



Survey Strategic Context

**New Zealand Institute of Surveyors
&
Land Information New Zealand**

Joint Working Group

2009

The Future

**Recommendations to LINZ Executive and NZIS
Council on moving the Cadastral Survey
Industry into the future**

Joint Working Group

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Contents

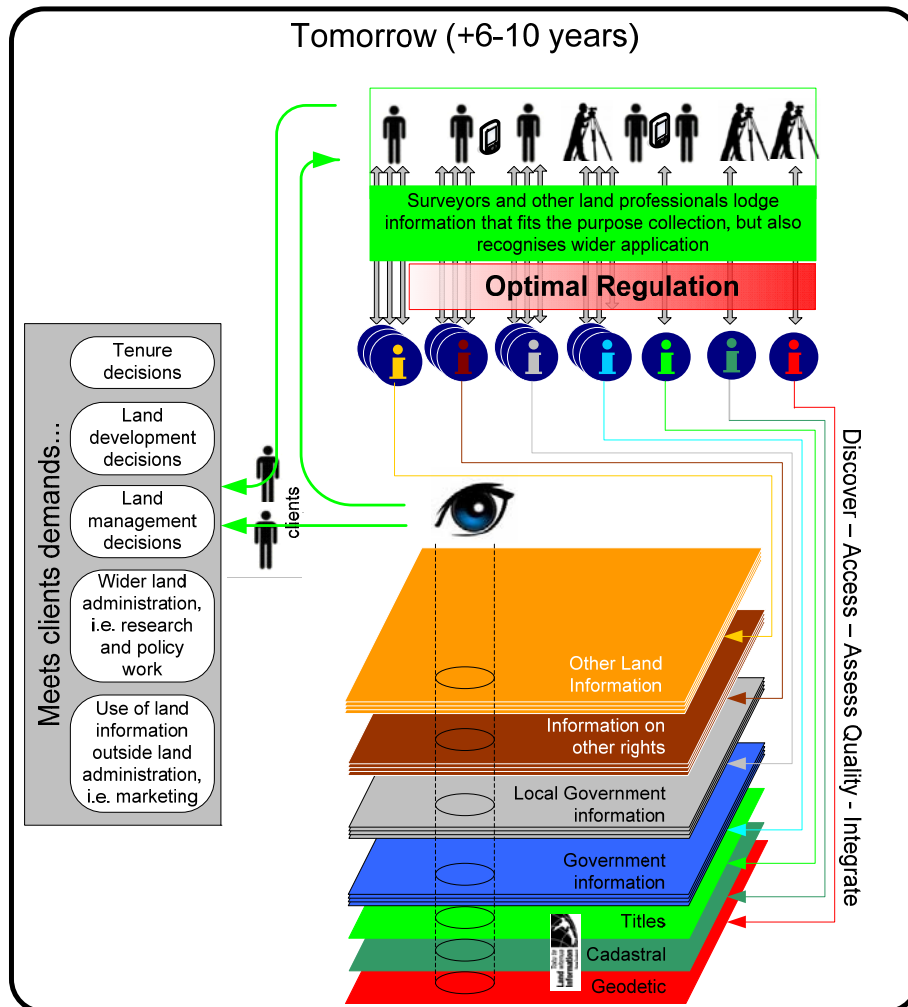
	Description	Page
	Executive Summary	3
	Introduction – Process Overview	10
	Aim	13
	Part I: The View of Tomorrow’s Industry	
	International benchmark	13
	Legislative and regulatory factors	13
	Context of New Zealand markets	15
	Industry demands	16
	Tomorrow’s cadastral survey industry (graphic)	19
	Principle 1: Coordinated repositories	19
	Principle 2: Protect right of tenure	20
	Principle 3: Government working with private sector	21
	Principle 4: Address legacy information and changes over time	23
	Information characteristics	23
	Part II: Challenges in Moving Towards the Future	25
	Survey advice	26
	Research and professional development capability	30
	LINZ bulk survey and title data access and application	33
	Integrity of the survey data capture area	35
	Access to LINZ survey and title paper records	37
	Future-proofing the e-survey system (Landonline)	38
	Challenges in the wider environment	40
	Conclusion	44
	Recommendations	46

Executive Summary

1. The Land Information New Zealand (LINZ) and New Zealand Institute of Surveyors (NZIS) joint working group examined the future of the cadastral survey industry and formed a shared view of tomorrow's state of the cadastral survey industry in New Zealand, how key players contribute and what it will take to get there.
2. This paper recommends a shared view of the future cadastral survey industry and associated strategic objectives to the LINZ Executive and the NZIS Council as the basis for moving into the future.
3. In forming the shared view and strategic objectives the working group:
 - a. Conducted a study with three sessions with the focus of: the future, the challenges in moving from today to the future and what can be done to overcome these challenges.
 - b. Considered:
 - 1) International benchmark (Cadastre 2014, A Vision for a Future Cadastral System (FIG Commission 7))
 - 2) New Zealand legislative and regulatory factors
 - 3) Context of New Zealand markets
 - 4) Industry demands
 - 5) More than 40 submissions from survey professionals and people from the wider industry.
4. The recommended shared view of the future cadastral survey industry is based on the following principles:
 1. Repositories of information, in a coordinated environment, to establish the spatial extent of all rights empowered by statute
 2. Protects the authoritative source for right of tenure
 3. Central and local government working with the private sector
 4. Addresses legacy information and changes over time.

5. Information with characteristics of:

- 1) Quality (known accuracy, current, complete and renovated)
- 2) Access (Discoverable, able to be assessed, suitable access channels and able to be integrated).



5. The recommended challenges and respective strategic objectives to move towards this future are:

Survey Advice	
Challenge	Strategic Objective
<p>The advice function supporting the LINZ repository of cadastral survey information needs to be more clearly defined and efficient to support the integrity of the cadastre.</p> <p>Guiding principles</p> <ul style="list-style-type: none"> • The profession will be the credible source of advice on best practice for conduct of cadastral surveys. • LINZ will be the credible source of advice for use of the e-survey application and approval processing, exceptional requests and integration into the cadastre. • Industry wide knowledge management. 	<p>Tomorrow's cadastral survey industry is supported by known sources of credible advice in order to improve efficiency and maintain integrity of the cadastre.</p> <p>Contributing actions</p> <ul style="list-style-type: none"> • NZIS and LINZ jointly (LINZ lead) determine the mix of advice to support the industry from LINZ and NZIS. • NZIS and LINZ conduct individual actions to build their respective and collective capability. • Joint sector wide engagement to ensure that all stakeholders are aware of the correct sources of advice.

Research and Professional Development Capability.	
Challenge	Strategic Objective
<p>The cadastral survey industry needs the correct balance of professionals with the ability to do the job now, and enquiring minds to lead developments that keep pace with evolving industry demands.</p> <p>Guiding principles</p> <ul style="list-style-type: none"> • Actions anchored to NQF. • Spatial science education supports the future industry requirements. • Need to have a world class post graduate research programme. • Professional development 	<p>Surveying professionals are confident they have the skills and knowledge to meet the evolving demands of the cadastral industry.</p> <p>Contributing actions</p> <ul style="list-style-type: none"> • NZIS working to reconvene the Board of Studies. • NZIS to lead the development of a strategically aligned research programme. • NZIS to lead development of a coordinated professional development programme.

Bulk survey and title data access and application.

Challenge

The current monthly supply of LINZ bulk cadastral information limits the efficiency of many systems and processes within the cadastral industry.

Strategic Objective

Access to LINZ bulk survey and title data allows efficiency gains for the cadastral industry.

Guiding principles

- LINZ will give priority to freeing up the cadastral data as part of the federation of geospatial information.
- Improved access will comply with the evolving Spatial Data Infrastructure.
- LINZ must engage with the wider group of users of cadastral data to optimise efficiency gains.

