

Cadastral Survey Data Exchange Format - LandXML

Version v 2.0

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March 2010

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Document Reference	
Author:	LINZ and PwC Consulting
Date:	13 March 2007
File Name:	Cadastral Survey Exchange Format - LandXML
Version:	1.03

Issue History			
Issue	Date	Section No.	Summary of Changes / Amendments
0.1	12/11/2001		Initial Draft
0.2	29/11/2001		Revised Draft
0.3	14/12/2001		Draft Review (Internal)
0.4	19/12/2001		Draft Release (External)
1.0	26/2/2002		Release
1.01	18/4/2002	5.5	Updated the Landonline codes and added additional column to describe them. Changes designed to more accurately map the LandXML enumerations and enable automated population of type component on Mark Name in Landonline.
1.02	01/12/2005	5 & 7	Updated Section 5.1 to 5.10 and 7.1 to 7.10 after MAR 847 changes to Landonline in V2.7 Workspace November 2005.
1.03	13/03/2007	4.21.2	Accreditation Status updated MAR 796 in Version 2.9 release
1.04	2/10/2007	4.12.2, 5.10, 6.4, 7.10	Incorporating changes for LandXML Schema 1.1
2.0	16/03/2010	3.2.2, 3.2.3, 3.4.1, 4.19.2, 4.20.2, 4.22.2, 4.23.1, 5, 6, 7	Incorporating changes to support schema v1.2 and new Rules for Cadastral Survey 2010 (under Landonline release v3.4)

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1. CADASTRAL SURVEY EXCHANGE FORMAT - LANDXML

1.1 Introduction

The purpose of this document is to outline the LandXML data elements and attributes necessary to lodge digital cadastral survey datasets with Landonline. A description of each data element and attribute is provided as well as information relevant to how Landonline will use the element/attribute. Also provided is an indication of whether the element/attribute is optional, recommended or required when lodging a digital cadastral survey dataset with Landonline.

Along with the lodgement information, this document identifies the LandXML data elements and attributes populated by Landonline when exporting cadastral survey information. Comments relating to the element or attribute being exported are included where appropriate.

This document will be available to parties interested in supporting survey elements of the LandXML schema in their software products and/or packages. To assist understanding of this document and the Landonline requirements for LandXML, additional information about Land Information New Zealand (LINZ), the Landonline Automation Project and Landonline survey concepts are included for reference.

1.2 References

The following documents were referenced in the writing of this document

- LandXML Schema v1.0 (draft, dated 31th January 2002)
- LandXML Schema v1.0 (draft, dated 15th October 2001)
- LandXML Schema Help file v1.0
- LandXML Schema Help file v0.88
- Landonline Stage Two Functional Requirements and Design
- Land Information New Zealand web site (www.linz.govt.nz)
- Landonline web site (www.landonline.govt.nz)
- Maintenance Amendment Request (MAR) 847
- Maintenance Amendment Request (MAR) 796

2. LINZ AND LANDONLINE

2.1 Land Information New Zealand (LINZ)

Land Information New Zealand (LINZ) is a New Zealand government department with the following key roles and responsibilities:

- providing policy advice to the Minister for Land Information on matters concerning land; seabed and property information
- ensuring the integrity and consistency of property valuations for rating purposes
- maintaining the survey system which provides spatial support for the State Guarantee of Title and the topographic and hydrographic databases
- maintaining the land titles register which provides a true and up-to-date picture of the ownership of freehold land and to minimise any risks to the State Guarantee of Title
- managing the Crown's collective interest in land and property (outside the conservation estate) including acquisition, administration, disposal, Crown liabilities in land and property and assistance in the settlement of Treaty claims through the utilisation of surplus Crown land
- maintaining and enhancing the core topographic and hydrographic databases.

The main role of the department is a regulatory one, to set guidelines and standards, and to manage contracts for carrying out the day to day business associated with each of the key areas. The department is also responsible for the operational aspects related to managing the core survey and title records.

More information about LINZ can be obtained from www.linz.govt.nz.

2.2 Landonline

Landonline is LINZ's electronic database of land title and survey information. The Landonline Programme is a challenging IT and people project that is converting millions of title records, title instruments, plans, parcels and geodetic survey marks into the Landonline database. The first stage of Landonline began rollout in Otago in April 2000 and is being implemented progressively throughout New Zealand with completion expected late 2002.

From a survey perspective, Stage One saw the development of a digital database capable of supporting digital processing of both Geodetic Work and Cadastral Survey transactions. The database also supports the integration of the transactional based information with underlying digital networks as well as providing graphical (spatial) views of that transactional and network information.

For Stage One, the survey focus was on the survey related internal validation, approval and management processes that support LINZ statutory requirements along with the associated supporting processes (eg Plan Capture, Network Maintenance, Electoral Maintenance) that resulted. Consequently, the digital survey transaction processing system was developed and implemented as an in-house system, with only search and view capabilities available to interested external parties.

The main objective of Stage Two of Landonline is to enable conveyancers and surveyors to exchange information with LINZ electronically and to allow for survey and routine title transactions to be processed automatically. For survey this means:

1. Enhancing the search and view capabilities made available to external parties in Stage One.

2. Providing facilities that will allow surveyors to extract survey information (eg marks, observations, parcels, supporting documents) directly from the Landonline database for their own use.
3. Providing facilities that will allow surveyors to import and/or capture survey information directly into the Landonline database as preparation for survey lodgement.
4. Providing facilities that will allow surveyors to pre-validate the survey information they have imported/captured against a set of predefined, automated LINZ business rules as well as providing facilities that support the electronic submission of that information to LINZ for their formal validation and approval.
5. Providing facilities to support the Territorial Authority (TA) approval process including semi-automated generation of images equivalent to Survey Plans and Title Plans.
6. Providing facilities to support the title process through generation of Title Plan images for new title transactions and Title Diagram images for title search copies.
7. Integrating with the Landonline Workspace environment, which will allow surveyors to manage the survey transactions they have initiated in Landonline.
8. Integrating with the existing Landonline Workflow environment, which will allow LINZ to manage any electronically submitted survey transactions.

Further detail about Landonline can be obtained from www.landonline.govt.nz.

2.3 The Survey Approval Process and LandXML

In Landonline Stage One, the surveyor submits a paper plan along with supporting documents to LINZ. The information on the survey plan is used to define land titles, the cadastral network for the area, and is used as the basis for future surveys. Within the Landonline application, a basic plan capture tool is used to electronically capture much of the survey information from a survey plan and store it as structured data. The survey plans and supporting documents are also scanned and stored as images in the Landonline image repository with links to the captured information.

Stage Two will extend the Landonline application to allow surveyors to submit a digital cadastral survey dataset instead of a paper plan. Ideally the surveyor will enter the dataset into their chosen survey software much the same as they do now. That software will then convert the survey into a Landonline compatible survey dataset.

For Landonline the survey exchange format will be based around an XML file. XML (eXtensible Markup Language) is a simple markup language that can be used to store and transfer information between parties. As XML formats are based around non-proprietary plain text files they generally encourage the exchange of data. The diagram below illustrates the flow of data via XML files to and from the Landonline application.

To ensure that minimal work is required by the surveyor after dataset upload, the

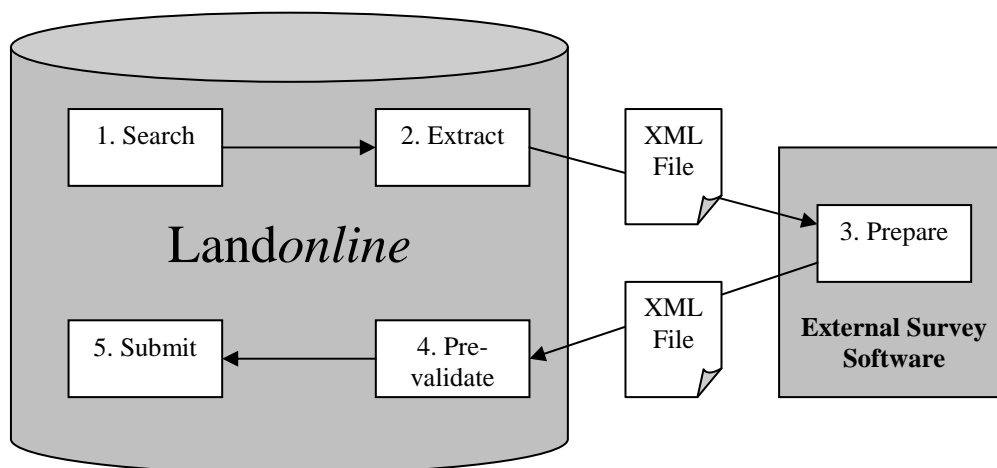


Figure 1 - Data Flow to and from

structure chosen for the dataset format needs to represent the majority of the survey information required by LINZ. The elements and structures of LandXML fulfil this requirement; hence the Landonline application will use LandXML as its transfer format.

LandXML (www.LandXML.org) is an industry driven XML format intended to facilitate the exchange of data during the Land Planning, Civil Engineering and Land Survey Process. Significant progress has been made to incorporate the additional LINZ data requirements in this standard.

2.4 Survey Capture Tool

The goal of digital survey lodgement is for the surveyor to capture the dataset in their chosen survey software and have the ability to pre-validate and submit the dataset with minimal modification in the Landonline environment. LINZ has recognised however that some of the data requirements for Landonline might be difficult for external software providers to incorporate into their own products. To make the Landonline data requirements for the transfer format as flexible as possible, Landonline will provide an online Survey Capture Tool to complement the digital cadastral survey data lodgement process.

The purpose of the Survey Capture Tool is to allow surveyors to complete the capture of digital survey cadastral datasets that are only partially complete when compared with the full set of Landonline survey data requirements. After loading a partially complete dataset, the surveyor will be able to use the tool to capture the additional survey information required by Landonline in order for it to correctly process the survey.

Note that partially complete datasets must still include the LandXML elements and attributes required by Landonline during import.

3. LANDONLINE SURVEY CONCEPTS

This section describes Landonline survey concepts that have affected the way Landonline will use the cadastral survey data provided through LandXML

3.1 Landonline Identifiers

One of the key concepts of Landonline is that Landonline stores an integrated history of survey information. This means that as new surveys are processed through the system, the information from those surveys must be linked into the underlying network information recorded by Landonline. Linking is achieved by assigning the relevant unique identifier that Landonline records for all the entities it supports (eg: nodes, marks, lines, parcels), to matched information from the survey. Once linked, Landonline is able to correctly determine how to integrate the new information from the survey into the underlying networks.

To ensure a streamlined digital lodgement process can be supported with Landonline (and potentially other land related systems), LandXML has been extended to include an oID (official identifier) attribute on some of the survey elements. Digital cadastral survey datasets lodged with Landonline should include oID's where the element matches an entity already recorded in Landonline. For example, CgPoints from the survey that match to nodes in Landonline should include the relevant Landonline node identifier as the oID. Note that the oID to use for the element can be obtained by exporting the relevant entity from Landonline.

Although the use of oID's is encouraged, LINZ have recognised that most external software products are unlikely to be able to support oID's without some modification. For this reason oID's are not a required attribute when importing digital cadastral survey datasets into Landonline. Where oID's are not provided, it will be necessary for the lodging user to use the Landonline Survey Capture Tool to perform the matching process.

3.2 Marks and Nodes

Landonline supports the concept of marks and nodes. Nodes are essentially points in the cadastral network that have known coordinated positions. Marks are usually (see qualification of unmarked marks below) the physical monument (eg: Iron Spike) placed on a node. In LandXML marks are referred to as the more generic term "Monument" while nodes map to "CgPoint".

The reason Landonline distinguishes marks from nodes is that over time a series of survey marks can exist on the same node. From a survey perspective, a survey shows a snapshot of the network. Therefore on a single survey there can only be one mark on a node. This enables Landonline to report the mark that each different survey used on a node.

3.2.1 Unmarked Marks

Surveys often include points on which no monuments have been placed, usually labelled "Unmarked". Landonline records these as "unmarked marks" requiring both a Mark type ("unmarked") and a name (eg. "UNMARKED DP 1234").

