Intergovernmental Committee on Surveying and Mapping

ePlan Protocol

LandXML Structural Requirements

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Amendment History

Version	Date	Author	Comments
0.1	5 October, 2010	Vivian Farrell Robert Green	First Draft
0.2	7 October, 2010	Vivian Farrell Mark Deal	Inclusion of first review comments Deleted partial allocations (reason: QLD specific and not compliant with Protocol mapping) Heavily revised Allocations general rules
0.3	13 October, 2010	Vivian Farrell	Updated Introduction Added examples for section 2.1.8 and 2.1.9
0.4	5 November, 2010	Vivian Farrell	Rearranged Parcels section. Changes to Admin area linkages. Moved admin linkages out of allocations into own section.
0.5	11 November, 2010	Rob Green	Minor editorial fixes.
1.0	12 November, 2010	Vivian Farrell	Final version for release
1.0	15 December, 2015	Hamed Olfat	Added the missing enumeration value of 'Encroached' to section 2.1.2.

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1   Introduction

1.1   Purpose

This document aims to eliminate any ambiguities in the structure of LandXML for ePlan. It outlines specific complex mapping scenarios and specifies how the XML should be interpreted in the context of an ePlan CIF. Its purpose is to provide a uniform approach to structuring LandXML that all jurisdictions follow.

This document builds on a series of other ePlan documents and specifications that must be read in conjunction (see § 1.3 References).

1.2   Scope

The following is in scope for this document:

- LandXML structural requirements that specify how the CIF should be structured to correctly represent specific pieces of data.

The following are not in scope for this document:

- Specification of every valid LandXML data element included in the ePlan CIF, see § *1.3 References REF2*.

- Cardinality of the data elements according to the requirements of the ePlan Model i.e. whether an element is mandatory or optional and number of allowable occurrences.

- Specification of jurisdictional-specific requirements for CIFs. This is specified in jurisdictional level documentation. (Note: while this document defines every element that is contained in the ePlan Model, not every jurisdiction will use all of the elements.)

- Conceptual level specifications that deal with the fundamental understanding of the ePlan model. These are in the National ePlan Model Specification.

1.3   References

1. ICSM, *ePlan Model*, version 1.0, 10 September, 2009
   http://icsm-eplan.govspace.gov.au/eplan-model/

2. ICSM, *ePlan Protocol – LandXML Mapping*, version 2.0, 15 November, 2010
   http://icsm-eplan.govspace.gov.au/eplan-protocol/

3. LandXML.org, *LandXML Schema*, version 1.2, 29 July, 2008
   http://www.landxml.org/schema/LandXML-1.2/LandXML-1.2.xsd

4. W3C, *Extensible Markup Language (XML)*, version 1.0, Fifth Edition
   http://www.w3.org/TR/xml/

5. ICSM, *ePlan Protocol – Schema Architecture*, version 2.0, 19 November, 2010
    http://icsm-eplan.govspace.gov.au/eplan-protocol/

1.4   Abbreviations

ePlan

A model for cadastral survey information defined by the ICSM

ICSM

The Intergovernmental Committee on Surveying and Mapping.

XML

Extensible mark–up language.

CIF

Cadastral Information File – The file type used to store the data specified by the ePlan
Model.

LandXML

An XML schema used as the platform for a CIF.

1.5   Audience

The following is the primary audience of this document:

- Australian and New Zealand jurisdictions intending to implement ePlan into their land
  administration systems.

- 3rd party/commercial software developers looking to add ePlan functionality to their
  software.

In addition, this document will also assist anyone interested in how cadastral information
portrayed on paper cadastral survey plans is represented in a CIF using LandXML elements
and attributes.

1.6   Using this document

This document describes various structural guidelines for creating an ePlan CIF with
LandXML. It is broken into three major sections:

- Structural Requirements for Parcels

- Structuring Spatial Elements of the CIF

- Structuring Administrative Features of the CIF

This document is designed to support a modular approach to ePlan CIFs. This means that
any jurisdiction implementing ePlan is free to adopt only the components that apply to their
requirements. However, if a jurisdiction implements a similar concept to one outlined in this

document, they must follow the guidelines specified by this document. Any deviation requires a formal Statement of Proposal to the ICSM ePlan working group so that impact on the ePlan Data Model can be assessed.

2   LandXML Structural Specifications for ePlan CIFs

LandXML is a flexible schema allowing for a wide variety of structures to store geospatial data. Several information components of traditional cadastral survey plans require more complex mapping to LandXML than simple one–to–one mapping to an element or attribute. This document specifies the mapping of complex information structures supported by the ePlan CIF.

A simple data item is a piece of information that maps directly into a field in LandXML. For example, a parcel has an identifier such as a lot number or road name. This piece of data maps directly into the `name` or `desc` attribute of a `Parcel` element. Additionally, a parcel has an area, class and other discrete pieces of information that map directly to attributes of the `Parcel` element.

A complex data item is created using a number of simple data items, it requires multiple elements and attributes to store its information. For example, to represent a multipart parcel in LandXML, the simple data items continue to map directly into their associated attributes but additional relationships are used to fully describe the multipart parcel. These relationships are shown with parcel linkages. In an ePlan CIF, multipart parcels are linked using the `pclRef` attribute as explained below. The document explains how to construct and interpret LandXML for more complex scenarios.

2.1   Structuring Parcels

The following section deals with the structure of spatial interests which are represented in a CIF using the Parcel element. The concepts presented here are generic and not specific to any jurisdiction.

2.1.1   General

Parcel elements within an ePlan CIF are effectively general polygons, they are not specifically cadastral parcels. The `class`, `parcelFormat` and `parcelType` attributes provide information on what the parcel represents. These attributes are used with other criteria to store information about a parcel. ePlan parcels represent spatial and administrative interests. Much of ePlan deals with the representation of interests rather than focusing solely on cadastral parcels.

The following section provides a brief summary of the relevant features of the parcel element and sub elements and how they are stored using LandXML in a CIF.

2.1.2 Parcel State

The life of a parcel in ePlan is captured by the parcel `state` attribute. This is a LandXML enumerated field that can have one of 5 values:

- Created - A new parcel being created by the survey. A created parcel is always accompanied by an "extinguished" parcel (see below).

- Existing – a parcel created by a previous survey that, at the time of this survey, has not be extinguished or cancelled and is not affected by the survey. Existing parcels are

shown on a plan for various reasons, primarily to provide context for subject parcels
and to show abutting and adjoining parcels.

- Affected – Existing parcels that have changes made to their interests are given a state
  of "affected". For example, a change to an easement benefit or the addition of an
  encumbrance.

- Extinguished – When a parcel is subdivided on a plan, it is "extinguished" and new
  "created" parcels fill the space. The term extinguished is analogous to retired,
  cancelled or destroyed.

- Referenced – The state of "referenced" is used to indicate that the parcel does not
  currently exist, but some information about that parcel is relevant to the plan or survey.
  E.g. crown parcels are often referenced for boundary adoptions years after they were
  extinguished.

- Encroached – The state of "encroached" is used to describe the complete spatial
  extent of a parcel which is to be partially extinguished by the creation of another spatial
  parcel.

2.1.3   LandXML Parcel Structure

The following shows the complete LandXML Parcel structure including all the sub elements
that reside within a Parcel.

```xml
<!-- Root LandXML element, container for all CIF elements -->
<LandXML...>
  ...
  <!-- Container for all Parcel elements -->
  <Parcels>
    <!-- Each discrete parcel is described by a parcel element -->
    <Parcel ...>
      <!-- Container for parcels related to this parcel (linkages -->
      <Parcels ...>
        <!-- References to related parcels (linkages) -->
        <Parcel pclRef="..." ... />
        <Parcel pclRef="..." ... />
        ...
      </Parcels>
      <!-- Title references -->
      <Title ...>
      <!-- Street Addressing -->
      <LocationAddress ... />
      <!-- Exclusion Areas -->
      <Exclusions .../>
      <!-- Coordinate Geometry (parcel polygon) -->
      <CoordGeom .../>
    </Parcel>

    <!-- More parcels -->
    <Parcel ...>
      ...
    </Parcel>
```

```
    </Parcels>
    ...
</LandXML>
```

A `Parcels` element is used as a container or grouping element for `Parcel` elements. Each parcel element may have one or more nested parcels elements that have further parcel elements. While LandXML allows for further (essentially unlimited) nesting, ePlan only uses one level of nested Parcels. Nested parcel elements within the main Parcel element are used for parcel linkages (see below).

