Intergovernmental Committee on Surveying and Mapping

ePlan Working Group

ePlan Model

Document Reference:	ePlan Model v1.0.doc
Version Number:	Final
Version Date:	12/11/2010

COPYRIGHT

AMENDMENT HISTORY

Version	Date	Authors	Comments
Draft	25/08/2006	Nevil Cumerford	First release of document
Final Draft	21/03/2009	Nevil Cumerford	Updated Format and revised structure
Final	5/11/2009	Nevil Cumerford	Finalise Document

DOCUMENT ENDORSEMENT

This document was ratified by the ICSM on recommendation from the ePlan Implementation working group at the ICSM Meeting in Melbourne in November 2009.

TABLE OF CONTENTS

TERM	DESCRIPTION
ACT	The Australian Capital Territory, Australia
CIF	Cadastral Information File is an instance of a LandXML document (*.xml) consistent with the ePlan Protocol that represents a cadastral survey.
CIS	Cadastral Infrastructure Search is an instance of a LandXML document (*.xml) that represents the cadastral infrastructure in an area of interest within the cadastre. This framework data can be used as a basis for searching cadastral data in an area of interest.
COGO	A suite of programs aimed at coordinate geometry problems in Civil Engineering. See http://en.wikipedia.org/wiki/COGO
DCDB	Digital Cadastral Data Base. It is the legal parcel fabric (current subdivisional pattern) of the State of NSW supplied by the Department of Lands.
ePlan Model	ePlan Model is a logical representation of a cadastral survey. See http://www.icsm.gov.au/icsm/membersonly/eplan
ePlan Protocol	The ePlan Protocol is a physical mapping of the ePlan Model to LandXML. See
GML	Geography Markup Language. See http://www.opengis.net/gml
GOVDEX	GOVDEX is the Australian Government Collaboration Web Site hosted by the Australian Department of Finance and Deregulation The ePlan Working group has a workspace on this site that hold the Published documents, schemas and example files. See.

.... 59

END OF TABLE OF CONTENTS

1. INTRODUCTION

Plans of survey are fundamentally the same throughout Australia, a national working group sponsored by the Intergovernmental Committee for Surveying and Mapping (ICSM) was formed to develop a national model to transfer digital cadastral survey data between the surveying industry and government agencies. The model needed to support all of the functions of the present Cadastral Survey Plan as well as being consistent with the Harmonised Data Framework of Australia to ensure that the Cadastral Transfer protocol also supports a standardised approach to cadastral data management.

Digital Plan Lodgement is a topic of discussion that has been around for some time. New Zealand has developed a system of digital lodgement and automated processing that is now in production. New Zealand invested an enormous sum of money in developing this system and Australia took a watching brief over the New Zealand initiative. The New Zealand System is a fully integrated system and included the development of the Land Online Portal and associated application.

Digital Plan Lodgement in Australia has adopted a different approach to that of New Zealand but has drawn heavily on New Zealand's experiences. The significant difference being that all Australian Jurisdictions have existing systems, be they computerised or manual, that are used to manage and use Cadastral Survey Data.

This initiative could only look at the transfer protocol rather than the systems it supported, hence this model had 3 main elements:

- The model could not dictate the final business processes of a jurisdiction.
- The model must contain all elements currently shown on a Cadastral Survey Plan.
- The model must support the Harmonised Data Framework of Australia to enable a national approach to Cadastral data Management.

The outcome is a data model that has been agreed upon by the working group and recommended to ICSM as the national model for ePlan. This is expected to be adopted as a national standard and as such will give the CAD and engineering package vendors the business incentive to develop interfaces to accommodate ePlan.

It is the ePlan model that has been adopted as the model for the ePlan Protocol. An instance of this protocol is called a Cadastral Information File (CIF) and will contain all of the information that currently appears on the Plans of Survey submitted to the Agencies for registration as well as other administrative information.

The EArl Project in Queensland has exercised the ePlan model by capturing the information displayed on paper based plans into digital format and creating a CIF which was then be subjected to an automated validation process based on the current business practices.

There is also a requirement for the CIF be reproduced in hard copy format to display the information captured from the paper copy of the plan.

1.1 Purpose of Document

The Purpose of this document is to describe the physical mapping of the ePlan Model to LandXML1.2.

1.2 Scope of Document

The scope of this document is to define the relationships of the ePlan Model cross referencing it to the ePlan Protocol.

1.3 References

Enterprise Architect UML Class Diagram for ePlan in the SIP Document Repository. (Eplan4.EAP)
The LandXML Schema Version 1.2 ourced from www.LandXML.org
ePlan Protocol

1.4 Abbreviation

- CIF - Cadastral Infrastructure File is a LandXML Instance equivalent to a survey plan.
- ICSM – Intergovernmental Committee for Surveying and Mapping
- XML – Extensible Mark-up Language
- EDAIS – Ele3cdtronic Development Assessment Interchange Schema
- NECS – National Electronic Conveyancing

For a More Extensive Glossary See Appendix A.

1.5 Stakeholders

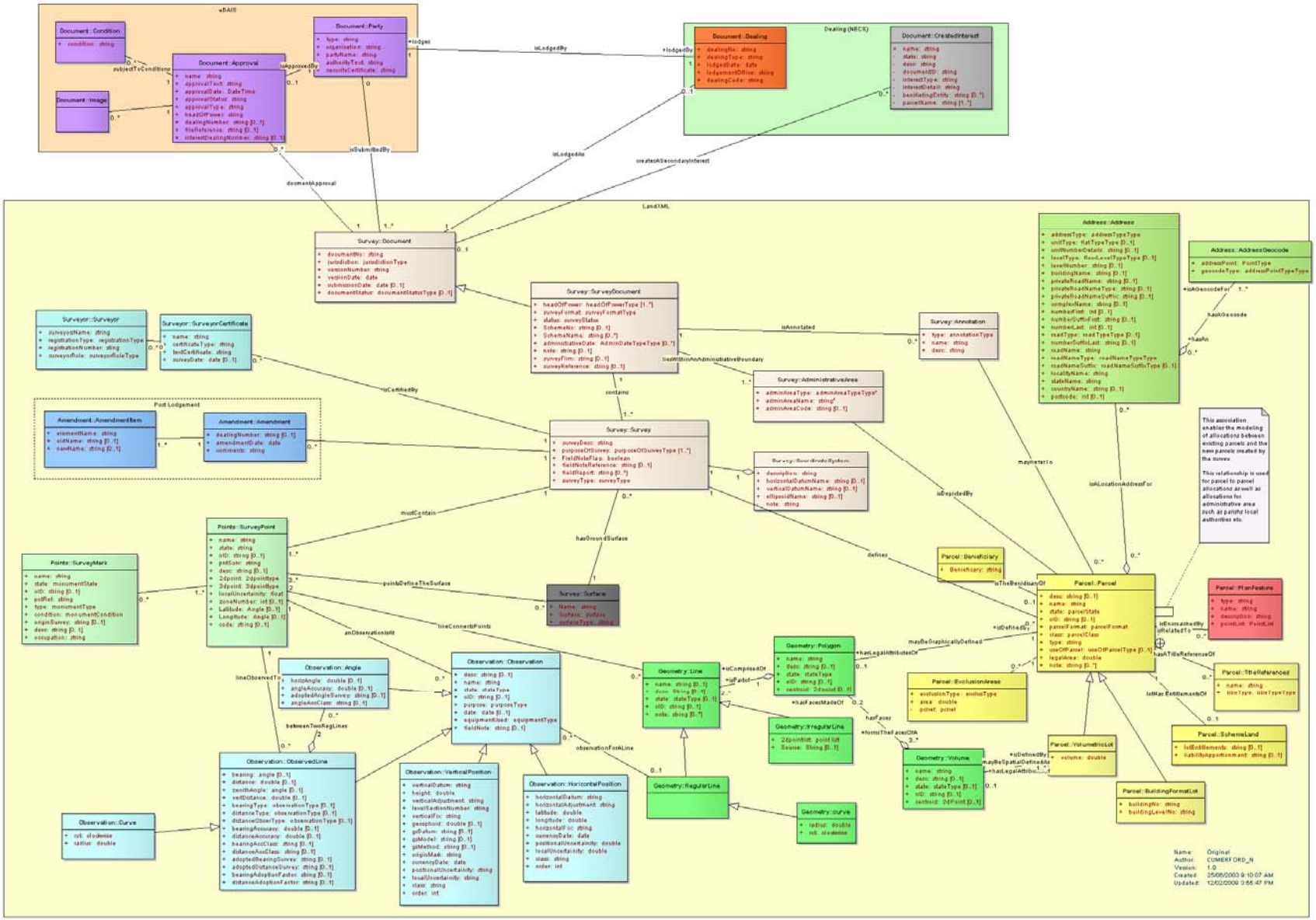
The stakeholders to this document include

- Member Jurisdictions of the ICSM
- The Surveying Industry
- The Software Vendors to the Surveying Industry.

1.6 Issues and Risks

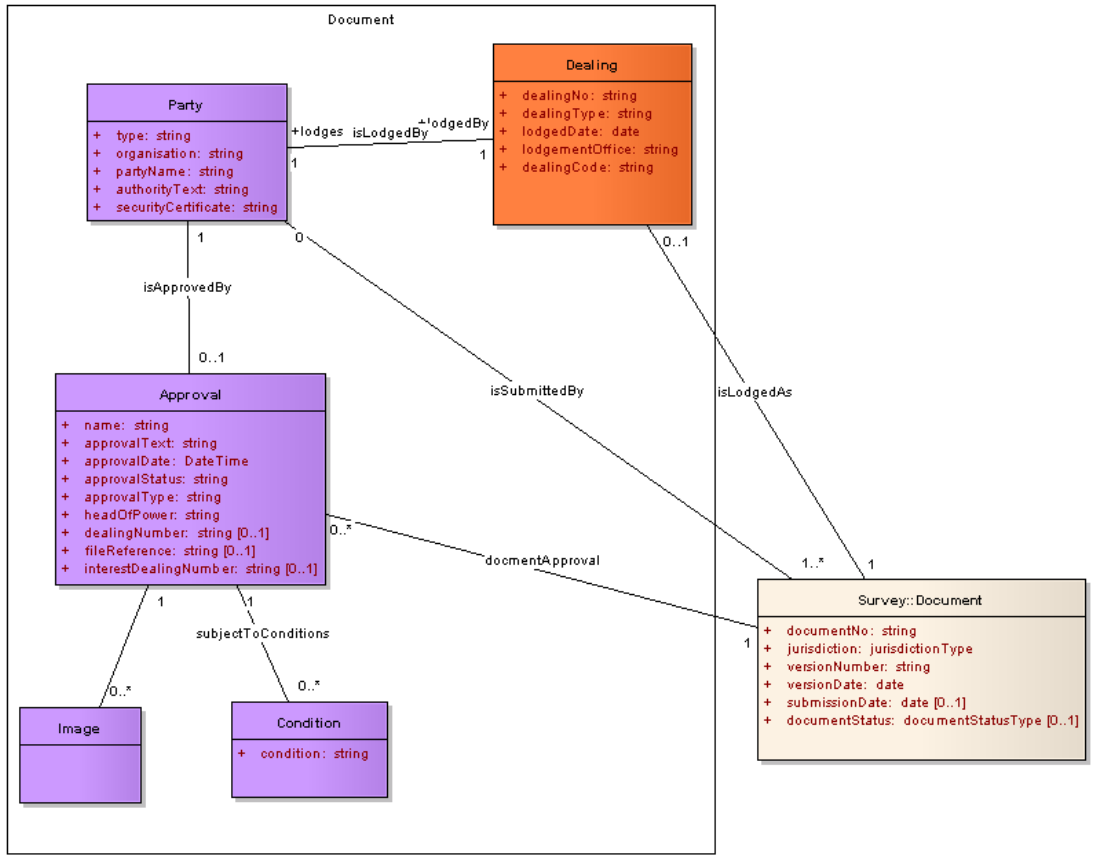
2. TECHNICAL REQUIREMENTS EPLAN MODEL

The ePlan Model has been developed using Unified Modelling Language (UML) class diagrams from existing survey plans. The requirement of this model is based on the logical model of a Cadastral Survey. This model inherits the ISO Standards and rules of Harmonised Data Model (HDM), classified into a number of packages. The latest copy of this model can be found on the ICSM Web Site.


eDAIS
Document::Condition
Document::Approval
Document::Party
Document::Image
Dealing (NECS)
Document::Dealing
Document::CreatedInterest
LandXML
Survey::Document
Survey::SurveyDocument
Survey::Annotation
Survey::AdministrativeArea
Survey::Survey
Survey::Surface
Surveyor::Surveyor
Surveyor::SurveyorCertificate
Post Lodgement
Amendment::AmendmentItem
Amendment::Amendment
Points::SurveyPoint
Points::SurveyMark
Address::Address
Address::AddressGeocode
Parcel::Beneficiary
Parcel::Parcel
Parcel::PlanFeature
Parcel::TitleReference
Parcel::ExclusionArea
Parcel::VolumetricLot
Parcel::SchemeLand
Parcel::BuildingFormatLot
Geometry::Polygon
Geometry::Line
Geometry::RegularLine
Geometry::IrregularLine
Geometry::Volume
Geometry::curve
Observation::Angle
Observation::Observation
Observation::ObservedLine
Observation::VerticalPosition
Observation::HorizontalPosition
Observation::Curve
This annotation enables the modelling of allocations between existing parcels and the new parcels created by the survey.
This relationship is used for parcel to parcel allocations as well as allocations to administrative area such as parish/ local authorities etc.