In many cases Landonline does not have any information about the mark on a node, in which case it is recorded as a "DCDB" Mark Type with no name. These nodes may or may not have a mark on them in the real world.

Occasionally Landonline creates a node at the intersection of new and existing or underlying lines (eg. stream boundaries). These are required to ensure the preservation of topological relationships. These system-generated nodes are given a mark name of "LOL" (Landonline).

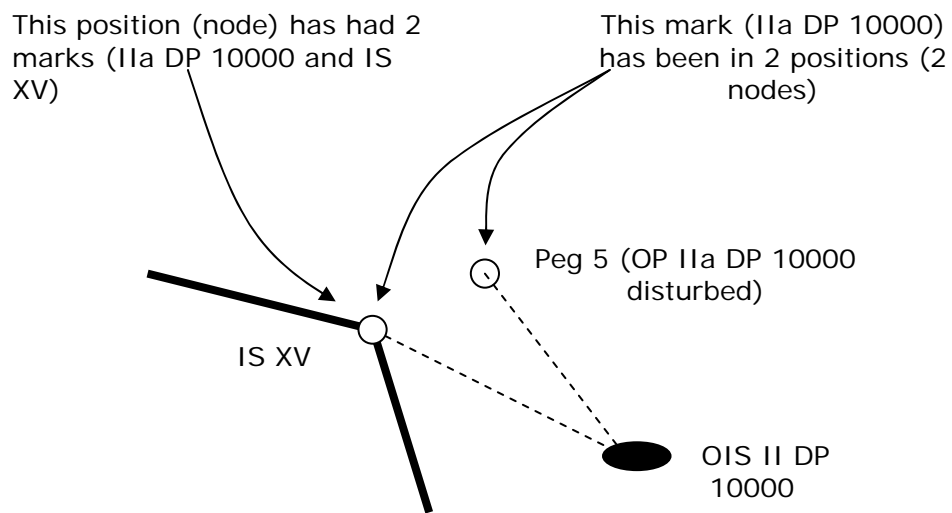
3.2.2 Disturbed Marks and Renewed Marks

An existing mark which is labelled as disturbed will be recorded in Landonline in two positions, the original position and the new disturbed position, in other words there will be two different nodes for the same mark.

A renewed mark will be assumed to be a new mark in the same position as a previous mark so Landonline will record two marks for the same node.

The mark state enumerations are fairly general and it is expected that more detailed information will be provided in the mark description. e.g. IT6 in position of ITIII DP 46325. The surveyor's report will normally provide additional information on the reasons for the disturbance or replacement.

The following diagram illustrates the mark-node relationships for disturbed/replaced marks.



The database retains observations from DP 10000 to the original position (node) for peg IIS, and from the current survey, observations to the disturbed position of IIS and to the position of IS XV

Figure 2 - Disturbed/Replaced Marks

3.2.3 Origins

Previously Landonline implemented "Origins" as defined in the Survey Regulations 1998 (*"A survey must be connected to at least 3 existing survey marks, adequate to prove its reliability, orientation, and scale, ..."*). Marks use to be defined as having a purpose of "Origin". Note that there was no provision for specifying an observed bearing as being the "Origin of Bearings" in Landonline.

Under the new Rules for Cadastral Survey 2010, Origins are no longer required and will not be used in terms of those rules.

3.3 Observations vs Lines

In order for Landonline to effectively represent an integrated history survey information, it has become necessary to distinguish between observations and lines. The main reason for this is that as new survey information is received, the observations do not need to be topologically consistent with the survey information preceding it.

For example, the following diagrams show a progressive subdivision of land. Survey A defines two parcels of land as shown below. The boundary observations for Survey A are shown dashed blue. At this stage, there is a one-to-one relationship between the observations and lines, and either could be used to adequately represent the definition for the parcels.

At some point later, a new survey (Survey B) is completed that splits LOT 1 into three new parcels. The diagram below depicts the new situation. New lines created by Survey B are shown in red, and the observations are shown in green.

The new parcels created by Survey B (Lots 3-5) have a one-to-one relationship between the boundary observations and the lines that define the parcels. However the topological definition for LOT 2 has been forced to change to include I in order to remain topologically consistent with the adjacent parcels (Lot 3 and Lot 5).

If observations were used to represent the definition of Lot 2, it would be necessary to incorporate the observations for Lot 3 (B-I) and Lot 5 (I-E) into Lot 2. The problem here is that Lot 2 was defined on Survey A with a single observation between B-E. To now use two observations to define B-E is disregarding the survey information originally used to define Lot 2 on Survey A.

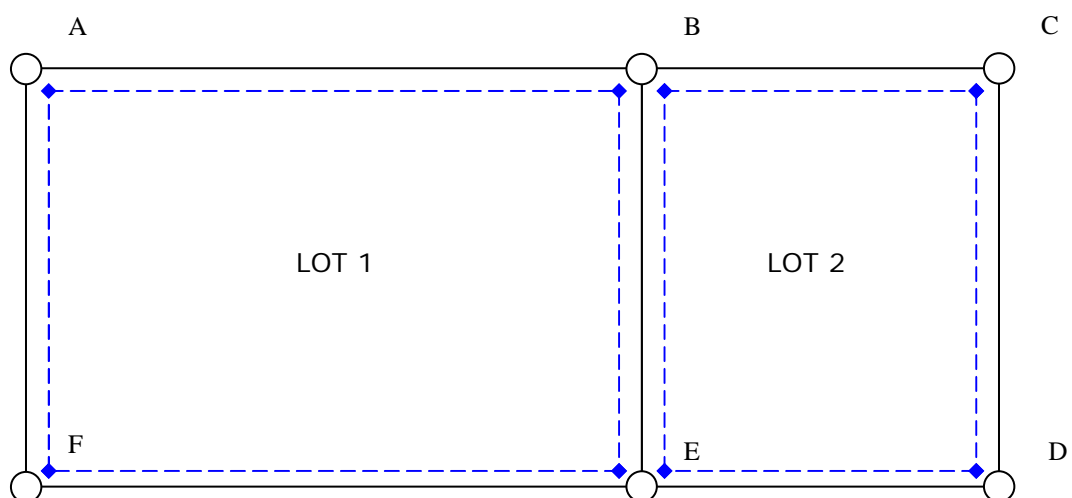


Figure 3 - Survey A

Until such time as Lot 2 is resurveyed, the blue observations remain the legal dimensions (parcel dimensions) of Lot 2.

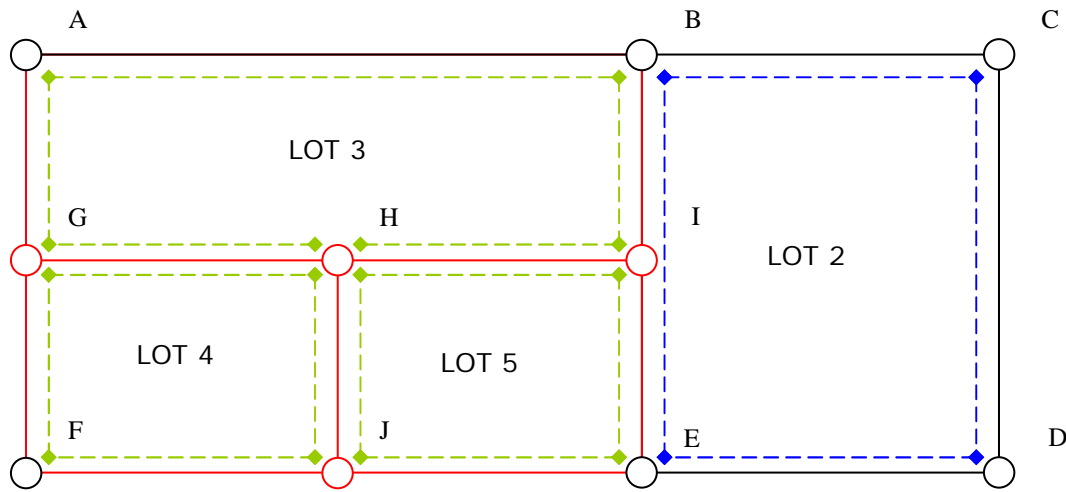


Figure 4 - Survey B

Using lines allows a simple line replacement to occur on Lot 2, with B-E redefined as B-I and I-E. Additionally performing a line replacement in this manner does not disregard or contradict the survey information provided on Survey A as the observation between B-E on Survey A is still valid for Lot 2.

Survey C shows yet a further complication to this scenario where Lot 3 has been subdivided to create lots 6 and 7. Observations are shown orange, new lines shown in light blue.

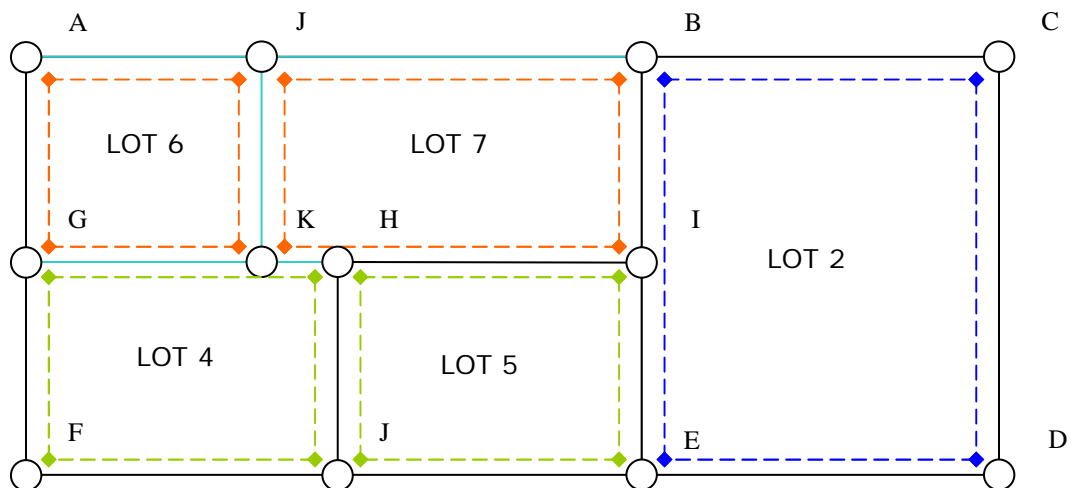


Figure 5 - Survey C

In this situation the surveyor may only provide a dimension observation from I-K, despite there being another node shown. Good practice might suggest that I-H and H-K are required, however current practice is to not always require this. In this case, it is not possible to use the green and orange observations to define topologically consistent parcels for Lots 4 and 7.

From this example, it is possible to derive the Landonline definitions for observations and lines:

- Observations are the dimensions between two nodes. Note that boundary dimensions come within the definition of “observations” even when they have been calculated rather than directly observed.
- Lines represent the connectivity between nodes. Two nodes connected by a line are considered to be adjacent. Lines form the basis of Parcel Topology.

By separating observations from lines, Landonline has been able to maintain coherent and consistent topology networks as new survey information is added.

3.3.1 Parcel Topology

Parcel Topology describes how boundary nodes and lines are connected to form parcels. This includes identifying the sequence in which lines are connected to create parcels as well the relationships between parcel rings forming donut and multi-polygon parcels.

3.3.2 Constraints for Parcel Topology and Lines

Landonline enforces some constraints with regard to parcel topology and lines. The constraints applicable to LandXML are listed here for reference:

- There must be a minimum of 2 nodes to define a parcel. This includes parcels defined completely by irregular lines.
- Only 1 straight line can exist between two nodes. Note that multiple arc and/or irregular lines can exist between two nodes if they have differing properties (eg: different radius, or different shape for irregular lines as in Figure 7).

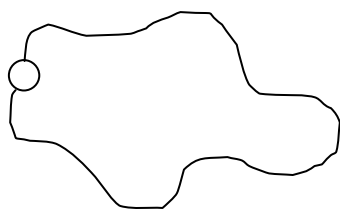


Figure 6 - Invalid Parcel Topology

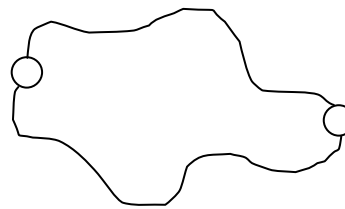


Figure 7 - Valid Parcel Topology

3.3.3 Parcel Dimensions

As described above, Landonline does not use observations to define the topology of parcels, however it does use observations to show the legal dimensions (ie: parcel dimensions) of the parcel. The legal dimensions for a parcel are identified when the parcel is initially surveyed. Changing the dimensions on one side of a boundary line does not over-ride the legal dimensions on the other side of the line until that parcel is re-surveyed.