2.1.4   Title References

Title references are shown using the `Title` sub element of `Parcel`. The title element provides a linkage to interests in a parcel by referencing rights on the title for the parcel. These include not only the title itself, but also current or new rights such as dealings for mortgages, easements and leases. As a general rule, any current right recorded on the parcel's title is shown as a title reference.

Title references work together with parcel linkages to capture the allocations of rights over land parcels. Where a parcel linkage carries forward rights from an existing or extinguished interest to a new parcel, a title reference explicitly references the right on the parcel. Further explanation of this concept is found in *§ 2.1.2 Parcel State.*

The following example shows a parcel's title elements – the title itself and a benefit right over an easement.

```
<Parcel name="1\PS12456" ...>
   <Title name="123/4562" titleType="Freehold" />
   <Title name="E1\PS654587" titleType="Easement Benefit" />
</Parcel>
```

2.1.5   Parcel Linkages

A parcel linkage is a method using the `pclRef` attribute of the `Parcel` element to link parcels together, forming a relationship. Parcel linkages are used for the following purposes:

- Multipart parcels – links from multipart parcels to their parts

- Parcel allocation – transfer various rights and restrictions from old or existing to new parcels.

- Administrative linkage – associates parcel elements for an administrative purpose (e.g. assigning administrative areas, assigning to owners corporation)

A parcel linkage is created by placing a nested parcel under the *source* parcel and placing the name of the *target* parcel in the `pclRef` attribute of the nested parcel. See example below:

```
<LandXML>
  <Parcels>

    <Parcel name="Source" ...>
      <Parcels>
```

```
       <Parcel name="Nested" pclRef="Target" />
     </Parcels>
   </Parcel>

   <Parcel name="Target" ...> </Parcels>


  </Parcels>
</LandXML>
```

This technique is described in document reference 1, sections 2.3.1.1 and 2.3.1.2.

The following are guidelines for structuring nested parcels in an ePlan CIF.

- The nested parcel should have no content, i.e. it should contain no value or sub elements.

- A nested `Parcel` element acts as a link to another `Parcel`. Therefore, the `pclRef` attribute must:

    o be included and have a value

    o its value must match the `name` attribute of the target `Parcel` and

    o the target parcel must be in the CIF

- Nested parcels contain only a `name` and a `pclRef` attribute except where extra information is necessary to interpret the linkage[1]. The `name` attribute must be unique in the CIF and must not match the `pclRef` attribute.

- Parcels can have nested parcels to a maximum of 1 level deep. This means that there is a maximum of 1 nested level of `Parcel` elements as in the example below.


```
<LandXML>
  <Parcels>
    <Parcel ...> <!-- parent parcel -->
       <Parcels>
          <Parcel ... /> <!-- nested parcel – maximum depth -->
       </Parcels>
    </Parcel>
  </Parcels>
</LandXML>
```

2.1.6   Types of Parcels

Parcels can be represented in a CIF using the following types:

---

[1] Owner's Corporation administrative parcels also require the `LotEntitlement` and `LiabilityApportionment` attributes.

- Single

- Multipart

The type is held in the `parcelType` attribute:

```
<Parcel class="Lot" state="existing" parcelType="single" ...>
```

`Multipart` and `part` parcels are complimentary. For each parcel with a type of `multipart`, at least two other parcels of type `part` must be in the CIF. Conversely, if a CIF contains parcels with a type of `part`, it must also contain at least one parcel of type `multipart`.

The following sections show how each type of parcel is represented in the CIF.

2.1.6.1   Single Parcels

Single parcels are shown with one parcel element containing all the administrative and spatial information for that parcel. The following shows a complete record for a parcel element (not all lines are shown in the `CoordGeom` element for convenience):

```
<Parcel class="Lot" parcelFormat="Standard" state="existing"
 parcelType="single" name="11/SP168942" area="9963.00"
 desc="38866/578">
  <Center pntRef="CENTRE3"/>
  <CoordGeom>
    <Line desc="RIGHT-LINE ROAD">
      <Start pntRef="BX"/>
      <End pntRef="BQ"/>
    </Line>
    ...
  </CoordGeom>
  <Title titleType="title" name="50488141"/>
</Parcel>
```

The above defines an existing single parcel. It includes all the information about the parcel, including its coordinate geometry, administrative areas and title. If the parcel was extinguished, it would also include references to the parcel elements that it was allocated to. Note that this is a jurisdictional specific parcel definition. Other jurisdictions may vary the specific requirements for parcel attribute data.

2.1.6.2   Multipart Parcels

Multipart parcels consist of multiple closed part parcels linked to form a single cadastral entity. This achieved using a one parcel with a `parcelType` of "multipart" with linkages (see *2.1.5 Parcel Linkages*) to to two or more other parcels with a `parcelType` of "part".
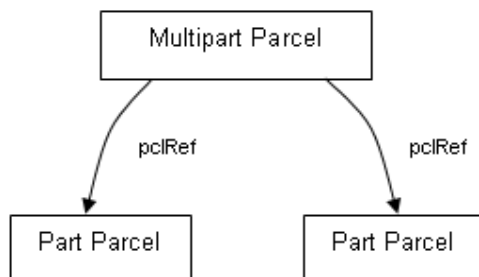
Figure 1 – Multipart parcel structure

A multipart parcel has the following structural features:

- The "multipart" parcel contains parcel linkages to all the "part" parcels.

- The "multipart" parcel does not contain the `CoordGeom` and `Center` elements. Only the "part" parcels contain coordinate geometry.

- It is at the discretion of the jurisdiction whether the "mulitpart" parcel specifies an `area` attribute value. If it is not specified, the total area is derived from the sum of the "part" parcel areas. All part parcels must specify an area.

The following is an example implementation of a multipart parcel in a CIF. The element names are arbitrary and used for demonstration purposes only.

```
<Parcel name="1\PS123456"
        class="Lot"
        state="created"
        parcelType="multipart" >
  <Parcels>
  <!-- linkage to parts -->
    <Parcel name="BBB" pclRef="1-p1\PS123456"/>
    <Parcel name="CCC" pclRef="1-p2\PS123456"/>
  </Parcels>
  <Title ... />
  <LocationAddress ... />
</Parcel>

<Parcel name="1-p1\PS123456"
        class="Lot"
        state="created"
        parcelType="part"
        area="500">
  <Center> ... <Center>
  <CoordGeom> ... </CoordGeom>
</Parcel>
<Parcel name="1-p2\PS123456"
        class="Lot"
        state="created"
        parcelType="part"
        area="500">
  <Center> ... <Center>
```

```
   <CoordGeom> ... </CoordGeom>
</Parcel>
```

Multipart parcels can be used for various classes of parcels including lots, easements and restrictions. The specific requirements about the inclusion of sub elements (e.g. title, location address) and use of parcel linkages for some purposes is specific to each jurisdiction and is specified by jurisdictional documents.

For example, a jurisdiction may or may not require attributes of multipart parcels to be repeated in its parts (e.g. repeat class or state values).

2.1.7   Parcel Allocations

2.1.7.1   Overview of Interests

All cadastral parcels have certain rights and restrictions associated with them. For example, the original deed of grant may state rights in regard to minerals, access, fair use and enjoyment, and so on. Each jurisdiction operates a title registry to record the rights and restrictions that are registered on land titles. Interests that are registered with the titles registry are called registered interests.

There are various types of registered interests, such as:

1. Primary: the title or deed for a parcel is a primary interest. Primary interests can't overlap, there must only be one primary interest for a parcel. Primary interests essentially create a parcel of land that other interests can be registered over.

2. Secondary: other interests such as easements and leases. Secondary interests can overlap or intersect each other and but must always overlap a primary interest.

3. Other: there are many other types, such as mortgages and caveats, that may be registered over part or all of a primary interest.

Land may also have unregistered interests, for example the local government authority has an interest for rating and town planning purposes.

Depending on the type of survey being performed and the requirements of the related jurisdiction, a surveyor may be required to identify some or all of the interests in the land being surveyed. These interests are recorded in a CIF using `Title` elements that reference the relevant dealing or object describing the type of interest, such as title, mortgage or easement (see § *2.1.4 Title References*).

2.1.7.2   Allocations – Fundamental Concepts

Parcel allocations transfer the rights and restrictions (i.e. interests) of an extinguished or affected parcel to new parcels. For example, an easement benefit or a restrictive covenant on an extinguished parcel is usually carried forward to the newly subdivided parcels.

