Urban greenspace mapping and characterisation handbook

greenspace scotland
revised and updated December 2010
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1 Introduction

1.1. This guidance supports the greenspace mapping and characterisation process. It was developed initially through research carried out in the Glasgow and Clyde Valley Structure Plan area, with guidance being produced by greenspace scotland, Scottish Natural Heritage, Forestry Commission Scotland and the Glasgow and Clyde Valley Structure Plan Joint Committee. Revisions were made in 2007/8 following a greenspace scotland mapping programme of twelve local authority areas supported by Scottish Government and Scottish Natural Heritage. The guidance has been further revised in 2010 as part of a project to develop a national map of Scotland’s urban greenspace. This brings together all existing greenspace mapping and characterisation guidance into one handbook.

1.2. Using this guidance for greenspace mapping and characterisation will ensure that a comprehensive and consistent approach is taken when creating GIS based maps of urban greenspaces and green networks.

1.3. Further guidance notes in this series cover:

- use and application
- use and application – data integration
- use and application – lessons learned
- calculating accessibility case study
- data management and maintenance

They can be downloaded from www.greenspacescotland.org.uk/mapping

2 Selection of area of interest

2.1 Planning Advice Note (PAN) 65 gives advice on the role of the planning system in protecting and enhancing existing open spaces and providing high quality new spaces. The advice in PAN 65 relates to “open space in settlements: villages, towns and major urban areas.”

2.2 The definition of an urban area used for greenspace mapping and characterisation is a settlement with a population greater than 3000.

2.3 Settlement areas are taken from General Register Office for Scotland (GROS) census geographies.

2.4 A 500 metre buffer is applied to each settlement boundary to define the total area of interest for each settlement. This ensures that transitional spaces are considered in the mapping process.
3 Data sources

3.1 The methodology used for the mapping and characterisation of greenspace is based upon Aerial Photo Interpretation (API) of Ordnance Survey MasterMap to an open space typology. The methodology for API is explained in detail in section 5.

3.2 The methodology requires access to a number of data sources for the extent of Area of Interest. Essential data sources are:

- OS MasterMap
- Aerial Imagery
- Corporate Address Gazetteer/ OS Address Layer

3.3 Other supporting data may be used where appropriate to provide additional evidence. These may include:

- OS 1:10,000 mapping
- PointX
- Local Authority data sets, for example: greenspace audit data, core path network data, habitat survey data

4 Pre-classification process

4.1 The pre-classification process prepares the OS MasterMap Topography Layer for classification and also undertakes a limited classification of the source data in order to focus resources on the interpretation and classification of the PAN65 Open Space typologies. The pre-classification is undertaken using the Topography Layer attribution and other supporting GIS data.

4.2 Create land use classification codes

Two new fields are added to the Topography Layer which will be populated with the land use classification.

- Both fields should be type Float
- Field PRIMARY_LU’ – to be used for capturing the primary land use code
- Field ‘SECONDARY_LU’ – to be used for capturing the secondary land use code
- For a description on the use of the primary and secondary codes see section 5

4.3 Duplicate / broken topography layer polygons

Early versions of the polygon data contained numerous ‘duplicate’ or overlapping polygons. These have largely been removed from the current product however some may still be present. In addition there are occasional ‘broken’ polygons. Broken polygons are defined as “… a result of processing of polygons over tile boundaries. Where broken polygons exist, several identical polygons overlay each other. These stacked polygons (each with a
separate TOID reference) may or may not have the same MasterMap attributes”.

Allowed overlapping polygons exist within the data to represent landform areas i.e. slopes of embankments but these are superfluous and should be removed.

- Query on the attribution “DESCGROUP” = ‘Landform’
- Delete the selected landform polygons
- Quality control to ensure there are no other duplicate polygons within the Project Area
- If any duplicate polygons are found compare the attribution with the aerial photography to determine which ‘duplicate’ polygon should be retained
- Delete the other duplicate polygons
- Identify any ‘broken’ polygons through the query [broken] = -1

A decision will be required on the actual polygon feature that should be maintained to allow work to continue. The polygon with the most appropriate attribution in comparison to the supporting GIS information should be maintained with the other polygons deleted.