Consider Survey B above after it is approved. The legal dimensions for Lot 2 would consist of the observations from Survey A, ie: B-C, C-D, C-E and E-B. However, the legal dimensions for Lot 3 would be A-B, B-I, I-H, H-G, G-A and the legal dimensions of Lot 5 would be J-H, H-I, I-E, E-J.

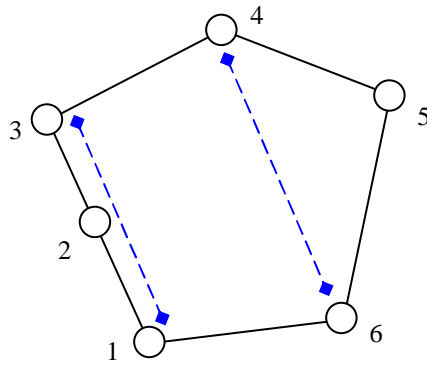


Figure 8 - Parcel Dimensions

The example above illustrates that observations classified as parcel dimensions can be between non adjacent nodes in a parcel, eg: observation 1-3. It is important to note however that not all dimensions between nodes in a parcel are parcel dimensions, eg: 4-6 is not a parcel dimension.

3.4 Topology Layers

3.4.1 Parcel Topology Layers

Landonline differentiates parcel topology into seven categories known as parcel topology layers. The topology layer a parcel belongs to is dependent on the type or intent of the parcel. Each layer has a different set of features and is subject to different topology rules. The following table outlines the parcel topology layers of Landonline, describing the topology rules applicable to each layer. The table also provides examples of parcels that belong to each layer.

Layer	Rules	Examples
No Topology	No Topology parcels are not spatially defined and therefore cannot be shown spatially. They are not subject to any topology rules.	Area, Principal Unit, Unit, Accessory Unit
Primary	Primary parcels: 1. Cannot overlap other primary parcels. 2. Must share boundary topology with abutting primary parcels to ensure no topological gaps occur (eg: "slivers"). 3. Creation of new primary parcels must coincide with extinguishing one or more existing primary parcels (ie: to ensure no overlaps).	Lot, Section, Road, River, Sea
Secondary	Non Primary parcels: 1. Must be wholly contained within a primary parcel (ie: cannot cross primary parcel boundaries). 2. Can only overlap other non primary parcels with a topology class of 'Tertiary' 3. Creation of new non primary parcels in this topology class must coincide with extinguishing one or more existing non primary parcels (only where they are spatially defined and are affected by the new non primary parcel)	Easement, Covenant, Mining

Layer	Rules	Examples
Tertiary	<p>Non Primary parcels:</p> <ol style="list-style-type: none"> 1. Can overlap more than one primary parcel (only applicable if it's an existing balance non primary parcel) 2. New non primary parcels in this topology class must be contained wholly within a primary parcel (ie cannot cross primary parcel boundaries) 3. Can only overlap other non primary parcels with a topology class of 'Secondary'. 4. Creation of new non primary parcels, in this topology class, must coincide with extinguishing one or more existing non primary parcels (only where they are spatially defined and are affected by the new non primary parcel). 	Easement, Covenant, Mining
Secondary Centreline	<p>Non Primary Centreline parcels:</p> <ol style="list-style-type: none"> 1. Cannot form closed rings. 2. Must be wholly contained within a primary parcel (ie: cannot cross primary parcel boundaries). 3. Can only overlap other non primary parcels with a topology class of 'Tertiary' 	Centreline Easement
Tertiary Centreline	<p>Tertiary Centreline parcels:</p> <ol style="list-style-type: none"> 1. Cannot form closed rings. 2. Can overlap more than one primary parcel. (only applicable if an existing balance centreline parcel) 3. New Non Primary Centreline parcels must be wholly contained within a primary parcel (i.e cannot cross primary parcel boundaries) 4. Can only overlap other non primary parcels with a topology class of 'Secondary' 	Centreline Easements
Strata	<p>Strata parcels:</p> <ol style="list-style-type: none"> 1. Can only overlap non primary parcels with a topology class of 'Secondary' and 'Tertiary' 2. Must be wholly contained within a primary parcel (i.e cannot cross primary parcel boundaries) 	Tunnels, Bridges, Strata Estates

3.4.2 Multi-Layer Lines

Parcels can only belong to one parcel topology layer, however individual lines can belong to more than one topology layer. Examples of lines that belong to more than one topology layer are:

- where an easement butts up against a primary boundary, the line segment is both primary and secondary
- where a strata parcel butts up against a primary parcel, the line segment is both primary and strata
- where an easement butts up against a mining parcel that covers several primary parcels, the line segment could be secondary and tertiary or primary, secondary and tertiary

3.4.3 Traverse Layer

Landonline uses the traverse layer for lines that have a spatial definition (are plotted), but do not form parcel boundaries. Examples of lines that belong to the traverse layer are:

- survey traverse lines (not on the boundary)
- observation only lines (bearing control)
- pegging ties

- natural boundary fixes
- adopted Traverses
- adopted boundary lines that are not part of the land under survey (these are specified as traverse on a new survey so that Landonline does not try to include the lines in a new survey parcel.)

3.5 Observation Accuracy

Observation accuracy information is important to Landonline because the accuracy information is used to help calculate the new position of nodes during adjustment. Ideally observation accuracy would be determined based on the calibration of the equipment used to conduct the observation. Specific observation accuracy information is usually not provided on paper plans, and during the development of Stage One of Landonline it quickly became evident that recording a large amount of equipment type information simply for the purpose of determining observation accuracy would not be practical.

For this reason Landonline uses a generalised method for determining appropriate observation accuracy based on several factors:

- the generalised type of equipment used to conduct the observation
- the class of the observation
- the purpose (eg: prm, boundary defined by survey) of local and remote setups
- the length of the observation

LandXML does support observation accuracy through its observation elements, however Landonline will continue to calculate observation accuracy information for digital cadastral survey datasets in the short term. Future enhancements are expected which will allow Landonline to use the accuracy information provided through LandXML. For future reference, those products supporting observation accuracy should note that Landonline uses a least squares adjustment method, therefore if accuracy information is provided, it must be non zero.

3.6 Parcel Appellations

A Parcel Appellation is essentially the name assigned to a parcel, although due to historical reasons, it is not necessarily unique. Appellations generally conform to a certain structure, the most common format of all New Zealand Parcel Appellations is <Parcel Type> <Parcel Number> <Plan Type> <Plan Number> eg: Lot 1 DP 1000. There are a large number of different appellation formats and to assist processing Landonline has grouped these into three main types:

- General – common appellation formats that have a well defined structure. This covers the simple type discussed above but also a wide range of other more complex appellations which can, nevertheless, be accommodated within a standard structure
- Maori – appellation formats specifically for parcels created on Maori lands
- Other – appellation formats that are not commonly used and/or cannot be easily structured (usually stored as single text strings)

To simplify processing of digital cadastral survey datasets, Landonline will expect the appellations of parcels created on digitally lodged surveys to be compatible with the common appellation format described above (ie: <Parcel Type> <Parcel Number> <Plan Type> <Plan Number>). If this common appellation format is not appropriate for the new parcel, then it will be necessary for the lodging user to specify the appellation for the parcel using the Landonline Survey Capture Tool. Note the use of appellations of the type "Other" should generally be limited to situations where reference is made to an existing parcel where the type is "Other".

3.6.1 Parcel Appellations and Legal Descriptions

Parcel Appellations should not be confused with Legal Descriptions. A Parcel Appellation is a name that is assigned to a single parcel, eg: Lot 1 DP 1000. A Legal Description describes parcels that relate to a single title. A Legal Description can cover one or more parcels, eg: Lots 1, 2 & 3 DP 1000.

In some cases, even where there is only one parcel in a title, the wording in the title's legal description may differ from the parcel appellation for historical reasons.

In these cases, the parcel will have both a legal description and a parcel appellation until such time as a new title is issued which resolves this difference.

3.7 Coordinate Geometry Resolution

Within the Landonline database, coordinates are stored with high precision numeric values. A specialised geometric representation of the coordinate is also generated for graphical display and is stored with an accuracy of 2mm. When data is imported into Landonline it is important that any coordinate geometry (eg: lines and/or parcels) do not include line definitions with a delta x or delta y of less than 2mm as these could cause geometry to cross when reduced to a 2mm accuracy.

3.8 Observation Based System vs Coordinate Based System

Landonline fundamentally supports an observation based survey system. The observations provided by surveys are added to the database and are used by Landonline to generate coordinates (usually by least squares adjustments). If there are any changes made to the higher order framework (eg. geodetic trig coordinates are changed), the survey observations can be used to generate new coordinates for lower order marks.

Consequently coordinates that are held in Landonline do not provide a permanent definition of position. However at a point in time the coordinates are expected to be in terms of neighbouring marks and the local control framework. Observations made by surveyors between such marks should fit within the coordinates the surveyor extracts from Landonline (within appropriate accuracy and survey limits etc.), and also within the coordinates that may be different in Landonline once the survey is lodged.

The coordinates that are provided by the surveyor are helpful in initially locating the marks within Landonline. However after Approval of the survey they are superseded by new coordinates generated within Landonline by readjustment in terms of the local cadastral and geodetic frameworks.

Note that this readjustment, while it changes the current coordinates of points in Landonline, does not change the observation provided by the surveyor. These remain in the database, even after later re-survey and re-observation of the same line. If a new survey conflicts with existing observations, the older observations may be removed from adjustments or given lesser weight but all observations are retained in the database. Therefore, while a point in Landonline only has one authoritative NZGD2000 coordinate at any one time (previous coordinates are "decommissioned" but retained for historical purposes) an observed line can have many different authoritative observations at the same time.

Observations (typically bearings and distances) must be recorded to every node in Landonline to enable it to be co-ordinated by an adjustment.

3.9 Coordinate Systems

In Landonline, a Coordinate System is principally used for classifying types of coordinates. A Coordinate System is made up of a datum (e.g. NZGD2000) and a coordinate type (e.g. latitude and longitude). For cadastral surveys the coordinate systems are either:

- Meridional Circuits in terms of a series of plan datums – Old Cadastral Datum (OCD)
- Transverse Mercator Meridional Circuits in terms of New Zealand Geodetic Datum 1949 (NZGD49);
- Transverse Mercator Meridional Circuits in terms of New Zealand Geodetic Datum 2000 (NZGD2000); or
- in special cases, New Zealand Map Grid (NZMG).

A Meridional Circuit is a defined area in which cadastral survey coordinates and bearings (azimuth's) are expressed relative to an initial station and a corresponding central meridian respectively.

The Old Cadastral Datum (OCD) coordinates systems were established prior to the advent of NZGD49. These are "plane" coordinate systems with no formal mathematical projection to account for the curvature of the earth. A series of 28 OCD Meridional Circuits were set up across the country although in some areas, there are also other very localised OCD coordinate systems based on a local trig.

Following the introduction of NZGD49, a set of geodetic Meridional Circuit coordinate systems were introduced based on the same coverage as the OCD Meridional Circuits. There are 29 Transverse Mercator projections (including Chatam Islands) across the country with a specified central meridian, scale factor and false origin. The more recent introduction of NZGD2000 was accompanied, for cadastral survey purposes, by a set of 29 new coordinate systems, covering the same meridional circuits, in terms of the new datum. NZMG is a special purpose map projection - principally used for mapping but also used for some cadastral surveys of large extent where cadastral or topographic mapping data has been used as a base for presentation of the survey.

All the coordinates on a cadastral survey will be in terms of the same coordinate system which should be specified. The coordinate system for coordinates can be specified in the LandXML element.