An extinguished parcel is a cancelled parcel. If it represents a primary interest, it must be replaced by newly created parcels. An affected parcel is an existing parcel that has had changes to the arrangement of interests (e.g. added a restriction or changed a benefit easement).

Parcel allocations are represented using a parcel linkage (*2.1.5 Parcel Linkages*). The allocation of interests can be either implied or explicitly defined. If they are implied, nothing further is required. If they must be explicitly defined, a Title Reference is used (*2.1.4 Title References*).

Depending on jurisdictional requirements, the surveyor may be required to allocate the interests from the affected and extinguished parcels to the new parcels. The following sections describe how various types of allocations are represented in an ePlan CIF.

Interests are not included in a CIF (and therefore not allocated) if they are to be surrendered, released or otherwise removed from the title when the survey is registered. It is at the jurisdiction's discretion which rights must be explicitly stated using a title reference. These rules are consistent with existing rules for paper plans and should already be known by cadastral survyeors.

The following sections describe the general guidelines on implementing parcel allocations and then provide explanations and requirements of specific allocation scenarios. These have been divided into Primary Interest Allocations and Secondary Interest Allocations.

2.1.7.3   General rules

Allocations are from old to new. Where two new parcels overlap i.e. a new primary and secondary interest, the allocation is from the primary to the secondary interest e.g. from a created parcel to a created easement.

2.1.7.4   Primary Interest Allocations

Primary Interest Allocations refer to allocations between cadastral parcels (e.g. lots, roads, etc). Existing and created cadastral parcels do not overlap each other. Extinguished parcels must be fully "consumed" by created parcels, there must be no land left unaccounted for by the survey.

2.1.7.4.1   Extinguished parcel to new parcels

Single lot

Where one or more lots are subdivided into new lots, the spatial extent of the new lots (as defined by their coordinate geometry) must fully cover the extinguished parcel. The example below is a simple case of one lot subdivided into two with no encumbrances.
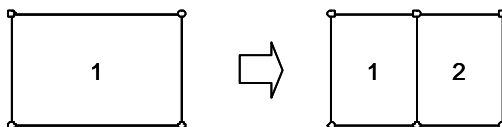

Figure 2: Extinguished lot allocation

```
<!-- Extinguished parcel element -->
<Parcel parcelType="single" name="1/RP456789"
 state="extinguished" parcelFormat="Standard" class="Lot">
  <CoordGeom>...</CoordGeom>
  <Parcels>
    <!-- Allocation to created parcels -->
    <Parcel name="iou" pclRef="1/SP12456"/>
    <Parcel name="hjk" pclRef="2/SP12456"/>
    ...
```

```
    </Parcels>
    <Title name="12345678" titleType="title"/>
    ...
</Parcel>
```

In the above, lot 1 on RP456789 is fully allocated to two new parcels, lots 1 and 2 on SP12456. The parcel elements for the created parcels will be elsewhere in the CIF, each will have a coordinate geometry that defines their spatial extent.

Single lot and new road

In the following example, lot 1 is subdivided into two new lots and new road.

Figure 3: Extinguished lot and new road

```
<Parcel parcelType="single" name="1/RP456789"
 state="extinguished" parcelFormat="Standard" class="Lot">
  <CoordGeom>...</CoordGeom>
  <!-- The parcels to which the title is allocated -->
  <Parcels>
    <Parcel name="hkj" pclRef="1/SP12456"/>
    <Parcel name="rye" pclRef="2/SP12456"/>
    <Parcel name="wer" pclRef="R1/SP12456"/>
  </Parcels>
  <Title name="12345678" titleType="title"/>
   ...
</Parcel>
<!-- The new road parcel (new lots 1 and 2 are elsewhere) -->
<Parcel class="Road" parcelFormat="Standard" state="created"
 parcelType="single" name="R1" area="194" desc="ROAD">
  <CoordGeom name="CG-R1">...</CoordGeom>
</Parcel>
```
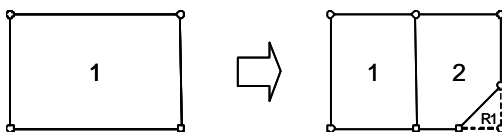
Multipart lot

The following extinguished multipart lot 28 references lots 28a and 28b (its parts) and created lots 281 and 282 (the lots to which it is allocated).

Figure 4: Multipart lot

```
<!-- Multipart lot 28 -->
<Parcel parcelType="multipart" name="28/SP178652" state="extinguished"
 parcelFormat="Standard" class="lot">
  <Parcels>
    <!-- The parts of lot 28 -->
    <Parcel name="iuy" pclRef="28a/SP178652"/>
    <Parcel name="wtr" pclRef="28b/SP178652"/>
```
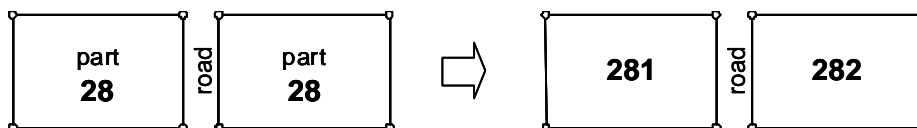
```
    <!-- The parcels lot 28 is allocated to -->
    <Parcel name="poi" pclRef="281/SP206205"/>
    <Parcel name="khl" pclRef="282/SP206205"/>
  </Parcels>
  <Title name="50631472" titleType="title"/>
  <Title name="40052534" titleType="original grant"/>
</Parcel>
<!-- Part lot 28a -->
<Parcel parcelType="part" name="28a/SP178652" state="extinguished"
 parcelFormat="Standard" class="lot">
  <Center pntRef="CENTRE 6"/>
  <CoordGeom>...</CoordGeom>
</Parcel>
```

In this case, lot 28 is also the original grant lot. Allocations to the new lots are in the multipart
lot. Administrative areas are included in the part lots for information only, allocations are not
done from the part lots.

Following is an example of a created multipart lot. Allocations to it will be to the parent
multipart lot.

```
<!-- Created multipart parcel -->
<Parcel class="Lot" parcelFormat="Standard" state="created"
 parcelType="multipart" name="201/SP216103" area="127240">
  <Parcels>
    <Parcel name="bnm" pclRef="201a/SP216103"/>
    <Parcel name="cvb" pclRef="201b/SP216103"/>
  </Parcels>
</Parcel>
<!-- Created part of above multipart parcel -->
<Parcel class="Lot" parcelFormat="Standard" state="created"
 parcelType="part" name="201a/SP216103" area="103200">
 <CoordGeom name="CG-201a-SP216103">...</CoordGeom>
</Parcel>
<!-- Created part of above multipart parcel -->
<Parcel class="Lot" parcelFormat="Standard" state="created"
 parcelType="part" name="201b/SP216103" area="24040">
  <CoordGeom name="CG-201b-SP216103">...</CoordGeom>
</Parcel>
<!-- Extinguished lot allocating to created multipart parcel -->
<Parcel class="Lot" parcelFormat="Standard" state="extinguished"
parcelType="single" name="2/S234" area="721204">
  <Parcels>
    <!-- Extinguished lot allocations to created lots -->
    <Parcel name="cvd" pclRef="201/SP216103"/>
    <Parcel name="nht" pclRef="202/SP216103"/>
    <Parcel name="sst" pclRef="203/SP216103"/>
    ...
  </Parcels>
  ...
</Parcel>
```

2.1.7.4.2   Original Grant (Crown Parcels)

Original grant allocations provide a method to associate the original crown allotments and
portions (collectively known as *crown parcels*) with a new parcel. The association can be
between a historic crown parcel and new parcel, or an existing crown parcel being
subdivided on the current plan. The following sections outline the various scenarios and how
to implement them.

Single original grant

Where a survey involves a single original grant, the original grant is either an existing crown
parcel being subdivided, or an historic referenced crown parcel. The following guidelines
apply to single original grant allocations:

- If the crown parcel is being subdivided, it will specify a `status` of "extinguished". If
  the crown parcel is historic (it no longer exists), it will specify a `status` of
  "referenced".

- Crown parcels are identified by their parcel `name` or `title` reference or both. The
  parcel name primarily captures the allotment or portion number. The title reference
  captures the identifier of the original grant (or equivalent) for that parcel. Note that a
  parcel `name` is mandatory but a `title` reference is optional based on jurisdictional
  requirements.

- Coordinate Geometry of the crown parcel is optional depending on jurisdictional
  requirements.