2.1 Document

The Document package contains those classes which relate to the Survey Plan as a Legal Document. The Legal Document is based on rights and restrictions. This package deals with the approval of the document and links to the Electronic Development Assessment Interchange Schema (EDAIS) which defines the format for the approval of the plan by parties subjected to conditions etc. This is beyond the LandXML schema and is a function of the document approval process rather than the creation of the survey document. This Package also refers to the Plan as a legal document and refers to the National Electronic Conveyancing System (NECS) which deals with the lodgement of dealings, this is the realm of the Titling Systems and is beyond the scope of this model.


Document
Party
+ type: string
+ organisation: string
+ partyName: string
+ authorityText: string
+ securityCertificate: string
Dealing
+ dealingNo: string
+ dealingType: string
+ lodgedDate: date
+ lodgementOffice: string
+ dealingCode: string
+lodges
isLodgedBy
+lodgedBy
1
1
1
0
0..1
isApprovedBy
0..1
isSubmittedBy
isLodgedAs
Approval
+ name: string
+ approvalText: string
+ approvalDate: DateTime
+ approvalStatus: string
+ approvalType: string
+ headOfPower: string
+ dealingNumber: string [0..1]
+ fileReference: string [0..1]
+ interestDealingNumber: string [0..1]
0..*
docmentApproval
1..*
1
1
1
subjectToConditions
0..*
0..*
Survey::Document
+ documentNo: string
+ jurisdiction: jurisdictionType
+ versionNumber: string
+ versionDate: date
+ submissionDate: date [0..1]
+ documentStatus: documentStatusType [0..1]
Image
Condition
+ condition: string

2.1.1 Approval

This class details to approval being given and the power under which the approval is given. The document must be approved by specified parties in accordance heads of power, this could be either legislative (i.e. Under the integrated planning act) or by a private legal process (the holder of a secondary registered interest). Its also allows for recording of approvals which may be by conditional consents as separate dealings. This Class is not covered by the LandXML Schema.

Attribute	Type	Req	Note	LandXML
Name	String	R	Unique File ID of an Approval. Required for auditing requirements and if amendments are made.	
ApprovalText	Date time	R	This is the body of approval and will often need to conform to specific regulation.	
ApprovalDate	String	R	The date that the approval was given.	
ApprovalStatus	String	R	This is an enumerated list of the type of approval. Datafield = 'Not Required' - This is used where we need to account for an approval in the business rules but a Note will need to be given to substantiate the approval. Datafield = 'Conditional' - Approval is given subject to conditions which will need to be given. Datafield = 'Approved' - Unconditional approval has been given	
ApproverType	String	R	This is a list of the types of approvers, i.e. the person, delegate, company official etc. Datafield = 'State Land Administration' Datafield = 'Local Government' Datafield = 'Interest Holder' - This is the lease for example Datafield = 'Mortgage' Datafield = 'Registered Proprietor' Datafield = 'Statutory Authority' - For other Statutory Authorities.	

HeadOfPower	String	R	This is the legislation, regulation or legal document, which gives the approver the right to sign the document. I might be for example a piece of legislation (i.e. the Integrated Planning Act) or a power of attorney.	
dealingNumber	String	R	This would be used if a paper document was being used to record the approval. This would be added post registration.	
fileReference	String	R	This is the free text field, the approver can enter a file reference if he desire	
InterestDealingNumber		R	If the approval is being given because the party has an interest in the land (i.e. Mortgages Consent) then this is the dealing number of the interest being dealt with.	

2.1.2 Condition

This class details any specific conditions to an approval, i.e. the creation of an easement, dedication of a park etc. An approval may be given subject to a set of conditions. This class is not covered by the LandXML Schema.

Attribute	Type	Req	Note	LandXML
condition	String	R	Specific condition to approval.	

2.1.3 Dealing

This class contains the title information that is usually added to a plan upon lodgement. This is the internal key to the Titling system. These details are system generated upon lodgement. This class will be consistent with the Titles schema dealing.

Attribute	Type	Req	Note	LandXML
dealingNo	String	R	The dealing number of the lodged plan.	
dealingType	String	R	Enumerated list of values. If the plan is dealing only a subset is required.	
lodgeDate	Date	R		
lodgement Office	String	R	Enumerated list of lodgement offices, which vary from jurisdiction to jurisdiction.	
dealingCode	String	R	This is a local value to the titling system.	

2.1.4 Image

This is to enable the inclusion of images of approval documents where the client cannot approve of the plan digitally. In Queensland this could be the use of a general consent form. In this case the project manager will already note that the approval will be by a manual form. This form will be stored as a tiff image.

2.1.5 Party

This class identifies the person who is issuing the approval. It will be included as the Titles Party schema, which is based on AS4590

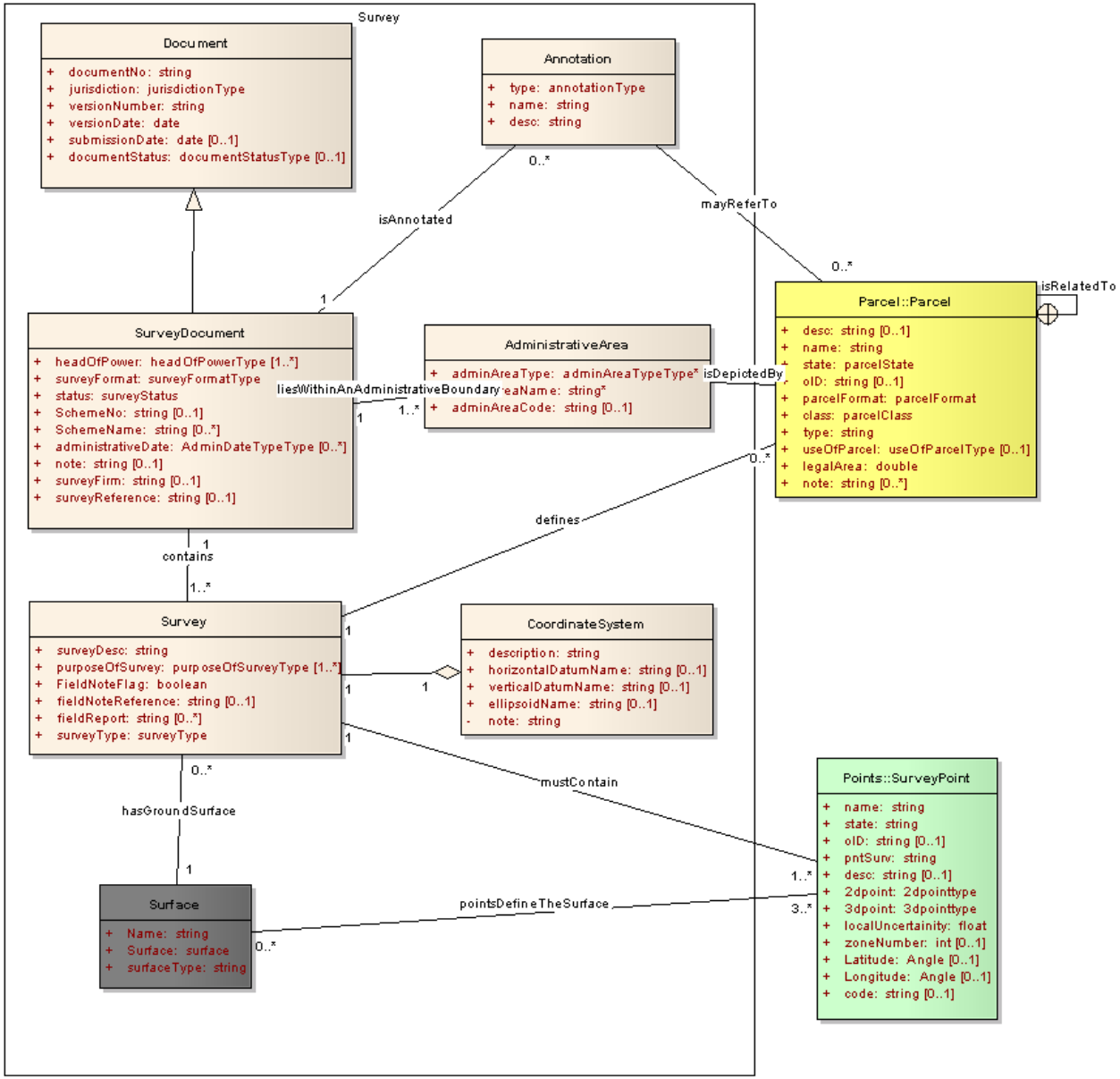
Attribute	Type	Req	Note	LandXML
Type	Char	R	Approver to submitter	
organisation	Char	R	The Name of the organisation	
partyName	Char	R	The Name of the person giving the approval.	
authorityText	Char	R	This is a reference to how this person has the delegation to give the approval, i.e. delegation from the CEO of the local authority, Power of attorney etc.	
SecurityCertificate	Char	R	This defines the security certificate used for audit purpose	

2.2 Survey

This package contains classes which contain metadata about the survey.

The Classes Document, SurveyDocument and Survey could be modelled as a single class however they have been broken into 3 classes here along the following concepts:

- Document class holds the generic elements for a document that are common to several classes of documents dealing with Land Transactions.
- The SurveyDocument Class holds elements which are specific to cadastral Surveys and inherits from the Document Class.
- The Survey Class holds elements relating to the survey.


Survey
Document
+ documentNo: string
+ jurisdiction: jurisdictionType
+ versionNumber: string
+ versionDate: date
+ submissionDate: date [0..1]
+ documentStatus: documentStatusType [0..1]
Annotation
+ type: annotationType
+ name: string
+ desc: string
0..*
isAnnotated
1
mayReferTo
0..*
isRelatedTo
Parcel::Parcel
+ desc: string [0..1]
+ name: string
+ state: parcelState
+ oID: string [0..1]
+ parcelFormat: parcelFormat
+ class: parcelClass
+ type: string
+ useOfParcel: useOfParcelType [0..1]
+ legalArea: double
+ note: string [0..*]
SurveyDocument
+ headOfPower: headOfPowerType [1..*]
+ surveyFormat: surveyFormatType
+ status: surveyStatus
+ SchemeNo: string [0..1]
+ SchemeName: string [0..*]
+ administrativeDate: AdminDateTypeType [0..*]
+ note: string [0..1]
+ surveyFirm: string [0..1]
+ surveyReference: string [0..1]
liesWithinAnAdministrativeBoundary
1
1..*
AdministrativeArea
+ adminAreaType: adminAreaTypeType*
+ areaName: string*
+ adminAreaCode: string [0..1]
isDepictedBy
0..*
defines
1
contains
1..*
Survey
+ surveyDesc: string
+ purposeOfSurvey: purposeOfSurveyType [1..*]
+ FieldNoteFlag: boolean
+ fieldNoteReference: string [0..1]
+ fieldReport: string [0..*]
+ surveyType: surveyType
1
1
1
CoordinateSystem
+ description: string
+ horizontalDatumName: string [0..1]
+ verticalDatumName: string [0..1]
+ ellipsoidName: string [0..1]
- note: string
1
0..*
hasGroundSurface
1
mustContain
Points::SurveyPoint
+ name: string
+ state: string
+ oID: string [0..1]
+ pntSurv: string
+ desc: string [0..1]
+ 2dpoint: 2dpointtype
+ 3dpoint: 3dpointtype
+ localUncertainity: float
+ zoneNumber: int [0..1]
+ Latitude: Angle [0..1]
+ Longitude: Angle [0..1]
+ code: string [0..1]
1..*
3..*
Surface
+ Name: string
+ Surface: surface
+ surfaceType: string
pointsDefineTheSurface
0..*

2.2.1 Document

This class holds general attributes that would pertain to any document.