For cadastral surveys in Landonline the coordinate system also serves a second purpose – namely identifying the projection of the bearings (azimuths in LandXML). In most cases, this will be the same as the coordinate system of the coordinates. However it is possible to have a "mixed datum" survey in which the bearings (azimuths) are in terms of, say, a geodetic meridional circuit projection, but the coordinates are in terms of, say, Old Cadastral Datum. This has occurred in the past where it was easier to establish geodetic bearing (azimuth) control over long distances, than to establish a geodetic coordinate origin.

The coordinate system is specified in the Survey Header element and applies to all the projection bearings (azimuths) on the survey. Note that specifying the coordinate system in the Survey Header element does not substitute for the Coordinate System sub-element in the LandXML element. If it is specified in the Survey Header element only, the coordinate system of the bearings (azimuths) will be known but the coordinate system of any coordinates supplied will not be known.

3.9.1 Transforming Coordinates between Coordinate Systems in Landonline

Landonline supports coordinate transformations between most Landonline coordinate systems. However, coordinate transformations are not available to or from OCD coordinate systems. OCD coordinate systems are local coordinate systems developed by plane surveying without taking account of the curvature of the earth. As such they have no consistent mathematical relationship with geodetic coordinate systems. It would be possible to empirically define a transformation between OCD and geodetic coordinates (for example using a transformation grid), although the inconsistent nature of the OCD coordinate systems would limit the accuracy that this could achieve. As a result, authoritative transformations between OCD systems and the New Zealand Geodetic Datum's have not been developed.

3.10 Adopted Azimuth Corrections

"Azimuth" is the LandXML term for what is generally referred to as a "bearing" on a New Zealand cadastral survey. All azimuths (bearings) on a Landonline survey must be in terms of the same coordinate system, e.g. a Meridional Circuit. Where a survey has adopted azimuths from a previous survey that is in terms of a different coordinate system a correction factor is usually applied (eg. *"bearings adopted from DP 1234 (Old Cadastral) have been corrected by -2' 30" to bring in terms of NZGD2000"*). Where Landonline already holds a record of the azimuth from a previous survey (on a different coordinate system – Old Cadastral Datum in this example), it will apply this adoption factor before validating that the azimuth from the new survey correctly matches the existing.

The factor is applied in the sense that it is added to the original value:

$$\text{Original azimuth} + \text{Correction Factor} = \text{Azimuth on Survey}$$

The LandXML schema also includes an Adopted Distance Factor, which enables scaling of an adopted distance by multiplying the original distance by the factor (e.g. 1.0002). This technique (which requires measured proof of systematic scale distortion) is very rarely used on New Zealand cadastral surveys and will not be supported in Landonline Stage Two. If a surveyor believes that use of a distance scale factor is appropriate, the distances should be described as "calculated" and the justification for this included in the survey report.

4. LANDXML ELEMENTS APPLICABLE TO LANDONLINE

The diagram below illustrates the LandXML schema elements that will be utilised by Landonline for the import and export of cadastral information. Further description of how Landonline will use these elements and their attributes is presented in the following sections.

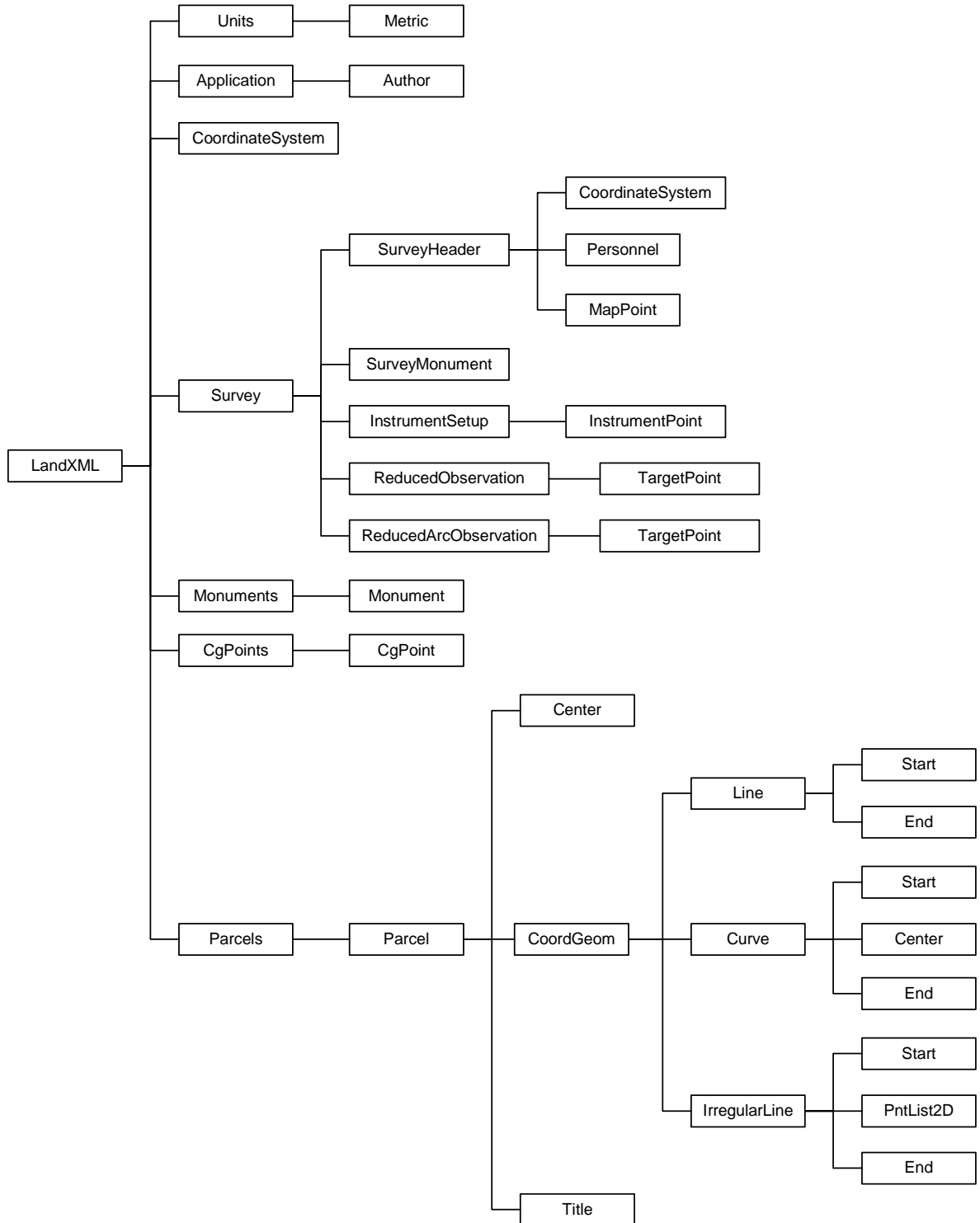


Figure 9 - LandXML Elements Utilised by Landonline

4.1 Import Codes

Import codes have been assigned to each LandXML element and attribute described by this document to indicate the importance of the element/attribute to Landonline when importing a digital cadastral survey dataset. The import code will be one of:

Import Code	Name	Description
NI	Not Imported	Landonline will not use or record information contained by the element or attribute. If the element or attribute is populated, Landonline will ignore that information. Note that the element or attribute may still be required for a valid LandXML file.
Op	Optional	Landonline does not require the information described by the element or attribute to load the XML file, however it will record that information if it exists. Generally Landonline will provide tools to add or edit optional information once the XML file has been loaded.
Rm	Recommended	Landonline does not require the information described by the element or attribute to load the XML file, however if provided this information will allow Landonline to perform additional automated processing of the digital cadastral survey dataset. The purpose of the additional automated processing is to minimise the number of manual edits the lodging user would otherwise have to perform before the digital cadastral survey dataset could be formally submitted to LINZ for validation and approval.
CR	Conditionally Required	The information described by the sub element or attribute is required if certain conditions are met. Refer to the Import Comments for the element/attribute for further detail.
R	Required	The information described by the element or attribute must be provided before Landonline can correctly load the XML file. Note that partially complete datasets must at a minimum include all required elements and attributes.

4.2 Export Codes

Export codes have been assigned to each LandXML element and attribute described by this document to indicate the information Landonline will provide when exporting cadastral information. The export code used will be one of:

Import Code	Name	Description
NP	Not Populated	Landonline will not populate the element or attribute
PE	Populated if Exists	Landonline will populate the element or attribute if that information is recorded in Landonline.
CP	Conditionally Populated	Landonline will populate the element or attribute if certain conditions are met. Refer to the Export Comments of the element/attribute for further detail.
P	Populated	Landonline will always populate the element or attribute.

4.3 Application

This element contains details relating to the software that produced the file. This element will be populated with details relevant to Landonline when Landonline produces a file. These details are not required by Landonline during import, however it is expected that details relevant to the software/company that produced the file will be provided.

4.4 Sub Elements

Sub Element	Description	I Code	Import Comment	E Code	Export Comment
Author	Describes details relevant to the author of the XML file.	NI		P	Will contain details relevant to Landonline.

4.4.1 Attributes

Attribute	Description	I Code	Import Comment	E Code	Export Comment
name	The name of the software that produced the XML file.	NI	Note that this attribute is required by the LandXML schema.	P	Will contain "Landonline".
desc	Short description of the software that produced the XML file.	NI		P	Will contain a short description of Landonline.
manufacturer	The name of the manufacturer that produced the software.	NI		P	Will contain "Land Information New Zealand"
version	The version number of the software that produced the XML file.	NI		P	Will contain the relevant Landonline version number.
manufacturerURL	The URL of the manufacturer.	NI		P	Will contain www.linz.govt.nz

4.5 Center

The Center element defines the location of the radius point of an arc, the centroid of a parcel, or the center of a pipe network structure. It is defined by either a space delimited coordinate text value or a CgPoint number reference using the pntRef attribute.

Landonline will use this element to indicate the label point for a parcel and/or the radius point of an arc.

4.5.1 Attributes

Attribute	Description	I Code	Import Comment	E Code	Export Comment
desc	A description for the center point.	NI		NP	
name	The name of the center point.	NI		NP	
code	The code for the center point.	NI		NP	
state	The state of the center point.	NI		NP	
pntRef	A reference to a CgPoint	CR	Must be provided if a northing/easting text value is not provided for the Center element. The preferred representation for a Center element is a northing/easting text value rather than a CgPoint reference.	NP	Landonline will always provide a northing/easting text value for the Center element.
pointGeometry	Flag to indicate if the center is a point or a curve.	Op	It is assumed the center will be a point unless specified otherwise.	P	Always 'point'
DTMAttribute	Digital Terrain Model Attribute.	NI		NP	

4.6 CgPoint

A coordinate geometry (COGO) point element. The point is identified by the name attribute and the value will be northing/easting or northing/easting/elevation.

Landonline refers to CgPoints as Nodes. Nodes will be exported from Landonline with northing/easting values. See section 3.2 for further information about Landonline Nodes.

4.6.1 Attributes

Attribute	Description	I Code	Import Comment	E Code	Export Comment
name	The name of the CgPoint. This must uniquely identify the CgPoint in the file. Other point elements may use this attribute to refer to the CgPoint.	R	This value should equal the monument pntref="". If the file does not contain a Monument element for the CgPoint, this value will be used as the mark name in Landonline.	P	This attribute will contain the same value as the oID. ie: the Landonline unique identifier for the node.

Attribute	Description	I Code	Import Comment	E Code	Export Comment
oID	Official Identifier. The Landonline unique identifier for the node. This will be an integer number.	Rm	If the CgPoint relates to a node that already exists in Landonline, then the oID should be supplied. If this oID is supplied so should the monument oID. If this is a new CgPoint defined by the survey, the oID should be omitted.	P	
surveyOrder	The Landonline order for the associated node. The order indicates the accuracy of a node coordinate within a datum.	NI	Landonline will assign an appropriate order to all nodes it creates.	P	
pntSurv	Indicates the survey point type.	Op		P	Always 'Monument'.
zoneNumber	The zone number for the CgPoint	NI		NP	
role	The role of the CgPoint	NI		NP	
code	The code for the CgPoint.	NI		PE	Populated with the geodetic node code if one exists.