4.4 Topography layer attribution

A number of attribute queries are used to pre-classify the ‘LU_CODE’ field:

- "DESCGROUP" = ‘Road Or Track’ – classify as 1.1
- "DESCGROUP" = ‘Roadside’ AND "MAKE" = ‘Manmade’ – classify as 1.2
- "DESCGROUP" = ‘Roadside’ AND "MAKE" = ‘Natural’ – classify as 6.33
- "DESCGROUP" = ‘Roadside’ AND "MAKE" = ‘Unknown’ – classify as 1.5
- “DESCGROUP” = ‘Glasshouse’ – classify as 5.3
- "DESCGROUP" = ‘Structure’ – classify as 5.4
- "DESCGROUP" = ‘Building’ – classify as 5.1
- “DESCGROUP” = ‘Inland Water’ – classify as 6.73
- "DESCGROUP" = ‘Tidal Water’ AND "DESCTERM" = ' ' – classify as 2.2
- "DESCGROUP" = ‘Tidal Water’ AND "DESCTERM" = ‘Foreshore’ – classify as 2.3
- "DESCGROUP" = ‘Rail’ – classify as 3
- "DESCGROUP" = ‘Path’ – classify as 4
- "MAKE" = 'Multiple’ – classify as 6.21

4.5 Buildings pre-classification

Further refinement is undertaken on the ‘buildings’ class to populate commercial and institutional buildings from the ‘5.1 Residential’ class assigned in 4.3. This process has known limitations but is a relatively quick and easy method.
From the Corporate Address Gazetteer (CAG) identify all business addresses. The method for achieving this will vary depending on the attribution contained within each Local Authority CAG. In some instances, the CAG will not contain the attribution required to distinguish between residential and commercial addresses.

All residential buildings that intersect business addresses should be recoded as 5.2 Commercial/ Institutional.

An alternative method if no CAG is available is to use either the OS Address Layer or OS Address-point products.

Note that future OS Address Layer products may incorporate building class information i.e. residential, commercial, industrial and so this should be checked at the start of the project.

From OS Address-point data identify all business addresses using the query “ON_” IS NOT NULL. This identifies all organisational names.

- Create a layer
- Select buildings coded as 5.1 Residential
- Create a layer
- Using “Select by location” identify all buildings that CONTAIN the business addresses in the new Address-point layer
- Recode the selected 5.1 Residential features as 5.2 Commercial / Institutional

Note: This process only codes one building polygon per address. In many cases an address may be made up of multiple buildings i.e. schools. Additional commercial/ institutional polygons should be classified during the API process.

### 4.6 Golf course pre-classification (optional)

Golf courses may represent a not insignificant area within some settlement areas and it is relatively straightforward to pre-classify them. This process has known limitations as it can be difficult to identify whether some polygons on the edge of golf courses are part of the golf course or not.

- From the OS PointX data identify all golf courses using the query “CLASS_CODE” = ‘Golf Ranges, Courses and Clubs’
- Create a layer
- Compare the golf course layer with the aerial imagery and OS MasterMap Topographic polygon data. Note that the club house location is normally captured through PointX so the point will be offset from the actual spatial extent of the golf course polygons.
- Manually select those polygons that definitely represent the extent of the golf course.
- Code the selected polygons as 6.52 Golf Courses

The secondary code should be used to capture information on the extents of woodland or other semi-natural areas that make up part of the golf course.
5 **Classification**

5.1 **Data management**

Depending on the size of the Project Area and the number of staff undertaking the API process it may be necessary to split the pre-classified Topography Layer into data tiles. Alternatively the data may be maintained as a single data set for the entire area. This can help to improve system performance and allow the API team to work on different areas of the data at the same time. At the conclusion of the API the data should be recombined within the GIS.

The only considerations with tiling the data are:

- Select a suitable grid system, preferably based on the OS coordinate grid network
- Grid tiles must not ‘cut’ edge polygons into multiple features across boundaries
- Edge polygons will be maintained in their entirety within one tile and removed from the adjacent tile. This has been described as ‘hairy chunk’ tiles due to the visual appearance of the tiles having thin, edge polygons extending out beyond, or removed, from the tile edge

5.2 **Aerial photographic interpretation team**

It is recommended that the API team works together for the entire duration of the classification process and that staff changes are avoided unless absolutely necessary.

5.3 **Pilot area**

An initial pilot study area should be selected in order to ‘train’ the API team and derive methods of working e.g. data management, quality assessment, quality control, reporting etc. This is a critical component of the classification process and should not be overlooked. The pilot area should be selected in order to represent a broad range of classification types and may be a single contiguous area or several, smaller, discrete areas of data. There are no hard rules on determining the size of the pilot study and so it is left to the Project Team in place to decide on the requirements.