Contributing actions

- LINZ will make cadastral data comply with the access and other standards of the emerging NZ SDI
- LINZ engaging with bulk data users to transition to the new access arrangements and achieve efficiency gains.

Integrity of the Survey Data Capture Area

Challenge

The original assumption on what constitutes the survey data capture (SDC) area has proven incorrect, and the spatial accuracy of the SDC area is degrading.

Strategic Objective

SDC areas have accuracy to provide spatial confidence and delivery efficiencies to the future industry.

Guiding principles

- It is not acceptable to maintain status quo.
- The timing and resourcing of additional actions will be in relation to the benefits that are to be delivered.
- Centimetre accuracy will be achieved for urban areas.

Contributing actions

- LINZ will maintain the current level of maintenance.
- LINZ leads development of the business case to confirm benefits, methods and funding to achieve the required integrity.
- LINZ will improve the

- The remainder of New Zealand will have 1-5 metre accuracy.

Access to LINZ survey and title paper records

Challenge

Paper records are important even in the digital age, but it is not feasible to convert them all into electronic formats. This leads to access barriers and inefficiency.

Strategic Objective

Access to LINZ survey and title paper records is not a cause of inefficiency.

Guiding principles

- The current LINZ strategy for paper records is the vehicle to achieve this objective
- Digitising on demand, based off quality indexes, is acceptable.
- In implementing the strategy priority will be given to access for the profession over non-land professionals – rural and non SDC areas.

Contributing actions

- Implementation of the LINZ strategy with the focus on:
 - producing quality electronic indexes,
 - working with the profession to establish the priority areas, and
 - transition to effective electronic channels when centres close.

Future-proofing the e-survey system (Landonline)

Challenge

Landonline is a transactional system based on mid 90s technology that is unlikely to meet the demands of the future industry

Strategic Objective

The future cadastral survey industry operates confidently, effectively and efficiently in an appropriate electronic environment

Guiding principles

- Landonline enhancement must benefit the future industry as a whole with prioritise criteria to reflect this.
- Development of the electronic environment is driven by realistic user requirements.

Contributing actions

- LINZ will lead the development of a process to enhance Landonline to benefit the whole industry.
- LINZ will lead a review the systems effectiveness and efficiency in meeting the user requirements.

Challenges in the wider environment

Challenge

There is no sector wide approach to move forward

Strategic Objective

All stakeholders know their role within the future industry, and know how to carry out their role for the benefit of New Zealand.

Guiding principles

- The sector wide approach will be built on the LINZ and NZIS partnership.
- LINZ accepts the leadership role to develop the sector wide approach, but it may not be the sector leader in future.
- Future sector leadership will lie with the Government department that Cabinet deems most appropriate.
- The sector wide approach will use the principles of the future cadastral industry as the start point.
- To contribute as an effective professional body that can deliver benefit to members in future, NZIS must move to a model of paid strategic staff.

Contributing actions

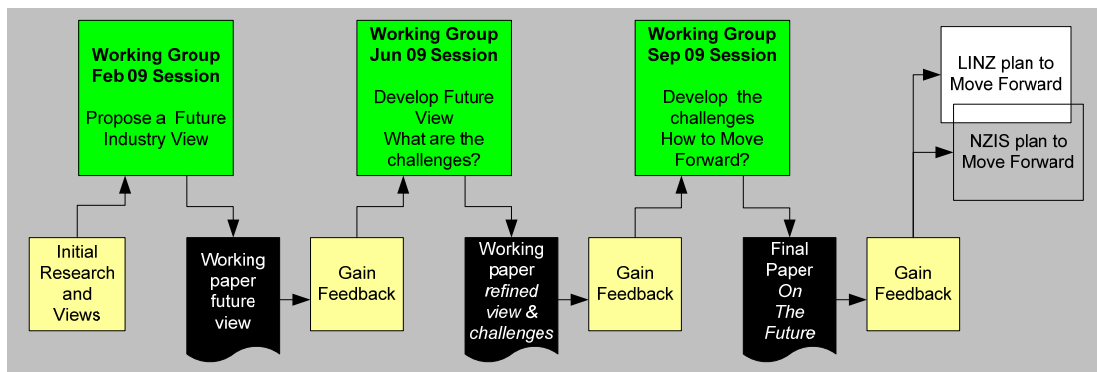
- LINZ will raise awareness among stakeholders of the future cadastral sector on the importance of unlocking the potential of the future cadastral information in line with the geospatial strategy and the principles of the future cadastral survey industry.
- LINZ, jointly with NZIS where possible, will engage with the stakeholders to frame a case for the benefits of a sector wide approach, and what that may look like.
- LINZ and NZIS will then support the sector moving forward for the five years to the future state, in particular in the areas where LINZ has a sound platform.
- NZIS will move to the model of paid strategic staff.

Introduction – Process Overview

6. Given recent developments with 100% e-lodgement and pending changes to the Cadastral Survey Rules, LINZ and NZIS established the Survey Strategic Context Joint Working Group. The working group examined the future of the cadastral survey industry and formed a shared view of tomorrow's state of the cadastral survey industry in New Zealand: how key players contribute and what it will take to get there.

*'today' covers 3-5 years,
'tomorrow' looks out 6-10 years.*

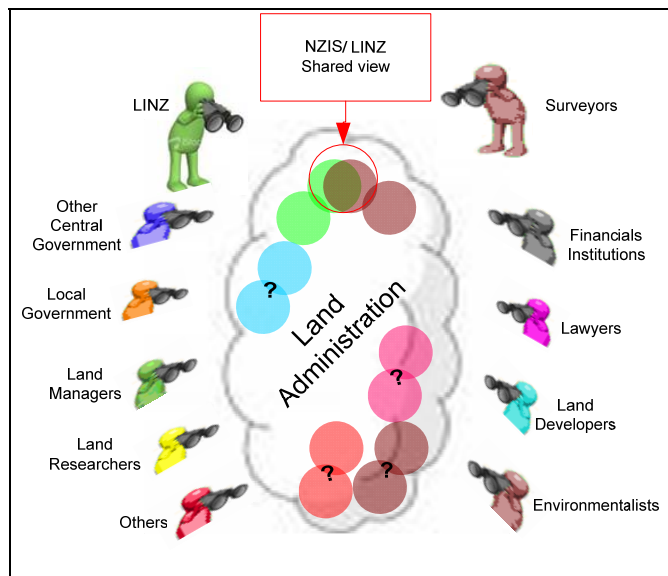
7. The working group process was:



8. In forming the future industry view during the February session, the working group considered:
 - a. **International benchmark.** *Cadastre 2014, A Vision for a Future Cadastral System* (FIG Commission 7)ⁱ along with other associated papersⁱⁱ and the future view of the Australian environment.ⁱⁱⁱ
 - b. **New Zealand legislative and regulatory factors.** This was the likely future application of Cadastral Survey Act (2002), and the risk-based approach to regulation.
 - c. **Context of New Zealand industry.** This looked at all players in the cadastral industry in a wider context than surveyors and traditional land development. This included the

use of cadastral information for land administration and land information markets.

- d. **Industry demands.** Working group members brought along their own views with 18 submissions on various issues provided from around the industry.
9. The result of the first session was a thought piece: ***Proposal for Tomorrow's Cadastral Survey Industry***. This included an industry overview with the principles it should be based on, plus the roles of the key players. This paper was disseminated across the industry.
10. After feedback and reflection, the June session the working group confirmed that future view and looked at the challenges in moving towards it. Of note:
- a. The working group realised the complexity of the industry, with varied players with diverse roles and agendas. Furthermore, the working group did not have the time or mandate to gain the understanding of the whole industry. So the focus went on looking at the shared area, where LINZ and NZIS had full understanding and could act decisively. The working group still recognised the wider environment but accepted greater understanding was required before either party could bring about decisive change.