4.7 CgPoints

This element is a collection of COGO point elements. Each point is described by a CgPoint element. All COGO points may exist in a single CgPoints element, or they could be separated into multiple CgPoints elements using any combination of the name, desc and state attributes to uniquely identify the different collections.

4.7.1 Sub Elements

Sub Element	Description	I Code	Import Comment	E Code	Export Comment
CgPoint	Identifies one or more CgPoint elements.	R		P	Every file extracted from Landonline will include CgPoint elements.

4.7.2 Attributes

Attribute	Description	I Code	Import Comment	E Code	Export Comment
desc	The description of the CgPoints	NI		NP	
name	The name of the CgPoints	NI		NP	
state	The state of the CgPoints.	NI		NP	
code	The code for the CgPoints	NI		NP	

Attribute	Description	I Code	Import Comment	E Code	Export Comment
zoneNumber	A zone number for the CgPoints	NI		NP	
DTMAttribute	Digital Terrain Model Attribute	NI		NP	

4.8 CoordGeom

Defines a collection of lines, curves(arcs) and spirals. It is used by the Parcel and Alignment element's to define the object's geometry.

The CoordGeom element can also exist off the root LandXML element to define a collection of geometry for a type of data that is not explicitly described by the schema. The location points on the geometry elements, such as the line start and end or curve radius point, can either be indicated using the actual "northing easting" values for the significant points on the geometry, or it can be defined by references to CgPoint elements in the CgPoints collection. With Parcels and Alignments, the order of the geometry elements is important. They should be listed in the order that they occur as the parent object is traversed. The End point coordinates of each element should be the same as the Start point of the next element.

4.8.1 Sub Elements

Sub Element	Description	I Code	Import Comment	E Code	Export Comment
Line	Identifies one or more lines elements that make up the coordinate geometry.	CR	Required unless the coordinate geometry of the parcel is entirely defined by irregular lines and/or arcs	PE	Populated if one or more lines form part of the coordinate geometry of the parcel.
IrregularLine	Identifies one ore more irregular lines elements that make up the coordinate geometry.	CR	Required if there any irregular lines that form part of the coordinate geometry of the parcel.	PE	Populated if one or more irregular lines form part of the coordinate geometry of the parcel.
Curve	Identifies one or more curve elements that make up the coordinate geometry	CR	Required if there any arcs that form part of the coordinate geometry of the parcel.	PE	Populated if one or more arcs form part of the coordinate geometry of the parcel.
Spiral	Identifies one or more spiral elements that make up the coordinate geometry	NI		NP	Landonline does not support spiral coordinate geometry.

4.8.2 Attributes

Attribute	Description	I Code	Import Comment	E Code	Export Comment
desc	A description for the coordinate geometry.	NI		NP	
name	The name of the coordinate geometry.	Rm	Will be used as a reference from the Reduced Observation coordGeomRefs attributes to indicate parcel dimension relationships.	P	
state	The state of the coordinate geometry.	NI		NP	

4.9 CoordinateSystem

Associates the relationship between datum and coordinate type and can be a reference to an OpenGIS coordinate system or include the XML description of an OpenGIS coordinate system.

This element is a sub element of both the LandXML element and the SurveyHeader element. As a sub element of LandXML, CoordinateSystem describes the coordinate system used to represent all coordinates in the file. As a sub element of SurveyHeader, CoordinateSystem describes the specific coordinate system the survey was completed in. In particular this element provides a reference system for the azimuths (bearings) on that survey.

Landonline recognises the following coordinate systems:

- Transverse Mercator Meridional Circuits projected from the geographic coordinate systems New Zealand Geodetic Datum 2000 (NZGD2000) and New Zealand Geodetic Datum 1949 (NZGD1949)
- New Zealand Map Grid (NZMG)
- Local New Zealand spatial coordinate systems referred to as Old Cadastral Datum circuits or OCD. Note that Landonline is not able to transform coordinates to or from OCD systems.

All coordinated points recorded by Landonline have a coordinate in the NZGD2000 geographic coordinate system. During export, users will have the opportunity to transform coordinates to one of the projected coordinate systems in NZGD2000 or NZGD1949. For import, coordinates should be provided in one of the NZGD2000 or NZGD1949 projected coordinate systems.

4.9.1 Sub Elements

Sub Element	Description	I Code	Import Comment	E Code	Export Comment
Start	The origin of the coordinate system	NI		P	Will be the coordinate assigned to the circuit origin eg: for NZGD 2000 circuits, 800000mN and 400000mE

4.9.2 Attributes

Attribute	Description	I Code	Import Comment	E Code	Export Comment
rotationAngle	Not applicable to Landonline	NI		NP	
datum	Not applicable to Landonline	NI		NP	
horizontalDatum	Not applicable to Landonline	NI		NP	
verticalDatum	Not applicable to Landonline	NI		NP	
ellipsoidName	Not applicable to Landonline	NI		NP	
fittedCoordinateSystemName	Not applicable to Landonline	NI		NP	
horizontalCoordinateSystemName	Not applicable to Landonline	NI		NP	
compoundCoordinateSystemName	Not applicable to Landonline	NI		NP	
localCoordinateSystemName	Not applicable to Landonline	NI		NP	
geographicCoordinateSystemName	Not applicable to Landonline	NI		NP	
projectedCoordinateSystemName	Not applicable to Landonline	NI		NP	
geocentricCoordinateSystemName	Not applicable to Landonline	NI		NP	
verticalCoordinateSystemName	Not applicable to Landonline	NI		NP	
desc	Description of the coordinate system.	Rm		P	Will contain the common name for the coordinate system.

Attribute	Description	I Code	Import Comment	E Code	Export Comment
name	The name of the coordinate system	Rm	If 'desc' is supplied then 'name' is required. This must be populated with a code recognised by Landonline. Refer to Appendix A for a list of coordinate system codes recognised by Landonline.	P	Will contain a unique code that will identify the coordinate system in Landonline.

4.10 Curve

Defines the properties of a curve in a CoordGeom collection.

The Start, Center and End elements along with the "rot" attribute define the curve Geometry. The "rot" attribute indicates whether the curve goes clockwise or counter-clockwise about the Center point from the Start to the End. The name, desc and state attributes can be used to provide additional information about the curve. The remaining attributes are only used to report geometric information about the curve. They should never be used as the source information to reproduce the curve geometry. These attributes are only included in the output if the file is to be used by a reporting mechanism, such as an XSL style sheet, that is not able to directly calculate these values from the base geometry properties.

Landonline will use curves to describe arcs that form part of the coordinate geometry for a parcel.

4.10.1 Sub Elements

Sub Element	Description	I Code	Import Comment	E Code	Export Comment
Start	The start point for the curve.	R	The preferred representation for a start point is as a reference to a CgPoint.	P	Will be a reference to a CgPoint.
Center	The centre point for the curve.	NI	Landonline does not record the centre point for an arc. The radius information will need to be provided in a ReducedArcObservation element.	P	Landonline does not record the centre point for an arc. The centre will be calculated during export and will be represented as a northing/easting value of the Center element.
End	The end point for the curve.	R	The preferred representation for an end point is as a reference to a CgPoint.	P	Will be a reference to a CgPoint.
PI	Point of Intersection.	NI		NP	

4.10.2 Attributes

Attribute	Description	I Code	Import Comment	E Code	Export Comment
rot	The rotation of the curve (clockwise or counter clockwise).	R		P	
chord	The length of the chord	NI		NP	
crvType	The type of curve definition	NI		NP	
delta	The delta angle for the curve in radians	NI		NP	
desc	A description for the curve	NI		NP	
dirEnd	The end direction for a Curve, in radians with East = 0 rad, measured counter-clockwise.	NI		NP	
dirStart	The start direction for a Curve, in radians with East = 0 rad, measured counter-clockwise.	NI		NP	
external	Not applicable to Landonline	NI		NP	
length	Not applicable to Landonline	NI		NP	
midOrd	Not applicable to Landonline	NI		NP	
name	A name for the curve	NI		NP	
radius	The radius of the curve. The radius can also be determined by the distance between the Start and the Center.	NI		NP	
staStart	Not applicable to Landonline				
state	The state of the curve	NI		NP	
tangent	Not applicable to Landonline	NI		NP	
oID	Official Identifier. The Landonline unique identifier for the arc. This will be an integer number.	Rm	If the curve relates to an arc that already exists in Landonline, then the oID should be supplied. If this is a new arc defined by the survey, the oID should be omitted.	P	

4.11 InstrumentSetup

Defines details relating to the instrument setup.

4.11.1 Sub Elements

Sub Element	Description	I Code	Import Comment	E Code	Export Comment
InstrumentPoint	Identifies the coordinate position of the setup.	R	The preferred representation for an instrument point is as a reference to a CgPoint.	P	Will be a reference to a CgPoint.
Backsight	Not applicable to Landonline	NI		NP	
TargetSetup	Not applicable to Landonline	NI		NP	
RawObservation	Not applicable to Landonline	NI		NP	
ObservationGroup	Not applicable to Landonline	NI		NP	
ControlObservations	Not applicable to Landonline	NI		NP	

4.11.2 Attributes

Attribute	Description	I Code	Import Comment	E Code	Export Comment
id	A reference identifier to the instrument setup	R		P	Will be a number that uniquely identifies the InstrumentSetup in the file.
instrumentDetailsID	Not applicable to Landonline	NI		NP	
stationName	Not applicable to Landonline	NI		P	Will be populated similarly to the Monument name attribute.
instrumentHeight	Not applicable to Landonline	NI		P	Always 0.
orientationAzimuth	Not applicable to Landonline	NI		NP	
circleAzimuth	Not applicable to Landonline	NI		NP	

4.12 IrregularLine

Defines an irregular line or natural boundary feature of a survey. Examples of irregular line features include river banks and shore line. All lines in Landonline must start and end on a node (ie: CgPoint). Lines that contain more than one line segment between the start and end nodes are treated as irregular lines.

4.12.1 Sub Elements

Sub Element	Description	I Code	Import Comment	E Code	Export Comment
Start	The starting point for the irregular line.	R	The preferred representation for a start point is as a reference to a CgPoint.	P	Will be a reference to a CgPoint.

Sub Element	Description	I Code	Import Comment	E Code	Export Comment
End	The end point for the irregular line.	R	The preferred representation for an end point is as a reference to a CgPoint.	P	Will be a reference to a CgPoint.
PntList2D	A sequential space delimited list of 2D coordinates with a minimum of 2 points (4 values). The list must include the start and end points.	CR	Required if PntList3D is not populated. The preferred representation for the Point List is 2D.	P	
PntList3D	A sequential space delimited list of 3D coordinates with a minimum of 2 points (6 values). The list must include the start and end points.	CR	Required if PntList2D is not populated. The preferred representation for the Point List is 2D, however if PntList3D is provided, the height dimension will be discarded.	NP	

4.12.2 Attributes

Attribute	Description	I Code	Import Comment	E Code	Export Comment
desc	Description of the irregular line.	NI		NP	
dir	Not applicable to Landonline	NI		NP	
length	Not applicable to Landonline	NI		NP	
name	The name of the irregular line.	NI		NP	
staStart	Not applicable to Landonline	NI		NP	
state	The state of the irregular line.	Op		P	Always populated with 'Existing'
oID	Official Identifier. The Landonline unique identifier for the irregular line. This will be an integer number.	Rm	If the irregular line relates to an irregular line that already exists in Landonline, then the oID should be supplied. If this is a new irregular line defined by the survey, the oID should be omitted.	P	Populated.

4.13 LandXML

LandXML is the base element of the LandXML schema. It contains all of the elements and attributes that comprise the LandXML data. Note that only elements relevant to the Survey portion of the schema have been described here.