Although the pilot may be identified as a ‘risk’ to the timely classification of the data it should be viewed as an integral part of the project plan and incorporated accordingly. Classification can continue when the pilot data is being reviewed by the Project Team but any consistent errors revealed will have to be re-classified.

The pilot review should raise several discussion points ranging from the consistent application of specific codes to the alteration of the classification typology itself. This review and development of the methodology should be carried forward in the ongoing work and is critical to the success of the project.
5.4 Classification

- Ordnance Survey MasterMap will be classified according to the land use classification given in Table 1. This will be interpreted from MasterMap attribution and aerial photography.

- MasterMap polygons will not be split. The unique topographic identifier (toid) with each MasterMap polygon will be retained. All tiles will be edge matched.

- Each MasterMap polygon will have two new attributes. These will be PRIMARY_LU and SECONDARY_LU.

- Every polygon will be interpreted and the primary land use recorded in the PRIMARY_LU field. Every polygon must have this field populated. Where an open space polygon has an easily identified secondary type/function this will be recorded in the SECONDARY_LU field. The SECONDARY_LU field will be used where a secondary type/function occurs within all or part of that polygon.

- Urban areas undergo constant land use change and so there will be instances where the imagery and map base do not support a consistent classification. Where classification cannot be resolved the PRIMARY_LU field should be recorded as 99 (areas undergoing change). This identifies areas for site visit or re-classification as the MasterMap base and aerial photography are updated.

- Where other open space data sets exist, these should be used to aid interpretation. Discussion of data sets available at a local level to inform the mapping and categorisation work will be part of the project inception meeting.

- Every polygon must be attributed with a valid ‘PRIMARY_LU’ code.

- The ‘PRIMARY_LU’ code must reflect the dominant function of that polygon.

- Classification in either the ‘PRIMARY_LU’ or ‘SECONDARY_LU’ fields should be to the most detailed level possible i.e. sports areas using codes 6.51 to 6.55 as opposed to 6.5.

- The secondary code is used to show significant features which warrant a code in their own right, but which are part of a larger area of open space. For example, children’s play areas or playing fields within a public park should be mapped as secondary features within a public park using the ‘SECONDARY_LU’ code. Similarly playing fields within school grounds should be mapped using the secondary code.

- In general, polygons making up a single ‘interconnected’ unit of open space should be given the same ‘PRIMARY_LU’ code. For example, around a sports centre the open space polygons associated with the centre such as shelter belts or grassy areas should have a ‘PRIMARY_LU’ code of 6.5x and a ‘SECONDARY_LU’ code assigned if it is wooded or semi-natural in character.

- Where it is not clear that a polygon forms part of an ‘interconnected’ unit of open space the ‘PRIMARY_CODE’ should be the identifiable class of that polygon. For example, when the limit of a golf course can’t be defined a woodland block on the edge of the course should have the ‘PRIMARY_LU’ code assigned as 6.71 Woodland as opposed to 6.52 Golf courses with a ‘SECONDARY_LU’ code of 6.71 Woodland.

- Where the purpose or function of small/thin polygons cannot be individually mapped from the digital imagery they should be assigned the primary
category of the adjacent (or encompassing), dominant class within the classified data.

- The ‘PRIMARY_LU’ code of 99 must be applied to polygons where the digital imagery and polygon data do not support a consistent classification.

