4th Questionnaire on
3DLand Administration:
status December 2022

New Zealand

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),*

[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).

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 formulation 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 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. GENERAL/APPLICABLE 3D REAL-WORLD SITUATIONS

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.

Questions	Status 2022	Expectations 2026
1.1. Are all 3D parcels (3D spatial units in LADM terminology) constrained to be within one surface 2D parcel?	No	Unlikely to change
1.2. Are 2D and/ or 3D ambulatory[2] boundaries permitted?	Yes, both 2D and 3D	No change
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)?	Yes. It is the minority approx. 20%. This would include Primary and non-primary (e.g., easements) parcels with at least one stratum boundary.	No change
1.4. Are disconnected parts of a single 3D parcel allowed?	No	No change
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)?	It is allowed to have unbounded 3D parcels.	No change
1.6. Are curved surfaces to bound the 3D parcels allowed?	Yes	No change
1.7. Must the curved surfaces (if allowed) be cylindrical sections, or any other constraint?	No but must be able to be depicted in a 2D diagram context, including cross sections.,	Under investigation
1.8. Any other constraints – e.g. all surfaces must be horizontal or vertical?	No	No change

[2] 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.

1.9. Is there legislation (law and/or regulations) for 3D descriptions of parcels? If so please, mention law and article(s).	Yes Cadastral Survey Rules 2021	No change
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	No change
1.11. Is the legal text (relevant part) available in English translation at an official document?	All New Zealand legislation is in English	No change
1.12. Do you have example descriptions of typical 3D parcels; either 'prototype' or 'operational'?	Operational- 2D diagrams with supporting cross sections and annotations	Under investigation
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, although work in this space has been done via the 3D Cadastral Survey Data Model and Exchange Project	Under investigation
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)?	Not shown spatially, memorialised on a Record of Title. In the example of mining rights, they are not defined in the cadastre as 3D parcels but are 3D for practical application.	No change
1.15. Are legally restricted spaces, above or below the earth's surface, such as polluted areas considered as 3D parcels?	No. A parcel with say contaminated soil, would be identified as a '2D area' within a Regional/Local authority jurisdiction, not the Cadastre.	No change
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	Unlikely to change

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?	Marine leases to support Aqua culture. Non-primary rights.	Unlikely to change
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?	Yes. Common Property is dealt with under the Unit Titles Act 2010.	Unlikely to change
1.19. Which agency is responsible for the recording of titles information?	Land Information New Zealand	Unlikely to change
1.20. Which agency is responsible for recording cadastral transactions?	Land Information New Zealand	Unlikely to change
1.21. Are transactions for standard 2D lots and 3D lots done by the same agency or titles office?	Yes	Unlikely to change
1.22. Are there any 3D storage permissions recorded (e.g. underground storage of CO_2)?	No	Unlikely to change

1.23 Has there been developed any country profile based on LADM ISO19152[3]? (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, ..)?	No, noting work on 3D Cadastral Survey Data Model and Exchange Project	Unlikely to change
1.24. Any other geometric issues related to 3D parcels?	-	

[3] 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?

2. INFRASTRUCTURE/UTILITY NETWORKS

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.

Questions	Status 2022	Expectations 2026
2.1. Do you register utility networks as an entity in the land administration? (e.g. subterranean conduit networks)	No as-built detail. The existence of a utility network item would be identified in 2D by the registration of an easement (non-primary parcels). The purpose of which is included in a tabular format.	Unlikely to change
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) Easements can be viewed graphically. The associated 'schedule' provides a description of the purpose e.g., water supply electricity supply etc. (b) No. (c) Yes. Easements have a unique parcel identifier – typically a 'letter'. (d) No. I Easements are submitted as part of the Cadastral Survey Dataset, currently via LandXML.	Under investigation
2.3. Does the jurisdiction have private networks? If so please, mention law and article(s).	No	No change
2.4. If so, are they registered as 3D property parcels (spatial units)?	NA	
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).	English	No change
2.6. Is the text of laws and regulations (relevant part) available in English translation of an official document?	Yes (only English)	No change
2.7. Do you have example descriptions of typical 3D parcels	Network objects not recorded	No Change

(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?	Network objects not recorded	No Change
2.9. Any other geometric issues related to the registration of networks?	-	

3. CONSTRUCTION/ BUILDING UNITS

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*".