The example below shows an existing crown parcel (portion 71 on CK686) that has been
extinguished and allocated to 2 new parcels (1 and 2 on SP212173).

```
<Parcel name="71/CK686" state="extinguished" parcelFormat="Standard"
 class="Lot" parcelType="single" desc="Por 71">
  <Parcels>
    <Parcel name="asd" pclRef="1/SP212173"/>
    <Parcel name="dsa" pclRef="2/SP212173"/>
  </Parcels>
  <Title name="11908097" titleType="original grant"/>
</Parcel>
```

The example below shows a historic crown parcel.

```
<Parcel class="Lot" name="9002/NOPLAN1" parcelFormat="Standard"
 state="referenced" parcelType="single" desc="ALLOT 2 SEC 43">
  <Parcels>
    <Parcel name="zxc" pclRef="1/SP212233"/>
    <Parcel name="cxz" pclRef="2/SP212233"/>
  </Parcels>
  <Title name="20952027" titleType="original grant"/>
</Parcel>
```

Note that in the above examples, parcel names are arbitrary. Conventions are specified at
the jurisdictional level.

Multiple original grants

A CIF that specifies multiple original grants is treated much the same as for a single original grant except that partial allocations may be required. In the following, portions 2 and 3 are partially allocated to new lot 2, portion 2 is fully allocated to lot 1.

Figure 5: Multiple original grants

```
<Parcel class="Lot" parcelFormat="Standard" state="referenced"
 parcelType="single" name="2/C3711" desc="Por 2">
  <Parcels>
    <Parcel pclRef="1/SP215842" name="1/SP215842"/>
  </Parcels>
  <Parcels name= "partially allocated ">
    <Parcel pclRef="2/SP215842" name="hef"/>
  </Parcels>
  <Title titleType="original grant" name="10308188"/>
</Parcel>

<Parcel class="Lot" parcelFormat="Standard" state="referenced"
 parcelType="single" name="3/C3711" desc="Por 3">
  <Parcels name= "partially allocated ">
    <Parcel pclRef="2/SP215842" name="uif"/>
  </Parcels>
  <Title titleType="original grant" name="10317052"/>
</Parcel>
```
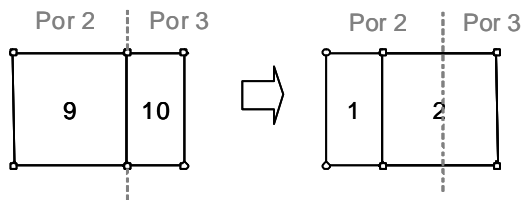
Depending on the requirements of the jurisdiction, partial allocations may not be necessary and a spatial definition of the crown parcels may not be required.

2.1.7.5   Secondary Interest Allocations

Secondary Interest Allocations refer to interests that are not cadastral parcels, but represent an interest associated with a cadastral parcel such as easements, leases, mortgages and others. Secondary interests must always have an underlying cadastral parcel.

Unlike primary interests, secondary interests can intersect each other, e.g. two easements or an easement and a lease may overlap.

2.1.7.5.1   Easement Encumbrance

Existing Easement and New Lot

Where a new lot is created over an existing easement, the easement must be allocated to the new lot. The new lot then becomes burdened by the easement in the area that is overlapped spatially by the easement.
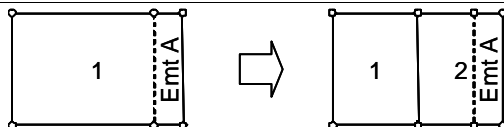
Figure 6: Existing easement—Case 1

```
<Parcel parcelType="single" name="A/RP836891" state="affected"
 parcelFormat="Standard" class="Easement" desc="43081/600"
 area="2951">
  <CoordGeom>...</CoordGeom>
  <Parcels>
    <Parcel name="ter" pclRef="2/SP212173"/>
  </Parcels>
  <Title name="601875519" titleType="easement"/>
   ...
</Parcel>
```

In the above, lot 2 on SP212173 has been created and affects existing easement A on
RP836891, easement A is affected and has an allocation to lot 2. The coordinate geometry
of the easement and the new lot (elsewhere in the CIF) are included so that the effect of the
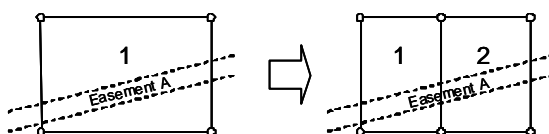easement on the new lot can be determined.

Figure 7: Existing easement—Case 2

In the above case, easement A will be allocated to both new lots 1 and 2.

Created Easement and Created Lot

Where a survey creates an easement that affects a created lot, there must be an allocation
from the new lot to the easement. This is the only case where a created lot has an allocation.

Extinguished parcel to new parcels (§ 2.1.7.4.1) also apply to created easements.
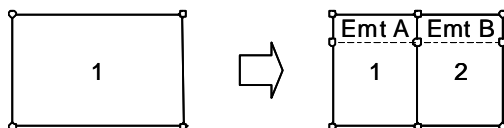
Figure 8: New easement in new lot

In the above example, extinguished lot 1 has allocations to created lots 1 and 2 and created
easements A and B. Created lots 1 and 2 also allocate to created easements A and B
respectively.

```
<!-- Extinguished lot 1 allocated to new lots 1, 2 and emts A & B -->
<Parcel class="Lot" parcelFormat="Standard" state="extinguished"
 parcelType="single" name="1/SP177637">
  <Parcels>
    <Parcel pclRef="9/SP215842" name="hew"/>
    <Parcel pclRef="10/SP215842" name="ksw"/>
    <Parcel pclRef="A/SP215842" name="qer"/>
```

```
      <Parcel pclRef="B/SP215842" name="kwe"/>
    </Parcels>
    <CoordGeom>...</CoordGeom>
    <Title name="50563174"/>
    <Title titleType="title" name="50563174"/>
     ...
</Parcel>
<!-- Created lot 1 with allocation to easement A -->
<Parcel class="Lot" parcelFormat="Standard" state="created"
 parcelType="single" area="2513" name="1/SP215842">
    <CoordGeom>...</CoordGeom>
    <Parcels>
      <Parcel pclRef="B/SP215842" name="pyd"/>
    </Parcels>
    <Title titleType="title" name=""/>
</Parcel>
<!-- Created lot 2 with allocation to easement B -->
<Parcel class="Lot" parcelFormat="Standard" state="created"
 parcelType="single" area="2513" name="1/SP215842">
    <CoordGeom>...</CoordGeom>
    <Parcels>
      <Parcel pclRef="B/SP215842" name="gfe"/>
    </Parcels>
    <Title titleType="title" name=""/>
</Parcel>
<!-- Created easement A -->
<Parcel class="Easement" parcelFormat="Standard" state="created"
 parcelType="single" area="5" name="A/SP215842">
    <CoordGeom>...</CoordGeom>
</Parcel>
```

2.1.7.5.2   Easement Beneficiary and Restriction Benefit/Burden

There are 2 types of easement beneficiaries: authorities and physical lots. If the beneficiary is an authority, it is specified using the `owner` attribute of the easement parcel. For example,

```
<Parcel name="EE1\PS513165" desc="Encumbering Easement 1, Part 3 on
PS513165" class="Easement" state="created" parcelType="part"
useOfParcel="Pipeline" parcelFormat="Standard" owner="GOULBURN VALLEY
REGION WATER AUTHORITY">
```

If the beneficiary is a parcel, the `title` element of the benefiting parcel records the easement interest. This is an example of an explicit allocation of a right to a parcel.

```
<Parcel name="4\PS513165" desc="Lot 1 on PS513165" class="Lot"
parcelFormat="Standard" parcelType="Single" state="created" area="1015">
   <Title name="EE2\PS513165" titleType="Easement Benefit" />
</Parcel>
```

Restrictions use the same principle. Every parcel benefitted or burdened by a restriction must contain a title reference specifying the identifier of the restriction interest. The `owner` attribute is not used in allocating restrictions.

```
<Parcel name="4\PS513165" desc="Lot 1 on PS513165" class="Lot"
parcelFormat="Standard" parcelType="Single" state="created" area="1015">
   <Title name="RST1\PS513165" titleType="Restriction Burden" />
   <Title name="RST1\PS513165" titleType="Restriction Benefit" />
</Parcel>
```

2.1.8   Administrative Linkages

Administrative Linkages use the parcel linking technique to capture and construct administrative data. They are generally used for association purposes. For example, owners corporations link to the lots associated with the OC. Admin areas link to parcels that sit inside the admin area. The scenarios listed here are not exhaustive. Individual jurisdictions may employ their own administrative linkages for proprietary purposes.