### Table 1: Full land use classification incorporating PAN 65 Open Space typology

<table>
<thead>
<tr>
<th>PAN 65 Typology</th>
<th>Full land use classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Roads</td>
<td>1.1 Roads and tracks</td>
</tr>
<tr>
<td></td>
<td>1.2 Roadside (manmade)</td>
</tr>
<tr>
<td></td>
<td>1.4 Parking/loading</td>
</tr>
<tr>
<td></td>
<td>1.5 Roadside (unknown)</td>
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<tr>
<td>2. Water</td>
<td>2.2 Tidal water</td>
</tr>
<tr>
<td></td>
<td>2.3 Foreshore/rocks</td>
</tr>
<tr>
<td>3. Rail</td>
<td>3 Railway</td>
</tr>
<tr>
<td>4. Paths</td>
<td>4 Path</td>
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<td>5. Buildings</td>
<td>5.1 Residential</td>
</tr>
<tr>
<td></td>
<td>5.2 Commercial/Institutional</td>
</tr>
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<td></td>
<td>5.3 Glasshouses</td>
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<td></td>
<td>5.4 Other structures</td>
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<td></td>
<td>5.5 airports</td>
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<td>6. PAN 65 Open Space</td>
<td>6.1 Public park and garden</td>
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<tr>
<td>Private gardens or grounds</td>
<td>6.21 Private gardens</td>
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<td></td>
<td>6.22 School grounds</td>
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<td></td>
<td>6.23 Institutional grounds</td>
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<tr>
<td>Amenity greenspace</td>
<td>6.31 Amenity - residential</td>
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<td>6.32 Amenity - business</td>
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<td>6.53 Tennis courts</td>
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<td>6.55 Other sports</td>
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<td>Green corridors</td>
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<tr>
<td>Natural/Semi-natural greenspace</td>
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<td>6.72 Open semi-natural</td>
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<td></td>
<td>6.73 Open water</td>
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<td>Allotments &amp; community growing spaces</td>
<td>6.81 Allotments &amp; community growing spaces</td>
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<td>Burial grounds</td>
<td>6.82 Churchyard</td>
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<td>6.83 Cemetery</td>
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<tr>
<td>Other functional greenspace</td>
<td>6.84 Other functional greenspace, e.g. caravan park</td>
</tr>
<tr>
<td>Civic space</td>
<td>6.9 Civic space</td>
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<td>7. Other open land</td>
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<td>7.2 Moorland</td>
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<td></td>
<td>7.3 Other, e.g. landfill, quarries</td>
</tr>
<tr>
<td>99. Areas undergoing land use change</td>
<td>99 Change</td>
</tr>
</tbody>
</table>

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6  Aerial photo interpretation - definitions and rules

The PAN 65 open space typology is made up of 10 greenspace types plus a further category of civic space. Civic space is defined as ‘accessible, open areas that are primarily hard landscaped and provide a civic function’. Greenspace is defined as ‘any vegetated land or structure, open water or geological feature within or adjoining an urban area’.

The full land use classification in Table 1 incorporates the PAN 65 open space typology. As the area to be classified covers settlement areas plus a 500 metre buffer it is expected that most open space will fit into the PAN 65 open space typology. Where open space within the study area is not covered by the PAN 65 typology then the additional classes in Table 1 should be used.

The following definitions and protocols should be used to map and categorise open space to the land use classification given in table 1.

6.1  Public parks and gardens

PAN 65 description: areas of land normally enclosed, designed, constructed, managed and maintained as a public park or garden. These will include a variety of features which may include formal footpaths, playspace, sports areas, trees, planted beds and ponds.

All polygons making up a public park should be classified as 6.1 (public park and garden) in the PRIMARY_LU field. The SECONDARY_LU field should then be used to record specific functions/greenspace types associated with polygons making up the above. This might include:

- 6.51 – 6.55 for playing fields, tennis courts, bowling greens or other sports areas within the park
- 6.4 for playspace within the park
- 6.71 where the polygon contains more than 20% (approximately) tree cover
- 6.72 for open semi-natural areas
6.2 Private gardens and grounds

PAN 65 definition: areas of land normally enclosed and associated with a house or institution and reserved for private use.

This is divided into 3 sub-classes:

6.21 private gardens

Enclosed individual or shared gardens associated with residential properties.

Enclosed communal areas associated with flats and tenements should be classified as 6.21 (private garden) (see 1 above). Unenclosed greenspace surrounding high-rise flats and other residential buildings should be classified as 6.31 (amenity – residential) (see 2 above).

Parking areas associated with housing should be recorded as 1.1 (roads and tracks).

6.22 school grounds

Land normally enclosed and associated with a school.

All polygons associated with a school should be classified as 6.22 (school grounds) in the PRIMARY_LU field. The SECONDARY_LU field should be used to record specific functions/greenspace types which are associated with polygons making up the grounds. This might include:
• 6.51 to 6.55 for areas marked for sports
• 6.71 for woodland
• 1.4 for parking areas not accessible for play

6.23 institutional grounds
Enclosed land around other public institutions (hospitals, police stations, fire stations, universities, colleges, nursing homes).

