

## Flow of Events for Use Case – Define Land Use Space

Change Log	
19/06/2004	Created This use case replaces the previous use cases 'Define Special Area', and 'Define Risk Area'.
29/09/2004	Replaces previous use case 'Capture Soil Properties' Modified against current status of model development
05/10/2004	Corrections to remove references to IfcLandUseSpace
01/11/2004	Finalized for pre-integrated model

### Overview

Defines the boundary limits of an area of land having certain properties with regard to its use or restriction of use or physical aspects. It covers:

- Areas within which only certain special types of construction are allowed for a special reason. The reason is that land may have been set aside for an environmental or recreational reason and only constructions that serve that purpose are allowed within the boundaries of that area. Such areas may include:
  - Areas for residential, commercial or industrial use by zoning category.
  - areas for private roads
  - camping sites
  - areas with underground constructions
  - restricted areas near airports, military installations etc
  - areas partly including rivers, lakes, coastlines
  - cultural heritage areas
  - fishing piers
  - special animal areas (e.g. for reindeer conservation etc)
  - environmentally protected areas
  - water supply sources with catchment areas
  - free-line-of-sight road adjoining areas
  - restricted airport/port/military/customs areas etc
  - graveyards
  - municipal technical installation areas
  - cableways and funiculars
  - amusement parks
- Areas within which construction is not allowed for reasons of safety or health risk. A number of risks may be proposed including those due to natural phenomena, unsuitable conditions, environmental hazard or other risk that may be defined by a classified list.
- Areas with consistent properties (e.g. soil properties)

Land use spaces of the same type must be non overlapping

The use case also takes into account the need to capture temporal information regarding land use where a land use space can take on different values at different times of the year (e.g. a particular recreation space may be designated as a golf course during the summer but be designated as being for recreational skiing during the winter.

### Process

#### Preconditions

None

## Actors

Authority

## Main Flow

1. Determine whether land use space and its boundary are being initially created, a modification proposed or a boundary/modification being accepted or rejected.
  - If the land use space and boundary are being created then <S1>
  - If a modification to the boundary is being proposed then <S2>
  - If a boundary or a modification of a boundary is being accepted or rejected then <S3>
2. If the land use space is for an area having consistent soil properties, then set the soil properties values using a property set as in <S4>

## Subflows

### S1: Set Land Use Boundary

Flow	Entity
1. Determine the placement origin for the land use space (used as the datum of the local coordinate system for all geometric representation items used to represent the space).	IfcPoint
2. Place the extents of the land parcel using the use case 'Place 2D Spatial Shape'	IfcShapeRepresentation
3. The representation identifier is set to 'Land Use Boundary'.	IfcShapeRepresentation.RepresentationIdentifier
4. Create an instance of IfcSpace to designate the area and ensure attribute values are set appropriately to an external space.	IfcSpace
5. Determine the identity of the land use space on each side of the boundary. <ul style="list-style-type: none"><li>• The boundary needs to consider each segment of the land use space boundary as a curve in its own right, the curve being the manifestation of a relationship between two land use spaces.</li><li>• Therefore, each segment of the boundary needs to capture a binary relationship between two land use spaces.</li></ul>	IfcSpace Pset_SpaceLandRegistration
6. Assert the identity of the land use space on each side of the boundary through a relationship object that determines the relation between spatial structures <ul style="list-style-type: none"><li>• Depending on the physical adjacency, any type of curve might be selected to represent a boundary.</li><li>• Since adjacent spaces should be touching at their boundaries, CAD or GIS applications should not have difficulty in determining relating/related property.</li></ul>	IfcRelConnectsElements IfcSpace Pset_SpaceLandRegistration
7. Determine the purpose of the land use space.	Pset_SpaceLandRegistration
8. Assert the purpose of the land use space through a property within the relevant property set.	Pset_SpaceLandRegistration

### **S1a: Use existing boundary**

<b>Flow</b>	<b>Entity</b>
1. Determine the coordinates of the existing line	IfcPoint
2. Add the line to the set of lines that will form the boundary.	

### **S1b: Make new boundary**

<b>Flow</b>	<b>Entity</b>
1. Determine the type of curve to connect from the current point to the previous point	IfcCurve
2. Create the line	IfcCurve
3. Add the line to the set of lines that will form the boundary.	IfcCurve

### **S2: Propose Land Use Boundary**

<b>Flow</b>	<b>Entity</b>
1. Determine the land use space(s) for which a new boundary is to be proposed.	IfcSpace
2. Determine the boundary of the land use space.	IfcCompositeCurve IfcPolyline
3. Copy the existing boundary and all relationships that exist between land use spaces at the boundary lines.	IfcCompositeCurve IfcPolyline
4. Edit the existing boundary either by adjusting start and end points of the boundary lines or by inserting new lines into the boundary specification or by deleting existing boundary lines or by a combination of the above.	IfcCompositeCurve IfcPolyline
5. As lines are edited, add new details of the line to the boundary list.	IfcCompositeCurve IfcPolyline
6. As a line is edited, test the relationship that exists between land use spaces and adjust as required. Where a new land use space is being inserted, thus requiring the boundary change, the relationship may not be able to be fully asserted until the new land use space and its boundary are fully defined.	IfcCompositeCurve IfcPolyline
7. Create an instance of IfcSpace within the proposed boundary and ensure attribute values are set appropriately to an external space.	IfcSpace
8. Identify the new instance of IfcSpace as 'proposed' and copy relationships from the existing land use space to the proposed land use space	IfcSpace
9. At this point, both the existing and the proposed land use space should exist and all relationships should be fully asserted in both cases.	IfcSpace
10. Create a proposed boundary in the same way as for 'Set Land Use Boundary' above. The representation identifier attribute is set to	IfcShapeRepresentation.RepresentationIdentifier

IfcShapeRepresentation.RepresentationIdentifier = 'Proposed Land Use Boundary'	
11. At this point, both the existing boundary and the proposed boundary should exist and all relationships for the boundary should be fully asserted in both cases.	