2.1.8.1   Owners Corporations

Owners Corporation (OC) schedule information is stored in an administrative parcel element using parcel linkages to reference the land affected by the OC.

- The parcel must have a class of "Owners Corporation".

- The type of Owners Corporation is reflected in the `useOfParcel` attribute (e.g. Unlimited, Limited to CP and Limited). These are listed as jurisdictional enumerated values.

- The Owners Corporation number is recorded in the `name` attribute (e.g. OC1/PS123456). The specific format is defined by the jurisdiction.

- Nested parcel allocations define the Area Affected by OC (Lots) and lot entitlement and liability.

- The `state` attribute specifies whether the OC is created in this plan. Values are LandXML enumerations.

The following is an example of a simple OC implementation.

```
<Parcel name="OC1\PS616582" class="Owners Corporation"
useOfParcel="Unlimited" state="created" parcelType="single">
   <Parcels>
     <Parcel name="AAA" lotEntitlements="50" liabilityApportionment="50"
pclRef="1\PS616582" />
     <Parcel name="BBB" lotEntitlements="50" liabilityApportionment="50"
pclRef="2\PS616582" />
     <Parcel name="CCC" lotEntitlements="0" liabilityApportionment="0"
pclRef="CM1\PS616582" />
   </Parcels>
</Parcel>
```

The OC `parcel` element must contain linkages to all parcels affected by the OC including common property.

2.1.8.2 Administrative Areas

CIFs contain `AdministrativeArea` elements representing the parish, county, locality and local government (LGA) of the land surveyed. If the survey involves multiple administrative areas of the same type (e.g. multiple parishes or LGAs), `Parcel` elements can be used to define their spatial extent or boundaries (either fully or partially).

Land parcels can also be linked using a parcel linkage to administrative area parcels to explicitly specify the administrative areas for each parcel. This is useful where the surveyor is required to specify the administrative areas for each parcel by regulation or other direction, or where a parcel crosses an administrative area boundary and one must be specified as the primary.

The following example demonstrates the above concepts.

```
<Parcels>
  <!-- Administrative Area parcels linked to SurveyHeader -->
  <Parcel name="pcl1" oID="1000" desc="BRISBANE CITY"
class="Administrative Area" useOfParcel="LGA" parcelType="Administrative"
state="existing" >
    <!-- Coord Geom showing a partial boundary line -->
    <Center pntRef="Cg4" />
    <CoordGeom>
      <Line>
        <Start pntRef="Cg1"></Start>
        <End pntRef="Cg2"></End>
      </Line>
      <Line>
        <Start pntRef="Cg2"></Start>
        <End pntRef="Cg3"></End>
      </Line>
    </CoordGeom>
    <!--Linkages to all the parcels that fall inside this admin area -->
    <Parcels>
      <Parcel name="xyz1" pclRef="1\PS123456" />
      <Parcel name="xyz1" pclRef="2\PS123456" />
    </Parcels>
  </Parcel>
  <Parcel name="pcl2" oID="535" desc="CARINDALE" class="Administrative
Area" useOfParcel="Locality" parcelType="Administrative"
state="existing">
    <Center pntRef="Cg5" />
    <CoordGeom>
      <Line>
        <Start pntRef="Cg6"></Start>
        <End pntRef="Cg7"></End>
      </Line>
      <Line>
        <Start pntRef="Cg7"></Start>
        <End pntRef="Cg8"></End>
      </Line>
    </CoordGeom>
    <!--Linkages to all the parcels that fall inside this admin area -->
```

```xml
    <Parcels>
      <Parcel name="xyz1" pclRef="1\PS123456" />
      <Parcel name="xyz1" pclRef="2\PS123456" />
    </Parcels>
  </Parcel>
  <!-- Land parcels allocated to admin areas -->
  <Parcel name="1\PS123456" class="Lot" parcelType="Single"
state="created" area="5000" >
    <!-- Coord geom omitted -->
  </Parcel>
  <Parcel name="2\PS123456" class="Lot" parcelType="Single"
state="created" area="5000" >
    <!-- Coord geom omitted -->
  </Parcel>
</Parcels>

<Survey>
  <SurveyHeader >
    <!-- Administrative areas listed in the SurveyHeader -->
    <AdministrativeArea adminAreaCode="1000" adminAreaType="LGA"
adminAreaName="BRISBANE CITY" pclRef="pcl1" />
    <AdministrativeArea adminAreaCode="535" adminAreaType="Locality"
adminAreaName="CARINDALE" pclRef="pcl2" />
  </SurveyHeader>
</Survey>
```

In addition to the links between admin area parcels and land parcels, admin area parcels can be hierarchically linked to each other for convenience. This is used if admin areas fall inside another admin area e.g. townships sit inside parishes and localities sit inside LGAs. Parcels linked to the lower level admin area have an implied link to the higher level admin area i.e. all parcels in a township are implied to also be in the parish. The following example demonstrates this.

```xml
<Parcels>
  <Parcel name="STEAVENSON3500" desc="STEAVENSON" oID="3500"
class="Administrative Area" useOfParcel="Parish" parcelType="Single"
state="existing">
    <Parcels>
      <Parcel name="LNK-9" pclRef="MARYSVILLE5509"/>
    </Parcels>
  </Parcel>
  <Parcel name="MARYSVILLE5509" desc="MARYSVILLE" oID="5509"
class="Administrative Area" useOfParcel="Township" parcelType="Single"
state="existing">
    <Parcels>
      <Parcel name="LNK-10" pclRef="1\PS513165"/>
      <Parcel name="LNK-11" pclRef="2\PS513165"/>
      <Parcel name="LNK-12" pclRef="3\PS513165"/>
      <Parcel name="LNK-13" pclRef="4\PS513165"/>
      <Parcel name="LNK-14" pclRef="5\PS513165"/>
      <Parcel name="LNK-15" pclRef="6\PS513165"/>
      <Parcel name="LNK-16" pclRef="7\PS513165"/>
      <Parcel name="LNK-17" pclRef="R1\PS513165"/>
```

```
        </Parcels>
    </Parcel>
</Parcels>
```

2.1.9   Road Parcel Rules

Roads in an ePlan CIF are represented by a `Parcel` element with a class of "road". Roads may be:

1. new: a road parcel created by the survey

2. existing: an abutting or adjoining road shown for reference purposes

The `name` attribute of a road parcel must be unique in the file, it may be required to conform to a specified naming standard or be an arbitrary identifier depending on jurisdictional requirements. In addition, Road parcels must specify an official or gazetted name (e.g. "Bourke Street") in the `desc` attribute if it applies. If the road does not have a name, a `desc` of "new road" should be used or a value determined by the jurisdiction.

2.1.9.1   New Road

Roads are identified by their official name (i.e. `desc` attribute value). However, subdivided road parcels can fall into one of two categories:

1. Single road

2. Road broken into separate parts

In both situations, "single" parcels are used. A single road is captured as one single parcel. A road broken into separate parts is captured as multiple single parcels. The official name (desc attribute) is the same for these parcels but the parcel name is different.