Questions	Status 2022	Expectations 2026
3.1. Do you register legal spaces for 3D construction/ building units (separate from the land)?	Yes	No change
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 windmillI...)	Apartment units, bridges, tunnels.	No change
3.3. Does the jurisdiction have construction/building units? If so please, mention law and article(s).	Yes. Applicable legislation Unit Titles Act 2010	No change
3.4. Is the legal text available in original language?	Yes	No change
3.5. Is the legal text (relevant part) available in English translation at an official document?	Yes	No change
3.6. Do you have example descriptions of typical 3D parcels; either 'prototype' or 'operational'?	Yes	No change
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) Typically the units are defined by 'Permanent Structure Boundaries' (PSB) which is a boundary that follows a described part of a permanent structure, such as middle of wall, external face of wall etc. The definition of a PSB is set out in Cadastral Survey Rules 2021.	Unlikely to change
3.8. Is common property inside the building registered? If so, how?	Common Property is not captured as a separate parcel (s) and is not registered per se, however, it can be subdivided or added to. A Supplementary	Under investigation

	Record Sheet (SRS) is used to record rights and other matters which effect common property.	
3.9. Who owns the common property inside the building?	The unit developments' Body Corporate	No change
3.10. Who owns the land on which the apartment is built?	The fee simple estate in freehold is comprised in the stratum estate in freehold on deposit of the Unit plan. On cancellation of the unit development, ownership in the base land is vested to the owners based on their 'ownership interest' which is determined on a proportional share basis.	No change
3.11. Do you allow sub-division of apartments or apartment blocks?	Yes	No change
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?	Unusual, but in unique circumstances as long as it meets legislative requirements yes e.g., land taken for a Public Work.	No change
3.13. What is the numbering convention for apartments (please specify in terms of cadastral parcel as well as street addressing)	Principal Unit, Accessory Unit, Future Development–Unit - which has the unique identifier in the format of a number which may only be followed by a letter e.g., Principal Unit 1A. Australia/New Zealand Standard 4819:2011 Rural and urban addressing specifies sub-addressing for multi-level apartments. E.g., Apartment 7 at 305 Kiwi Street would read 7/305 Kiwi Street. There is no requirement to correlate parcel number with street address.	No change
3.14. Are there any mandates[4] that set specifications on the delivery of	No	Unlikely to change

[4] That arise through legislation or from the procurement process.

design/ construction drawing of properties in BIM-based format, when registering new 3D parcels (from design)?		
3.15. Are there any operational or in prototype stage platforms. implementations that reuse BIM information from design as cadastral/ land administration input?	Licensed Cadastral Surveyors are free to use BIM, or similar applications/processes as input into their preparation of a Cadastral Survey Dataset for submission. However, BIM data cannot be included in that dataset.	Unlikely to change
3.16. Any other geometric issues?	-	

4. COORDINATES

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

Questions	Status 2022	Expectations 2026
4.1. Do the plans of survey guarantee X/Y coordinates? (and are they relative or in an absolute spatial reference system?)	No. The basis of the New Zealand cadastre is monuments with vector observations	No change
4.2. Are the cadastral database coordinates authoritative?	No. The basis of the New Zealand cadastre is monuments with vector observations	No change
4.3. If not, what is the authoritative source of X/Y coordinates?	The LINZ Geodetic Database	No change
4.4. Do you have parcels defined by the walls of a building (with no recorded geometry)?	Yes. Parcels with Permanent Structure Boundaries.	No change
4.5. What is the spatial reference system for X/Y Coordinates? (Please , provide the EPSG)	NZGD2000	No change
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.)?	Boundary bearings and distances, permanent structure boundaries if present, road name, abuttals, north point, boundary point symbols on identifying corners, area, appellation. 3D parcels also include sectional views detailing vertical extents via permanent structure boundaries and/or reduced levels.	No change
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	Significant change
4.8. Any other X/Y coordinate issues?	-	

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

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

Questions	Status 2022	Expectations 2026
5.1. Are the height values of 3D parcels relative to local ground?	Effectively Yes. Height information can be provided by either a vertical offset from a permanent structure, or if a Stratum Boundary, a reduced level (RL) in terms of local reference marks.	No change
5.2. Are height values reduced to a standard datum (absolute)? If so, what is the spatial reference system for this 3rd ordinate?	Yes. If an RL is used it is a normal-orthometirc height in terms of an official vertical datum (either the national NZVD2016 datum of 13 local datums).	Planning to require that only NZVD2016 can be used (compatible with GNSS).
5.3. In principle, is it possible to store both relative and absolute height/ depth values?	Yes	No change
5.4. Is the earth surface (elevation) explicitly stored (in the DCDB or other accessible register)?	No	No change
5.5. What is the source of height values for the 2D surface parcel?	Not recorded	No change
5.6. How is elevation information recorded in the cadastral plan or database?	Not recorded in the database. Cross sections, elevations, and plan information provided on plan graphics which support the representation, showing either Reduced Levels or height differences.	No change
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. Aspatial height details currently used as an input for other applications.	No change
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?	No	Uncertain
5.9. Any other 3rd dimension ordinate value issues?	-	