The main purpose for splitting document from Survey Document is to allow flexibility to incorporate other documents at a latter stage.

These attributes are currenlt not handled in LandXML.

Attribute	Type	Req	Note	LandXML
documentNo	String	R	This is the unique number for the survey. This is analogist to the existing plan number	Surveyheader:name
jurisdiction	String	R	This is the jurisdiction in which the plan is to be dealt with (i.e Queensland). This field will define the set of jurisdictional business rules that the plan audit will follow.	Surveyheader: jurisdiction
versionNumber	Integer	R	This is the version number for this file and is system generated for tracking purposes	LANDXML: version
versionDate	Date	R	The date that a new version of the file was generated. This is a system-generated field to manage audit process of the file.	LANDXML: Date LANDXML: Time
submissionDate	Date	O	This is the date that the first instance of the file was submitted or created by data capture	Surveyheader: submissionDate
documentStatus	Char	O	This element indicates if a document has been lodged digitally (i.e. is the legal record), has been data captured for digital processing or is an historical capture. It is defined by a jurisdictional enumeration.	Surveyheader: documentStatus

2.2.2 Survey

This class contains generic Survey Data. This common between jurisdictions and has some standard validation processes The survey description is standard form for a description. It would appear the several methods are employed between jurisdictions. Some jurisdictions enter the description of the parcels being cancelled whilst others enter the description of the parcels being created. Some jurisdictions enter both. This model will provide for both occupancies by providing a surveyDesc and surveyCancelDesc. It will be up to the jurisdictions to impose the business rules associated with each.

Attribute	Type	Req	Note	LandXML
SurveyDesc	String	R	This attribute is used to define the parcels and interests being created by this survey. i.e. Lots 1-3 and Easement A	SurveyHeader: Desc
PurposeOfSurvey	String	R	This attribute details the purpose of survey (ie Subdivision) and is a enumerated list which is jurisdictional specific. A survey can have more than one purpose and the business rules which associate purposes can be defined within the Jurisdiction. A survey can have more than one purpose.	SurveyHeader: PurposeOfSurvey:Name
FieldNoteFlag	Boolean	O	This is a field to indicate if sets of field notes have been lodged separately. For example in Queensland if a tidal boundary is being redetermined then an extensive report is required to substantiate to reinstatement. In this case the field report is stored under separate cover under the reference o the plan number.	SurveyHeader: fieldNoteFlag
fieldNoteReference	String	O	In some jurisdictions field notes are stored under a separate numbering system, in some jurisdictions these are pre issued numbers	SurveyHeader: fieldNoteReference

field Report	String	O	This is a note field to enable a surveyor to give a brief description of the field survey. If this report is extensive i.e. a report on the complex determination of an ambulatory boundary then a separate report should be filed. In that case reference should be made here to that report and its content.	FieldNote
FileReference	String	O	The Surveyors file reference if required	SurveyHeader: fileReference
SurveyType	SurveyType	R	This element identifies if a plan has been surveyed or compiled. It should be noted that a survey plan could be an about dimensional plan but is still a survey. Compiled denotes that the record was compiled completely from other sources.	SurveyHeader: surveyType

2.2.3 Survey Document

This is the main class which holds holistic level data about the survey. These data elements may need to be validated against external sources or may be required to check the internal consistency of the file. This class contains the administrative and textual data associated with the metadata of the plan and the administrative actions displayed on the plan. These elements are largely jurisdictionally based and are not covered in LandXML, version 1.

Attribute	Type	Req	Note	LandXML
headOfPower	String	O	This is the legislative regime under which the plan was prepared (ie the Land Title Act 1994). These acts will be specific to a jurisdiction but can be enumerated. A survey may be conducted under more than one Head of Power. See Juridictional Lists for data elements	SurveyHeader: headOfPower
surveyFormat	String	R	This is the type of survey (ie Volumetric). Some of these terms may be jurisdictionally specific . Each Jurisdiction can provide a list as required.	SurveyHeader: surveyFormat
status	String	O	The Status gives an indication of the reason for lodgement of this file. For example it may be being lodged as a record of survey only or for pre-examination and is not yet suitable for lodgement	SurveyHeader:surveyStatus
SchemeNo	String	CR	All scheme land has a community title scheme number assigned to it. This field must have an entry for any scheme land (i.e. where there is reference to common property. This field is a system generated field and may not be known by the consultant at submission so it may be left blank.	SurveyHeader:communityTitles SchemaNo

SchemaName	String	CR	Community Titles Schemes require the name to be attached. A survey may deal with many schemes so multiplicity must be for many. This is a mandatory field for all scheme land, i.e. a consultant should always know the scheme name, even a new scheme. : is Known - If a communityTitleSchemeNo is given then the scheme is an existing scheme and therefore must have a name. In which case the name must be given. : is required - If the Survey Format is Building Format or at least one of the new parcels is a parcel type of common property then a scheme name must be given here.	SurveyHeader: communityTitleSchemeName
administrativeDate	String	O	In all jurisdictions a range of administrative dates are required on some plan types. These dates relate to the compliance with legislation. For example In Queensland the Development Approval Date is required specifically for Volumetric and Building Format Surveys to determine if certain attributes are required. In South Australia the date of Valuation is required for community Title plans. The Type of Administrative Date is given as a Jurisdictional enumeration	SurveyHeader:administrativeDate:adminDateType SurveyHeader:administrativeDate:Date
SurveyFirm	String	O	The Name of the Survey Firm undertaking the Survey. This may not be a registered entity.	SurveyHeader:SurveyorFirm
SurveyorReference	String	O	The surveyors file reference.	SurveyHeader:SurveyorReference
Note	String	O	A Note about the plan if required	SurveyHeader:FieldNote

2.2.4 Administrative Area

A Survey Plan needs to reference many different administrative areas, which may affect the processing of a plan or are, used as a geo-code. Although the HDM can define administrative areas the survey only needs to reference these areas. For example we may need to know what parts of the plan lie in a particular parish but we do not want to define the whole parish. Another example is that the parcel may lie within a beach protection area, which may require additional consents. This object will handle Locality, Parish, County, Local Authority, and other more specific ones such as Beach protection zones etc. All Files must have at least 1 Local Government and then depending on Jurisdiction at least 1 Locality, Parish, and County etc

Although the HDM enables the depiction of these relationships at the macro level these elements need to be dealt with in the survey at the micro level. Land XML does not handle these relationships at this stage (except for county). These AdminAreas are important to the processing of a plan as they may govern some of the administrative processes for the plan.

Attribute	Type	Req	Note	LandXML
adminAreaType	String	R	**This element stores the Text of Administrative boundaries for a survey. If the boundary needs to be graphically defined then a parcel record for the area is required** These are jurisdictionally specific. Examples would be Local Government.	AdminstrativeArea: adminAreaType
adminAreaName	String	R	This is the full text name of the admin Area ie Brisbane City. The will be jurisdictionally specific within admin area types. The enumerations are not specified in LandXML and will need to be specified at the jurisdictional level.	AdministrativeArea: adminAreaName
adminAreaCode	String	O	This is the standard code used for a particular boundary for example the Local Authority Code. These may be local codes or ANZLIC codes depending on the nature of the boundary.	AdministrativeArea: adminAreaCode
pclRef	String	O	This is a reference to a parcel if the admin areas needs to be described spatially in the survey for example to allocate the parcel.	AdministrativeArea: pclRef

2.2.5 Survey Annotation

The Survey Annotation class is to enable the surveyor to annotate the plan with statements required under specific legislation. These annotations are not managed by either the LandXML Schema or the HDM. They are required to clarify the land management process, specifically from a clients perspective for example Road to be Opened, Area to be excised etc. Often these annotations are required by specific legislation and business processes.

Attribute	Type	Req	Note	LandXML
Type	String	R	This is a category of annotation and would be a defined list per jurisdiction. An Annotation could be based on the plan as a general statement or specific to a parcel or number of parcels. Abn Example would be a Compilation Certificate or Area of New Road etc The full text of an annotation is usually defined by jurisdictional regulations and guidelines. The Type field will be used to manage the validation process for that annotation.	Annotation: type
Name	String	R	This is the unique name of the Annotation and is used for tracking the reference and amendments. It is unique within the file.	Annotation:name
Desc	String	R	The actual text of the statement i.e. Road to be closed etc. This description may be required in a specific format as set out in regulations.	Annotation: desc
pclRef	String	CR	If the annotation refers to a parcel then that parcel will be defined and have a name assigned to that parcel. This is to enable referencing action statements to parcels. This is a conditional field as some annotations do not refer to parcels i.e. marks set at all corners. An example of this is an annotation describing a Non-Statutory Easement. Also a statement may be referred to several parcels.	Annotation: pclRef

2.2.6 Coordinate System

This class identifies the coordinate system used to define the survey. Only certain values can be used in this element. The Coordinate System Class is to describe the datum in which the survey is being presented. It may be being presented on MGA or a local arbitrary system. The HDM Infers the use of a coordinate system described by metadata linked to the ISO Standard but is not specific.

The LandXML can also use the ISO Standard GML definitions of coordinate systems. However the ePlan file need only reference the system being used not define it, hence the simplicity of this class. It should also be noted that a significant numbers of surveys still use the meridian of adjoining surveys for the bearings and terrain height distances.

Attribute	Type	Req	Note	LandXML
description	String	CR	If the horizontalDatumName is Artibary or Local then the description is used to define the orientation. For Example Oriented to SP12345.	CoordinateSystem: Desc
horizontalDatumName	String	R	The name of the Coordinate System. They should be from a defined list.	CoordinateSystem: HorizontalDatum
verticalDatumName	String	CR	This is the datum for the published heights in the file. It will be picked from a list of known value	CoordinateSystem: VerticalDatum
elipsoidName	String	CR	The Name of the Ellipsoid for computational purposes	CoordinateSysten:ElipsoidNaME
note	String	O		CoordinateSystem:FieldNote

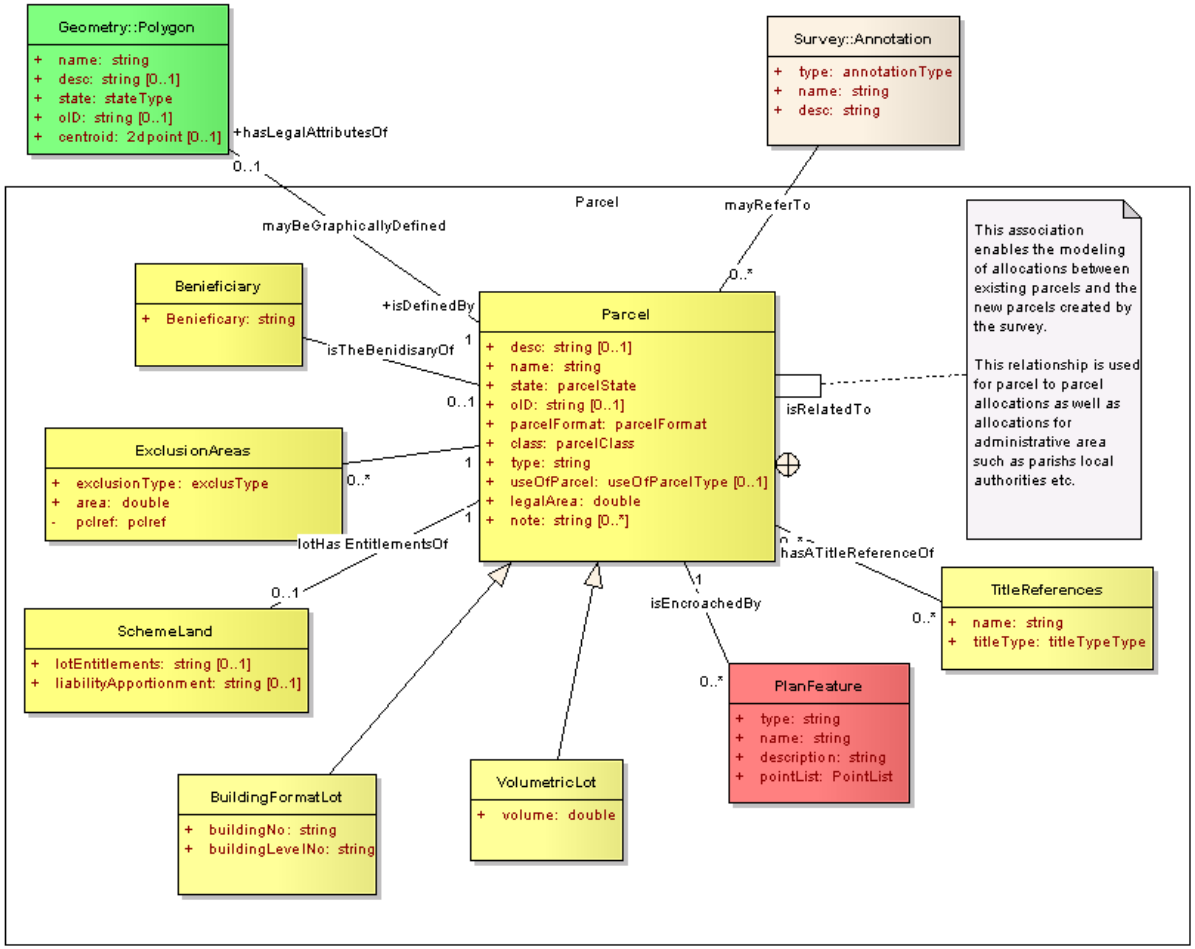
2.2.7 Surface

This class is used to describe the surface level for a parcel, specifically when the subject parcels are volumetric parcel and a visualisation of the parcel is required relative to the mean terrain surface. For example in Queensland a Volumetric parcel must also show the footprint at ground level of the parcel and also be able to give the user an understanding of the relationship between the parcel and the ground. For example the parcel is an underground tunnel or is an air space. Though not specifically dealt with in the HDM in relation to the cadastral survey it can be dealt with using the surface element within LandXML Schema.