The following example is a CAD representation of a captured plan with road intersections. Meander Grove is split into two parcels across the intersection with Raleigh Street. Raleigh Street and Nithsdle Street are continuous parcels. The red labels identify specific ePlan attributes.
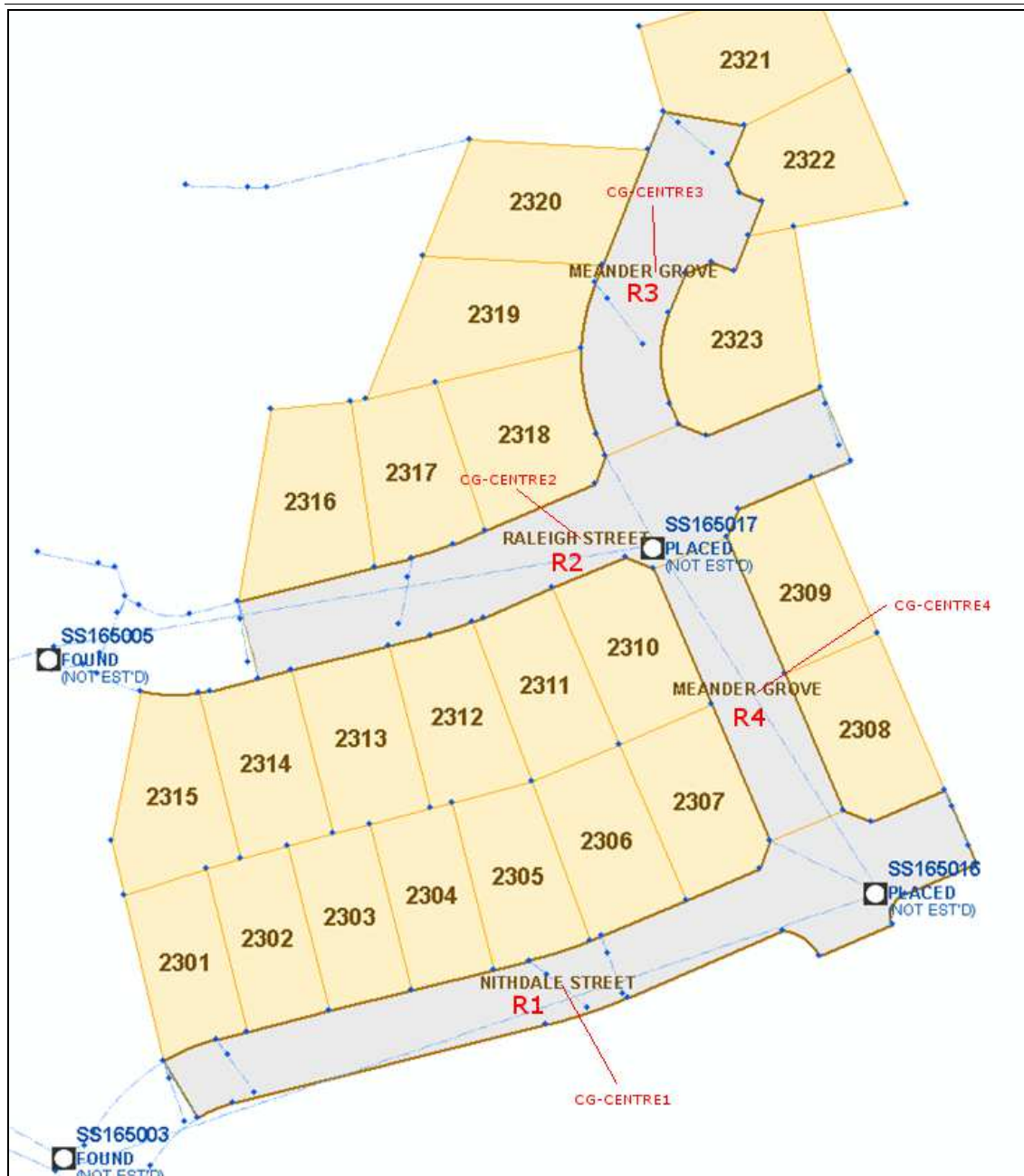
Figure 9: Road parcel intersection example

The following is the LandXML structure of the road parcels for the above example. The `name` and `id` attributes contain arbitrary values for demonstration only.

```
<Parcel name="R1" desc="Nithsdle Street" class="road"
parcelFormat="standard" parcelType="single" state="created" area="1000">
  <Center pntRef="CG-CENTRE1" />
  <CoordGeom name="CG-1-DP1156245">
    <Curve rot="cw" radius="37.5">
      <Center pntRef="CG-CENTRE6"/>
```

```xml
        <Start pntRef="CG-1-DP1156245"></Start>
        <End pntRef="CG-2-DP1156245"></End>"
      </Curve>
      <Line>
        <Start pntRef="CG-3-DP1156245"></Start>
        <End pntRef="CG-4-DP1156245"></End>
      </Line>

      <!-- remaining lines omitted -->

   </CoordGeom>
</Parcel>

<Parcel name="R2" desc="Raleigh Street" class="road"
parcelFormat="standard" parcelType="single" state="created" area="850">
   <Center pntRef="CG-CENTRE2" />
   <CoordGeom name="CG-2-DP1156245">
      <Line>
        <Start pntRef="CG-11-DP1156245"></Start>
        <End pntRef="CG-12-DP1156245"></End>
      </Line>
      <Line>
        <Start pntRef="CG-13-DP1156245"></Start>
        <End pntRef="CG-14-DP1156245"></End>
      </Line>

      <!-- remaining lines omitted -->

   </CoordGeom>
</Parcel>

<Parcel name="R3" desc="Meander Grove" class="road"
parcelFormat="standard" parcelType="single" state="created">
   <Center pntRef="CG-CENTRE3" />
   <CoordGeom name="CG-3-DP1156245">
      <Line>
        <Start pntRef="CG-19-DP1156245"></Start>
        <End pntRef="CG-20-DP1156245"></End>
      </Line>
      <Line>
        <Start pntRef="CG-21-DP1156245"></Start>
        <End pntRef="CG-22-DP1156245"></End>
      </Line>

      <!-- remaining lines omitted -->

   </CoordGeom>
</Parcel>

<Parcel name="R4" desc="Meander Grove" class="road"
parcelFormat="standard" parcelType="single" state="created">
   <Center pntRef="CG-CENTRE4" />
```

```
   <CoordGeom name="CG-4-DP1156245">
     <Line>
       <Start pntRef="CG-27-DP1156245"></Start>
       <End pntRef="CG-28-DP1156245"></End>
     </Line>
     <Line>
       <Start pntRef="CG-29-DP1156245"></Start>
       <End pntRef="CG-30-DP1156245"></End>
     </Line>

     <!-- remaining lines ommitted -->

   </CoordGeom>
</Parcel>
```

2.1.9.2   Existing Road

Existing road is abutting, adjoining or surrounding road that is used to re-establish a survey area or provide context to the plan. The primary information required in a CIF for existing road is:

- The spatial extent of boundaries that border the survey area or provide reference for the survey.

- Common road name.

- Any jurisdictional system identifiers

Existing road parcels do not require additional parcel information such as area.

The coordinate geometry for existing roads is not required to close as a complete polygon. Additionally, a `Center` element is required with coordinates that fall within the road parcel. This serves to correctly position the road name for visualisation as well as identifying the side of the boundary that the road is on.

The following example shows two abutting roads. The Parcel element captures only the abutting boundaries shown in the diagram. The Center element must be on the correct side of the road boundary and is used to position the road name for display. The red labels identify specific ePlan elements and attributes. The centre crosshairs identify the location of `Center` elements. Each red box identifies a road parcel `CgPoint`.