6. TEMPORAL ISSUES (4th DIMENSION)

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

Questions	Status 2022	Expectations 2026
6.1. Are temporal limits part of the definition of a parcel (2D or 3D)?	Yes. Easements can be defined with time limits. Leases are for a specific time period.	No change
6.2. Are moving parcels allowed?	Only ambulatory boundaries which by definition move (e.g., a watercourse that has moved and that meets specific criteria).	No change
6.3. Are there any limitations on the range of temporal limits? (e.g. only on 3D apartments).	No	No change
6.4. Is there any attempt to integrate 3D space and temporal representations, into a single 4D space/time representation?	No	No change
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?	All ambulatory boundaries change in accordance with the movements. Doctrine of accretion and erosion apply.	No change
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.	New Zealand cadastre is 3D but currently captured and represented in 2D. The representation in the cadastre when the survey plan is approved and is not otherwise updated.	No change
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 – Leasehold	No change
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	No change
6.9. For Cadastral transactions, how far in time do buyers need to make a search to ensure the title	New Zealand titles are guaranteed by the Crown (central Government).	No change

or deed is legal?	There is no legal requirement for buyers to search historic titles. However, it is encouraged/good practice to review previous titles to ensure all is in order with the current one.	
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?	No	No change
6.11. Any other temporal issues?	Many temporal aspects not managed by live data connections from the title system to the cadastral record.	

7. RIGHTS, RESTRICTIONS AND RESPONSIBILITIES (RRRs)

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.

Questions	Status 2022	Expectations 2026
7.1. Please provide the range of RRRs on 3D parcels. If there is an online depository, provide the link.	All parcels are 3D. Only registered users can access Landonline	No change
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).	Yes, in the example given, otherwise not generally.	No change
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).	No	No change
7.4. Are there RRRs that are only allowed in 3D (and not valid for 2D)	Restriction by height	No change
7.5. Is there specific legislation (laws, regulations) defining 3D RRR types? If so, provide details, e.g. references to documents/ articles.	Yes - Unit Titles Act 2010, District Plans (Town Planning), Regional Plans	No change
7.6. Can 3D sub-surface/above-surface parcel be owned by someone other that the person owning the land parcel?	Yes – e.g., tunnel	No change
7.7. What applications do you foresee for 3D land administration?	The same as for 2D but with many more value-add opportunities.	No change
7.8. Are the administrative source documents (source of RRRs) title or deed based?	Record of Title	No change
7.9 Who is responsible for the correctness of the specified 3D boundaries in spatial source documents (which authority)?	Responsibility is that of the Licensed Cadastral Surveyor who certifies and submits the dataset. The authority concerned with validating/approving the dataset is Land Information New Zealand	No change
7.10. Is registration of 3D parcels done inside the cadastral mapping	Land Information New Zealand (responsible for	No change

agency, the land registry or elsewhere?	both survey and title)	
7.11. Are 3D registrations handled by the same organisation that handles traditional (2D) land administration?	Yes	No change
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?	Digital title record which is provided as a product in a TIFF/PDF format. This image includes a depiction of the 2D parcel at ground level with cross sections if a defined 3D parcel.	No change
7.13. Is the 3D registry separate or integrated with the 2D registry?	They are the same.	No change
7.14. Any other RRR issues?	-	

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

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

Questions	Status 2022	Expectations 2026
8.0. Is the database schema LADM based?	No	No
8.1. Does the DCDB contain representation of 3D parcels (in any form)?	A 'strata parcel' layer can be captured.	Under investigation
8.2. If so, how are they represented (in the DCDB)?	the DCDB)? Represented in a 2D layer titled 'Strata parcels'	Under investigation
8.3. If so, how are they presented on cadastral "maps" (including screen presentations)?	Layered in the Landonline database which is indexed to survey plans with cross sections.	Under investigation
8.4. Are there possibilities to store geometry of 3D parcels in the DCDB?	No	Under investigation
8.5. Is it possible to manage a 3D topological structure in the DCDB?	No	Under investigation
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?	Drafted but not formalised	Under investigation
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 available	Under investigation
8.8. What Spatial DBMS software do you use? Any 3D capabilities included and used?	Landonline. No	Under investigation
8.9. Do you have any validation rules for 3D representation in the database?	No	Under investigation
8.10. What (GIS/CAD) software is used for updating, editing, analysis, and visualization of the cadastral data? Any 3D capabilities included and used?	Landonline. No 3D capability	Under investigation
8.11. What web software is used for remote data access/distribution and visualization? Any 3D	Landonline and LINZ Data Service. No 3D capability other than layering.	Under investigation

capabilities included and used?		
8.12. Is your DCDB organised as Multi-Layers or Object Oriented or some other data model?	Multi-layer	Under investigation
8.13. How do you query 3D objects in your DCDB?	There are no digital 3D objects	Under investigation
8.14. Is it possible to query neighbourhood parcels to a 3D object, vertically as well as horizontally?	No	Under investigation
8.15. Any other DCDB issues?	-	