Context

The working group established that we were only able to see part of the picture. We could wait, take the time to get everyone together and get the whole picture, or focus now on our small area and then build that greater understanding over time.

Gain enough of the view to start moving forward

- b. Challenges were identified by looking at how we measure up today against the established principles. Six were identified within the 'shared view' area and six in the wider environment.
11. The June session also delivered a second working paper: ***Today vs Tomorrow*** to convey the refined future view and challenges. This was disseminated for comment across the industry.
 12. The final session in September refined the challenges and considered what actions LINZ and NZIS could do to move into the future. Decisive action is recommended where LINZ and NZIS have a shared challenge and can control the outcome. It was recommended that more targeted exploration was needed to address the challenges in the wider environment. For each challenge the strategic objective, guiding principles to assist achieving that objective and contributing actions are defined.

Aim

The aim of this paper is to recommend the shared view of the future cadastral survey industry and associated strategic objectives to LINZ Executive and NZIS Council as the basis for the future.

Part I: The View of Tomorrow's Industry

13. Factors that shape tomorrow's industry:

- a. **International benchmark.** The following international information is relevant to the New Zealand industry:
 - 1) The FIG Commission 7 work surrounding Cadastre 2014 provides a suitable reference point. However, the differences between the European and New Zealand situations need to be considered – particularly their cadastral mapping practices and population densities where they do not apply to the New Zealand environment.
 - 2) Of particular relevance is having a system that shows the 'complete legal situation of land', moving beyond tenure-related parcels of land to 'land objects' that define extents affected by statutory right, i.e. a forest defined for the purposes of the Emissions Trading Scheme or defining rights for mussel farming. Within this context, land includes land covered by water, the air above and earth below.
 - 3) While achieving this comprehensive view of the legal situation is the goal, internationally it is acknowledged that no single agency or database can be expected to hold the breadth and variety of information that would be required. This is not so much a technology issue but a practical reality of many disparate databases for different information types being held together.
 - 4) The environment for surveyors is broadening well beyond the land development market. This expansion sees survey information supporting the land

administration market and the even wider geospatial information markets.

- 5) The role of the surveyor is therefore looking to encompass more than the pure cadastral/land tenure description of land that the licensed cadastral surveyor (LCS) transacts with currently. The cadastral surveyor will also need to define the spatial extent of these land objects to the degree required by other statutes – such as the Resource Management Act 1991. This also opens up the possibility of defining some land objects to levels achievable with less accurate technology, thereby expanding the role of collecting such information beyond that of qualified surveyors.

b. Legislative & regulatory frameworks

- 1) Consideration of the Cadastral Survey Act 2002 noted that the legal definition of the cadastre and cadastral information is only within the context of land tenure and not the full legal situation of the land.

There is a fundamental difference between the NZ legislative definition of a 'cadastre' and the international benchmark.

- 2) In the context of international benchmarking, there is the requirement to look wider than just the Cadastral Survey Act to ensure that spatial definition of land objects is suitable to support all land related legislation, e.g. how forested areas are defined to support the Emissions Trading Scheme.
- 3) The Cadastral Survey Act defines land as including subsoil, airspace, water and marine areas and interests in or over land. This supports the international benchmark for a future cadastre.
- 4) Optimal regulation models used by LINZ are likely to remain in future. Given the varied range of rights and privileges associated with land, and the varied consequences of spatial errors in the execution of these rights, correspondingly different degrees of regulation

will be required. For example, it is in everyone's best interests that the spatial definition of land parcels for downtown Auckland are to centimetre accuracy and is well regulated. Considerable effort by the industry, including the Surveyor General and LINZ is taken to ensure this accuracy. However, the definition of a high-country walking track providing public access need not be subject to the same rigour, although some rigour is still required.

- c. **Context of New Zealand markets.** The overall future environment that surveyors are likely to operate in will include:
- 1) The involvement of surveyors, and the information they manage, becoming increasingly important in the land administration and geospatial information markets as well as the traditional land development market. While GPS will be used extensively by non-surveyors for spatial definition, that will be in addition to, and not in place of the precise work of the cadastral surveyor. Investors will still require, or want to take for granted, that a highly regulated and precise cadastral survey supports their financing of a multimillion dollar subdivision.
 - 2) The land development market is becoming more complex with surveyors, in conjunction with lawyers, required to identify, interpret and spatially define an increasing number of corresponding land rights, privileges and restrictions associated with development.
 - 3) Land management where surveyors will be used to identify, interpret and spatially define increasing rights and restrictions associated with the land, including changing the way land is managed as new rights or privileges are introduced.
 - 4) The land information market will develop as society becomes increasingly spatially aware and reliant. Technology will allow us to take for granted knowing where things are and this market will provide the information to enable that. This is evident with the increased use and popularity of the likes of SATNAV and

- 5) Generating cadastral information is a commercial activity. Cadastral surveyors will have to consider how widely each piece of information can be applied and their ownership of that information and set their fees accordingly. If the information will only be used once, in one of the above areas, or they will lose the ability to on-sell the information, then the fee should reflect the true collection cost. However, if the information can be applied in numerous situations, then the collection cost can be split between these uses.