Figure 10: Existing road plan diagram

```
<Parcel name="R1" desc="Martin Road" class="road" parcelFormat="standard"
parcelType="single" state="existing">
  <Center pntRef="CENTRE1" />
  <CoordGeom name="CG-1-PS604571">
    <Line>
      <Start pntRef="CG-1"></Start>
      <End pntRef="CG-2"></End>
    </Line>
    <Line>
      <Start pntRef="CG-2"></Start>
      <End pntRef="CG-3"></End>
    </Line>
    <Line>
      <Start pntRef="CG-3"></Start>
      <End pntRef="CG-4"></End>
    </Line>
  </CoordGeom>
</Parcel>

<Parcel name="R2" desc="Falls Road" class="road" parcelFormat="standard"
parcelType="single" state="existing">
  <Center pntRef="CENTRE2" />
```

```
  <CoordGeom name="CG-2-PS604571">
    <Line>
      <Start pntRef="CG-4"></Start>
      <End pntRef="CG-5"></End>
    </Line>
    <Line>
      <Start pntRef="CG-5"></Start>
      <End pntRef="CG-6"></End>
    </Line>
  </CoordGeom>
</Parcel>
```
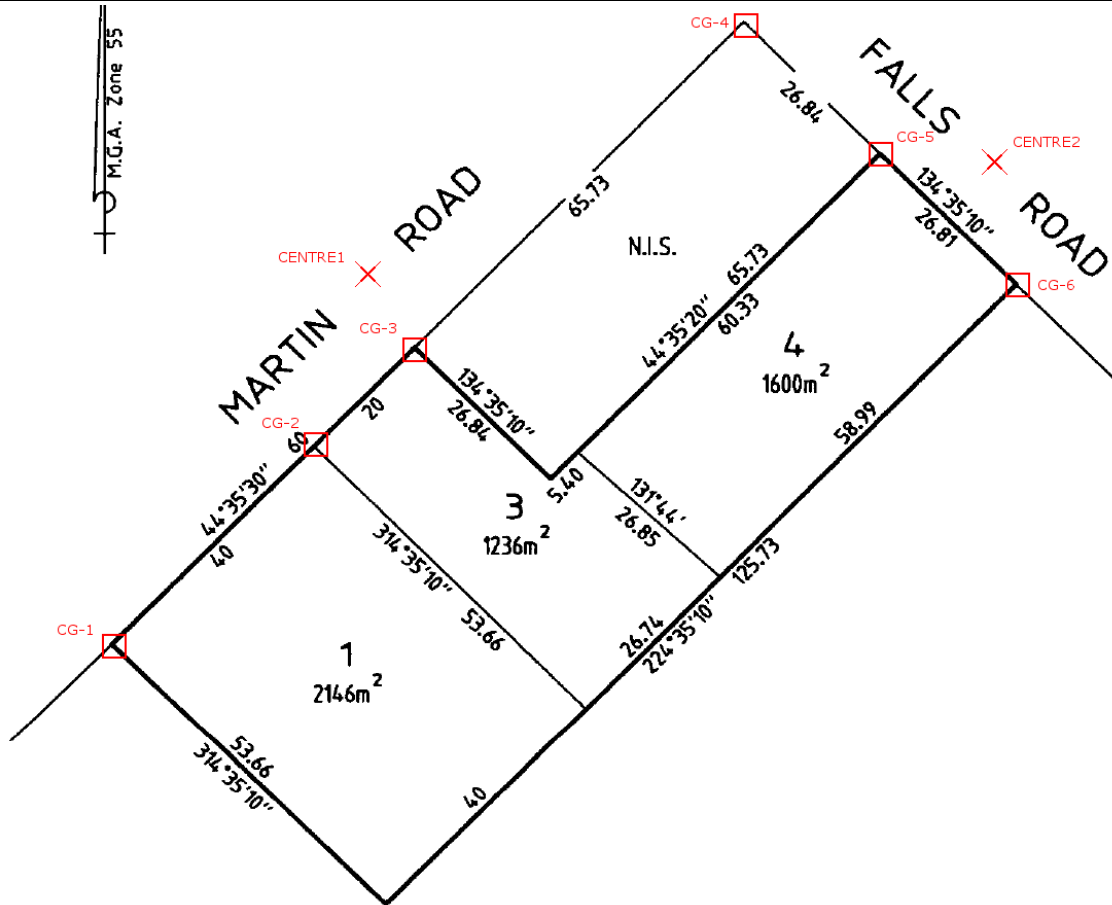
2.1.9.3   Street Address Linking

The `LocationAddress` element used for `Parcels` stores the street address of the parcel.
When specifying the road name, it can be linked to the parcel element representing the road
or segment of road.

```
<Parcels>
  <Parcel name="">
    <LocationAddress   addressType="Primary"
                flatNumber="13"
                flatType="Unit"
                floorLevelNumber="4"
                floorLevelType="Level"
                numberFirst="224"
                numberLast="226"
      <ComplexName desc="River Front Plaza" priority="1"></ComplexName>
      <RoadName roadName="Beaconsfield" roadNameType="Parade"
roadType="State Highway" pclRef="R1/PS123456"/>
      <AdministrativeArea adminAreaType="Locality"
adminAreaName="Middle Park" pclRef="1235MIDDLEPARK" />
      <AddressPoint pntRef="CG1" addressPointType="Residential"/>
    </LocationAddress>
  </Parcel>
</Parcels>

<CgPoints zoneNumber="55">
  <CgPoint name="CG1" pntSurv="administrative" state="proposed">320497
5808576</CgPoint>
</CgPoints>
```

2.1.10   Parcel Centroid and Address Points

Parcel Centre (Center element) and address points (AddressPoint element) are
administrative points used by parcel elements.

* The pntRef attribute links to a CgPoint with coordinate information.

* The CgPoint must have a pntSurv value of "administrative".

For example:

```
<AddressPoint pntRef="CG1" addressPointType="Residential"/>


<CgPoints zoneNumber="55">
   <CgPoint name="CG1" pntSurv="administrative" state="proposed">320497
5808576</CgPoint>
</CgPoints>
```

2.2 Structuring Spatial Elements of the CIF

The following elements in a CIF contain spatial information:

- All elements under `CoordGeom` (e.g. `Line`, `Curve`, `IrregularLine`)

- All elements under `ObservationGroup`

- `CgPoint` elements

Coordinate geometry (`CoordGeom`) elements are used to store 2D and 3D line and polygon structures for `Parcel` and `PlanFeatures` elements. A `CoordGeom` element must be a child of a `Parcel` or `PlanFeature` element.

`Observation` elements are contained within an `ObservationGroup` element and are used for measurement and dimension information.

CgPoints are single points that are used to build more complex structures such as lines, arcs and polygons and:

- To associate observation and monument information with a point

- To store the position of a point for rendering purposes.

`CgPoint` elements are all contained within a `CgPoints` element and are referenced using their name attribute. Other elements that are associated with a particular `CgPoint` have a `pntRef` attribute whose value is the name of the related `CgPoint` element. These include `Lines`, `Curves`, `Monuments`, `ReducedObservations` and others. For example, `Lines` in a `CoordGeom` have `Start` and `End` nodes, which in turn reference `CgPoint` elements. Where a measurement or dimension is required between two points, they are referenced by `Observation` elements through `InstrumentSetup` elements.

`CgPoint` elements can store coordinate information for the node. Coordinates are used only for rendering purposes and should not be used for any purpose requiring survey accurate data as `CgPoint` coordinates may be distorted for display optimisation. The `CoordinateSystem` element specifies the coordinate system used to interpret the `CgPoint` coordinates.

Survey measurements are captured using Observation elements that are related to Parcels and PlanFeatures through CgPoint elements (see § 2.2.1). Therefore any CgPoint without a related observation element should be considered as reference or display data only and has

no other significance to the underlying survey. For example, adjoining parcels may be
included to show their topological relationship with surveyed parcels using coordinates in the
CgPoint only (i.e. without associated observation elements).

2.2.1   Linking Observations to CgPoints

To link observation and dimension information to parcel coordinate geometry, links are made
from the relevant Observation elements to the CgPoints representing the parcel's corners as
follows:

- The `ReducedObservation` and `ReducedArcObservation` elements are linked
  using the `setupID`, `targetSetupID` and (if angles are being used)
  `targetSetup2ID` attributes. These attributes contain the value of the name attribute
  of an `InstrumentSetup` element.

- The `InstrumentSetup` element contains a nested `InstrumentPoint` element that
  contains a `pntRef` attribute that references the `name` attribute of a `CgPoint` element.

- The `InstrumentSetup` element must have:

  o a unique `name` value

  o a `stationName` (which may use the `CgPoint` name or some other value)

  o an `instrumentHeight` (which may be a default value of zero)

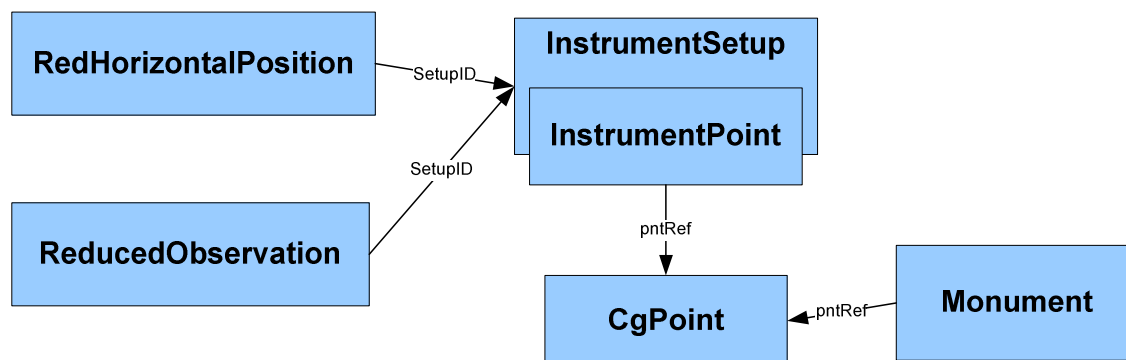The following diagram shows the links between observations, `CgPoints` and `Monuments`.