9. PLANS OF SURVEY (INCLUDING FIELD SKETCHES)

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

Questions	Status 2022	Expectations 2026
9.1. Do the survey plans carry 3D parcel representations?	Yes	No change
9.2. If so, how are they represented?	2D plans with cross sections	No change
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.	Yes – Cadastral Survey Rules 2021	Under investigation
9.4. Is sketch level allowed (low geometric quality, but in principle enough to indicate the 3D object)?	Yes. Basic representation through cross-sections submitted as a plan graphic in TIFF format. All boundaries must be able to be defined.	Under investigation
9.5. Is it possible to define a 3D parcel by referring to other 3D real world objects/ topography (and not specifying coordinates)?	Yes. Referring to walls, floors, roofs, etc. above and below ground level.	Under investigation
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….?	3D parcels are submitted as a Supporting Document (TIFF format) plan graphic i.e., cross sectional representation. The dataset is submitted to Landonline as a LandXML with no 3D capabilities.	Under investigation
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)?	A visual check of the plan graphic.	Under investigation
9.8. Do you have examples of	Yes	-

(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)?	No. Building elements such as buildings, lifts, balconies, stairs, etc. are noted but not as reference objects	Under investigation
9.10. What form of 3D data acquisition is used (CAD, terrestrial surveying, sketches, stereo/oblique images, laser scanning, …)?	3D acquisition by the field surveyors is generally terrestrial surveying or scanning, LiDAR, terrestrial photogrammetry. This 3D digital data is reduced down to a 2D plan representation prior to submission. LINZ does not acquire any 3D data	Acquisition techniques continued to be driven by private sector with rules agnostic of technology (i.e., a continuation of current state)
9.11. What software do you use for creating and processing survey plans? Any 3D capabilities included and used?	LINZ does not acquire 3D data. However, surveyors submitting 3D surveys typically use a CAD based software package for drafting 2d plans describing the 3d objects	Continuation of creation and processing by private sector
9.12. Can 3D parcels be subdivided, consolidated or nullified?	Yes	No change
9.13. Is there any existing technical circular or directive to assist Surveyors in 3D data collection in the field?	Yes, rule issued by the Surveyor-General - Yes – Cadastral Survey Rules 2021 and supporting guidance material.	No change
9.14. Are the surveyors required to undertake a field survey for 3D cadastral data?	Yes	No change
9.15. Are building construction plans used to compile 3D cadastral information for apartments?	Yes, but only as a starting point with adjustments as necessary based on an actual as-built survey	No change
9.16. Is 2D/3D field survey done by private licensed surveyors or by government surveyors?	Private licensed cadastral surveyors	No change
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.	Yes. A new dataset is prepared for new parcels, 2D or 3D. All superseded datasets are searchable.	No change
9.18. Do you show dimensions or isometric views of 3D parcels on survey plans (do you also store	Yes. Dimensions are shown on 2D plans. At ground level dimensions are also spatially	Under investigation

this in a database)	captured whereas above or below ground the representation is on a plan graphic only. Isometric views are sometimes shown but normally with dimensions.	
9.19. Do the cadastral survey plans differentiate between different types (e.g. volumetric plans, building plans and standard 2D plans)?	Yes	No change
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.?)	Plan elements are specified in the Cadastral Survey Rules 2021	No change
9.21. Are authoritative cadastral surveys carried out by government surveyors or private licensed surveyors or both?	Licensed Cadastral Surveyors, who could be Government or private, although the vast majority are private.	No change
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)?	As defined by original and undisturbed ground monumentation with bearing and distance observations between marks.	No change
9.23. How much time does it usually take for a subdivision process to complete?	Resource Management Act Process (planning requirements): from 3 months to years, depending on complexity, deviation from permitted activities, need for public consultation etc. LINZ : survey validation approximately 10 days and title registration approximately 10 days (survey and title processing may be simultaneous).	-
9.24. What is the legal source for cadastral representation (e.g. cadastral plans, or DCDB or index plans or descriptive sketch/text etc.?)	Cadastral Survey Datasets (data and matching/associated plans) as certified by the licensed cadastral surveyor and approved by LINZ.	No change
9.25. What is the positional accuracy		Improving all of the time

of the cadastral plans (e.g. boundaries may be accurate but may not be referenced in datum properly)?	Varies significantly as to whether or not the survey is an Survey Accurate Digital Cadastre (SDC) Area. If SDC urban 0.20m, SDC Rural 0.50m, Non SDC rural could be +/- 100m	
9.26. Any other survey plan issues?	-	

