Geography – Background Information – 2011 Census

Output Areas, Local Characteristic and Detailed Characteristic Sectors

Output Areas

The main building bricks for census areas are Output Areas (OAs). Most OAs are created by aggregating a small number of neighbouring postcodes, although some postcodes are large enough to become a single-postcode Output Area (OA). All higher geographies (eg Health Board areas) are built up from these OAs. Any area for which census output is produced is the aggregation of OAs. OAs will aggregate exactly to a council area but not necessarily to any other higher geographies. The aggregations of OAs for these other higher geographies are termed 'best-fit' as the boundaries of the aggregations approximate the true boundaries of the geography. This is because the boundaries of the individual postcodes do not follow existing administrative and political boundaries.

More information on 'best-fit' aggregations can be found in the geography Policy section of the National Records of Scotland (NRS) website.

An individual output area generally covers a sufficiently small area (subject to meeting minimum population / household counts) so that user defined or ad-hoc areas (eg a historical conservation district within a town) can be created while maintaining a sufficient level of quality. National Records of Scotland produces only one set of OAs and creates all other output geographies using the OA as the building brick. Each OA is assigned to an area (eg Fife) in a higher geography (e.g. council areas) by first selecting one of the postcodes in the OA as a 'master' postcode. The OA inherits all of the characteristics of the master postcode including its assignments to higher areas and its grid reference.

An index table is available which provides a link between each OA and the higher areas that each OA belongs to, enabling users to aggregate OA-level Census results to higher areas, such as council areas or user defined areas e.g. Community Council Area. A small number of OAs were manually assigned to different higher areas in cases where the differencing of higher areas could have created potentially disclosive 'slivers'.

Output Areas, Local Characteristic and Detailed Characteristic Sectors

How Output Areas were created for the 2011 Census

Output Areas(OAs) for the 2011 Census were created as groups of postcodes nesting as well as possible into the following geographies, in descending order of preference (when not all postcodes in the OA belong to a single combination of these area types).

- Council Area
- The 2010 Locality dataset

The main aim governing this order of geographies is to give continuity with the 2001 OAs while ensuring, as far as possible, that 2011 OAs fit into the appropriate locality (urban area) which are seen as an increasingly important statistical area. Where at all possible, postcodes which were excluded from the 2010 Locality dataset, but subsequently met the population density criteria for inclusion in a locality, were included in an OA in the locality or grouped to form a new urban OA.

The majority of 2011 OAs will be of similar size to those used in 2001 to allow as much comparison as possible with the 2001 Census data. Where a 2001 OA has dropped below the 2011 minimum thresholds for confidentiality (50 persons and 20 households) e.g. because of housing demolitions, it has been merged with a neighbouring 2001 OA. In addition, 2001 OAs which have increased in seize, particularly those which exceeded the 2011 recommended maximum threshold (approximately 78 households), have been split where possible into two or more OAs.

The postcode boundaries used to create the 2011 OA have been maintained over time to take into account the relatively small number of local authority boundary changes there have been since 2001. The design of the 2011 OAs will therefore align with the local authority boundaries which have been in force since 1st April 2011.

More information on local authority boundary changes since 2001 can be found in the 2011 Census Supporting Information section of the National Records of Scotland website.

Output Areas, Local Characteristic and Detailed Characteristic Sectors

The master postcode

The master postcode was selected using an algorithm which calculates the postcode centroid within an Output Area (OA) which has grid references closest to the population-weighted centre of the OA. This is different from the methodology employed in 2001 where the weighting was based on household count alone. In some instances, it was necessary to assign master postcodes manually or deviate from the standard algorithm, for example, if two postcode centroids were equidistant from the population-weighted centre of the OA.

Example of a 2011 Census Output Area

Output Area 2011: S00096361 (contains 3 postcodes)

|	Household Count	Population Count
Output Area	41	82
G83 0JH	18	40
G83 0JJ	9	18
G83 0JY	14	24
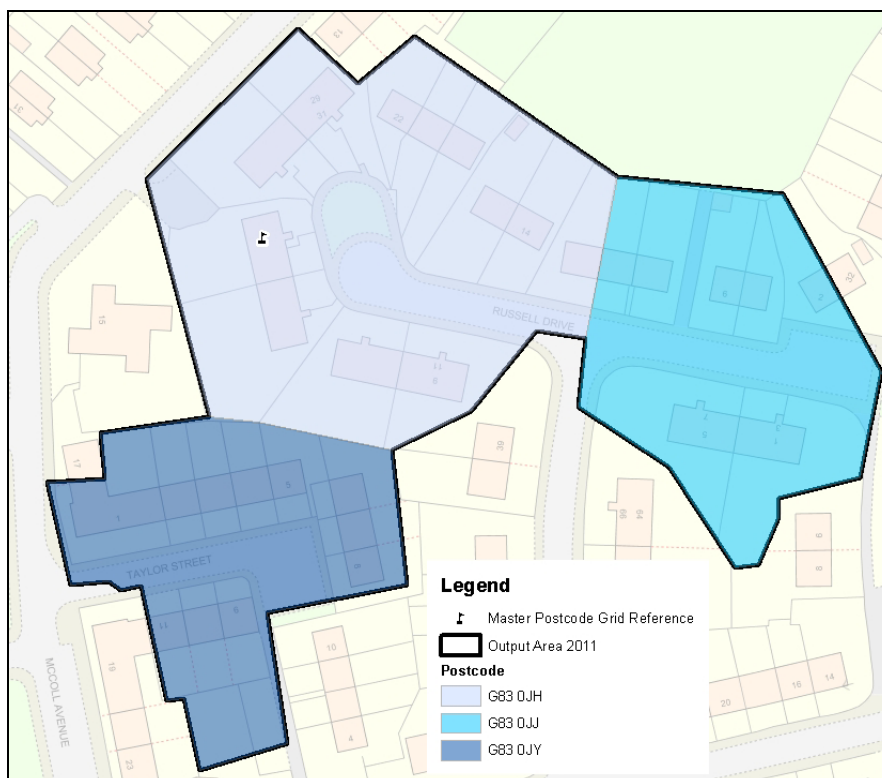
Output Areas, Local Characteristic and Detailed Characteristic Sectors