Attribute	Type	Req	Note	LandXML
surfaceType	Char	CR	Denotes how surface is being specified	Surfaces: Surface:Definition:surfType
surface	String	CR	Data which defines the surface	Surfaces: Surface: Definition: pnts/faces

2.3 Parcel

The Parcel package handled the non-spatial elements of parcel. It relates directly to the HDM: Cadastral: PrivateLawObject and the LandXML: Parcels elements.



2.3.1 Parcel

A parcel is the unit over which a single interest can be created. A parcel may have a specific parcel type for example in Queensland the parcel over which an indefeasible title can be issued is called a lot. A parcel can be made up of a number of sub parcels; each sub parcel must be a closed figure. The total area of a parcel is the sum of the areas of the sub parcels. For example a parcel (lot) on a Building Format Plan (Stratum Plan) may have several parts on different floors in the complex, i.e. a car park, a balcony and the main unit.

The parcel class holds the non-geometric elements relating to a parcel. The term parcel here has a different meaning to the parcel in the Harmonised Data Model. In the HDM a parcel refers to a cadastral lot for which a title can be issued. This model uses a much broader definition of parcel in that it is a polygon (or volumetric figure) for which a right or obligation can be defined. It includes base cadastral lots as well as easements and secondary interests.

This package models the administrative and Metadata information about parcels with the term parcel means a polygon created for some administrative purpose. Most of these classes map to the parcel class in LandXML except for specialise elements for volumetric and Stratum parcels. These classes map to the HDM class of PrivateLawObjects of Parcel, Easement, Secondary Interest, Road Reserve and Reserve.

The other part of a parcel is that it has an “is related to” association, this relationship assists us in:

- If a parcel is made up of several parts (i.e. stratum lot over several floors).
- Creating historical allocations to bring forward existing title encumbrances, rights and obligations.
- Create historical linkages to link parcels to their ancestors (as in historical survey searching or native title investigations)
- From the HDM an administrative area is linked to cadastral polygons, which represent parcels, we can then use this relationship to allocate new parcels to existing administrative areas i.e. allocation of areas to local governments for rating purposes.

This is accomplished by using an embedded Parcels/Parcel relationship to show the relationship between existing parcels and those parcels being created,

Attribute	Type	Req	Note	LandXML
desc	String	CR	A description of the parcel. Where a parcel is not traditionally described via a parcel identifier ie Road or Hydrography then the description is used to describe the parcel. For example a survey may create a road made up of several parcels (ie R1,R2,R3) in this case the description field will hold the name of the road (ie Smith Street). All Road and Hydrography parcels must have a decription.	Parcel: desc

name	String	R	The Unique Parcel Name in the file, it must be unique even for part parcels. For example a lot create on this survey could be simply (lot)1. for an existing lot the full nane (lot) 1/RP1 would be used. For a part lots a local convention such as 1.1 or 1a could be used. In Queensland we do don't create parcel identifiers for roads, Hydrography or action statement parcels. These parcels need to be uniquely identified in the file so a Alpha/ Numeric identifier is used ie R1 for Roads etc.	Parcel: name
parcelType	String	CR	Parcel Type is used to differentiate if the parcel is a top level parcel or a part parcel. For example a parcel which is bisected by a road is made up of two parts the Areas of the Title parcel is made up of the area of the two parts. For processing purposes and validation we need to be able to identify these parts. There are four valid entries Datafield = 'single' – The parcel is made up of a single coordinate geometry eg a standard house lot. Datafield = 'multipart'- The parcel is made up of more than one part parcel eg a building format lot. These part parcels are referenced in the parcels attribute. Datafield = 'part' – The parcels is a part parcel eg a balcony in a building format lot. Several part parcels make up a multipart parcel. A part parcel cannot be issued with a title and it may not conform to the parcel identifier standards (ie Lot 1a). Datafield = 'adminarea' – The parcel represents an admin area eg a parish which may or may not have a coordinate geometry. These parcels are used to allocate these admin areas to parcels. Note only 'single' and 'multipart' parcels can be Title Parcels and would exist in the Title block of the survey.	Parcel:parcelType
state	ParcelStateType	R	The state of the parcel in relation to the survey. This is a standard LandXML Enumeration.	Parcel: state

OID	String	O	Official identifier of parcel.	Parcel:oID
parcelFormat	String	O	This is to define the format of the lot there are business rules which will define the format of parcels allowable for a particular survey format. For example a volumetric plan may have parcel formats of standard and volumetric. This is a jurisdictional specific list.	Parcel: parcelFormat
class	Parcel Class	R	This is a well-defined list, which is jurisdictionally based. For Example “Lot” or “Easement”	Parcel: class
useOfParcel	String	O	The use of a parcel is a set of values define by regulation to describe the use or purpose of a parcel or sub parcel. This list will be a jurisdictionally specific list and will have a relationship between the Parcel Format, Parcel Class. An example would be the Statutory Purpose of an Easement	Parcel: useOfParcel
legalArea	Double	CR	This is the legal area of the parcel. If the parcel contains exclusions then these need to be noted for calculation purposes. The area of the parcel is conditionally required as a volumetric parcel does not have an area, nor does some part parcels or road parcels.	Parcel:Area
pclRef	String	O	This is the parcel reference name used to refer to a previously defined parcel	Parcel:pclRef
note	String	O	This note allows for general information relating to the parcel. A parcel may have several notes.	FieldNote

2.3.1.1 Lots in Parts

A single parcel may be made up of several parts for example a building format lot may have the main part of the lot, a garage and a balcony each of these part lots must have an area. The area of the upper level parcel is the sum of the underlying parcel..

The following example shows a multi part parcel

```
<Parcel name="102/A2451" parcelFormat="Standard" class="lot" state="created" area="3238.00">
    <Parcels>
        <Parcel name="102a/A2451" pclRef="102a/A2451"/>
        <Parcel name="102b/A2451" pclRef="102b/A2451"/>
    </Parcels>
    <Title name="14703047" titleType="title"/>
<Parcel name="102a/A2451" parcelFormat="Standard" class="lot" state="created" area="2000" >
    <Center pntRef="AQ"/>
    <CoordGeom>
        …
    </CoordGeom>
</Parcel>
<Parcel name="102b/A2451" parcelFormat="Standard" class="lot" state="created" area="1238" >
    <Center pntRef="AK"/>
    <CoordGeom>
        …
    </CoordGeom>
</Parcel>
```

2.3.1.2 Allocations (Linkages)

An allocation is the process by which an existing interest is brought forward onto the parcel s being created. The LandXML enables us to provide both a graphical and textual capability to track these allocations. The allocation can be determined by overlaying one graphical element over another or it can be explicitly defined using the Parcel/Parcels elements.

There are 3 types of allocations

- Allocating created primary and secondary interests to an extinguished parcel (ie Subdivision)
- Allocating created secondary interests to an affected parcel
- Allocating created secondary interests to created primary parcel (ie easement during a subdivision)

In all cases the allocation is shown from the affected/extinguished/created primary parcel to the created primary or secondary interest. This means that we will never have an allocation from an existing registered secondary interest forward to any other parcel type.

The following example shows the allocation of a existing parcel to the newly created Parcels and interests.

```
<Parcel name="10/RP843007" state="extinguished" parcelFormat="Standard" class="lot" area="16000">
    <CoordGeom name="…">
    </CoordGeom>
    <Parcels>
        <Parcel name="1/SP110008" pclRef="1/SP110008"/>
        <Parcel name="2/SP110008" pclRef="2/SP110008"/>
```

```
            <Parcel name="3/SP110008" pclRef="3/SP110008"/>
            <Parcel name="A/SP110008" pclRef="A/SP110008"/>
        </Parcels>
    </Parcel>
```

Where a survey creates a secondary interest that interest needs to be allocated to the parcel that it affects in many cases this requires a special allocation from the newly created secondary interest to its affected parcl which was created during the same survey. For example in the survy of “Lots 1-3 and Easement A in Lot 3” then an explicit allocation between Easement A and Lot 3 needs to be defined.

The following example shows the allocation of an affected parcel to the created secondary interest.

```
<Parcel name="10/RP843007" state="affected" parcelFormat="Standard" class="lot" area="16000">
    <CoordGeom name="…">
    </CoordGeom>
    <Parcels>
        <Parcel name="A/SP110008" pclRef="A/SP110008"/>
    </Parcels>
</Parcel>
```

The following example shows the allocation of a created parcel to the created secondary interest.

```
<Parcel name="3/SP110008" state="created" parcelFormat="Standard" class="lot" area="7860">
    <CoordGeom name="…">
    </CoordGeom>
    <Parcels>
        <Parcel name="A/SP110008" pclRef="A/SP110008"/>
    </Parcels>
</Parcel>
```

2.3.2 Building Format Lot

For a Building Format Lot this class is used to define the Building and Level that the lot (or Part Lot) is contained in.

Attribute	Type	Req	Note	LandXML
BuildingNumber	String	O	A building format lot needs to define the building no so that the proprietor can identify the building in which the parcel lies.	Parcel: buldingNumber
BuldingLevelNo	String	O	This element defines the level of the building on which the part of the lot lies.	Parcel: buildingLevelNo

2.3.3 Title References

This class is used to define Title References relevant to a parcel; a parcel may have several interests created by different documents, which will need to be dealt with. for example a lot may have several Certificates of Title and some mortgages which will need to be allocated to new parcels for example. To define this we need to know the Title or dealing reference and the type of dealing.

Attribute	Type	Req	Note	LandXML
name	String	O	This is the Title Number or dealing number which creates the interest	Parcel: name
titleType	String	O	This defines the type of interest defined for example is it a mortgage a title or a lease Datafield = 'Mortgage' - This is the Mortgage document which will need to be allocated. Datafield = 'Easement' - Used when the parcel is subject to a benefice easement which needs to be allocated. Datafield = 'Title' - This is where the Title Name is the Certificate of Title for the parcel. Datafield = 'Original Grant' - Used to identify parcel which are original grants which need to be allocated to the created parcels.	Parcel: titleType

2.3.4 Volumetric Lot

If the parcel is volumetric lot then the parcel must have a volume rather than a legal area.

Attribute	Type	Req	Note	LandXML
Volume	Double	CR	This is the volume of the volumetric format lot. It is mandatory if the lot being created is a volume format lot.	Parcel: volume

2.3.5 Scheme Land

Scheme Land requires special attributes relating to the apportionment of Rights and Obligations of the Body Corporate. Most Ausralian jurisdictions allocate a voting entitment to a parcel to determine the proportion paid by the owner of a unit for rates and services.

These attributes are only assigned for scheme land which could be building format lots, units plans, Stratum plans etc.