10. DISSEMINATION OF 3D LAND ADMINISTRATION INFORMATION

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

Questions	Status 2022	Expectations 2026
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?	Yes, Landonline and LINZ Data Service. Aspatial 3D available if present.	Under investigation
10.2. Are there specific file formats or standards used to distribute 3D LA/ Cadastral information? (e.g. LandXML, CityGML, BIM/IFC, 3D pdf,…)	No	Under investigation
10.3. Are there specific cartographic styling rules for representing 3D cadastral plans, or to represent 3D cadastral objects on 2D cadastral maps?	As per Cadastral Survey Rules 2021	Under investigation
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?	As per Cadastral Survey Rules 2021	Under investigation
10.5. Is the 3D Cadastral information accessible in integrated manner with the 2D Cadastral information?	Yes (combination of digital 2D and connected 3D data that is represented aspatially)	Under investigation
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)?	Not specially (other than CSD references displayed)	Under investigation
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	Yes, integrated survey and title system, Landonline	No change

approach)		
10.8. Are 2D/3D cadastral data available to the general public or just to the relevant parties?	Yes	No change
10.9. Any other 3D cadastral information dissemination issues?	Just those relating to 3D not being presently catered for in structured, digital format.	Under investigation

11. STATISTICAL INFORMATION

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).

Questions	Status 2018	Expectations 2022
11.1. What is the smallest 2D and 3D parcel that is present/ allowed to be registered in the land administration?	0.0001ha	No change
11.2. What is the largest 2D and 3D parcel that is present allowed to be registered in the land administration?	No limit	No change
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,…)	No known as this varies significantly. Unit title parcels say 80-100m2.	No change
11.4. How many 2D and 3D parcels do you currently have in your land administration?	>2 million 2D >145,000 3D	Continued increases in 2D and 3D.
11.5. Which year did you start registering 3D parcels in the land administration?	1800s (including early railway tunnels surrounded by private land (in 3D).	-
11.6. What is the ratio of 3D parcels in rural vs. urban areas?	1 (rural) v 99 (urban)	No significant change
11.7. Please specify names of cities or towns or suburbs or regions or locations where there are significant numbers of 3D parcels.	Auckland, Wellington, Christchurch	-
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) 268,021 km² b) +2 million c) +145,000 d) 5 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)?	As these 3D parcels are not presently held in structured, digital format, this type of analysis is difficult to perform.	-

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).	Not known due to the nature of 3D parcels. The floor area of a unit parcel is not recorded.	-
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).

Statements	Remarks
12.1. Compared to the 2010, 2014, 2018 and 2022 expectations, which 3D land administration developments did go faster than expected?	Nothing of significance to note.
12.2. Same question, but now, which developments did go slower than expected?	Nothing of significance to note.
12.3. If some (limited) form of 3D Land administration functionality has become available, what are the observed benefits? And for who?	Maintained status quo.
12.4. What are the (top 3) challenges of issues to be addressed to realize further 3D Land administration progress?	1. Cost/effort associated with developing Landonline to handle 3D parcels digitally (as opposed to current aspatial 3D approaches coupled with 2D digital capabilities). 2. Dependency on third-party software vendors to develop/extend applications to better support the creation and supply of 3D data for survey and title purposes. 3. Not so much of an issue, but an important consideration is the need for support and guidance of surveyors/users during the transition to digital 3D. The change is likely to require a significant (and beneficial) move away from 'survey plans' to a truly digital dataset.
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?	New Zealand has a full 3D cadastre in the legal sense. We have been working with our Australian friends on the 3D Cadastral Survey Data Model and Exchange Project as part of our quest to realise 3D in the digital sense.
12.6. In case of known legal barriers, have there been made progress in creating and adopting new legislation to support 3D land administration?	There are no legal barriers to 3D, with the ability to register height-limited parcels since the 1800s.
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).

Contact Details & other issues	Remarks
13.1. Country (State, Province)	New Zealand
13.2. Name	Trent Gulliver
Function/ Position	Manager, Licensed Cadastral Surveyor
Organization	Toitū Te Whenua Land Information New Zealand
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Telephone	
13.4. Other issues	-

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