete?

.....

9.24. What is the legal source for cadastral representation (e.g. cadastral plans, or DCDB or index plans or descriptive sketch/text etc.?)

.....

9.25. What is the positional accuracy of the cadastral plans (e.g. boundaries may be accurate but may not be referenced in datum properly)?

.....

9.26. Any other survey plan issues?

Digital survey plans reform.

.....

10. DISSEMINATION OF 3D LAND ADMINISTRATION INFORMATION - Status 2022

This section refers to the **dissemination of 3D LA-related information** and the advances in this domain.

10.1. Is there a general-purpose web-based dissemination of 2D cadastral (graphical or text) information (e.g. a portal for the public or for professionals)?

If yes, please provide the link and refer it includes 3D data?

Various 2D dissemination options:

- SIX maps viewer (<https://maps.six.nsw.gov.au/>)
- Spatial Collaboration Portal including 3D visualisation capabilities (<https://portal.spatial.nsw.gov.au/>)
- Spatial Digital Twin including 3D visualisation capabilities (<https://nsw.digitaltwin.terria.io/>)
- Web services (WMS/WFS)
- Incremental Feed
- Clip & Ship/download
- Historic Lands Records Viewer (<https://hlrv.nswlrs.com.au/>)
- NSW Land Registry Services for titling records (<https://www.nswlrs.com.au>)

10.2. Are there specific file formats or standards used to distribute 3D LA/ Cadastral information?

(e.g. LandXML, CityGML, BIM/IFC, 3D pdf,...)

LandXML use is currently limited to 2D.

10.3. Are there specific cartographic styling rules for representing 3D cadastral plans, or to represent 3D cadastral objects on 2D cadastral maps?

Yes, these are documented in the various rules and regulations including the Lodgment Rules, Registrar General's Guidelines and Surveyor General's Directions.

10.4. Are there specific cartographic styling rules for 3D cadastral maps (models; e.g. as disseminated in 3D pdf)? If yes, are there 3D specific cartographic rules developed or being developed?

No

10.5. Is the 3D Cadastral information accessible in integrated manner with the 2D Cadastral information?

To an extent through the Spatial Digital Twin.

10.6. Are there specific symbols on the 2D cadastral map (paper, digital or web-based) indicating the presence of 3D Cadastral objects (and in web-context perhaps even linked)?

Yes, heights will often be identified by symbols or a border around a numeric value.

The DCDB and the titling system both contain flags to indicate where a 2D parcel or plan involves 3D subdivision or 'stratum'.

10.7. Is the legal information (RRRs and Parties) available in integrated manner in dissemination portal with the 3D Cadastral objects? (even if source of legal data may be a different organization, but then use information infrastructure approach)

This is available in a limited way through the Cadastral Records Enquiry and Cadastral Records Viewer, as notations are overlayed with the DCDB to indicate additional records, which may include 3D subdivision.

10.8. Are 2D/3D cadastral data available to the general public or just to the relevant parties?

The DCDB is freely available. Titling records are available to anyone but need to be purchased.

10.9. Any other 3D cadastral information dissemination issues?

Software limitations, interoperability, data standards etc.

10. DISSEMINATION OF 3D LAND ADMINISTRATION INFORMATION - Expectations 2026

This section refers to the **dissemination of 3D LA-related information** and the advances in this domain.

10.1. Is there a general-purpose web-based dissemination of 2D cadastral (graphical or text) information (e.g. a portal for the public or for professionals)?

If yes, please provide the link and refer it includes 3D data?

10.2. Are there specific file formats or standards used to distribute 3D LA/ Cadastral information?

(e.g. LandXML, CityGML, BIM/IFC, 3D pdf,...)

Development of a 3D Cadastral Survey Data Model for Australia and New Zealand.

10.3. Are there specific cartographic styling rules for representing 3D cadastral plans, or to represent 3D cadastral objects on 2D cadastral maps?

10.4. Are there specific cartographic styling rules for 3D cadastral maps (models; e.g. as disseminated in 3D pdf)? If yes, are there 3D specific cartographic rules developed or being developed?

.....

10.5. Is the 3D Cadastral information accessible in integrated manner with the 2D Cadastral information?

.....

10.6. Are there specific symbols on the 2D cadastral map (paper, digital or web-based) indicating the presence of 3D Cadastral objects (and in web-context perhaps even linked)?

.....

10.7. Is the legal information (RRRs and Parties) available in integrated manner in dissemination portal with the 3D Cadastral objects? (even if source of legal data may be a different organization, but then use information infrastructure approach)

.....

10.8. Are 2D/3D cadastral data available to the general public or just to the relevant parties?

.....

10.9. Any other 3D cadastral information dissemination issues?

.....

11. STATISTICAL INFORMATION - Status 2022

This part of the questionnaire refers to **statistical information** (and is most relevant for jurisdictions with parts of 3D Cadastre registration operational, but all are encouraged to complete this section, and especially the expectations for 2022).