4.13.1 Sub Elements

Sub Element	Description	I Code	Import Comment	E Code	Export Comment
Units	The units relevant to the information contained by the file.	R	Landonline will expect linear units to be metric metres.	P	Landonline will use metric metres as its linear units.
CoordinateSystem	The coordinate system used to represent all coordinates in the file.	Rm	If the coordinate system is not included in the file, the lodging user will need to specify which coordinate system to use for the survey in Landonline before loading the file.	P	
Application	Description of the software that produced the file.	NI		P	
Survey	Identifies information relevant to a survey.	R	Landonline will expect 1 survey element in the file.	CP	This sub element may not be populated if users choose to extract from Landonline by area.
Monuments	The list of monuments relevant to the CgPoints contained by the file.	Rm	Monuments (ie: Marks) should be identified for each of the CgPoint elements in the file.	P	
CgPoints	The list of COGO points relevant to the area of data and/or survey(s) contained by the file.	R		P	
Parcels	The list of parcels relevant to the area of data and/or survey(s) contained by the file	R	The parcels listed should be relevant to the survey being imported into Landonline.	CP	This sub element will not be populated if users chooses to omit parcel information when they extract cadastral information from Landonline.

4.13.2 Attributes

Attribute	Description	I Code	Import Comment	E Code	Export Comment
date	The date the file was created	NI		P	
time	The time the file was created	NI		P	
version	The version of the LandXML schema the file complies with	R	Landonline will check this value to verify if it supports the version of the LandXML schema used to produce the file.	P	Landonline will support versions 1.0, 1.1 and 1.2 of the LandXML schema.
language	The language of the file.	NI	Landonline will not recognise files unless they use "English"	P	Defaulted to "English"

Attribute	Description	I Code	Import Comment	E Code	Export Comment
readOnly	Indicates if the file should be treated as read only or modifiable.	NI	Landonline will not modify the files used to import survey information into Landonline.	P	Defaulted to "true". Cadastral information extracted from Landonline is provided as reference information only. It is expected external products will be able to a manipulate the extracted data and produce new files for import into Landonline.
landXMLId	Number identifying the LandXML file.	NI		P	Populated with a number that uniquely identifies the extract in Landonline.
crc	The crc number for the schema.	NI		NP	

4.14 Line

Defines the properties of a Line in a CoordGeom collection. The Start and End elements define the line Geometry.

4.14.1 Sub Elements

Sub Element	Description	I Code	Import Comment	E Code	Export Comment
Start	The starting point for the line	R	The preferred representation for a start point is as a reference to a CgPoint.	P	Will be a reference to a CgPoint
End	The end point for the line.	R	The preferred representation for an end point is as a reference to a CgPoint.	P	Will be a reference to a CgPoint

4.14.2 Attributes

Attribute	Description	I Code	Import Comment	E Code	Export Comment
desc	A description of the line.	NI		NP	
dir	The direction of the line.	NI		NP	
length	The length of the line.	NI		NP	
name	The name of the line.	NI		NP	
staStart	Not applicable to Landonline	NI		NP	
state	The state of the line.	NI		P	Always populated with 'Existing'.

Attribute	Description	I Code	Import Comment	E Code	Export Comment
oID	Official Identifier. The Landonline unique identifier for the line. This will be an integer number.	Rm	If the line relates to a line that already exists in Landonline, then the oID should be supplied. If this is a new line defined by the survey, the oID should be omitted.	P	

4.15 Monument

A monument is a object (eg: Iron Spike, Wooden Peg, Lead Plug, etc) that is placed in the ground for the purpose of being surveyed. **Landonline** refers to monuments as Marks.

4.15.1 Attributes

Attribute	Description	I Code	Import Comment	E Code	Export Comment
name	The name of the monument, eg: IT 10 DP 1000, Peg 3.	R	The name of the monument must be unique within the file.	P	Marks do not always have unique names in Landonline. For this reason the Landonline unique identifier for the mark will be appended to mark name. The identifier will be delimited by square brackets eg: Peg [2342145] If the mark name is not recorded in Landonline, then only the mark identifier will be provided eg: [2331411]
pntRef	A reference to a CgPoint.	R	Every monument must have a reference to a CgPoint in the file. This value must be the same as CgPoint name="".	P	Will be a reference to a CgPoint.
desc	The surveyors description of the monument.	Op		PE	
state	The state of the monument.	NI		P	Always populated with 'Existing'
type	The generalised type of the monument. See MonumentType enumerations.	Rm	If this information is not provided, Landonline will default the type to Not Specified.	P	
condition	This condition of the monument as it was found when used by the survey. See MonumentCondition enumerations.	Rm	If this information is not provided, Landonline will default the condition to Reliable.	PE	

Attribute	Description	I Code	Import Comment	E Code	Export Comment
oID	Official Identifier. The Landonline unique identifier for the mark. This will be an integer number.	Rm	If the monument relates to a mark that already exists in Landonline, then the oID should be supplied. If this oID is supplied so should the CgPoint oID. If this is a new mark defined by the survey, the oID should be omitted.	P	

4.16 Monuments

Identifies a collection of monuments.

4.16.1 Sub Elements

Sub Element	Description	I Code	Import Comment	E Code	Export Comment
Monument	Identifies one or more Monument elements.	R	All monuments relevant to the survey being imported should be listed in the file.	P	Every file extracted from Landonline will include monuments.

4.16.2 Attributes

Attribute	Description	I Code	Import Comment	E Code	Export Comment
desc	A description of the collection of monuments.	NI		NP	
name	The name of the collection of monuments.	NI		NP	
state	The state of the collection of monuments.	NI		NP	

4.17 Parcel

A Parcel element defines a closed geometric figure. It is identified by the "name" element. The geometry of the parcel is defined by the CoordGeom sub element, and the centroid of the parcel is defined by the Center element.

4.17.1 Sub Elements

Sub Element	Description	I Code	Import Comment	E Code	Export Comment
Center	The centroid of the parcel geometry.	Op	If provided, Landonline will use the coordinate of the center element as the label point for the parcel.	P	Will be the coordinate of the label point for the parcel in Landonline.
CoordGeom	The coordinate geometry for the parcel.	CR	All new parcels created by the survey will require coordinate geometry defined for them. If a parcel references a Landonline parcel (via the oID), then the coordinate geometry for the parcel is optional.	P	
Parcels	Identifies a sub-collection of parcels.	NI		NP	
Title	Identifies the comprised in CT references (ie: Titles) for the parcel.	Op	Only one per parcel is imported into Landonline. Multiple titles per parcel should be added in Landonline	PE	

4.17.2 Attributes

Attribute	Description	I Code	Import Comment	E Code	Export Comment
name	The name of the parcel.	R	<p>The general format of a parcel appellation in Landonline is: <Parcel Type> <Parcel Number> <Plan Type> <Plan Number> eg: Lot 1 DP 1000.</p> <p>For parcels created by the survey (ie: new parcels), Landonline will assign the <Plan Type> and <Plan Number> information, therefore only the <Parcel Type> and <Parcel Number> should be provided as the parcel name eg: Lot 1, Sec 5, etc.</p> <p>If the appellation for the new parcel does not meet the general parcel appellation format, the name of the parcel should be the entire parcel appellation eg: Sbrn Section 23 WELLINGTON</p>	P	<p>This will be the full parcel appellation as recorded by Landonline. Parcels do not always have unique appellations. For this reason the Landonline unique identifier for the parcel will be appended to the parcel name. The identifier will be delimited by square brackets eg: Lot 1 DP 1000 [3012412]</p> <p>If an appellation is not recorded in Landonline, then only the parcel identifier will be provided eg: [3012412].</p>
oid	Official Identifier. The Landonline unique identifier for the parcel. This will be an integer number.	Rm	If the parcel is defined in Landonline, then the oid should be supplied. If the parcel is created by the survey, the oid should be omitted.	P	
area	The area of the parcel.	CR	Required for any parcel created by the survey.	PE	If an area for the parcel is recorded in Landonline, that area will be provided. The area will be in square metres.
desc	The description of the parcel.	NI		NP	Not Populated.
dirClosure	The closure direction for a Parcel, from the end of the last entity to the start of the first entity. In Radians with East = 0 rad, measured counter-clockwise.	NI		NP	Not Populated.
distClosure	The closure distance for a Parcel, from the end of the last entity to the start of the first entity	NI		NP	Not Populated.
owner	The owner of the parcel.	NI		NP	Not Populated.

Attribute	Description	I Code	Import Comment	E Code	Export Comment
parcelType	The type of parcel and/or the intended purpose of the parcel.	NI	Landonline will derive the information it requires about the parcel type from the parcel class attribute.	PE	Landonline will populate the parcelType with the intent of the parcel if the intent is recorded in Landonline.
setbackFront	Not applicable to Landonline	NI		NP	
setbackRear	Not applicable to Landonline	NI	Not applicable to Landonline	NP	
setbackSide	Not applicable to Landonline	NI		NP	
state	Identifies the action or effect the survey had on the parcel. See ParcelStateType enumerations.	R	Refer to section 5.8 for descriptions of the ParcelStateType enumerations.	P	
taxId	Not applicable to Landonline	NI		NP	
class	The class of the parcel. Landonline will use the class to derive topology information such as the appropriate Parcel Topology Layer for the parcel. See ParcelClass enumerations.	Rm	Should be provided for all parcels created by the survey. Refer to section 5.7 for descriptions of the ParcelClass enumerations.	P	

4.18 Parcels

Identifies a collection of parcels.

4.18.1 Sub Elements

Sub Element	Description	I Code	Import Comment	E Code	Export Comment
Parcel	Identifies one or more Parcel elements.	R	All parcels relevant to the survey being imported should be listed in the file.	P	Will be populated if users choose to extract parcel information from Landonline.

4.18.2 Attributes

Attribute	Description	I Code	Import Comment	E Code	Export Comment
desc	A description of the collection of parcels.	NI		NP	
name	The name of the collection of parcels.	NI		NP	
state	The state of the collection of parcels.	NI		NP	

4.19 ReducedArcObservation

Landonline is required to capture survey information relating to curved boundary features such as road cul-de-sac's. To do this it uses the concept of an arc observation. An arc observation consists of measurements for the azimuth of the arc chord, the radius of the arc and the length of the arc boundary. The rotation of the arc (clockwise or counter clockwise) from the local setup to the target setup is also required.

Landonline requires all horizontal distance measures for arc observations to be reduced to sea level.

4.19.1 Sub Elements

Sub Element	Description	I Code	Import Comment	E Code	Export Comment
TargetPoint	Provides details about the target setup point of the observation	R		P	
OffsetVals	The offset of the target point	NI		NP	

4.19.2 Attributes

Attribute	Description	I Code	Import Comment	E Code	Export Comment
purpose	The purpose of the observation	NI		NP	
setupID	A reference to an InstrumentSetup element.	R		P	
targetSetupID	A reference to an InstrumentSetup element.	NI	The TargetPoint element indicates sufficient target setup details for Landonline.	NP	
setID	Identifies a collection of observations, eg: set of GPS multi-station baselines	NI		NP	
chordAzimuth	The azimuth of the chord for the arc observation.	R	The preferred representation for the chordAzimuth is in decimal dd.mmss.	P	The chordAzimuth will be decimal dd.mmss
radius	The radius of the arc observation	R	The preferred representation for the radius is metres.	P	Represented in metres.
length	The length of the arc for the arc observation	R	The preferred representation for the radius is metres.	P	Represented in metres
rot	The rotation of the observation from the local setup to the target setup. Can be clockwise or counter clockwise.	R		P	

Attribute	Description	I Code	Import Comment	E Code	Export Comment
equipmentUsed	The type of equipment used to perform the observation. Note that Landonline does not require specific information with regard to the equipment used. See EquipmentType enumerations.	Rm	If this information is not provided, Landonline will default the equipment type to 'Unknown'	P	
arcAzimuthAccuracy	The accuracy of the arc observation chord azimuth.	Op	Landonline will calculate an accuracy for the arc azimuth if it is not provided.	P	
arcLengthAccuracy	The accuracy of the arc observation arc length	Op	Landonline will calculate an accuracy for the arc length if it is not provided.	P	
date	The date the observation was made.	Op	If this information is not provided, Landonline will default to the survey date.	P	Landonline defaults the date to the survey date.
arcType	The method used to obtain the arc observation dimensions. See ObservationType enumerations.	Rm		P	
adoptedSurvey	The LINZ Survey Number of the survey the arc observation was adopted from.	Op	Value should only be provided where the observation has an arcType of "Adopted".	CP	Will be populated if the arc observation was adopted and Landonline has a record of the survey the arc observation was adopted from.
azimuthAccClass	The survey class for the chord bearing of the arc observation. This can be different to the class recorded in SurveyHeader.	Op	Landonline will default to the class specified for the survey. If a value is provided, it should be one of 'A', 'B' 'C' or 'D'	PE	Classes will be one of I,II, III,IV. A, B, C or D
lengthAccClass	The survey class for the arc observation arc length. This can be different to the class recorded in SurveyHeader.	NI		NP	Landonline does not record a separate accuracy class for the arc length.