![Image of institutional grounds with associated woodland](image1.png)

1. Institutional grounds with associated woodland

![Image of institutional grounds](image2.png)

2. Institutional grounds

All open space polygons associated with the building(s) should be classed as 6.23 (institutional grounds) in the PRIMARY_LU field with the SECONDARY_LU field used to record specific functions/greenspace types which are associated with polygons making up the grounds.

6.3 Amenity greenspace

PAN 65 definition: unenclosed, landscaped areas providing visual amenity or separating different buildings or land uses for environmental, visual or safety reasons, i.e. road verges or greenspace in business parks, and used for a variety of informal or social activities such as sunbathing, picnics or kickabouts.

This is divided into 3 sub-classes:

6.31 amenity - residential

![Image of amenity - residential](image3.png)

1. Amenity - residential

![Image of amenity - residential with associated playing fields and playspace](image4.png)

2. Amenity - residential with associated playing fields and playspace
All unenclosed polygons which provide for general amenity (informal recreation, kickabouts, dog walking, sitting out) within residential areas should be coded as **6.31** (amenity - residential) in the PRIMARY_LU field (see examples above). The SECONDARY_LU field should be used to record specific functions/greenspace types associated with polygons making up the amenity space. This might include:

- **6.4** (playspace) for areas with fixed play equipment  
- **6.51 to 6.55** for areas marked for sports (see example 2 above)  
- **6.71** (woodland) for polygons containing more than 20% (approximately) closed canopy tree cover

Polygons which are clearly just a road verge or the centre of a roundabout or other road feature should be coded as **6.33** (amenity – transport) in the PRIMARY_LU field. Open spaces that provide for a range of functions and contain a number of additional features such as sports areas, playspace, footpaths and formal planting should be coded **6.1** (public park and garden) in the PRIMARY_LU field, with additional codes used SECONDARY_LU field to record any additional greenspace functions/types associated with individual polygons.

**6.32 amenity - business**

![Amenity greenspace; business](image1.png)

![Amenity greenspace; business with associated woodland](image2.png)

All polygons which provide for general amenity (informal recreation, kickabouts, walking, sitting out) within industrial and business areas should be coded as **6.32** (amenity-business) in the PRIMARY_LU field. The SECONDARY_LU field should be used to record specific functions/greenspace types which are associated with polygons making up the amenity area, particularly semi-natural areas.

Hard standing areas associated with business parks should be recorded as **1.4** (parking/loading).
6.33 amenity - transport

This class should be used for open space associated with road and rail which provide visual amenity/landscaping only, i.e. they would not be used by people for recreation. Greenspace associated with roads in residential or business areas that could be used for informal recreation should be classed as 6.31 (amenity – residential) or 6.32 (amenity- business). It is expected that 6.33 (amenity – transport) will be used more frequently on classified roads (Motorway, A and B), and only for polygons which are clearly just a road verge or the centre of a roundabout or other road feature on unclassified roads.

6.71 (woodland) and 6.72 (open semi-natural) should be used in the SECONDARY_LU field to identify semi-natural areas associated with road and rail (see examples above).

6.4 Playspace for children and teenagers

PAN 65 definition: areas providing safe and accessible opportunities for children’s play, usually linked to housing areas.

All polygons which contain features for play, such as fixed play equipment, adventure play and skate parks, should be coded as 6.4 (playspace).
Where the playspace is within a public park or a larger area of amenity greenspace, it should be recorded in the SECONDARY_LU field, with the relevant code surrounding greenspace used in the PRIMARY_LU field (see examples above).

### 6.5 Sports areas

PAN 65 definition: large and generally flat areas of grassland or specially designed surfaces, used primarily for designated sports i.e. playing fields, tennis courts, bowling greens; areas which are generally bookable. This class includes natural and artificial playing surfaces.

Sports areas are divided into 5 sub-classes:

#### 6.51 playing field

Flat areas of grassland or specially designed surfaces used for a range of outdoor sports i.e. football, rugby, athletics.

1. Amenity greenspace with associated playing field
2. Playing fields with associated woodland

#### 6.52 golf course

Land enclosed and used for golf (including golf ranges).

1. Golf course
2. Golf course with associated woodland
6.53 tennis court
Land used for tennis.

1. Tennis court

2. Tennis courts with associated woodland

6.54 bowling green
Land used for bowling.

6.55 other sports areas
Land used for any sports not covered by Classes 6.51 to 6.54 i.e. riding stables/paddocks, as well as major sports stadiums which are not generally bookable (see example below).