Figure 11: Observation, CgPoint and Monument element relationship

Below is a LandXML example that shows links between observations, CgPoints and a
boundary line.

```
<CgPoints>
   <CgPoint name="AAA" oID="1-PS123456" pntSurv="boundary"
state="existing">111.111 222.222</CgPoint>

   <CgPoint name="BBB" oID="2-PS123456" pntSurv="boundary"
state="existing">148.779 184.006</CgPoint>
</CgPoints>
```

```
<Survey>
<InstrumentSetup id="IS-1-PS123456" instrumentHeight="0" stationName="" >
     <InstrumentPoint pntRef="AAA"/>
   </InstrumentSetup>

   <InstrumentSetup id="IS-2-PS123456" instrumentHeight="0
stationName="" >
     <InstrumentPoint pntRef="BBB"/>
   </InstrumentSetup>

   <ObservationGroup id="OG-1">
     <ReducedObservation setupID="IS-1-PS123456"
      targetSetupID="IS-2-PS123456"
      horizDistance="53.66" azimuth="314.3510" .../>
   </ObservationGroup>
</Survey>

<Parcels>
   <Parcel name="" ...>
     <CoordGeom>
       <Line>
          <Start pntRef="AAA"></Start>
          <End pntRef="BBB"></End>
       </Line>
       ...
     </CoordGeom>
   </Parcel>
</Parcels>
```

The above example shows how a line (`Parcel/CoordGeom/Line`) and its dimensions
(attributes of `ReducedObservation`) and rendering information (`CgPoint` coordinates) are
related using the `CgPoint` and `InstrumentSetup` elements in a CIF.

The following diagram is a representation of the above LandXML (note that `CgPoint`
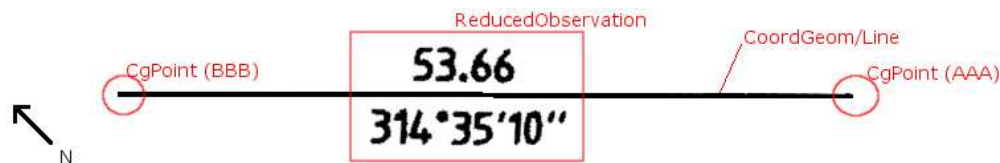coordinates are ordered northing, easting or y, x):

Figure 12: Linking observations and dimensions to lines

2.2.2   Survey Control

The following components are used to store information about a survey mark:

- `RedHorizontalPostion` and `RedVerticalObservation` elements hold
  measurement data

- CgPoint elements represent the point at which the mark is located

- Monument elements contain information about the physical object placed at the point

In addition, the InstrumentSetup element links the RedHorizontalPosition and
RedVerticalObservation elements to the CgPoint using the method outlined in
§ 2.2.1.

The following example shows the LandXML structure for representing survey marks. The
name and oID attribute values are arbitrary and used for demonstration purposes.

```xml
<CgPoints>
   <CgPoint name="AAA" oID="1-PS123456" pntSurv="boundary"
state="existing">111.111 222.222</CgPoint>

   <CgPoint name="BBB" oID="1-PS123456" pntSurv="boundary"
state="existing">333.333 444.444</CgPoint>
</CgPoints>

<Survey>
<InstrumentSetup id="IS-1-PS123456" instrumentHeight="0" stationName="" >
     <InstrumentPoint pntRef="AAA"/>
   </InstrumentSetup>

   <InstrumentSetup id="IS-2-PS123456" instrumentHeight="0"
stationName="" >
     <InstrumentPoint pntRef="BBB"/>
   </InstrumentSetup>

<ObservationGroup id="OG-1">
     <RedHorizontalPosition setupID="IS-1-PS123456" .../>
     <ReducedObservation setupID="IS-1-PS123456" targetSetupID="IS-2-
PS123456" .../>
   </ObservationGroup>
</Survey>

<Monuments>
   <Monument name="MON-1" pntRef="AAA" ...></Monument>
</Monuments>
```

In the above example, CgPoint (name="AAA") is linked through the InstrumentSetup
element (InstrumentSetup@id="IS-1-PS12345 and
InstrumentPoint@pntRef="AAA") to a RedHorizontalPosition element (setupID="IS-
1-PS123456").

A monument element is linked to the same CgPoint using its pntRef attribute
(Monument@pntRef="AAA" links to CgPoint@name="AAA").

The linkages follow the pattern detailed in § 2.2.1 and Figure 11.

To place this in context with other survey data, the italicised code shows the links between a
second CgPoint to a ReducedObservation element. This ReducedObservation is
linked by its setupID to the survey mark node and its targetSetupID to another

CgPoint which could be a boundary corner or a traverse. These relationships are used to associate observations and measurements with lines between two CgPoint elements.

2.2.3   Occupation

Occupation in a CIF is stored using PlanFeature elements. A PlanFeature is constructed from coordinate geometry similarly to a parcel.

[To be completed in future versions]

2.2.3.1   Offsets to Occupation

[To be completed in future versions]

2.2.4   CgPoint Types

CgPoints have an attribute called pntSurv that indicates the type of point they represent. The table below outlines the correct use of these types.

Point Type (pntSurv value)	Use
boundary	Any CgPoint that is part of a Parcel coordinate geometry. Applies to all types of parcels including administrative areas.
traverse	An unmonumented point that is connected by observations to other points in the survey by a traverse
sideshot	Single points that do not have observations, e.g. Curve centre point
administrative	Parcel Center and AddressPoint
monument	Any point used for a PlanFeature element e.g. occupation.
control	Survey control marks. CgPoint with RedHorizontalPosition and Monument attached.
reference	Reference marks. CgPoint with Monument attached.
natural boundary	A point used to define an ambulatory boundary such as a river or water body.

Where a point type can be more than one value but the jurisdiction requires only one value to be assigned, the following sequence of types should be used to assign a point type. The first matching point type (left to right) should be used.

control → reference → natural boundary → boundary → monument → traverse → sideshot → administrative

2.2.5   Observation Purpose Type

The following describes a temporary work around for a LandXML limitation. This will be
replaced with a new method in a future update the LandXML.

The `purpose` attribute for `ReducedObservation` is currently a LandXML enumeration.
However, some situations call for different enumeration values. To cater for this, the value is
stored in the `desc` attribute. Jurisdictions can specify valid values for this field using a
jurisdictionally defined version of `purposeType`. Below is a snippet of the schema that
defines this:

```
<xs:attribute name="purpose" type="purposeType" use="optional"/>
<xs:attribute name="desc" type="enum:purposeType" use="optional"/>
```

`enum:purposeType` points to the jurisdictionally defined version of purposeType. See *1.3
References REF5* for details on how the jurisdictional enumerations schema is defined.

2.3   Structuring Administrative Features of the CIF

2.3.1   Amendments

The `Amendment` element is used to record changes to the CIF. In all jurisdictions, amending
a file creates a new version of the file. However, the jurisdiction may choose one of the
following methods to apply amendments.

2.3.1.1   Strikethrough method

In some jurisdictions, all original information must remain in the file so an amended version
of a file will contain both the original and amended content. This method of recording
amendments replicates the system of strikethrough, where original information on a paper
plan was struck out but remained readable and new information was added in a style that
could be identified as being an amendment to the plan.

Using the strikeout method, an `Amendment` element will contain at least one
`AmendmentItem` element that will have either:

1. In the case of simple deletion, an `oldName` attribute referencing the name of the
   element that was deleted

2. In the case of a simple addition, a `newName` attribute referencing the name of the
   added element

3. In the case of an amendment or replacement, an `oldName` attribute referencing the
   element with the original data and a `newName` attribute referencing the element with
   the current data

Examples:

An amendment where a new element is added to the CIF:

```
<Parcels>
   <Parcel class="easement" name="A/RP892815" ... />
```

```
   ...
   </Parcels>
...
<Amendment dealingNumber="..." amendmentDate="..."
 comments="Easement added at council request">
   <AmendmentItem elementName="Parcel" newName="A/RP892815"/>
</Amendment>
```

An amendment where an element is modified:

```
<Parcels>
   <Parcel class="easement" name="old-A/RP892815" area="123" ... />
   <Parcel class="easement" name="A/RP892815" area="132" ... />
   ...
</Parcels>
...
<Amendment dealingNumber="..." amendmentDate="..."
 comments="Correction to easement area">
   <AmendmentItem elementName="Parcel" oldName="old-A/RP892815"
      newName="A/RP892815"/>
</Amendment>
```

2.3.1.2 Erasure method

In this method, only new and amended elements are included in a new version of the file and deleted elements are removed. This replicates the system of erasure, where changes are made by erasing incorrect information and adding correct information and changes are determined by comparing the new version to the previous version.

When using the erasure method, one `Amendment` element is required for each amendment and no `AmendmentItem` element is required.

```
<Amendment dealingNumber="AP123456" amendmentDate="2010-10-10"
 comments="Correction to easement area" />
```