Attribute	Description	I Code	Import Comment	E Code	Export Comment
azimuthAdoptionFactor	The angle that was added to arc observation chord azimuth from the original survey to get the adopted arc observation chord azimuth for this survey.	Op	Value should only be provided where the arc observation has an arcType of "Adopted" If the arc observation was adopted, and this value is not provided, Landonline will default the adoption factor to 0. If more than one value is provided for the source bearing Landonline will not populate the Referenced Surveys. Will only populate on an observational basis. The preferred representation for the azimuthAdoptionFactor is decimal dd.mmss.	CP	Will be populated if the observation was adopted and Landonline has a record of the adoption factor.
lengthAdoptionFactor	The distance factor multiplier that was applied to the arc observation from the original survey to get the adopted arc observation arc length for this survey. Represented as a factors of the original observation arc length eg: 1.03, 0.98.	Op	Value should only be provided where the arc observation has an arcType of "Adopted" If the arc observation was adopted, and this value is not provided, Landonline will default the adoption factor to 1.	CP	Will be populated if the observation was adopted and Landonline has a record of the adoption factor.
coordGeomRefs	A reference list to one or more ChordGeom elements.	Rm	Should be provided when the observation is a parcel dimension for one or more parcels.	CP	Will be populated if the observation is recorded as a parcel dimension in Landonline and one or more of the related parcels is being extracted.

4.20 ReducedObservation

Observations are the actual measured or calculated values associated with an observation of a specific type. Landonline only accepts and stores reduced observation information. Cadastral surveys are expected to provide distances reduced to sea level (no height information).

4.20.1 Sub Elements

Sub Element	Description	I Code	Import Comment	E Code	Export Comment
TargetPoint	Provides details about the target setup point of the observation.	R		P	
OffsetVals	The offset of the target point.	NI		NP	

4.20.2 Attributes

Attribute	Description	I Code	Import Comment	E Code	Export Comment
purpose	The purpose of the observation	NI		NP	
setupID	A reference to an InstrumentSetup element.	R		P	
targetSetupID	A reference to an InstrumentSetup element.	NI	The TargetPoint element indicates sufficient target setup details for Landonline.	NP	
setID	Identifies a collection of observations, eg: set of GPS multi-station baselines	NI		NP	
azimuth	The azimuth of the observation.	CR	Required if the observation has an azimuth or if the observation does not include a horizontal distance. The preferred representation for the azimuth is decimal dd.mmss.	CP	Populated if the observation includes an azimuth.
horizDistance	The horizontal distance of the observation.	CR	Required if the observation has a horizontal distance or if the observation does not include an azimuth. The preferred representation for the horizDistance is metres.	CP	Populated if the observation includes a horizontal distance.
vertDistance	The vertical distance of the observation.	NI	All cadastral observations recorded in Landonline should be reduced to sea level.	NP	Note that all cadastral observations in Landonline are reduced to sea level.
equipmentUsed	The type of equipment used to perform the observation. Note that Landonline does not require specific information with regard to the equipment used. See EquipmentType enumerations.	Rm	If this information is not provided, Landonline will default the equipment type to 'Unknown'	P	Populated.

Attribute	Description	I Code	Import Comment	E Code	Export Comment
azimuthType	The method used to obtain the observation azimuth. See ObservationType enumerations.	Rm		P	
distanceType	The method used to obtain the observation horizontal distance. See ObservationType enumerations.	Rm		P	
azimuthAccuracy	The accuracy of the observation azimuth.	Op	Landonline will calculate an accuracy for the azimuth if it is not provided.	P	
distanceAccuracy	The accuracy of the observation horizontal distance.	Op	Landonline will calculate an accuracy for the horizontal distance if it is not provided.	P	
date	The date the observation was made.	Op	If this information is not provided, Landonline will default to the survey date.	P	Landonline defaults the date to the survey date.
azimuthAccClass	The survey class of the observation azimuth. This can be different to the class recorded in SurveyHeader.	Op	Landonline will default to the class specified for the survey. If a value is provided, it should be one of 'A' 'B' 'C' or 'D'	PE	Classes will be one of I, II, III, IV, A, B, C or D
distanceAccClass	The survey class of the observation horizontal distance. This can be different to the class recorded in SurveyHeader.	Op	Landonline will default to the class specified for the survey. If a value is provided, it should be one of 'A' 'B' 'C' or 'D'	PE	Classes will be one of I, II, III, IV, A, B, C or D
adoptedAzimuthSurvey	The LINZ Survey Number of the survey the observation azimuth was adopted from.	Op	Value should only be provided where the observation has an azimuthType of "Adopted".	CP	Will be populated if the observation was adopted and Landonline has a record of the survey the observation was adopted from.
adoptedDistanceSurvey	The LINZ Survey Number of the survey the observation horizontal distance was adopted from.	Op	Value should only be provided where the observation has a distanceType of "Adopted".	CP	Will be populated if the observation was adopted and Landonline has a record of the survey the observation was adopted from.
azimuthAdoption Factor	The angle that was added to observation azimuth from the original survey to get the adopted observation azimuth for this survey.	Op	Value should only be provided where the observation has an azimuthType of "Adopted" If the observation was adopted, and this value is not provided, Landonline will default the adoption factor to 0. The preferred representation for the azimuthAdoptionFactor is decimal dd.mmss.	CP	Will be populated if the observation was adopted and Landonline has a record of the adoption factor.

Attribute	Description	I Code	Import Comment	E Code	Export Comment
distanceAdoption Factor	The distance factor multiplier that was applied to the observation horizontal distance from the original survey to get the adopted observation horizontal distance for this survey. Represented as a factor of the original observation horizontal distance eg: 1.03, 0.98	NI	Not supported by Landonline.	NP	Not supported by Landonline.
coordGeomRefs	A reference list to one or more ChordGeom elements.	Rm	Should be provided when the observation is a parcel dimension for one or more parcels.	CP	Will be populated if the observation is recorded as a parcel dimension in Landonline and one or more of the related parcels are being extracted.

4.21 Survey

Users of Landonline will have the option of selecting information from more than one survey when they extract data from Landonline. The Survey element will be used to group the information (eg: Monument, Coordinate System and Observation information) relevant to each survey. Files imported to Landonline will be expected to contain information relating to only 1 survey, hence contain only 1 Survey element.

4.21.1 Sub Elements

Sub Element	Description	I Code	Import Comment	E Code	Export Comment
SurveyHeader	Provides general details about the survey.	R		P	
Equipment	The equipment used for the survey.	NI		P	This element is required by the LandXML schema and will be populated with default information.
SurveyMonument	Identifies the monuments that were used by the survey. Also contains information applicable to the use of each monument on the survey.	Rm		PE	Some older surveys in Landonline do not have monuments associated with them.
CgPoints	Identifies a list of CgPoints related to the survey.	NI		NP	
InstrumentSetup	Identifies the list of local setup points used for the observations in the survey.	R		P	
ReducedObservation	Identifies the observations (sea level distances and bearings) related to the survey.	R		PE	Some older surveys in Landonline do not have observations associated with them.

Sub Element	Description	I Code	Import Comment	E Code	Export Comment
ReducedArc Observation	Identifies any arc observations that were observed or adopted to support the definition of the survey.	CR	Required if any arc observations make up the definition of the survey.	PE	Not all surveys include arc observations.

4.21.2 Attributes

Attribute	Description	I Code	Import Comment	E Code	Export Comment
desc	General description of the survey.	NI		NP	The survey description is provided in the SurveyHeader element.
date	Not applicable to Landonline	NI		NP	
time	Not applicable to Landonline	NI		NP	
state	Indicates the state of the survey.	NI		P	The state of all surveys extracted from Landonline will be "Existing"

4.22 SurveyHeader

The header provides the general details for the survey including surveyor, survey type, date of survey and the class. One SurveyHeader element is required for each Survey element.

4.22.1 Sub Elements

	Description	I Code	Import Comment	E Code	Export Comment
CoordinateSystem	Identifies the coordinate system used for the survey.	Rm	If the coordinate system is not included in the file, the lodging user will need to specify which coordinate system to use for the survey in Landonline before loading the file.	PE	Will be populated if the survey has observations associated with it.
Personnel	Lists other personnel that have an involvement with the survey.	NI		PE	Landonline will populate this sub element with solicitor details where it has a record of those details.

	Description	I Code	Import Comment	E Code	Export Comment
MapPoint	Indicates the general location of the survey. It can be used to provide a spatial index to all surveys within an area. A single point is usually placed in the middle of the survey, although several MapPoint entries can be used where the survey covers a wide area.	Op	The preferred representation for a MapPoint element is a northing/easting text value rather than a CgPoint reference.	P	Landonline will provide northing/easting text values for MapPoint elements.
FieldNote	Textual field notes for the survey.	NP		NP	All documentation supporting survey (eg: Field Notes, Survey Reports) are imaged and stored in the Landonline image repository.

4.22.2 Attributes

Attribute	Description	I Code	Import Comment	E Code	Export Comment
name	The name for the survey. LINZ assigns a Survey Number to each survey they receive. The Survey Number uniquely identifies the survey within a Land District (see County attribute).	NI	Landonline will assign an appropriate Survey Number to the survey.	P	Will contain the LINZ Survey Number.
desc	The survey description. eg: Lots 1 – 6 being subdivision of Lots 1, 3 & 5 of DP 12413.	Op	Users of Landonline will have the opportunity to enter the survey description in Landonline before formally lodging the survey with LINZ.	PE	
purpose	The general purpose of the survey.	NI		NP	Refer to the surveyPurpose attribute.
date	The date the survey was completed by the surveyor.	Op	Users of Landonline will have the opportunity to enter the survey date in Landonline before formally lodging the survey with LINZ.	PE	
time	The time the survey was completed by the surveyor.	NI		NP	
surveyor	The name of the surveyor that performed the survey.	NI	This information must be recorded in Landonline before a user can load the XML file.	PE	Some the old surveys recorded by Landonline do not have appropriate surveyor details. No surveyor will be provided for those surveys.
surveyorFirm	The name of the firm or company the surveyor belongs to.	NI	This information must be recorded in Landonline before a user can load the XML file.	PE	See comment for surveyor attribute.

Attribute	Description	I Code	Import Comment	E Code	Export Comment
surveyorReference	The surveyors own reference for the survey.	Op	Users of Landonline will have the opportunity to enter the surveyor reference in Landonline before formally lodging the survey with LINZ.	PE	
surveyorRegistration	The registration status of the surveyor.	NI	Landonline will default the surveyors registration status Accredited.	NP	
surveyPurpose	The purpose of the survey as recorded by Landonline.	NI	This information must be recorded in Landonline before a user can load the XML file.	P	
type	Indicates whether the survey was compiled, computed or surveyed. See SurveyType enumerations.	Op	This information must be recorded in Landonline before a user can load the XML file but can be overwritten if supplied.	P	
class	The accepted class of the survey, i.e. A, B, C or D It is possible for a survey to include observations with mixed classes.	Op	Users of Landonline will have the opportunity to specify the survey class before formally lodging the survey with LINZ.	PE	
county	The New Zealand Land District for the survey.	NI	This information must be recorded in Landonline before a user can load the XML file.	P	

4.23 SurveyMonument

Identifies the monuments that were used by the survey. Also contains information applicable to the use of each monument on the survey, eg: the purpose of the monument within the survey.