Attribute	Type	Req	Note	LandXML
lotEntitlements	String	CR	This attribute details the voting entitlment assigned to a lot following survey. This is an attribute of the plan in most Australian Jurisdictions	Parcel:lotEntitlements
liabilityApportionment	String	CR	In some juridictions a value per lot is given to approtion liability in certain circumstances	Parcel:liabilityApportionment

2.3.6 Exclusion Area

Some parcels have exclusions from its area either specified such as an internal road or an included lot or as an area excluded from the title but is spatially undescribed (Reserved areas).

Most jurisdictions have a defined list of exclusions the class has an exclusion type and an area.

This is to enable the description of a multi line area. The Legal Area is the parcels gross area less the sum of all exclusions.

Attribute	Type	Req	Note	LandXML
exclussionType	String	R	This is a jurisdictionally based list of types of exclusions. Datafield = 'reservation in title' - This is an area that has been reserved from the title for future crown activity.	Parcel:exclusions:exclusionType
area	double	R	This is the area value for the exclusions.	Parcel:exclusions:area
pclref	string	O	The pclref allows an exclusion from a parcel to be linked to the defined parcel being excluded.	Parcel:exclusions:pclRef

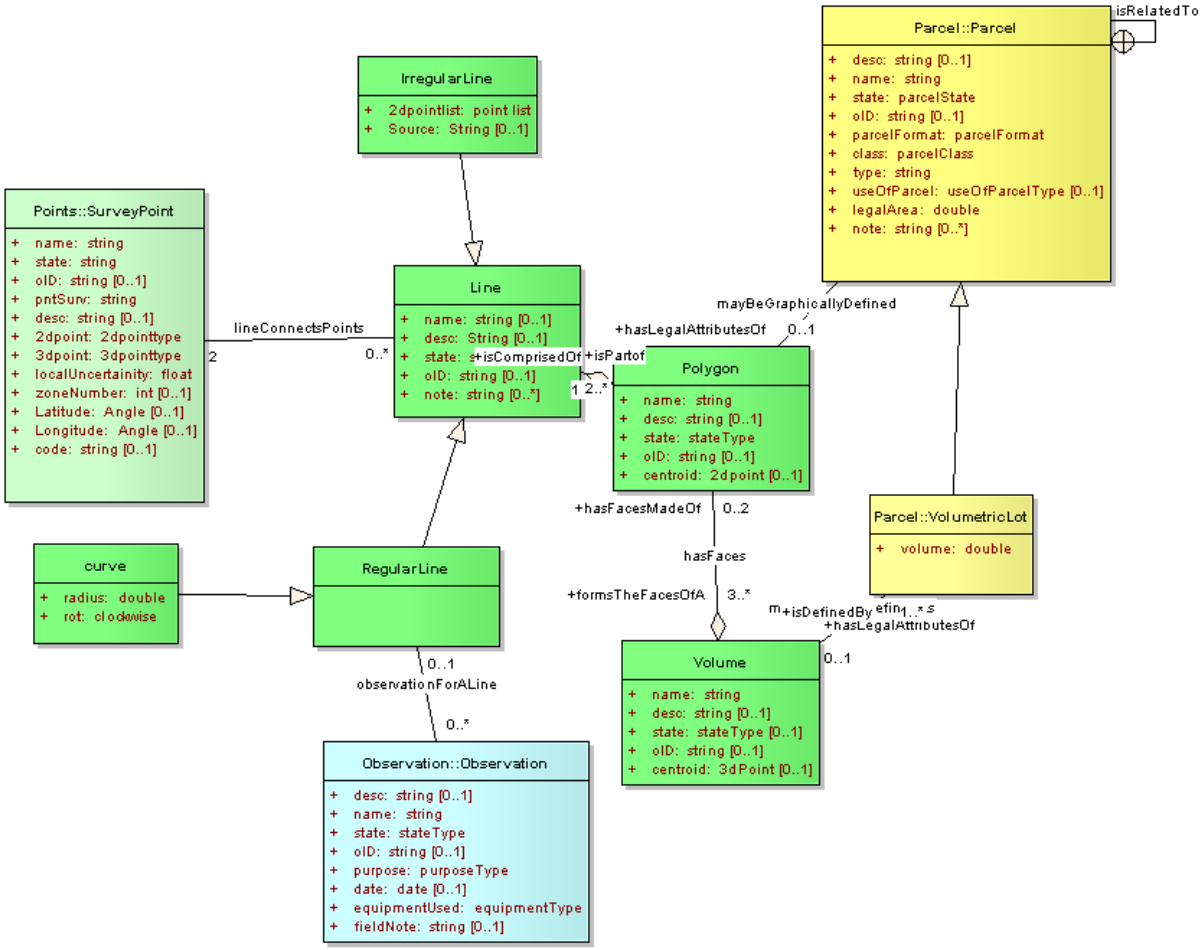
2.3.7 Plan Feature

This class identifies the improvement, which encroaches on its neighbour. It contains a 3dpoint list, which describes the extent of the encroachment. This feature will be depicted in the LandXML as a plan feature.

Attribute	Type	Req	Note	LandXML
type	String	O	This is a broad category of the encroachment Datafield = 'Encroachments' Datafield = 'Occupation'	PlanFeatures:Desc
name	String	O	Unique name within the file	PlanFeature: name
description	String	O	This is a short description of the encroachment, for example the eaves of a building etc.	PlanFeature: desc
pointlist	Point list	O	This is a 3dpoint list which defines the encroachment and is defined as a space delimited 3dpoints which are space delimited double values (xxx,xxx yyy.yyy zzz.zzz)	PlanFeature:CoordGeod

2.4 Geometry

This package contains the geometry information about graphical entities and parcel. It maps to the LandXML Coordinate Geometry elements within parcel.. It maps to the HDM classes survey polygon.



2.4.1 Line

Defines the properties of a Line in a coordinate Geometry collection. The Start and End points define the line. This is related to the Line Element in LandXML. This element does not map to the ICSM Data Model directly but it is manifested in the survey polygon. This model does as LandXML make a distinction between a line (which joins two points) and observation. In this model a line could have several observations, (i.e. mean terrain height or spheroidal distance).

Also this model allows for an observation between points, which are not part of a survey polygon, i.e. a connection to a reference mark or to a control station

Attribute	Type	Req	Note	LandXML
Desc	String	O	An Optional Description of the line	Line: desc
Name	String	R	The local name of the line in the file usually an integer value	Line: name
State	String	O	The State of a Line if Required (LandXML Enumeration)	Line: state
OID	String	O	Unique Identifier in the file	Line: oID
Note		O	A note field allow annotation to a line, used where a line represents a feature for example in WA and NT the boundary line may be depicting a latitude or longitude.	FieldNote

2.4.2 RegularLine

A Regular Line is a straight line between two points and depicts a regular straight-line boundary.
Every Regular Line contained within a polygon must has at least one observation. This element is blank in the model as it is used to differentiate between an irregular line and a curve

Attribute	Type	Req	Note	LandXML

2.4.3 Irregular Line

IrregularLine inherits elements from the line class. The irregular line must have a survey point as its start and finish point and a point list of at least 2 (the start and end points) points to define the line. An irregular line is not "observed" but is made up of a list of coordinate values (these coordinates may be made by observations but these observations are not part of the polygon).

Attribute	Type	Req	Note	LandXML
2dpointlist	2dpointList	O	A list of ordered 2dpoints, which depict the irregular boundary.	IrregularLine: PntList2d
Source	String	O	A brief description of the source of the irregular line, it may have be source from an existing plan or digitised from photography etc.	IrregularLine :FieldNote

2.4.4 Curve

A Curve inherits most of its attributes from the Line class. A Curve is a specific type of regular line between two points. It is defined by its start and end, is radius and direction of rotation.

Attribute	Type	Req	Note	LandXML
Radius	Double	R	The Radius of the Curve	Curve: radius
Rot	Clockwise	R	The direction of rotation Datafield = 'countercolockwise' Datafield = 'clockwise'	Curve: rot

2.4.5 Polygon

A Polygon is a closed figure that can be made up of two or more lines. These lines may be either Regular Lines, Curves or Irregular lines. A parcel only need to be defined by a Polygon if the survey needs to be spatial dealt with by the survey (i.e. as a created or cancelled parcel). Some parcels may not require to be spatial defined for the purpose of the survey, specifically where the parcel is defining an administrative area etc. These elements are mapped to the LandXML Coordinate Geometry elements. This maps to the HDM Survey Polygon element.

Attribute	Type	Req	Note	LandXML
Desc	String	O	A brief description of the polygon	CoordGeom: desc
Name	String	R	Unique name of the polygon in the file	CoordGeom: name
State	String	O	Standard state values from LandXML	Coordgeom: state
OID	String	O	Official ID for a polygon	Coordgeom:oID
Centroid	2dPoint	O	The Centriod of the parcel is an approximation of the centre of the figure and is used mostly for identifying the point to annotate the visualisation of that parcel.	Parcel: centre

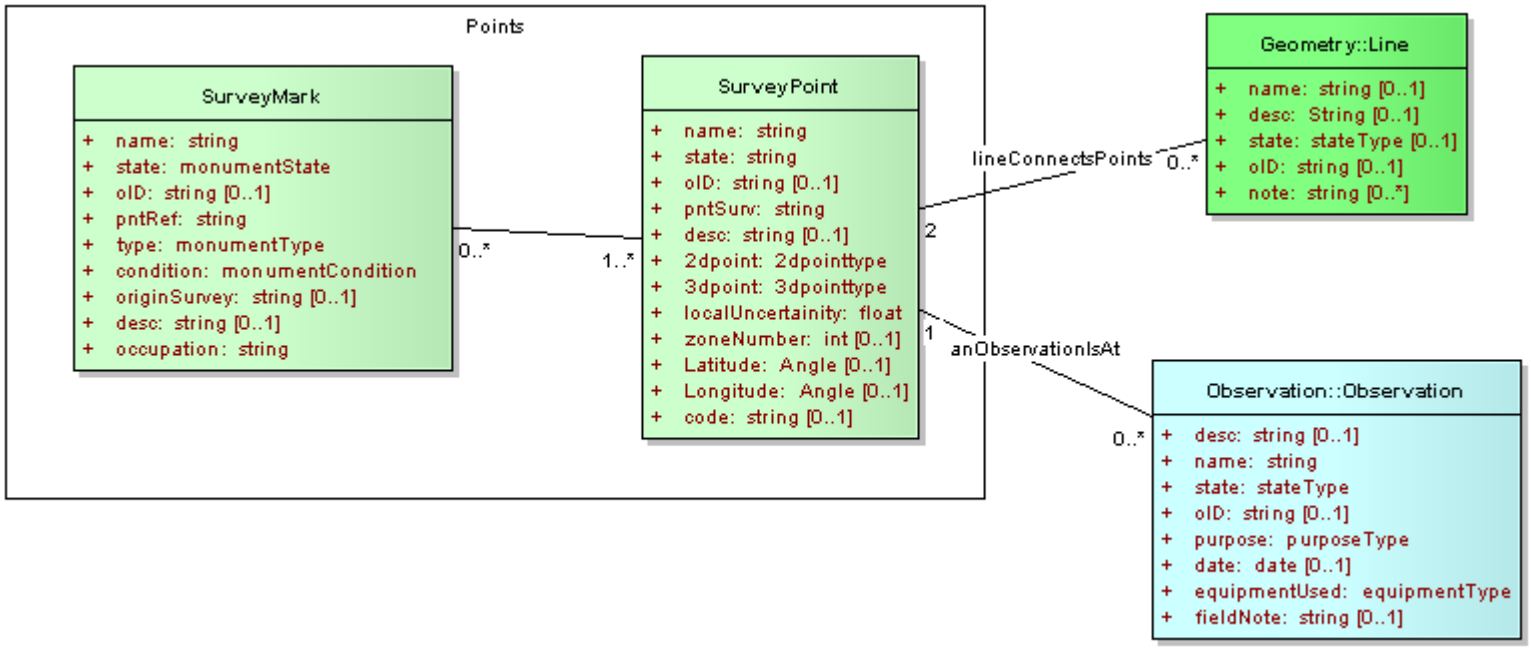
2.4.6 Volume

A volume is a cubic space made up of polygons, which are its faces. The HDM does not appear to handle volumetrics. The LandXML can deal with this as a volume or as a series of faces. Where the parcel being defined is a volumetric lot then the volume must be specifically defined by its faces. These faces are regular or irregular polygons by nature

Attribute	Type	Req	Note	LandXML
Desc	String	O	A Description of the volume or part volume.	VolumeGeom: desc
Name	String	R	The unique name of the volume within the file	VolumeGeom: name
State	String	R	Standard state values from LandXML	VolumeGeom: state
OID	String	O	The persistent identifier of the volume	VolumeGeom: oID
Centroid	3dpoint	R	The point3D depicting the centre of the volume.	parcel: centroid

2.5 Points

This Package contains the elements related to the Survey Points and the monumentation at those points. These classes are covered in the LandXML Schema by the cgpoints, monuments, and survey monuments elements. These classes are covered in the ICSM HDM by the SurveyMark and Survey Point Elements.