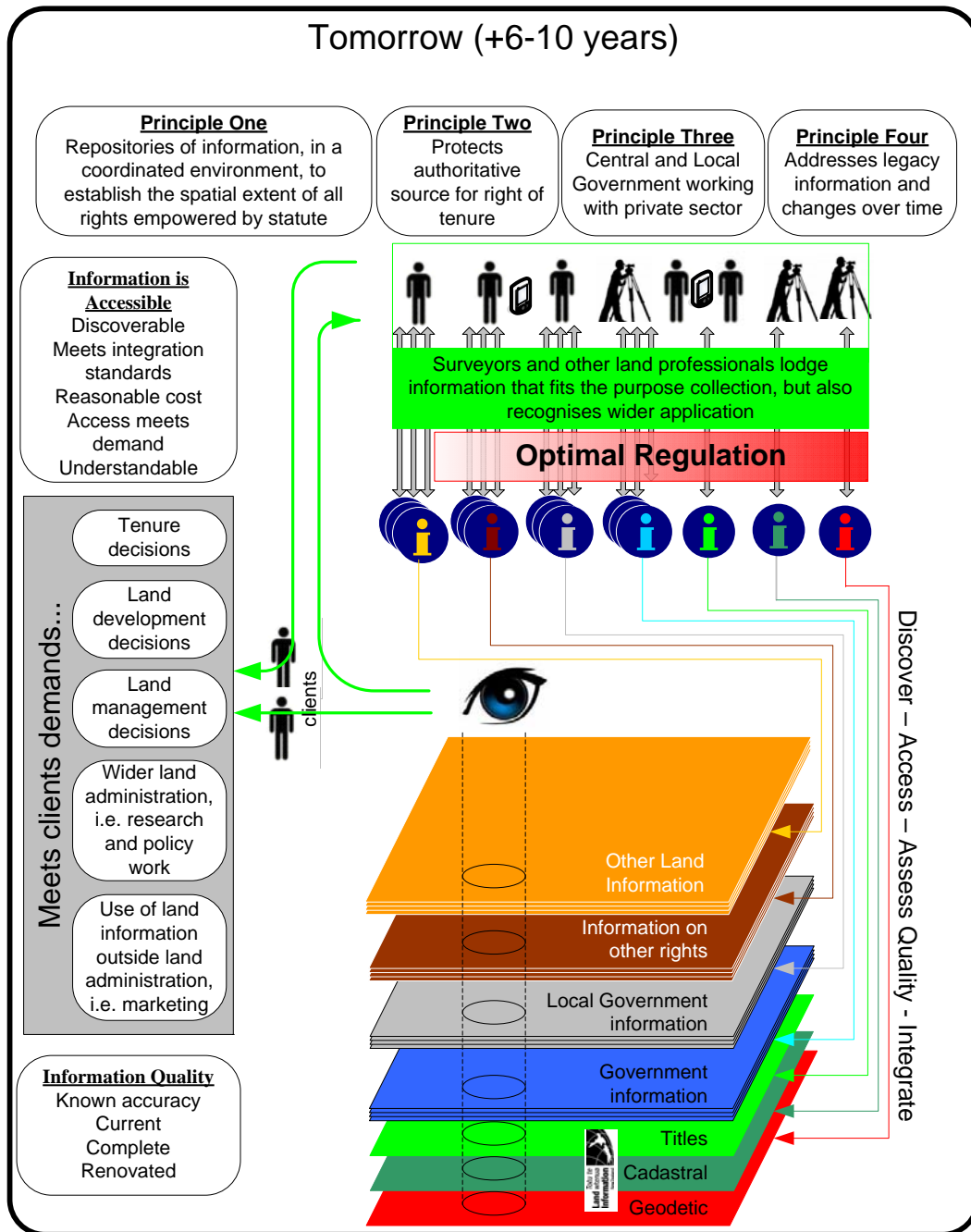
d. Industry demands

- 1) The New Zealand industry echoes international benchmarking in seeking to establish a complete legal situation of land. There is an industry demand, driven by client demand, to have all New Zealand land rights information accessible (discovered, accessed and appraised) and easily integrated to support sustainable land use, development and administration.
- 2) Four-dimensional information. The current two-dimensional model, associated with paper plans and current Landonline, will not meet future needs.
 - a) With high-density living commonplace, the rights associated with the airspace above ground are likely to become more contentious and more relevant for non-cadastral purposes such as emergency management. Similarly, in the future there will likely be greater emphasis on the rights associated with mining, drilling, otherwise winning, or managing natural resources from within the land or sea. These will require greater definition of the third dimension: the vertical datum.
 - b) The enduring nature of a cadastral system must be taken into account and allow a retrospective view of what rights and privileges were associated with the land at different times, how natural boundaries have moved over time, etc. Another example is the

- 3) Quality of information. The quality of the information needs to be fit for purpose. However, the purpose for which the information is collected may not be the only purpose to which it is applied. People can unwittingly make errors on the basis of this leading to incorrect land related decisions, e.g. investment, construction, planning or policy advice, where the purpose of the application of information is not what was intended or supported by the type of collection and processing. The future expectation is likely to be that the quality of the information is fit for purpose, depending on where it is on the scale of consequence of a spatial error. This covers:
- a) **Accuracy.** Areas defined within respective information must match the degree of accuracy required by the consequence of spatial error.
 - b) **Currency.** The areas defined are the most recent and able to be applied with certainty.
 - c) **Completeness.** All aspects relating to the purpose of that information are included.
 - d) **Description.** The information must have reliable metadata that describes its quality, source applicability etc.

- 4) Access to information. Given the information age, the general expectation will be to have quality information that is:
 - a) easily discoverable
 - b) accessible 24 hours a day, seven days a week
 - c) at low or no cost
 - d) in a digital format that enables integration with other information or if already integrated, is able to be separated, and
 - e) legible and able to be understood by a competent lay person.
- 5) Processing of information by those who hold it is transparent. People who later get the information know what processing has occurred and what that means for the quality and use.
- 6) Applications of the information beyond defining rights will be many and varied and relies on the information quality and accessibility.
- 7) Any change in the cadastral environment must, as a minimum, protect the outcomes supported by the current legislative and regulatory environment.

14. Tomorrow's cadastral survey industry:



- a. **Principle One.** Repositories of information, in a coordinated environment, to establish the spatial extent of all rights empowered by statute.

- 1) There is no single agency or database that can be expected to contain *all* future cadastral-related information of the future. However, each different piece, or database, of this information contributes to the complete picture that will be used by the industry.
- 2) 'Rights empowered by statute' is a dynamic statement allowing for information to support rights not yet established to be incorporated within the industry. One such area is customary rights, many of which are currently draped in ambiguity. In future these rights will need to be provided for like any other right or interest.
- 3) The machinery of government (the method of allocating functions to government agencies) identifies the agency responsible for administering each right in statute. Where spatial definition is required, that agency would establish a system to capture that. The coordination is through:
 - a) Sector-wide visibility of who holds what information, so the complete picture is easily achievable.
 - b) A sector-wide optimal regulation regime so the industry, and government, is assured that the quality of the information matches the purpose – and mitigate against adverse consequences from spatial errors. This may include rules for collecting different types of information, such as accuracy standards or individual accreditation.
 - c) Standards by which the information is held in each repository so that it can be discovered, accessed, assessed and integrated.

b. **Principle 2.** Protects the authoritative source for right of tenure.

- 1) This principle recognises that the future cadastral industry will likely have an expanded scope, but requires that the cornerstone of certainty of ownership, underpinning much of the economy, remains paramount.

- 2) The likely future cadastral industry will have information regulated or controlled to varying degrees corresponding with the consequence of spatial errors. For example, the level of current regulation applied to cadastral survey and land tenure is high, and will remain so, as the consequence of an error in defining the spatial extent of tenure, in some cases within centimetres, can strike at the heart of our economy, e.g. if a structure was built or purchased only to have another party lay claim to a slice of that asset as adjoining surveys overlapped. Conversely, the consequence of being in error by several metres when defining the spatial extent of public access for a high country-walking track may be minimal and therefore does not warrant the same degree of regulation. In some situations, such as the public good right to exercise dogs off the lead in urban areas, the consequence may warrant only voluntary adoption of standard or general control to define the spatial extent of that right.
- 3) Application of this principle will ensure the protection of tenure during any future expansion of the cadastral environment, and indeed this will remain at the highest degree of certainty in the future cadastral industry regardless of technology advances in other areas.

c. **Principle 3.** Central and local government working with the private sector.

- 1) Building on the statement of a coordinated environment, this acknowledges the range of players in the future cadastral industry.
 - a) Administering statutes is a Crown responsibility and given the mandate of New Zealand local government, they share responsibility with central government. Their roles are to:
 - drive the legislative and policy programme to establish the right in statute with the appropriate degree of regulation for the benefit of New Zealand economy, society or environment.

- provide effective stewardship of their information – receive, store, renovate and provide the information.
- support and advise industry players in interacting with the repository and complying with respective statutes.

b) The private sector component includes:

- Information providers, processors and users applying best practice to meet the demands of industry clients while operating within the relevant statutes and regulation. While today's cadastral surveyors fit into this area, how they interact in the future industry will change. There will be a need for access to a greater range of information, intelligently apply survey best practice, spatial science, legal understanding and use geospatial information systems to deliver the outcome for clients. The greater need may be met by cadastral surveyors themselves, other industry players (such as lawyers) or a combination of these.
- Professional development, including professional bodies and education institutions, to ensure the people involved in the industry have the required skills and knowledge to meet the statutory requirements and customer demands.
- Providing capability, such as database or other IT services, to assist central and local government in delivering their information management.
- Conducting other roles that would be inappropriate or inefficient for central or local government to conduct within the machinery of government or to give best use of public money.