### **S3: Accept/Reject Land Use Boundary**

<b>Flow</b>	<b>Entity</b>
1. Decision is taken to either accept or reject proposed changes to land use space boundaries. <ul style="list-style-type: none"> <li>If proposed changes to boundaries are accepted then. &lt;S3a&gt;</li> <li>If proposed changes to boundaries are rejected then &lt;S3b&gt;</li> </ul>	IfcApproval

### **S3a: Accept Proposed Land Use Boundaries**

<b>Flow</b>	<b>Entity</b>
1. Existing land use space and boundaries have their status changed to deleted.	
2. Relationships on the existing land use space and boundaries are marked for deletion. Use the IfcOwnerHistory.ChangeAction (with value set to deleted). Note that this requires applications to use a separate instance of owner history for these entities.	IfcOwnerHistory.ChangeAction
3. Proposed land use space and boundaries have their planning status changed to accepted.	IfcProjectOrder.ProjectStatus
4. On completion of practical changes to the boundary, existing entities marked for deletion can be deleted. This includes land use spaces, boundaries and relationships.	
5. Proposed land use spaces and boundaries whose planning status is currently set to 'accepted' have their planning status changed to 'actual', thus designating that they now define the existing state.	IfcProjectOrder.ProjectStatus
6. Depending on requirements, deleted entities may be stored for historical reasons. Each deletion may be identified through version control.	IfcProjectOrderRecord.PredefinedType=PLANNINGAPPLICATION

### **S3b: Reject Proposed Land Use Boundaries**

<b>Flow</b>	<b>Entity</b>
1. All proposed changes are deleted	
2. Depending on requirements, proposed changes may be stored with reference to the planning status being changed to 'rejected'.	IfcProjectOrder.ProjectStatus IfcProjectOrderRecord.PredefinedType=PLANNINGAPPLICATION

## S4 Capture Soil Properties

Flow	Entity
1. The soil properties zone boundary is specified as a shape representation that is one of the representations of IfcSpace that can be defined through the inherited IfcProduct.ProductRepresentation.	IfcSpace
2. The soil properties zone boundary may be geometrically described as a single 2D curve (such as IfcPolyline or IfcCompositeCurve), or by a list of 2D curves (in case of inner boundaries). The representation identifier is: <ul style="list-style-type: none"> <li>IfcShapeRepresentation.RepresentationIdentifier = 'Soil Properties Zone Boundary'</li> </ul>	IfcPolyline IfcCompositeCurve
3. Determine the soil properties within the zone.	
4. Assert the soil within the relevant property set.	Pset_SpaceSoilProperties
5. Where physical properties, special areas or risk areas have been defined that are wholly or partially contained within the soil properties zone: <ul style="list-style-type: none"> <li>Determine the areas that are wholly or partially contained within the soil properties zone</li> <li>Assert a relationship between the soil properties zone and the set of wholly or partially contained areas.</li> <li>Assert an inverse relationship between each area and the soil properties zone within which is is wholly or partially contained.</li> </ul>	

## Post Conditions

- Land use space is created
- Land use space boundary is initially created and relationships between land use spaces specified by boundary lines are asserted.
- A property within a relevant property set specifies the mandated purpose of a special area.
- In the event of proposed modifications, both the current land use space boundary and the proposed land use space boundary exist with the same logical identity (Space Identifier) and relationships OR both the current and the proposed boundaries exist with the same logical identity (i.e. reference to the land use space being bounded)
- Following acceptance of the land use space boundary, a single entity exists that defines the land use space and a single entity exists for the boundary around the land use space.

## IFC Usage and Extension Requirements

### Existing Entity/Class Usage

Entity Class Name	Usage
IfcConnectionGeometry	Defines the form of geometry at the connection. For spaces that are external generally, this will be specified by the subtype IfcConnectionCurveGeometry.
IfcDateAndTime	Date/Time values used in setting planning status and time series
IfcPersonAndOrganization	Identified person and/or organization with authority.
IfcShapeRepresentation	RepresentationIdentifier value set to appropriate value as discussed above.

IfcSpace	Used to define an external space that has defined land use properties and considerations and that has a boundary whose position must be recorded.
IfcTimeSeriesSchedule	Used to identify time bound purposes that may be assigned to a space.

## ***Issue List***

<b><i>Question</i></b>	<b><i>Answer</i></b>
Change name of use case to 'Land Use' Area	[JDW 19.06.2004] Done
Need to allow for areas that are adjacent with a common boundary (as with cadastral boundaries)	[JDW 09/10/2004] Refer to space boundary
Need to add land use categories e.g. residential, commercial etc. Use classification mechanism.	[JDW 05.10.2004] Dealt with using the space type mechanism.
Planning Status required on land use areas. Use separate class with relationship	[JDW 05.10.2004] Planning status dealt with through the planning application selection of IfcProjectOrderTypeEnum
Areas may have a temporal aspect to their use. E.g. golf course in summer and skiing course in winter.	[JDW 05.10.2004] Dealt with through the IfcTimeSeriesSchedule entity
[TL 16.08.2004] why does the requirement, that land use spaces shall not overlap, exists? Wouldn't it be enough, that land use spaces of the same category shall not overlap?	[JDW 29.09.2004] Agreed. Proposition removed.