Hampden Park, Glasgow
Sports areas should include not only the playing surfaces, but any other polygons associated with the playing surface, such as open space surrounding a pavilion or leading to the playing surface, where these are unlikely to be used for any other purpose. 6.71 (woodland) and 6.72 (open semi-natural) should be used in the SECONDARY_LU field to distinguish woodland or other semi-natural areas associated with sports areas. For example, all polygons associated with a golf course will be classified as 6.52 in the PRIMARY_LU field with 6.71 in the SECONDARY_LU field for any woodland areas.

Where sports areas are within a public park, school or institutional ground or amenity greenspace they should be recorded in the SECONDARY_LU field, with the surrounding greenspace type recorded in the PRIMARY_LU field.

6.6 Green corridors

PAN 65 definition: accessible, linear routes linking different areas within a town or city as part of a designated and managed network and used for walking, cycling or horse riding, or linking towns and cities to their surrounding countryside or country parks. These may link greenspaces together.

6.61 green access routes
Accessible greenspace, such as that associated with disused railway lines and paths.

6.62 riparian routes
Canal towpaths, accessible river corridors and the associated greenspace.
6.71 (woodland) and 6.72 (open semi-natural) should be used in the SECONDARY_LU field to identify semi-natural areas associated with green corridors.

6.7 Natural/semi-natural greenspace

PAN 65 definition: areas of undeveloped or previously developed land within or adjoining an urban area with residual natural habitats or which have been planted or colonised by vegetation and wildlife, including woodland and wetland areas.

6.71 woodland

Areas of undeveloped or previously developed land which have been planted or colonised by woodland. This is defined as any polygon where there is more than 20% closed canopy tree cover.

6.71 will only be recorded in the PRIMARY_LU field where the primary function of an area is woodland (see examples above). Where woodland is associated with other greenspace types it should be recorded in the SECONDARY_LU field.

6.72 open semi-natural

Areas of undeveloped or previously developed land with open natural habitats or which have been colonised by vegetation and wildlife. This will include vacant and derelict sites such as disused quarries, bings and sidings.

6.72 will only be recorded in the PRIMARY_LU field where the primary function of an area is as open semi-natural habitat (see examples above). Where open semi-natural areas are associated with other greenspace types it should be recorded in the SECONDARY_LU field.
6.73 **open water**
Areas of open water within or adjoining urban areas.

6.8 **Other functional greenspaces**

PAN 65 definition: allotments and community growing spaces, churchyards and cemeteries.

In all these classes all polygons associated with the function should be classed using the relevant class in the PRIMARY_LU field. Areas set aside for vehicles should be identified where possible using classes 1.1 to 1.5 in the SECONDARY_LU field. 6.71 (woodland) and 6.72 (open semi-natural) should be used in the SECONDARY_LU field where appropriate.

6.81 **allotments and community growing spaces**
Land primarily used as allotments and community growing spaces.

1. Allotment next to amenity; transport
2. Allotment adjacent to amenity; residential

All polygons within the allotment site should be recorded as 6.81 even if they do not appear to be formally cultivated.
6.82 churchyard
Enclosed land associated with churches and other places of worship.

1. Churchyard
2. Churchyard with associated woodland

6.83 cemetery
Land used currently or previously as a place of burial and land associated with crematoriums.

1. Cemetery with associated woodland
2. Cemetery

6.84 - other functional greenspace
Other functional greenspace not included in the descriptions above e.g. caravan parks.
6.9 Civic space

PAN 65 definition: squares, streets and waterfront promenades, predominantly of hard landscaping that provide a focus for pedestrian activity and make connections for people and for wildlife, where trees and planting are included.

All polygons making up areas of civic space should be coded as 6.9 in the PRIMARY_LU field.

Other open land

Open land which does not fit within the PAN 65 typology should be classified using classes 7.1 to 7.4, i.e:

- 7.1 (farmland) for polygons making up enclosed/lowland agricultural land
- 7.2 (moorland) for polygons making up unenclosed/upland agricultural land
- 7.3 (other) for polygons making up landfill sites, active quarries and other industrial land uses

Where there is unresolved conflict between the image and master-map layers such that open space polygons cannot accurately categorised should be coded as 99 in the PRIMARY_LU code.
7 Quality assurance

Quality assurance (QA) forms an integral part of the overall project work and should be managed at every stage of the work. It has been presented here as a separate section in order to cover the key considerations.