- d. **Principle 4.** Addresses legacy information and changes over time.
- 1) Moving into the future we must not lose visibility of old rights or privileges. This will only lead to later redress and uncertainty of the spatial extent of complete statutory rights, thereby potentially undermining the whole system.
 - 2) New Zealand has in excess of 150 years of information that pre-dates the digital age. Some of the large volumes still held in paper form will have to be moved to digital systems – be it digitally imaged or simply noted on an electronic index with the paper record stored for later manual access.
 - 3) Examples of this principle providing benefit is where the Crown is to return land to the original owner, and the acquisition predates, so is not recorded in, the digital system. Additionally, a future right associated with dumping a hazardous substance may require defining the spatial extent of hazardous sites that are currently recorded on paper only. In both examples, people accessing these repositories should be given the full picture over time without having to search through masses of paper in a basement or warehouse. Instead, the relevant repositories will have either the digital image or the electronic index to give efficient access to those records. It is the degree of efficiency that each repository can achieve that will set the level of digital imaging versus simply indexing and storing the paper record.
 - 4) Those who access and assess the information will be able to determine how that has changed over time. The application of this feature in trend or cause analysis will support improved decision making.
- e. **Information characteristics.** The future cadastral industry will discover and access the information, assess its quality and integrate information for the benefit of the customer and to meet the statutory obligations. (Refer to the arrow flow on

1) Quality.

- a) Accuracy will be known. The accuracy of the information collected will be a function of the reason it was collected, and if this is known then the application of that information for wider use can be assessed confidently. For example, if information is collected with centimetre accuracy, but then processed for another use that reduces the accuracy, this change will be known so that it is not then incorrectly applied with a false confidence that it is centimetre accurate.
- b) Current. The repositories will be able to provide the most up to date version of the required information. There will not be an in-house version and a release version.
- c) Complete. Each repository will show the complete situation in relation to the rights they support – there will not be gaps resulting in the spatial extent being unclear in any given area.
- d) Renovated. The information will be renovated, as opposed to obsolete. This renovation will come from two methods:
 - The steward of each repository may have a maintenance regime, actively updating their information with validation from other sources and rectifying identified errors.
 - Each repository is dynamic. While maintained by the steward, it is accessed, processed, updated and re-lodged by the industry as a whole with relevant regulation. The result is the quality is improved over time.

2) Access.

- a) Discoverable. First and foremost in the access chain is that people can find the information. This is partly

- b) Once found the information must be able to be accessed with standard systems for download and at a reasonable cost. New Zealand currently maintains a policy of user pays cost of dissemination for government information with the costs becoming cheaper as technology improves. This may or may not remain in future, but regardless, the cost of access should not be a barrier.
- c) The access channels must be open regularly to support industry demands. Given the emphasis on the currency for the information, limiting opportunities to gain access is counterproductive.
- d) Having accessed the information, it must be able to be understood by a competent lay person. This will allow the appraisal that the information can fit the required purpose.
- e) The final aspect of access is in meeting the interoperability standards that allow the integration with other information so they align and can inform decision making or communication.

Part II: Challenges in Moving Towards the Future

15. Challenges identified in the shared view of LINZ and NZIS are:

- a. Advice to surveyors
- b. Research and Professional Development capability
- c. LINZ Bulk survey and title data access and application
- d. Integrity of the Survey Data Capture Area
- e. Access to LINZ survey and title paper records
- f. Future-proofing the e-survey system (Landonline).

16. Each of these challenges is defined below with the strategic way forward. The way forward lists the strategic objective, the principles that should be adhered to when planning actions or assessing options, and the high level actions that will contribute to the objective.

17. Within the wider environment the key challenge is lack of a sector-wide approach. This impacts on the areas of culture, leadership, coordination, education and awareness, and information quality and access. As LINZ and NZIS need to do more exploration before being decisive in this wider context, these challenges have been grouped and addressed more generally.

18. Challenge - advice to surveyors

The advice function supporting the LINZ repository of cadastral survey information needs to be more clearly defined and efficient to support the integrity of the cadastre.

- a. In the mid 1990s DOSLI and then LINZ had a hands-on approach to advising cadastral surveyors on best practice for conducting cadastral surveys as well as lodging them and integrating them into the cadastre. At that time LINZ had numerous cadastral surveyors on staff and in the regions. LINZ also undertook a large number of surveys, and chief surveyors were often seen as final arbiters of survey practice.

- b. In the late 1990s LINZ changed this to align with the roles to support the digital survey system and later the Cadastral Survey Act 2002. This saw the number of surveyors more than halved as considered appropriate to support the less hands-on statutory roles of the Surveyor General and LINZ survey processing: mainly that of regulator, allowing for lodging cadastral datasets, approving and integrating these into the cadastre. Other staff were trained, but not qualified, in the limited survey aspects they needed for their part in the process. Where LINZ has pulled back from that advice function, the associated publications have not been updated and the advice is not always up-to-date or credible.
- c. The profession had intended to assume the best practice advice roles. NZIS had commissioned some work to establish a best practice guide, but this did not resolve the issue.
- d. Therefore, in reducing the LINZ advice functions, without a corresponding increase in the NZIS professional practice advice, a vacuum was created with no replacement for the hands-on DOSLI/LINZ advice.
- e. Given the digital survey system with part of the country not captured with survey accuracy, there is the additional geodetic component, and associated advice that is currently being resting with LINZ geodetic staff (not cadastral survey staff).
- f. The result is that the LINZ advice capability currently meets most survey adjustment or integration inquiries, but with the point of frustration around the best practice and exceptional or complex surveys. When cadastral surveyors now contact LINZ for advice in these areas they get inconsistent service and varied degrees of success:
 - 1) If the LINZ staff member is new, conflicting or confusing advice may be given. The request maybe declined as not a LINZ service the staff member is familiar with. Even a well intentioned new LINZ staff member may have difficulties finding the most suitable staff member to help meet the request. Surveyors may be 'passed around' without resolution or getting information that they are not confident in.

- 2) If the staff member has some residual knowledge from former work in another area, then they may offer that advice and, though not fully supported by the LINZ documentation or other process, the surveyor will be able to act off that and get a good result.
 - 3) Some surveyors know which particular LINZ staff have the required knowledge and willingness to provide the advice outside the described role, so directly contact that person.
- g. The challenge is further compounded by two factors:
- 1) By the time we reach 'tomorrow' there will be much less residual knowledge at LINZ.
 - 2) Stakeholders, such as councils, have not fully recognised the change in the advice function and will refer surveyors, land professionals and members of the public to LINZ based on their understanding of the former hands-on LINZ advice function.
- h. The challenge is around exceptional circumstances, e.g., what information LINZ will accept for a survey relating to erosion/accretion issues, working in some non-SDC areas, some Māori land circumstances, and other quite unusual definition issues. And what advice will LINZ give in relation to these issues.
- i. Where surveyors can't discuss these issues, early on in their work and with LINZ staff with good survey knowledge, the resulting survey is at risk of requisition, and possible rework or approval despite being in error. The consequence can be inefficiency and client frustration, which may include financial loss, or risk to the integrity of the cadastre.

19. Strategic Objective – Survey Advice

Tomorrow's cadastral survey industry is supported by known sources of credible advice in order to improve efficiency and maintain integrity of the cadastre.

20. Guiding principles:

- a. The profession will be the credible source of advice on best practice for conduct of cadastral surveys. This includes an increased application of geodetic knowledge as part of best practice.
- b. LINZ will be the credible source of advice for use of the e-survey application (currently Landonline) and approval processing, exceptional requests and integration into the cadastre.
- c. Industry-wide knowledge management:
 - 1) There will be no knowledge gap between LINZ and the profession's advice across the industry. Furthermore, in some areas it may be mutually agreed to overlap if this would aid efficiency and protect the integrity of the cadastre.
 - 2) The knowledge must be embedded within LINZ and the profession and not linked to individuals.
 - 3) The advice must be dynamic. Advice demands may change as driven by technology, regulation or other industry changes. Between LINZ and the profession, the source of the advice will be mutually agreed.
 - 4) Visibility of sources of advice. All stakeholders must be aware of the appropriate source of advice.