2.5.1 Survey Points

This is a list of all survey nodes within the file. A node is any point of interest in the Survey and may relate to Boundary Points, Traverse Point or Reference Mark. A Permanent Survey Mark is also a Node. Survey points define the nodes that are used on the survey plan. All persistent survey points need to exist in the record. This element maps to the LandXML Element of Cgpoint. This element also maps to the ICSM HDM Element of Survey Point.

Attribute	Type	Req	Note	LandXML
name	String	R	Name of point in the survey. The name must be unique on the plan. Some jurisdictions may use a local convention to name these points. Traditionally the station Number has been a number or letter.	CgPoint:name
state	String	R	Standard lists of states	Cgpoint: state
oID	String	O	Official identifier of node. If the Node is an existing point this is the persistent Identifier of the Node. **NOTE points created by the subject survey will not have an oID.**	CgPoint:oID
pntSurv	String	R	Indicates the type of survey point, i.e. Boundary, traverse, Reference mark.	CgPoint:pntSurv
desc	String	O	Optional description of the element	Cgpoint: desc
2dpoint	2dpointtype	CR	A space delimited double point (xxx.xxx yyy.yyy) to define the position of the point. Pre-Condition: Optional2dpoint - Use 2dpoint if 3dpoint not used	Dealt with as part of the structure of the cgpoint.
3dPoint	3dpointtype	CR	List of coordinates in the datum of the survey showing Easting Northing and Height. Shown as a list of space delimited doubles. Pre-Condition: Optional3dpoint - Use only if 2dpoint not used.	Dealt with as part of the structure of the cgpoint.
localUncertainity	Double	O	The Local Uncertainity of the Survey Point in Meters	CgPoint:localUncertainity
PositionalUncertanity	Double	O	The Positional Uncertainty of the Point in meters	CgPoint:positionalUncertaity
zonenumber	Integer	CR	Refers to the Map grid zone in which the point lies. This depends on the Coordinate Framework of the survey.	CgPoint: zoneNumber
surveyorder	Integer	O	The Order of the coordinate values of a point. It Represents the accuracy of the node within the survey.	CgPoint: surveyOrder
Latitude	Angle	O	The Latitude of the Point	CgPoint:latitude
Longitude	Angle	O	The Longitude of the Point	CgPoint:longitude

code	String	O	The Code of the Station, Link to other Survey systems such as the geodetic framework.	CgPoint:code

2.5.2 Survey Marks

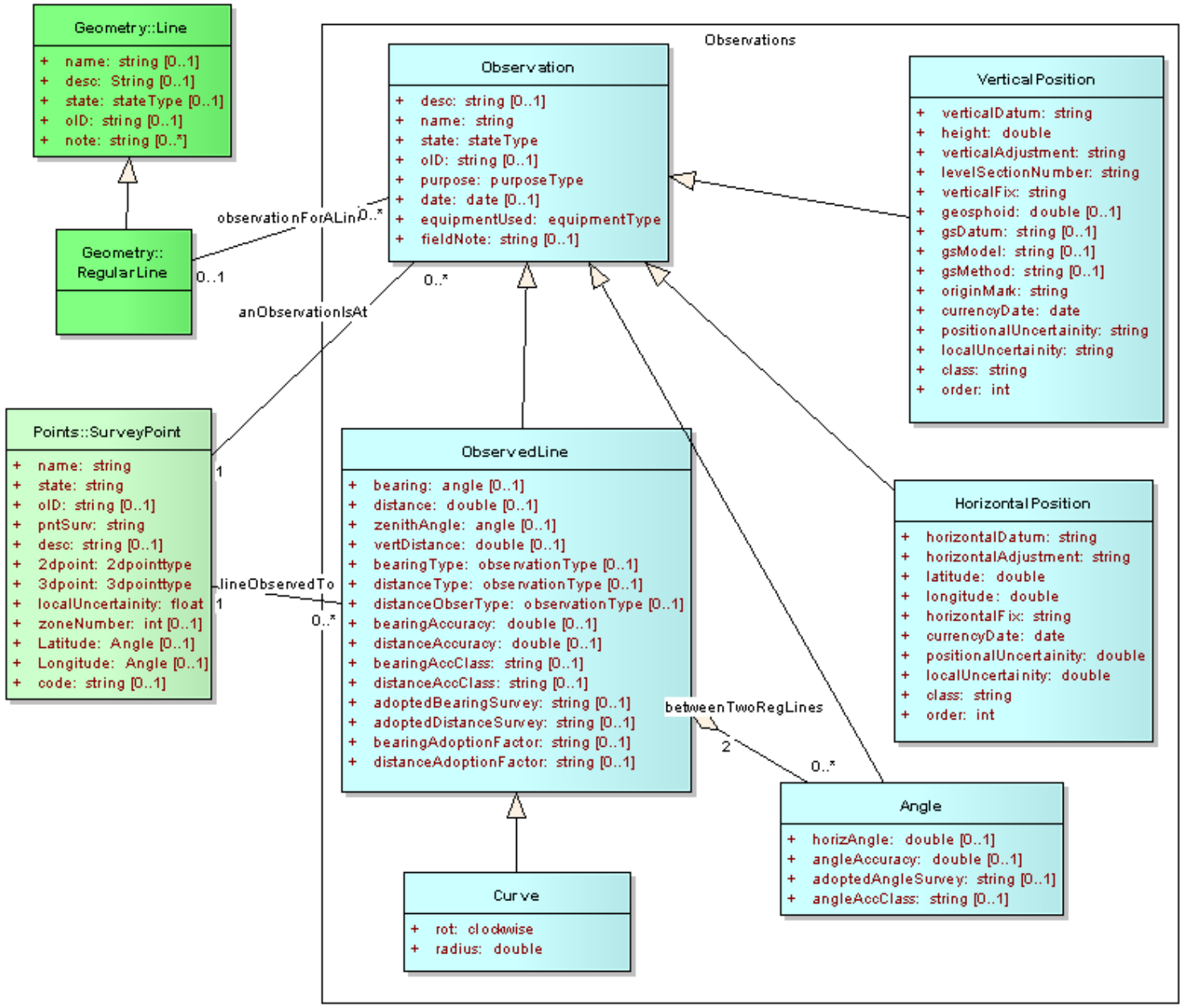
Survey Marks define the monuments at the survey points. A Monument is an Object (e.g., Pin, Peg, Permanent Mark) that is placed in the ground for the purpose of being surveyed. A monument must be at a survey point however a survey point could have more than one monument. For example there may be a nail in concrete for the corner and a reference to a brick wall at the same survey point.

Attribute	Type	Req	Note	LandXML
name	String	R	Name of monument for plan. The Name must be unique to the survey. A local convention may prevail but is not required.	Monument: name
pntRef	String	R	Reference to a Station Number in the file (Cgpoint)	Monument: pntref
desc	String	CR	Description of monument This is an optional field but is required if the monument type is “occupation” or “other”. For Example leaning Round Fence Post, Cnr of Brick Wall, Cen Face Square Fence Post. There is usually a jurisdictional list of permitted abbreviations for this description although the field should be left as free text to allow for different types of occupation.	Monument: Desc
type	MonumentType	R	The generalised type of the monument. An enumerated list is available and will change between jurisdictions. For Example “Peg”	Monument: type
state	MonumentState	R	The state of the Monument, ie New etc. A LandXML Enumeration	Monument: state
condition	MonumentCondition	O	A list of available conditions are given as jurisdictional enumerations.	Monument: condition

oID	String	O	Official identifier for monument. In Queensland this is made up of a two part key the PID of the Survey Point (ie 1234567) and a sequence number for the monuments at that point (i.e 1). This value will only contain the sequence number of the monument. These values are only available for existing marks and are supplied via the Cadastral Infrastructure Search.	Monument:oID
origin Survey	Origin Survey	O	This field will define the survey on which the original survey mark was placed. It is current practice in Queensland to annotate the plan, particularly for reference marks if the origin of the mark is known. This requirement may become redundant	Monument: originSurvey

2.6 Observations

The Observations package deals with the reduced observations of the survey. This package contains the observations between survey points and the lines contained within survey polygons. These classes map the HDM classes survey lines, survey angles etc. The classes map to the reduced observations within LandXML.


Geometry::Line
+ name: string [0..1]
+ desc: String [0..1]
+ state: stateType [0..1]
+ oID: string [0..1]
+ note: string [0..*]
Geometry::
RegularLine
observationForALin
0..*
0..1
anObservationIsAt
0..*
Observations
Observation
+ desc: string [0..1]
+ name: string
+ state: stateType
+ oID: string [0..1]
+ purpose: purposeType
+ date: date [0..1]
+ equipmentUsed: equipmentType
+ fieldNote: string [0..1]
VerticalPosition
+ verticalDatum: string
+ height: double
+ verticalAdjustment: string
+ levelSectionNumber: string
+ verticalFix: string
+ geosphoid: double [0..1]
+ gsDatum: string [0..1]
+ gsModel: string [0..1]
+ gsMethod: string [0..1]
+ originMark: string
+ currencyDate: date
+ positionalUncertainity: string
+ localUncertainity: string
+ class: string
+ order: int
Points::SurveyPoint
+ name: string
+ state: string
+ oID: string [0..1]
+ pntSurv: string
+ desc: string [0..1]
+ 2dpoint: 2dpointtype
+ 3dpoint: 3dpointtype
+ localUncertainity: float
+ zoneNumber: int [0..1]
+ Latitude: Angle [0..1]
+ Longitude: Angle [0..1]
+ code: string [0..1]
1
lineObservedTo
1
0..*
ObservedLine
+ bearing: angle [0..1]
+ distance: double [0..1]
+ zenithAngle: angle [0..1]
+ vertDistance: double [0..1]
+ bearingType: observationType [0..1]
+ distanceType: observationType [0..1]
+ distanceObserType: observationType [0..1]
+ bearingAccuracy: double [0..1]
+ distanceAccuracy: double [0..1]
+ bearingAccClass: string [0..1]
+ distanceAccClass: string [0..1]
+ adoptedBearingSurvey: string [0..1]
+ adoptedDistanceSurvey: string [0..1]
+ bearingAdoptionFactor: string [0..1]
+ distanceAdoptionFactor: string [0..1]
HorizontalPosition
+ horizontalDatum: string
+ horizontalAdjustment: string
+ latitude: double
+ longitude: double
+ horizontalFix: string
+ currencyDate: date
+ positionalUncertainity: double
+ localUncertainity: double
+ class: string
+ order: int
betweenTwoRegLines
2
0..*
Angle
+ horizAngle: double [0..1]
+ angleAccuracy: double [0..1]
+ adoptedAngleSurvey: string [0..1]
+ angleAccClass: string [0..1]
Curve
+ rot: clockwise
+ radius: double

2.6.1 Observation

This is the reduced observation between two points. These points may not be contained within a survey polygon, i.e. a connection to control marks. The Observation class is a high level class to set up the naming etc for the observations. These elements are inherited by the lower classes within the package. An Observation must be made at a Survey point specified in the file. For Observations such as Angles and Heights etc this is the AT point. For a line this is often referred to as the FROM point. Every Regular Line contained within a polygon must have at least one observation.

LandXML can handle both Raw and Reduced Observation an earlier decision was taken to deal only with reduced observations within the LandXML file.