7.1 Application of the classification system

The application of the classification should be closely monitored to ensure that the results achieved are consistent with the overall aims of the project. Application of the agreed, stable typology is critical and any other information that is being collected i.e. on management of sites, local designations etc should be stored as additional attribution.

The Project Team should ensure some internal QA is undertaken on the API work. This is probably best initially applied at the Pilot review stage but internal QA is an important consideration throughout the remainder of the classification process.

7.2 Feedback and discussion of the classification system

- Relevant comments on the classification typology and application should be recorded within any project work for discussion with the Project Team. Any examples should be highlighted.
- Confusions in the classification should be clarified with the Project Team immediately to ensure classification consistency is maintained.
- Specific queries about classification should be edited after discussion between the QA person and the API specialist implementing the interpretation.

7.3 Field verification

Field checking forms part of the overall QA process. It should examine particular greenspaces and combinations of features, checking that the classification is appropriate and consistent with the overall project aims and to collect reference photography. Field verification is not designed to check all the classifications, but only to ensure that the API for different groups of features is consistent with the evidence gained from site visits. Field verification may also be targeted to examine known green areas which are obscured by tree canopy cover in the aerial photography but should not be used to visit areas on the mapping which could not be classified where the aerial photography was out of date.

The results of the field verification should be fed back to the Project Team. This may result in the API team having to revise classifications, interpretations etc.

There is no defined rule on the intensity of sampling in the field verification work. Within the Glasgow & Clyde Valley Urban Greenspace Mapping Project some 120 sites were visited across the study area. This required two staff over a 3 day period. Obviously the field verification work is dependent on the extent of the project area, transportation issues, project budgeting, staff time etc.
7.4 Review by Project Team
If the Project Team consists of multiple partners all the data should be supplied for review and comment. This may include specific coding on an individual polygon to general observations on the interpretation. Through undertaking a sensible QA process there should be no major revisions required in the later stages of the classification work.

8 Final dataset compilation
The final stage of the workflow is to undertake a final data compilation. This should take into account all of the secondary sources, the field work verification exercise, any alterations to the pre-classification codes, edits and comments from any partners and a final set of logic checks. The logic checks are to ensure data consistency in the final product.

8.1 Data Consistency
At the end of the QA process the classification codes should be assessed to identify any outstanding classification inconsistencies and final errors made during the input stage of the QA. Logic checks should include:

- ‘PRIMARY_LU’ and ‘SECONDARY_LU’ codes must not be equal
- All ‘PRIMARY_LU’ and ‘SECONDARY_LU’ codes must belong to the land use classification typology as set out in Table 1
- All polygons with an assigned ‘SECONDARY_LU’ code have a corresponding ‘PRIMARY_LU’ class
- If data tiling has been undertaken that no ‘edge’ polygons are duplicated or missing in the data set

8.2 Project statistics
Summary statistics on the classification should be provided to the Project Team. These should include:

- Overall size of the project area – number of polygons in the final deliverable data set
- Number of classified polygons – the number of polygons that were classified by the PI team. Include the number of polygons assigned a ‘SECONDARY_LU’ code
- Overall results by area and number of polygons – this must state (by tile if processed this way) the total area (sq.kms), total number of polygons, total area pre-classified, total number of polygons pre-classified, total area of polygons to classify, actual number of polygons to classify, actual area of polygons classified, actual number of polygons classified and the number of secondary polygons classified
8.3 **Data delivery**
The final deliverable must be provided as agreed upon in the contract/project brief. The final GIS data must be delivered with the original Topography Layer attribution intact.

8.4 **Metadata**
Metadata must be provided with any final GIS data product. Metadata provides the means to assess the fitness for use of the data and track the history/lineage of the data.

Core attribution that must be included in the metadata includes the version number of the Land Use Classification used and the source and date(s) of the digital aerial photography including any imagery supplier copyright requirements.

9 **Data management and maintenance**
Once the greenspace mapping dataset has been completed it is important to consider how to manage and maintain the data so that it provides value into the future. Issues relating to data ownership, frequency of update and access to data should all be considered.

greenspace scotland has developed detailed guidance for the management and maintenance of greenspace data. This can be downloaded from [www.greenspacescotland.org.uk/mapping](http://www.greenspacescotland.org.uk/mapping)
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