11.1. What is the smallest 2D and 3D parcel that is present/ allowed to be registered in the land administration?

No limit defined in the titling system. Planning laws restrict minimum lot size.

11.2. What is the largest 2D and 3D parcel that is present allowed to be registered in the land administration?

No limit defined.

11.3. What is the typical (or average) size of 2D and 3D parcels which are registered in the land administration? Subdivide by nature of 3D parcel when relevant (e.g. related to building, apartment, airspace, tunnel,...)

Typical size for new 2D lots in Sydney is 380 square metres.
Average floor area of a new apartment in NSW is 99 square metres.

11.4. How many 2D and 3D parcels do you currently have in your land administration?

4.5 million 2D parcel objects recorded in the DCDB.

11.5. Which year did you start registering 3D parcels in the land administration?

Stata title was first introduced in NSW in 1961. Prior to this company title was used.
Stratum subdivision may have occurred much earlier.

11.6. What is the ratio of 3D parcels in rural vs. urban areas?

Almost exclusively in urban areas.

11.7. Please specify names of cities or towns or suburbs or regions or locations where there are significant numbers of 3D parcels.

Sydney, Newcastle, Wollongong plus other major regional centres.

11.8. Please provide the following data: (a) Size of jurisdiction in square kilometres

(b) Current number of 2D parcels

(c) Current number of 3D parcels

(d) Current population

(a) 809,444 km squared

(b) 4.5 million

(c) 100,000+

(d) 8.1 million

11.9. Approximately what are the proportions of various types of the 3D parcels (related to apartments, subsurface parking, subsurface shopping centres, bridges, tunnels, airspace, utility networks, etc)?

Statistics not available at this time.

11.10. Approximately what surface area of the jurisdiction is affected by 3D parcels (the total area of all the footprint of all 3D parcels).

Less than 0.1%

11.11. Any other interesting statistical fact(s)?

11. STATISTICAL INFORMATION - Expectations 2026

This part of the questionnaire refers to **statistical information** (and is most relevant for jurisdictions with parts of 3D Cadastre registration operational, but all are encouraged to complete this section, and especially the expectations for 2022).

11.1. What is the smallest 2D and 3D parcel that is present/ allowed to be registered in the land administration?

11.2. What is the largest 2D and 3D parcel that is present allowed to be registered in the land administration?

.....

11.3. What is the typical (or average) size of 2D and 3D parcels which are registered in the land administration? Subdivide by nature of 3D parcel when relevant (e.g. related to building, apartment, airspace, tunnel,...)

.....

11.4. How many 2D and 3D parcels do you currently have in your land administration?

.....

11.5. Which year did you start registering 3D parcels in the land administration?

.....

11.6. What is the ratio of 3D parcels in rural vs. urban areas?

.....

11.7. Please specify names of cities or towns or suburbs or regions or locations where there are significant numbers of 3D parcels.

.....

11.8. Please provide the following data: (a) Size of jurisdiction in square kilometres

(b) Current number of 2D parcels

(c) Current number of 3D parcels

(d) Current population

11.9. Approximately what are the proportions of various types of the 3D parcels (related to apartments, subsurface parking, subsurface shopping centres, bridges, tunnels, airspace, utility networks, etc)?

11.10. Approximately what surface area of the jurisdiction is affected by 3D parcels (the total area of all the footprint of all 3D parcels).

11.11. Any other interesting statistical fact(s)?

12. REFLECTION

This section is only relevant in case also one of the previous questionnaires for your jurisdiction (2010, 2014 and/ or 2018) was completed (otherwise skip this section).

12.1. Compared to the 2010, 2014, 2018 and 2022 expectations, which 3D land administration developments did go faster than expected?

.....

12.2. Same question, but now, which developments did go slower than expected?

.....

12.3. If some (limited) form of 3D Land administration functionality has become available, what are the observed benefits? And for who?

3D visualisation of proposed strata schemes to support development assessment.

.....

12.4. What are the (top 3) challenges of issues to be addressed to realize further 3D Land administration progress?

Data standards and interoperability

Software capabilities/limitations

Industry and stakeholder support for reform

.....

12.5. In case of not, yet, fully operational status, were there any 3D LA/ Cadastre registration pilots to take steps towards a more complete implementation?

3D Cadastral Survey Data Model

.....

12.6. In case of known legal barriers, have there been made progress in creating and adopting new legislation to support 3D land administration?

.....

12.7. Any other reflections?

.....

13. OTHER ISSUES

At this section, please include any other issues that may be of interest in an international context (for example, in some foreign jurisdictions 3D parcels can only be separated by horizontal planes) and your contact details.

13.1. Country (State, Province)

Australia, New South Wales

.....

13.2. Name/ Surname

Adrian White

.....

Function/ Position

Director Spatial Operations

.....

Organization

NSW Department of Customer Service – Spatial Services

13.3. Contact details/ Address

Address

346 Panorama Avenue, Bathurst NSW 2795, Australia

Email & telephone

Cadastral@customerservice.nsw.gov.au 1300 789 866

13.4. Other issues

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