4.23.1 Attributes

Attribute	Description	I Code	Import Comment	E Code	Export Comment
mntRef	A reference to a monument element recorded in the file.	R		P	
purpose	The purpose of the monument in the survey, eg: Boundary defined by survey, Witness. See MonumentPurpose enumerations.	R		PE	
state	The state of the monument for the survey. See MonumentState enumerations.	Rm		PE	

Attribute	Description	I Code	Import Comment	E Code	Export Comment
adoptedSurvey	The survey that the monument was adopted from	Rm	Should be populated if the monument was adopted.	CP	Landonline will populate this attribute if the monument is adopted and the adopted survey information is recorded by Landonline.
disturbedMonument	A reference to the monument that was disturbed.	Rm	Should be populated if the monument is added in place of a disturbed monument.	CP	Landonline will populate this information if the monument was added in place of a disturbed monument
disturbedDate	The date this monument was added in place of the disturbed monument.	Op	If not provided, the survey date will be used.	CP	Landonline will populate this information if the monument was added in place of a disturbed monument
disturbedAnnotation	Surveyors comment about the disturbed monument.	Op		PE	Populated if a disturbed annotation exists.
replacedMonument	A reference to the monument that was replaced by this monument.	Rm	Should be populated if the monument replaces an existing monument.	CP	Landonline will populate this information if the monument replaced a previously existing monument.
replacedDate	The date this monument replaced the old monument.	Op	If not provided, the survey date will be used.	CP	Landonline will populate this information if the monument replaced a previously existing monument.
replacedAnnotation	Surveyors comment about the replaced monument.	Op		PE	Populated if a replaced annotation exists.

4.24 Title

Identifies the comprised in title references (including limited titles) and/or gazette references relevant to the associated parcel.

New Zealand operates under the Torrens Land Title system, where a Certificate of Title (CT) is issued for land to record property rights and ownership. When a survey is lodged to subdivide or amalgamate parcels of land, the CT's for the parcels of land affected will eventually be cancelled upon deposit of the plan and new titles issued in terms of the new parcels. The CTs for the extinguished parcels form the comprised in title references.

4.24.1 Attributes

Attribute	Description	I Code	Import Comment	E Code	Export Comment
name	The CT Reference for the title	R	Note that the Title sub element is optional on the parcel element.	P	

4.25 Units

A required element that describes the units types of the LandXML data. It cannot occur more than once. The Units element always contains one sub element. It will either be a "Metric" or an "Imperial" element.

Landonline will only support metric units as described below. Landonline also expects angular units to have 0 degrees to the north and a positive rotation in a clockwise direction.

4.25.1 Sub Elements

Sub Element	Description	I Code	Import Comment	E Code	Export Comment
Metric	Describes metric units used by the file.	R	Landonline expects AreaUnit to be squareMeter and MetLinear to be meter. angularUnit should also be supplied as decimal dd.mmss	P	areaUnit will be squareMeters metLinear will be meter metPressure will be milliBars metTemperature will be Celsius metVolume will be litre angularUnit will be decimal dd.mmss
Imperial	Describes the imperial units used by the file	NI		NP	Not Populated.

5. LANDXML SURVEY ENUMERATIONS FOR IMPORT

For the LandXML survey enumerations please refer to the following document:

LandXML- Landonline Enumeration Mappings applicable to Landonline.

~~6. EXAMPLE LANDXML FILE FOR LANDONLINE~~

~~This section contains an example LandXML import file for Landonline.~~

~~6.1 Import~~

~~Accompanying this document is an example file of a complete digital cadastral survey dataset ready for import into Landonline (see Landonline Cadastral Survey Example 1.xml). This dataset is a simple 2 lot subdivision of the underlying parcel Lot 6 DP 1000. A right of way easement (Easement A) and two cross parcel centreline easements (Easements a-b and c-d) are also being created by the survey. A diagram of Landonline Cadastral Survey Example 1 superimposed on the existing cadastral network is shown below.~~

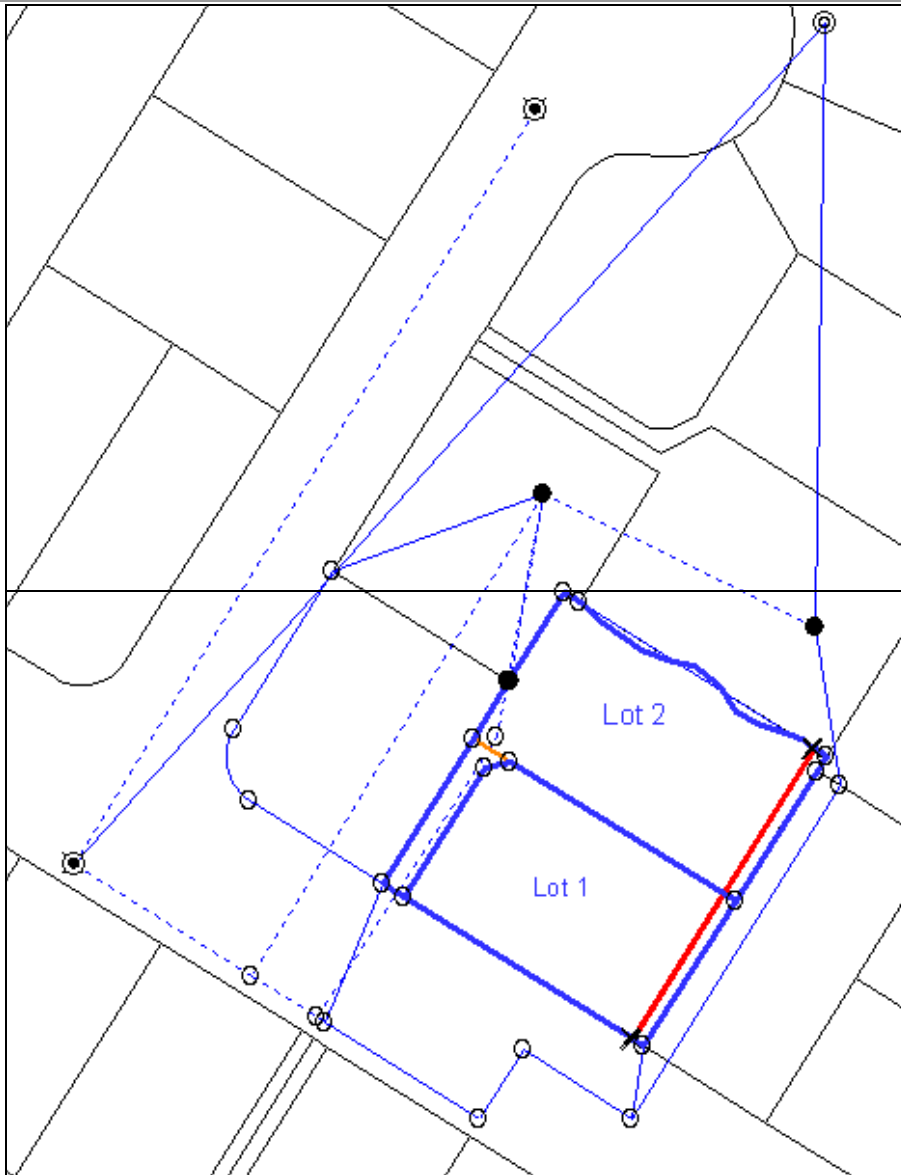


Figure 10 – Diagram of Landonline Cadastral Survey Example 1

7 APPENDIX A – LANDONLINE COORDINATE SYSTEM CODES

This appendix includes the list of the more common coordinate system codes that will be recognised by Landonline. Landonline will also use these codes to identify coordinate systems when exporting cadastral survey information. The full list of coordinate systems supported by Landonline can be obtained from the LINZ web site.

Code	Name	Initial Station Name
AMURTM1949	Amuri 1949	Isolated Hill
AMURTM2000	Amuri 2000	
AUCS1949	Auckland Islands 1949	
PLENTM1949	Bay of Plenty 1949	F Maketu
PLENTM2000	Bay of Plenty 2000	
BLUFTM1949	Bluff 1949	Observation Spot No 2

Code	Name	Initial Station Name
BLUFTM2000	Bluff 2000	
BULLTM1949	Buller 1949	Buller Initial
BULLTM2000	Buller 2000	
CHATTM1979	Chatham Islands Circuit 1979	Alpha
CHATTM2000	Chatham Islands Circuit 2000	
COLLTM1949	Collingwood 1949	Collingwood Initial
COLLTM2000	Collingwood 2000	
GAWLTM1949	Gawler 1949	A Gawler Downs
GAWLTM2000	Gawler 2000	
GREYTM1949	Grey 1949	Grey Initial
GREYTM2000	Grey 2000	
HAWKTM1931	Hawkes Bay 1931	A Hawkes Bay
HAWKTM1949	Hawkes Bay 1949	A Hawkes Bay
HAWKTM2000	Hawkes Bay 2000	
HOKITM1949	Hokitika 1949	Hokitika Initial
HOKITM2000	Hokitika 2000	
JACKTM1949	Jacksons Bay 1949	Jacksons Bay Initial
JACKTM2000	Jacksons Bay 2000	
KARATM1949	Karamea 1949	Karamea
KARATM2000	Karamea 2000	
LINDTM1949	Lindis Peak 1949	Lindis Peak Initial
LINDTM2000	Lindis Peak 2000	
MARLTM1949	Marlborough 1949	Goulter Hill
MARLTM2000	Marlborough 2000	
EDENTM1949	Mount Eden 1949	16 Mt Eden
EDENTM2000	Mount Eden 2000	
PLEATM1949	Mount Pleasant 1949	Mt Pleasant
PLEATM2000	Mount Pleasant 2000	
YORKTM1949	Mount York 1949	Mt York
YORKTM2000	Mount York 2000	
NICHTM1949	Mount Nicholas 1949	Mt Nicholas
NICHTM2000	Mount Nicholas 2000	
NELSTM1949	Nelson 1949	BH Botanical Hill
NELSTM2000	Nelson 2000	
NZMG	New Zealand Map Grid	
NZTM	New Zealand Transverse Mercator	
NNAT	North Island National Grid	
TAIETM1949	North Taieri 1949	A North Taieri
TAIETM2000	North Taieri 2000	
OBSETM1949	Observation Point 1949	Observation Pt Initial
OBSETM2000	Observation Point 2000	
OKARTM1949	Okarito 1949	Okarito Initial
OKARTM2000	Okarito 2000	

Code	Name	Initial Station Name
POVETM2000	Poverty Bay 2000	
POVETM1949	Poverty Bay 1949	Poverty Bay Initial
SNAT	South Island National Grid	
TARATM1949	Taranaki 1949	A Huirangi
TARATM2000	Taranaki 2000	
TIMATM1949	Timaru 1949	A(68) Mt Horrible
TIMATM2000	Timaru 2000	
TUHITM1949	Tuhirangi 1949	18 Tuhirangi
TUHITM2000	Tuhirangi 2000	
WAIRTM1949	Wairarapa 1949	Opaki
WAIRTM2000	Wairarapa 2000	
WANGTM1949	Wanganui 1949	Mt Stewart
WANGTM2000	Wanganui 2000	
WELLTM1949	Wellington 1949	Mt Cook
WELLTM2000	Wellington 2000	
NZGD1949	NZGD 1949	Papatahi
NZGD2000	NZGD 2000	

8 APPENDIX B – LANDONLINE COORDINATE SYSTEMS SUPPORTED

The following table identifies how Landonline supports each coordinate circuit. Cadastral surveys would always use the local circuit NZGD 1949 or 2000 for extract and import. If the survey is required to be in another circuit other than local circuit 1949 or 2000 the circuit can be changed in Landonline after import. Other extract coordinate systems are provided for non-cadastral surveyors who also use Landonline for example, Territorial Authorities, geodetic surveyors.

Landonline Capture Coordinate Systems Supported	Landonline Extract/Import Coordinate Systems Supported
Auckland Islands 1949	Auckland Islands 1949
Hawkes Bay 1931	
Chatham Islands 1979	
New Zealand Map Grid	New Zealand Map Grid
North Island National Grid	North Island National Grid
South Island National Grid	South Island National Grid
All local NZGD 1949 (700000 300000)	All local NZGD1949 (700000 300000)
All local NZGD 2000 (800000 400000)	All local NZGD2000 (800000 400000)
All local OCD	
	New Zealand Transverse Mercator
	NZGD1949 (lat and long)
	NZGD2000 (lat and long)