Attribute	Type	Req	Note	LandXML
name	String	R	Must be unique in the file.	ReducedObservation: name ReducedArcObservation: name
oID	String	O	The oID is the persistent identifier for the element, if the element is adopted from a previous survey and the oID is known then it can be given here.	ReducedObservation: oID ReducedArcObservation:oID
state	String	O	LandXML enumeration	ReducedObservation: state ReducedArcObservation: state
date	Date	O	Date of the observation	ReducedObservation: date ReducedArcObservation: date
desc	String	O	Optional Description of the Observation	ReducedObservation: desc ReducedArcObservation:desc
equipmentUsed	Equipment Type	O	Broad category of type of survey technology used for example Theodolite and Tape, Total Station, GPS etc.	ReducedObservation: equipmentUsed ReducedArcObservation: equipmentUsed
fieldNote	string	O	These are observational level field notes that can be attached	ReducedObservation: fieldNote ReducedArcObservation: fieldNote
purpose	Purpose Type	O	The purpose is a definition of what the observation was taken for. The purpose can come from a defined list.	ReducedObservation: purpose ReducedArcObservation: purpose

2.6.2 Observed Line

This class is used to define the attributes of an observed regular line. The Observed Line Class inherits data from the Observation class. A line can have more than one observation of a different type. For example in a remote location, we may have spheroidal Bearing and Distance from GPS Observations but we may also require a mean terrain height observation for cadastral purposes.

Attribute	Type	Req	Note	LandXML
bearing	Direction	CR	The Horizontal Bearing of the line in relation to the orientation of the survey as described in the Origin of Bearings field.	ReducedObservation: azimuth ReducedArcObservation: azimuth
distance	Double	CR	The Horizontal distance is the distance between two points. Where the observed line is a curve then the horizDistance is the arc length of the curve.	ReducedObservation: distance ReducedArcObservation: distance
zenithDistance	Angle	CR	The Zenith Angle for a slope distance.	ReducedObservation: zenithDistance ReducedArcObservation: zenithDistance
vertDistance	Double	CR	Vertical Distance is used to measure between the top and bottom surfaces of a volume if the faces are vertical. A vertical distance does not require a bearing.	ReducedObservation:vertDistance ReducedArcObservation: vetDistance
bearing Type	String	CR	See Observation Type enumerations for example Measures, Adopted etc	ReducedObservation:azimuthType ReducedArcObservation: azimuthType
distanceType	String	CR	Defines how the observations are obtained See Bearing Type of enumerations	ReducedObservation: distanceType
distanceObserType	Observation Type	CR	This defines the type of distance observation, for example Horizontal Distance (Mean Terrain Height) or Slope distance for example. It is a enumrated list and is realised in the LandXML as specific attributes in the Reduced Obsevation elements.	ReducedObservation: distanceObserType ReducedArcObservation: distanceObserType
bearingAccuracy	String	O	Accuracy of the bearing in seconds of arc	ReducedObservation:azimuthAccuracy ReducedArcObservation: azimuthAccuracy

distanceAccuracy	String	O	Accuracy of the distance in millimeters	ReducedObservation:distanceAccuracy ReducedArcObservation: distanceAccuracy
bearingAccClass	Double	O	The Class of the individual observation.	ReducedObservation:azimuthAccClass ReducedArcObservation: azimuthAccClass
distanceAccClass	Double	O	Accuracy Class of the distance observation	ReducedObservation:distanceAccClass ReducedArcObservation: distanceAccClass
adoptedBearingSurvey	String	O	Where the bearing has been complied from a previous survey this is a reference to that survey.	ReducedObservation:adoptedAzimuthSurvey ReducedArcObservation: adpoptedAzimuthSurvey
adoptedDistanceSurvey	String	O	Where the distance is complied from a previous survey this is a reference to that survey.	ReducedObservation:AdoptedDistanceSurvey ReducedArcObservation: AdoptedDistanceSurvey
bearingAdoptionFactor	Double	O	The angle that was added to the observation bearing from the original survey (The Swing)	ReducedObservation:AzimuthAdoptionfactor ReducedArcObservation: AzimuthAdoptionfactor
distanceAdoptionFactor	Double	O	Record of any scale factor supplied for a line from the original.	ReducedObservation:DistanceAdoptionFactor ReducedArcObservation: DistanceAdoptionFactor

2.6.3 Curve

A curve is a special case of an observed line; this class inherits attributes from ObservedLine. A Curve is a specific type of regular line between two points. It is defined by its start and end is a radius and direction of rotation.

Attribute	Type	Req	Note	LandXML
rot	String	CR	The direction of Rotation either clockwise or anticlockwise when view from the instrument station. Datafield = 'countercolockwise' Datafield = 'clockwise'	ReducedArcObservation:rot
radius	Double	CR	Radius of the Curve	ReducedArcObservation: radius

2.6.4 Angle

An Angle is an Observation and hence inherits from observation. The angle is observed at a point between 2 lines. The Angle is not used to define the polygon (these are a list of points and lines) but is used to determine the field observations at that point

Attribute	Type	Req	Note	LandXML
HorizonalAngle	Double	CR	The Angle value recorded	ReducedObservation:HorizontalAngle ReducedArcObservation: HorizontalAngle
AngleAccuracy	Double	O	Accuracy of the angular Observation	ReducedObservation:angleAccuracy ReducedArcObservation: angleAccuracy
adoptedAngleSurvey	String		If the angle was adopted from a previous survey then this needs to be recorded here.	ReducedObservation:adoptedAngleSurvey ReducedArcObservation: adoptedAngleSurvey

2.6.5 Horizontal Position

This class is used to define a horizontal Position. The coordinates are given in Geographical Coordinates and may come from a variety of means.

Attribute	Type	Req	Note	LandXML
horizontalDatum	String	R	The datum in which the coordinates where determined	RedHorizontalObservation: horizontalDatum
horizontalAdjustment	String	O	The adjustment or method to determine the coordinates. It is a free text field which may contain a recognised adjustment name i.e. Brisbane West Control or similar.	RedHorizontalObservation: horizontalAdjustment
Latitude	Double	R		RedHorizontalObservation: latitude
Longitude	Double	R		RedHorizontalObservation: longitude
HorizontalFix	String	R	The method used to fix the position of the mark. Is an Enumerated list.	RedHorizontalObservation: horizontalFix
CurrencyDate	Date	R	The date that the coordinates where published. For example if this record was for a mark which was used as a datum mark for a terrestrial traverse the currency date would be the date that the published coordinates where received. If these where new coordinates then the currency date would be the date of the survey.	RedHorizontalObservation: currencyDate
positionalUncertainity	Double	O	The 95% uncertainty of the horizontal position.	RedHorizontalObservation: postionalUncertinity
localUncertainity	Double	O	The local uncertainty to the other control marks in the survey.	RedHorizontalObservation: localUncertinity
Class	String	O	The class to which the coordinates where determined.	RedHorizontalObservation: class
Order	Integer	O	The order to which the coordinates where observed.	RedHorizontalObservation :order

2.6.6 Vertical Position

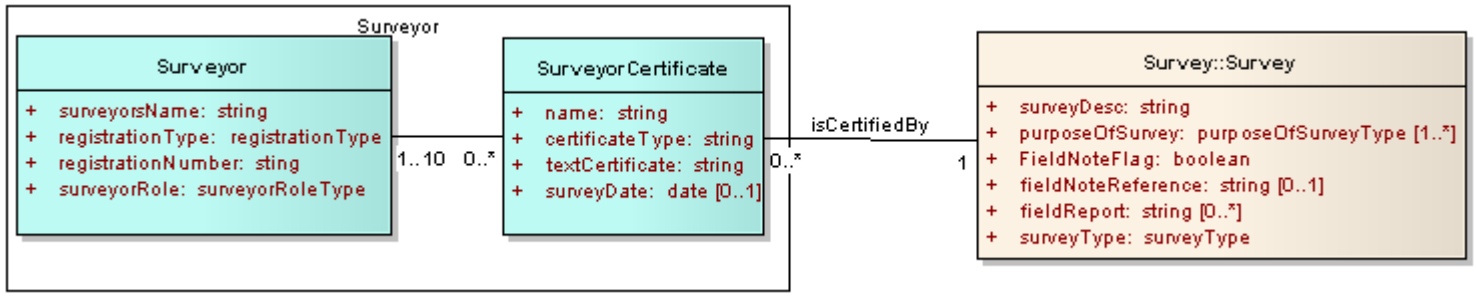
Records the Reduced Level and other details about a station. The object is to record and observation which is direct to the reference.

Attribute	Type	Req	Note	LandXML
verticalDatum	String	R	The vertical datum to which the survey is referenced i.e. AHD, State Datum etc.	RedVerticalObservation: verticalDatum
height	Double	R	The RL of the Point	RedVerticalObservation: height
verticalAdjustment	String	O	Defines the adjustment the values were derived from. For height derived by this survey it would be a local datum	RedVerticalObservation: verticalAdjustment
verticalFix	String	O	The Method used to determine the height value, for example Spirit Level, GPS etc	RedVerticalObservation: verticalFix
geosphoid	Double	O	This is the Geoid Spheroid Separation value used to determine the orthometric height from the ellipsoid height	RedVerticalObservation: geosphoid
gsDatum	String	O	The geoid Datum used.	RedVerticalObservation: gsDatum
gsModel	String	O	The Geoid Model used to determine the separation.	RedVerticalObservation: gsModel
gsMethod	String	O	The method used to determine the Geospeiod separation from the model. Is an enumerated list	RedVerticalObservation: gsMethod
originMark	String	O	The Origin mark used to determine the height value. This is to allow maintenance of the values if the Height datum is redefined	RedVerticalObservation:originMark
currencyDate	Date	O	Date of the published height	RedVerticalObservation: currencyDate
positionalUncertainity	String	O		RedVerticalObservation: positionalUncertainity
localUncertainity	String	O		RedVerticalObservation: localuncertainity
Class	String	O		RedVerticalObservation: class
Order	Integer	O		RedVerticalObservation: order

2.7 Surveyor

This package deal with the legal certification of the plan by the surveyor which must form part of the original survey document lodged so must be contained in the processing by the consultant.

The HDM has elements for the surveyor etc but the actual certification is at too low a level for the HDM. This element is also not part of the LandXML but could be incorporated as a plan feature element.



2.7.1 Surveyor

This package contains the details and certifications by the survey. These classes are not contained in either LandXML or Harmonised Data Model as separate classes. The HDM could be seen to incorporate this data within the plan class.

Attribute	Type	Req	Note	LandXML
SurveyorsName	String	R	The full name of the surveyor as registered.	Personel: surveyorsname
RegistrationType	String	R	This shows the level of registration i.e. cadastral surveyor, associate etc. These enumerations are jurisdictionally specific and are not stated in LandXML	Personel:registrationType
RegistrationNumber	Date	R	The surveyors board registration number for tracking purposes.	Personel: registrationNumber
SurveyorRole	String	R	The role the surveyor played, i.e. field surveyor, technician etc. Can be a jurisdictionally specific list if required.	Personel: surveyorRole

2.7.2 Surveyor Certificate

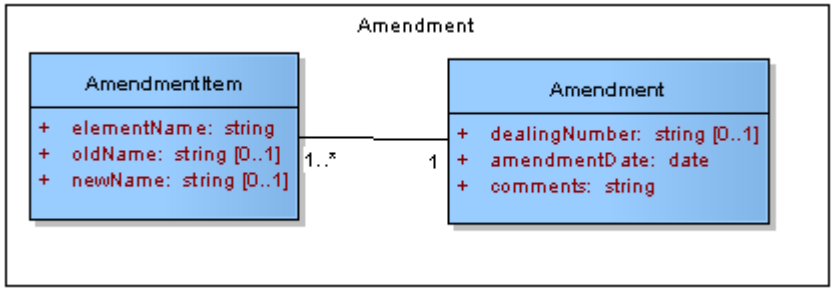
This is the Surveyors Certificate and contains the wording of the certificate and the dates etc.

Attribute	Type	Req	Note	LandXML
Name	String	R	Unique Name of the Certificate in the file for amendment tracking purposes.	SurveyorCertificate: name
certifiateType	String	R	This tells us the general format of the certificate for example a form 13 etc.	SurveyorCertificate:certificateType
textCertificate	String	R	This is the full wording of the certificate, which must conform to regulated standards. The text should conform to the certificate type	SurveyorCertificate:textCertificate
surveyDate	Date	CR	The date that the survey was completed for the purposes of the certificate. Please not that for compiled plans no survey date exists hence conditionally required.	SurveyorCertifcate: surveyDate

2.8 Amendment

This is a requirement to enable the internal tracking of amendments to the file post lodgement. This requirement does not fall within the realm of either LandXML or the HDM. The Amendment package is included so that any changes to the file, specifically after registration can be audited and easily identified. This is a legislative requirement and is at a lower level of abstraction than the HDM. It is functionality, which at this stage is not managed by LandXML but could be dealt with as a feature under the LandXML: Survey Element.

If there is any amendment record then there must be at least one amendmentItem record.



2.8.1 Amendment

This class is to record the Dealing information to allow an audit trail between the survey document and the titling system.