21. Contributing actions:

- a. NZIS and LINZ jointly work (LINZ lead) to determine the mix of advice to support the industry from LINZ and NZIS. The work would be undertaken through a joint project to examine the range of advice scenarios and assign LINZ and/or the profession as the source of advice. This joint work should occur over years 2010/2011 with the exceptional circumstances given priority in this process.
- b. NZIS and LINZ conduct individual actions to build their respective and collective capability. This can commence as

- 1) Both LINZ and the professional body may face issues in developing the advice capability. Some joint initiatives may be conducted in this area, i.e. LINZ staff seconded to the profession to gain required knowledge, or LINZ providing resources to NZIS.
 - 2) Both sources of advice will need to be maintained for currency.
- c. Joint sector-wide engagement to ensure that all stakeholders are aware of the correct sources of advice.

22. Challenge - research and professional development capability

The cadastral survey industry needs to have the correct balance of professionals with the ability to do the job now, and enquiring minds that can lead developments that keep pace with evolving industry demands.

- a. This recognises that the job done 10-20 years ago has changed – and it will change again. The qualification does evolve, but this can sometimes lag or become misaligned with demand.
- b. The Australian industry has recognised the importance of the spatial side of surveying. New Zealand has continued to produce very general practice surveyors with a broad and valuable capability that is light on knowledge of spatial data management. The result is that many spatial-centric roles are being filled with people with geography or GIS degrees as opposed to surveyors.
- c. The concern is that the profession is not comfortable working within the broader geospatial arena as required by the industry, instead concentrating on subdivision work.

- d. The survey school is presented with a dilemma – increasing the spatial data management component in the curriculum means taking something else out.
- e. Around the world universities are known for specialties and will be sought out by international students for PhD programmes. New Zealand universities do not offer specialist programmes, rather opting for the multipurpose generalist. Such generalist surveyors are often valued overseas but as a result the profession looks more towards international schools, not ours, for post-graduate study opportunities.
- f. Other tertiary institutes are also offering industry courses with the number of providers likely to increase with demand, particularly in the spatial science and GIS area and the rising importance of spatial information generally.
- g. Formerly the profession used the Board of Studies (BoS) to influence the survey school. This provided a direct link between the industry coalface and the school.
- h. At the level below the research within the survey school, the professional body maintains and funds a research committee. LINZ also maintains and funds internal research and innovation pools. As is typical of the industry, both research options are not fully used or aligned with any strategic future view.
- i. Much of the skills, knowledge and experience of the future will be developed on the job. It will be about creating opportunities for the profession to acquire these skills, knowledge and experience across the industry – government and private sector working together. In line with globalisation, this development also needs to include the international survey firms.
- j. There is no clear succession within the profession. Roles such as Surveyor-General and the president of the professional body are key to the industry, yet it is unclear how people, or more importantly a pool of people, should be developed to ensure the industry is well served.

23. Strategic Objective – Research and Professional Development

The profession is confident they have the skills and knowledge to meet evolving demands of the cadastral industry.

24. Guiding principles:

- a. Actions are anchored to the frameworks established for New Zealand qualifications.
- b. Spatial science education supports the future industry requirements. While the Otago Survey School may remain the centre for the survey school, other NZ institutions will grow in relevance for providing greater spatial knowledge and international institutions will contribute in respective specialty areas.
- c. The New Zealand industry needs to have a world class post graduate research programme with a recognised speciality, albeit the *generalist*.
- d. Professional development opportunities provides clear succession and meets the on the job training demands and of the future industry.

25. Contributing actions:

- a. NZIS working to reconvene the BoS:
 - 1) LINZ invited to participate with BoS.
 - 2) Guide evolution of qualifications, with survey school and other institutions, and development of speciality.
 - 3) Within 5 years to get the BoS working.
 - 4) Within 10 years to have the speciality established.
- b. NZIS lead the development of a strategically aligned research programme:

- 1) LINZ involvement in shaping proposals with possible co-sponsorship.
 - 2) Wider sector involvement with sponsored research.
 - 3) Within 5 years for NZIS research programme. (LINZ involvement within that time as required.)
 - 4) Sector-wide approach within 10 years.
- c. NZIS-lead development of a coordinated professional development programme with succession paths and opportunities to fill the wider spatial/geodetic knowledge gap, including public/private sector secondment and international activity. This should be designed within 5 years and effective within 10 years.

26. Challenge – bulk survey and title data access and application

The current monthly supply of LINZ bulk cadastral information limits the efficiency in many systems and processes within the cadastral industry.

- a. While Landonline is a transactional system, having the digital information has allowed wider application with real gains to efficiency and the New Zealand economy generally. In particular are the land information systems used by councils, where the cadastral information provides a critical base layer. However, the transactional nature and purpose means it is not ideally suited for providing bulk data to customers.
- b. LINZ currently issues bulk cadastral data via monthly DVD. This is used by some councils directly, with others getting the information via a third party data processor. In some cases, the effect of data processing has been to remove some of the data with the end-user being unaware of the accuracy or completeness of the information they are using. Additionally, the processing time adds another delay from the time the data was extracted to when it is then referred to.

- c. Once in the information systems, the cadastral information cannot be refreshed until the next monthly update.
- d. Being a critical base layer, this monthly refresh has limited the currency (quality) of the information on which decisions are made.
- e. Industry has been seeking improvements in bulk data access and LINZ has been considering options in this area for some time. Given the stated leadership role for LINZ in federating geospatial information, remaining with status quo is not a viable option.
- f. Options range from making data available real-time, with some cost and practicality issues with file size, with a spectrum of levels of improvement. With the varied options are varied costs, with estimates of \$30,000 to \$5 million.

27. Strategic Objective – LINZ Bulk Survey and Title Data Access.

Access to LINZ bulk survey and title data allows efficiency gains for the cadastral industry.

28. Guiding principles:

- a. LINZ will give priority to freeing up the cadastral data as part of the federation of geospatial information to benefit New Zealand's economy, environment and society.
- b. Improved access will comply with the standards and frameworks agreed for the New Zealand Spatial Data Infrastructure.
- c. To achieve the objective, LINZ must engage with the wider group of users of cadastral data to optimise efficiency gains.

29. Contributing actions:

- a. LINZ will make cadastral data comply with the access and other standards of the emerging NZ SDI, such as the Open Geospatial Consortium Web Feature Service (OGC WFS) or

ANZLIC standards. This work should commence in 2010/11 and be completed within 3 years.

- b. LINZ will engage with bulk data users, local government in particular, to transition to the new access arrangements and achieve efficiency gains. This work needs to start in 2010/11 in conjunction with the work to make the data comply with the SDI. However, the achievement of efficiency gains is longer term, particularly for councils with basic information systems, and linked with the sector leadership and coordination objective (refer paragraph 43). This is expected to be achieved at the 10 year mark.

30. Challenge – integrity of the survey data capture area

The original assumption on what should be a non SDC area has not proven to be optimal, and the spatial accuracy of the SDC area is degrading.

- a. When establishing the e-survey system the decision was made to have centimetre accuracy (survey accurate) cadastre for urban areas with the remainder of New Zealand up to +/- 50 m.
- b. Since then, New Zealand's growth has seen substantial survey work in areas that weren't survey accurate. The result is that these surveys can be problematic, time consuming and have significant issues with integration into the cadastre.
- c. LINZ has established the exception process to aid efficiency for surveyors working in these areas.
- d. A pilot project has been run to investigate cadastral adjustment techniques that can be used to upgrade the accuracy of these areas to 1-5m. A technical solution has been determined, however, given current resources, it would take many years before this issue would be fixed. Significant funding and other resources would be required to achieve upgraded accuracy in an acceptable timeframe.
- e. Additionally, the survey data capture areas with centimetre accuracy are degrading as a result of crustal movements and

updates to geodetic control coordinates. This also requires ongoing adjustment as part of LINZ maintenance.

- f. The current level of accuracy and the forecast degradation results in inefficiencies with the cadastral industry support to land development and management.

31. Strategic Objective – Integrity of the Survey Data Capture Area

Survey data capture areas have accuracy to provide spatial confidence and delivery efficiencies to the future industry.

32. Guiding principles:

- a. It is not acceptable to maintain status quo and additional actions are required within 10 years.
- b. The timing and resourcing of additional actions will be in relation to the benefits that are to be delivered to cadastral surveyors (efficiency) **and** local government (land/ infrastructure management).
- c. Centimetre accuracy will be achieved for urban areas.
- d. The remainder of New Zealand will have 1-5 metre accuracy.

33. Contributing actions:

- a. LINZ will maintain the current level of maintenance with the priority based on density of use.
- b. LINZ leads development of the business case to confirm benefits, methods and funding to achieve the required integrity. This work will require input from NZIS and councils. It should start during 2010/11 with the decision to implement made by the appropriate person/ body during 2011/12.
- c. LINZ will improve the integrity of the cadastre in accordance with the business case.

34. Challenge - access to LINZ survey and title paper records

Even in the digital age the paper records are important, but it is not feasible to convert them all to electronic formats. This leads to access barriers and inefficiency.

- a. LINZ is facing the same problems as everyone for converting paper records. There is a programme in place to address this, but it faces the same feasibility issues as other agencies. One key aspect is whether to image/ scan everything, or do so only on demand. Regardless, quality indexes remain key to accessing the records.
- b. Parts of the future Cadastral Survey Industry will still need access to papers records when reworking survey data predating digitisation and for rural areas. It is expected that this requirement will slowly reduce over time, but is a very real cause of inefficiency for the surveyors concerned and their customers.
- c. LINZ has closed public counters and records are to be centralised, with the channels via LINZ website or search agents. This has not transitioned well.
- d. Historians, genealogists or other social researchers have been vocal over records access and have different needs, and are focused on urban areas associated with settlement. This group is not part of cadastral survey industry and should not be given priority over the industry.

35. Strategic Objective – Access to LINZ Survey and Title Paper Records

In the future cadastral survey industry the access to the required LINZ survey and title paper records is not a cause of inefficiency.

36. Guiding principles:

- a. The current LINZ strategy – *for indexing, relocation and establishing electronic channels to access the records (the record produced may be in either digital or paper form*

depending on the imaging practicality) - for paper records is the vehicle to achieve this objective

- b. Digitising on demand, based off quality indexes, is acceptable.
- c. In implementing the strategy priority will be given to access for the profession over non-land professionals – focus on rural and non SDC areas that cause current inefficiency.

37. Contributing actions:

- a. Implementation of the LINZ strategy with the focus until the end of 10/11:
 - 1) Producing quality electronic indexes.
 - 2) Working with the profession to establish the priority areas.
 - 3) Transitioning to effective electronic channels when centres close.

38. Challenge – future-proofing the e-survey system (Landonline)

Landonline is a transactional system based on mid 90's technology that is unlikely to meet the demands of the future industry

- a. Landonline has achieved a world first in supporting e-survey. It has enhanced the reputation of LINZ nationally and internationally. This was a 10 year and \$100 million+ development.
- b. However, as an old transactional system, how long does LINZ keep enhancing as opposed to complete redevelopment?
- c. Powerbuilder is being migrated to other code bases, such as Java, across many sectors. The futureproof nature of Powerbuilder is unknown with limited people with Powerbuilder skills.

- d. The current system would not feasibly support delivery of bulk information and would require significant interface or add-on design.
- e. Currently the list of enhancements is long and enhancement sees regression testing potentially taking longer than system design and build. The process for enhancements, and what makes the priority cut, is unclear. Some ideas would substantially increase the integrity of the cadastre, with obvious efficiency gains, but aren't selected as they are "back room" enhancements as opposed to customer facing.

39. Strategic Objective – Future-proofing the e-survey System (Landonline)

The future cadastral survey industry operates confidently, effectively and efficiently in an appropriate electronic environment

40. Guiding principles:

- a. Landonline enhancement must benefit the future industry as a whole with prioritisation criteria to reflect this.
- b. Development of the electronic environment is driven by realistic user requirements as opposed to the pursuit of proprietary systems. That is, redevelopment of technology will occur when the current Landonline can no longer effectively and efficiently support user requirements.

41. Contributing actions:

- a. LINZ will lead the development of a process to enhance Landonline for the benefit of the (future) industry as a whole:
 - 1) This will see ideas for all stakeholders developed and tested against prioritisation criteria to determine what enhancements will be implemented.

- 2) Wide stakeholder engagement should be used to develop and implement this process, in particular in setting the prioritisation criteria and gaining the ideas.
 - 3) This work should be complete within 10/11.
- b. LINZ will lead work to routinely review the system, its effectiveness and efficiency in meeting user requirements. The first such review needs to be completed during 10/11 with subsequent reviews every five years, or when the enhancement process indicates realistic user requirements can no longer be met by the current system.

42. Challenges in the wider environment

There is no sector wide approach to move forward

- a. Looking at successful Australian examples of sector-wide initiatives, the federal government maintains accountability and funding while coordinating action across the sector. People follow the money and get results.
- b. New Zealand has a cross-sector history of 'club funding' (*where several agencies pledge to give funding but the money is not centralised*), shared accountability, and shared/borrowed resources that has not resulted in significant progress. It has also resulted in a degree of mistrust, particularly where the cultures of two agencies clash.
- c. As new rights are emerging they are not implemented or managed in a coordinated way. This can lead to illogical, and overly restrictive, regulation or even roles in administering rights that are in placed in statutes with inadequate consultation with the affected agency to assume that role.
- d. There is no clear leader for the future cadastral sector:
 - 1) Many of the issues related to the Resource Management Act – where the Ministry for the Environment has lead.

- 2) Many issues relate to local government, with many rights administered at the level. Though a key role within the future cadastral industry, it is problematic because:
 - a) There is no single entity or standards with each council operating differently.
 - b) There have already been failed cross-sector attempts by SSC to make district plans consistent.
 - c) Currently councils are able to be sued, so use bureaucracy as protection.
 - d) Many areas for councils are subjective and have emotive pressure on decision making. This is very different from the precision used for spatially defining the extent of rights.
- 3) Many issues relate to construction and other development where the Department of Building and Housing has lead.
- 4) LINZ has a good platform to take on the leadership role:
 - a) Success with current survey and titles systems, optimal regulation and rating system.
 - b) Ministerial leadership priority around federating geospatial information.
- e. To galvanise the sector, there are opportunities with an emerging recognition that geospatial information is a growth enabler:
 - 1) Establish a Marine Cadastre that builds on Ocean Survey 20/20 with coordinated repositories of spatially defined rights associated with management and exploitation of resources out to our EEZ. This would require different agencies to be coordinated with no clear leader for the marine layers of the future cadastre. LINZ could show some leadership and have some expertise but it equally could fall to another department such as MED, MfE or MoF.

- 2) Boundaries in tidal areas and customary rights are other possible opportunities to galvanise the sector, but economic benefit is less evident and would therefore get less traction. Customary rights have the additional challenge of being defined in the legal frameworks in such a way that they are meaningful and understandable.
- f. Many involved in the future cadastre are currently focused on their singular purpose, with their information characteristics to support only that and not wider application. The current principles, if defined, would be more insular and protective than open and sharing.
- g. Professional Bodies are based on voluntary work with a small paid secretariat that is administrative based. To build the capability options requires raising subscription fees, gaining alternate funding or forming strategic alliances to maximise resources.

43. Strategic Objective – The Future Cadastral Survey Industry Operates with a Sector-wide Approach

All stakeholders know their role within the future industry, and know how to carry out their role for the benefit of New Zealand.