In Queensland if a plan is amended post registration we need to be able to show directly the changes made as well as record a dealing in ATS to identify the changes.

Attribute	Type	Req	Note	LandXML
dealingNumber	String	CR	When an amendment is made, specifically after registration then a dealing describing the action must be lodged to provide an audit trail.	Amendment: dealingNumber
amendmentDate	Date	R	The date that the amendment took affect.	Amendment:ammendmentDate
comments	String	R	A short note as to the reason for the change and what it entails.	Amendment: comments

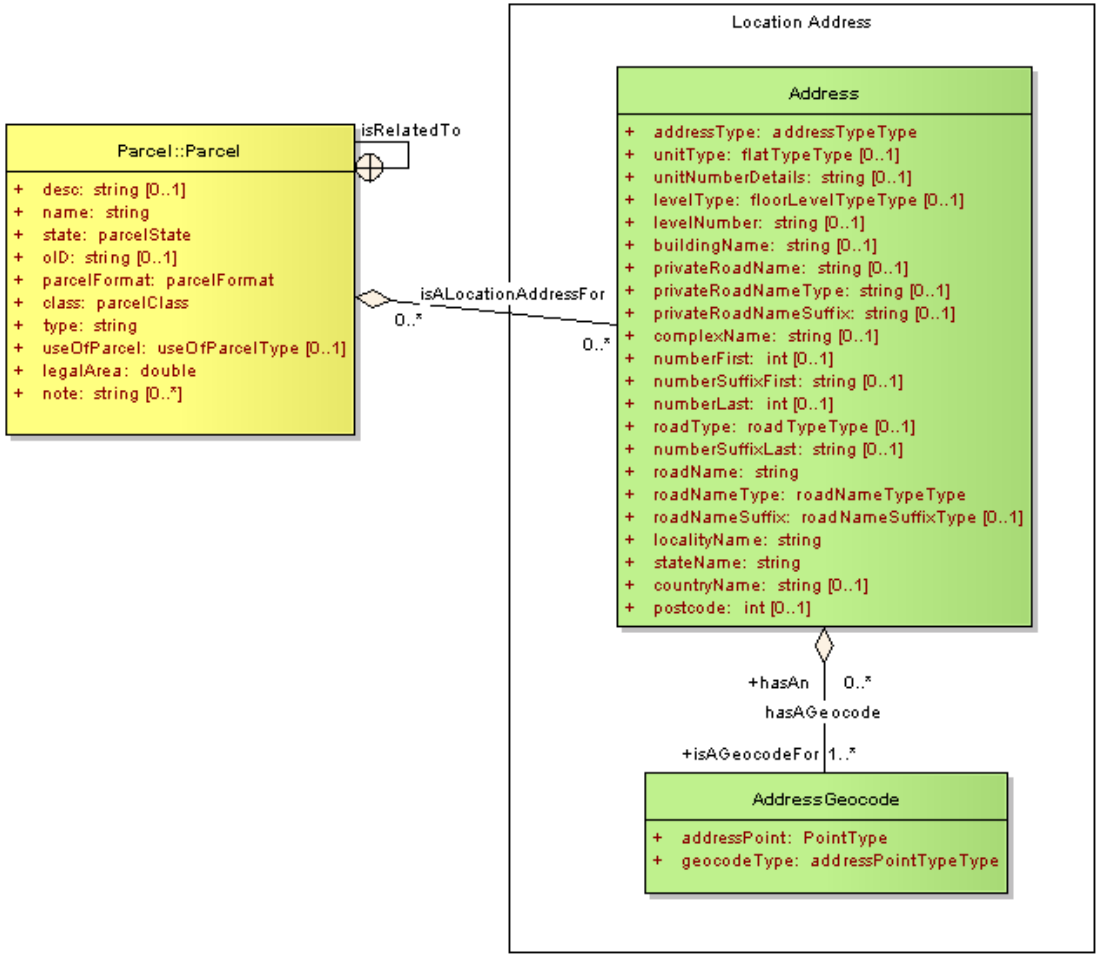
2.8.2 AmendmentItem

This class identifies the individual amendments identified by the amendment class. This is not mapped in either the LandXML Schema or the HDM.

Attribute	Type	Req	Note	LandXML
elementName	String	R	The elementName is the name of the element to which the named object belongs for example if we are replacing an observation then the elementname is Observation	AmendmentItem: elementName
oldName	String	CR	If no oldName is supplied it means that a new element is being added to the file	AmendmentItem:oldname
newName	String	CR	If no newName is supplied it means that an element is deleted from the file. To remove an element its state is changed to deleted.	AmendmentItem: newName

2.9 Address

This Package is to define the address for a parcel. The classes have also been designed to enable the entry of one or more geocode for the address. This is to enable interfaceing with the GNAF Project.



2.9.1 Address

This class contains the attributes to assign a location address to a parcel. This class does not deal with Australia Post attributes of Post Code and DPID as these are not locational functionality but postal delivery functions.

We have followed the Australian Standard AS4590 -1999 for the exhange of Client Information and the HDM where appropriate.

This class should support the Urban and Rural Street Address Standard AS/NZS4819-2002.

The following elements are not mapped to this class:

Location Descriptor, Post Code, DPID, Postal Delivery Type, Postal Delivery Number and Lot No.

Attribute	Type	Req	Note	LandXML
unitType	String	O	Max 7 Characters and is a set of known abbreviations.	Parcel:LocationAddres:flatType
unitNumberDetails	String	O	An AlphaNumeric Unit Number.Max 7 Char	Parcel:LocationAddres:flatNumber
levelType	String	O	The Floor level must be a known abbreviation	Parcel:LocationAddres:floorLevelType
levelNumber	String	O		Parcel:LocationAddres:floorLevelNumber
privateRoadName	String	O	This is a text string used for private roads within a development. The field must hold the full name of the private road which includes road name, road type, road suffix.	Parcel:LocationAddres:flatType
privateRoadNameType	String	O	Same as Road Type	Parcel:LocationAddres:flatType
privateRoadNameSuffix	String	O	Same as RoadName Suffix	Parcel:LocationAddres:flatType
SiteName	String	O	The Name of the Site	Parcel:LocationAddress:ComplexName

buildingName	String	O	The name of the building can be split over two field of 30 alpanumeric strings. They are part of the one element. for example North Wing, Treasury Building in acceptable but two separate building names are not for example Treasury Building, Town Hall. This equates to AS4819-2003 Utility Name and Address Site Name	Parcel:LocationAddres:ComplexName
numberFirst	String	R	First house number in the series or if only one house number.	Parcel:LocationAddres:numberFirst
numberSuffixFirst	String	O	Alpha Suffix for a house number	Parcel:LocationAddres:numberSuffixFirst
numberLast	String	O	Last Number in the series	Parcel:LocationAddres:numberLast
numberSuffixLast	String	O	Alpha suffix of the last number in a range	Parcel:LocationAddres: numberSuffixLast
roadName	String	R	The name of the road. the HDM uses the name element but it has been changed here for clarity.	Parcel:LocationAddres:RoadName:roadName
roadNameType	String	R	The Road Type ie Street, Lane etc	Parcel:LocationAddres: RoadName: roadNameType
roadNameSuffix	String	O	For example, East, Upper etc.	Parcel:LocationAddres:RoadName:roadNameSuffix
localityName	String	R	Must be a recognised locality from the administrative area for locality.	Parcel:LocationAddres:AdministrativeArea
stateName	String	O	The State or Territory	Parcel:LocationAddres:AdministrativeArea
postcode	String	O	The Post code if required	Parcel:LocationAddres:AdministrativeArea
countryName	String	O	The Country if required	Parcel:LocationAddres:AdministrativeArea
addressType	String	R	A Parcel could have many addresses as it could have several frontages and be used for different purposes. For example you may have a primary address and several alliases.	Parcel:LocationAddres:addressType

2.9.2 Address Geocode

A Geocode for an Address Point. The point will need to be described as a point type but it is not neccessary to be a Survey point. The coordinate values for the address point must be in the coordinate system of the file which can be later translated to the best appropriate coordinate system.

An address could have several geocodes for the one address. For example the letter box, the drive way, the front door. This is handled by the geocode type

Attribute	Type	Req	Note	LandXML
addressPoint	String	O	A point value for the geocoded point.	Parcel:LocationAddres:AddressPoint.
geocodeType	String	O	The type of geocode, will eventually be a enumerated list list. The list will be the responsiblity of each jurisdiction.	Parcel:LocationAddres:AddressPoint: AddressPointType

END OF SECTION

APPENDIX A - Glossary

TERM	DESCRIPTION
ACT	The Australian Capital Territory, Australia
CIF	Cadastral Information File is an instance of a LandXML document (*.xml) consistent with the ePlan Protocol that represents a cadastral survey.
CIS	Cadastral Infrastructure Search is an instance of a LandXML document (*.xml) that represents the cadastral infrastructure in an area of interest within the cadastre. This framework data can be used as a basis for searching cadastral data in an area of interest.
COGO	A suite of programs aimed at coordinate geometry problems in Civil Engineering. See http://en.wikipedia.org/wiki/COGO
DCDB	Digital Cadastral Data Base. It is the legal parcel fabric (current subdivisional pattern) of the State of NSW supplied by the Department of Lands.
ePlan Model	ePlan Model is a logical representation of a cadastral survey. See http://www.icsm.gov.au/icsm/membersonly/eplan
ePlan Protocol	The ePlan Protocol is a physical mapping of the ePlan Model to LandXML. See
GML	Geography Markup Language. See http://www.opengis.net/gml
GOVDEX	GOVDEX is the Australian Government Collaboration Web Site hosted by the Australian Department of Finance and Deregulation The ePlan Working group has a workspace on this site that hold the Published documents, schemas and example files. See. https://www.govdex.gov.au/confluence/display/ICSMEWG/Home

ICSM	Intergovernmental Committee on Survey and Mapping. See http://www.icsm.gov.au
Jurisdiction Schemas	This is a collection of XML Scheamas and documents which are used to define local enumeration. For the details of the structure of the Schemas see
LandXML	LandXML 1.1 is an XML Schema for describing XML documents that represent geospatial data. See http://www.landxml.org
NSW	The State of New South Wales, Australia
NT	The Northern Territory, Australia
Plan	In this context a Plan refers to a Cadastral Survey Plan. By Nature the plan is a paper based document which visualises the results of a Cadastral Survey.
QLD	The State of Queensland, Australia.
Survey	In this context a Survey refers to a Cadastral Survey and is a collection of measurements, observations and monumentation to identify interests in Land. The Surveyor collects this information in field books or electronic data records for later processing. The Survey has traditionally been visualised for the client by the preparation of a Plan
SA	The State of South Australia, Australia
TAS	The State of Tasmania, Australia
URI	Uniform Resource Identifier. See http://www.w3.org/Addressing
URL	Uniform Resource Location. See http://www.w3.org/Addressing
URN	Uniform Resource Name. See http://www.w3.org/Addressing
VIC	The State of Victoria, Australia
W3C	World Wide Web (WWW) Consortium. See http://www.w3c.org

W3C XML Schema	An expression language for describing the vocabulary and rules in an XML document. NOTE: An XML Schema is written using XML syntax. See http://www.w3.org/XML/Schema
WA	The State of Western Australia, Australia
WG	Working Group
XML	Extensible Markup Language. See http://www.w3.org/XML
XML Schema	See W3C XML Schema.
XSD	XML Schema Definition. Also refers to the XML Schema file extension (*.xsd).

TERM	DESCRIPTION
ACT	The Australian Capital Territory, Australia
CIF	Cadastral Information File is an instance of a LandXML document (*.xml) consistent with the ePlan Protocol that represents a cadastral survey.
CIS	Cadastral Infrastructure Search is an instance of a LandXML document (*.xml) that represents the cadastral infrastructure in an area of interest within the cadastre. This framework data can be used as a basis for searching cadastral data in an area of interest.
COGO	A suite of programs aimed at coordinate geometry problems in Civil Engineering. See http://en.wikipedia.org/wiki/COGO
DCDB	Digital Cadastral Data Base. It is the legal parcel fabric (current subdivisional pattern) of the State of NSW supplied by the Department of Lands.
ePlan Model	ePlan Model is a logical representation of a cadastral survey. See http://www.icsm.gov.au/icsm/membersonly/eplan
ePlan Protocol	The ePlan Protocol is a physical mapping of the ePlan Model to LandXML. See
GML	Geography Markup Language.

END OF APPENDIX

END OF DOCUMENT