44. Guiding principles:

- a. The sector-wide approach will be built on the LINZ and NZIS partnership.
- b. LINZ accepts the leadership role to develop the sector-wide approach, but it may not be the sector leader in future.
- c. Future sector leadership will lie with the government department that Cabinet deems most appropriate.
- d. The sector-wide approach will use the principles of the future cadastral industry as the start point, but these will evolve as

required to benefit New Zealand's economy, society and environment.

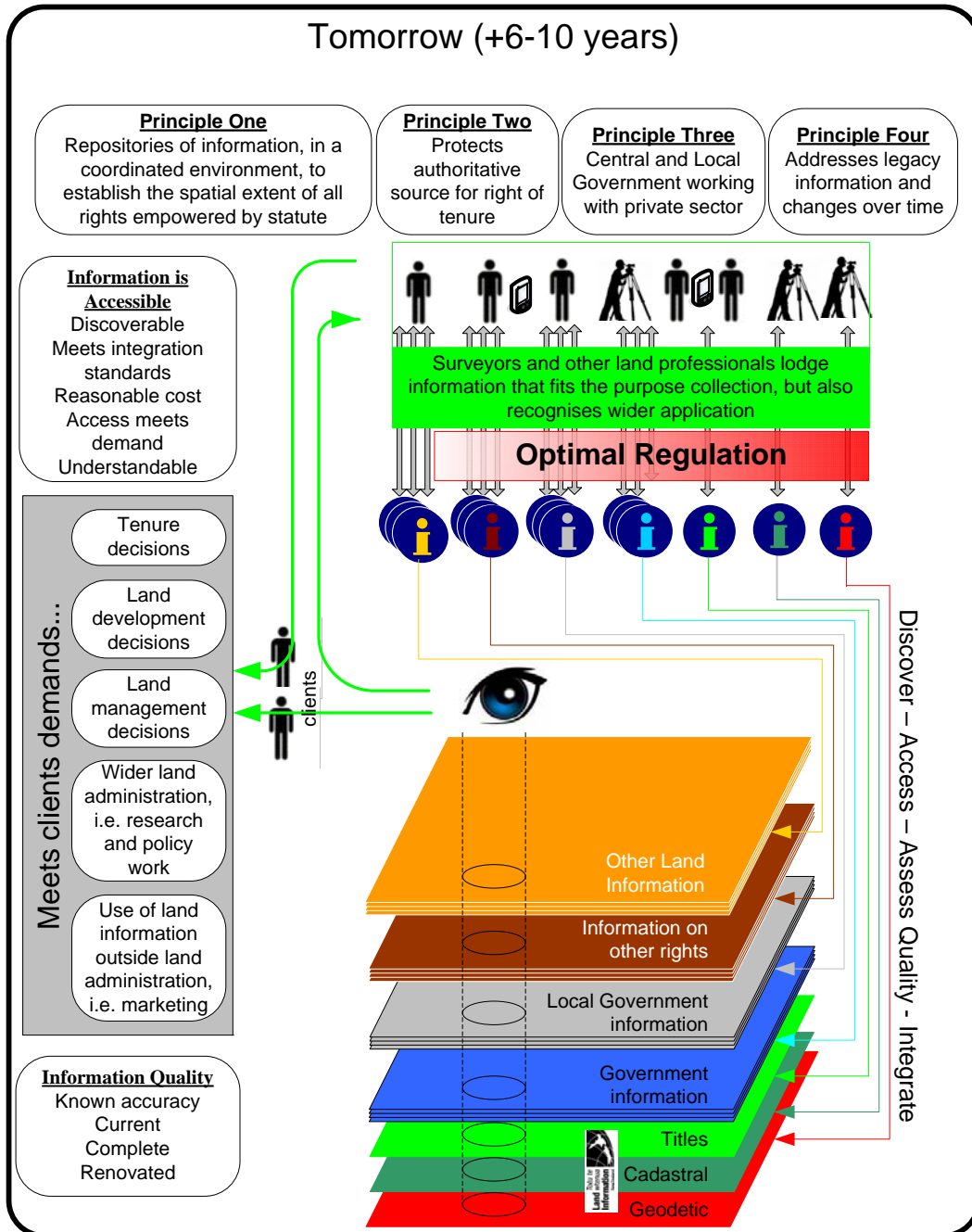
- e. To contribute as an effective professional body that can deliver benefit to members in future, NZIS must move to a model of paid strategic staff.

45. Contributing actions:

- a. LINZ will raise awareness among stakeholders of the future cadastral sector, on the importance of unlocking the potential of the future cadastral information in line with the geospatial strategy and the principles of the future cadastral survey industry. This awareness-raising activity should occur over 2010-12.
- b. LINZ, jointly with NZIS where possible, will engage with cadastral sector stakeholders to frame a case for the benefits of a sector-wide approach, and what that may look like. This may be based on taking the opportunity to implement the future view and establish a marine cadastre or galvanise local government. The sector-wide approach should be agreed by the five year mark.
- c. LINZ and NZIS will then support the sector moving forward over the next five years to the future state, in particular in the areas where LINZ has a sound platform.
- d. NZIS will move to the model of paid strategic staff within five years.

Conclusion

46. Having considered various factors, the agreed view of the future cadastral survey industry is:



47. The challenges and respective strategic objectives to move towards this future are:

Survey Advice

Challenge	Strategic Objective
The advice function supporting the LINZ repository of cadastral survey information needs to be more clearly defined and efficient to support the integrity of the cadastre.	Tomorrow's cadastral survey industry is supported by known sources of credible advice in order to improve efficiency and maintain integrity of the cadastre.

Research and Professional Development Capability.

Challenge	Strategic Objective
The cadastral survey industry needs the correct balance of professionals with the ability to do the job now, and enquiring minds to lead developments that keep pace with evolving industry demands.	Surveying professionals are confident they have the skills and knowledge to meet the evolving demands of the cadastral industry.

Bulk survey and title data access and application.

Challenge	Strategic Objective
The current monthly supply of LINZ bulk cadastral information limits the efficiency in many systems and processes within the cadastral industry.	Access to LINZ bulk survey and title data allows efficiency gains for the cadastral industry.

Integrity of the Survey Data Capture Area

Challenge	Strategic Objective
The original assumption on what should be a non SDC area has proven incorrect, and the spatial accuracy of the SDC area is degrading.	Survey data capture areas have accuracy to provide spatial confidence and delivery efficiencies to the future industry.

Access to LINZ survey and title paper records

Challenge	Strategic Objective
Even in the digital age the paper records are important, but it is not feasible to convert them all too electronic formats. This leads to access barriers and inefficiency.	In the future cadastral survey industry the access to the required LINZ survey and title paper records is not a cause of inefficiency.

Future-proofing the e-survey system (Landonline)

Challenge	Strategic Objective
Landonline is a transactional system based on mid 90's technology that is unlikely to meet the demands of the future industry	The future cadastral survey industry operates confidently, effectively and efficiently in an appropriate electronic environment

Challenges in the wider environment

Challenge	Strategic Objective
There is no sector wide approach to move forward	All stakeholders know their role within the future industry, and know how to carry out their role for the benefit of New Zealand.

Recommendations

48. The Survey Strategic Context Joint Working Group recommend that LINZ Executive and NZIS Council:
- a. Accept the agreed view of the future cadastral survey industry as the basis for moving forward.
 - b. Commence planning the individual and joint actions to achieve the strategic objectives.

ⁱ Kaufmann J., Steudler D. 1998, *Cadastral 2014, A vision for a future cadastral system*, Switzerland.

ⁱⁱ Steudler D. 2006, *Cadastral 2014 – Still a vision?* Switzerland.

ⁱⁱⁱ Williamson, I., Wallace, J., *Surveyors and the new land management tool – the cadastre*, Melbourne, Australia.