Examples of change between 2001 and 2011 Output Area

- No change to the extent of the Output Area (OA)

  Output Area 2001: S00006280 and Output Area 2011: S00095850

	Household Count		Population Count	
	2001	2011	2001	2011
Output Area	40	37	80	76
FK10 1DR	14	13	43	39
FK10 1LZ	26	24	37	37
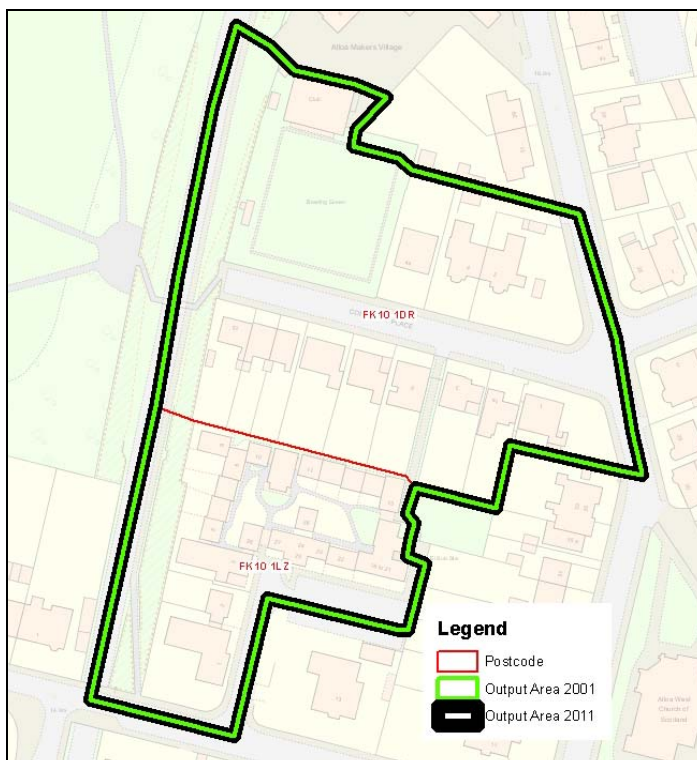
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In the above example, the extent of the 2 postcodes had not changed between 2001 and 2011. The household and population count for each of the 2 postcodes had changed, but the 2011 totals remained within the required parameters and therefore the 2011 OA boundary is the same as the 2001 OA boundary.
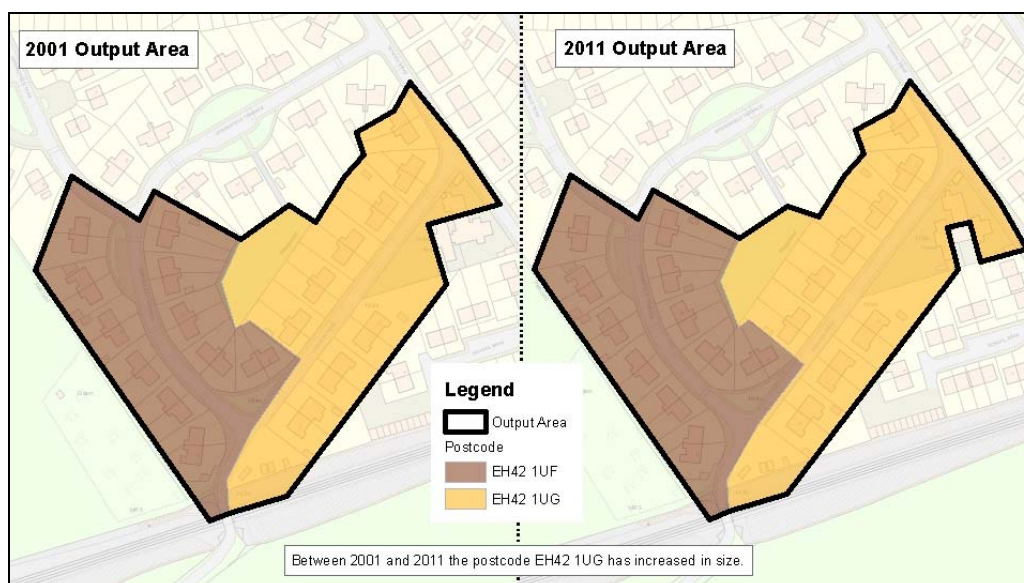
Output Areas, Local Characteristic and Detailed Characteristic Sectors

- Change to the extent of an output area due to a change in the size of the underlying postcode.

Output Area 2001: S00012339 and Output Area 2011: S00102295

	Household Count		Population Count	
	2001	2011	2001	2011
Output Area	41	40	80	90
EH42 1UF	22	22	44	48
EH42 1UG	19	18	36	42

In the above example, the extent of postcode EH42 1UG has increased between 2001 and 2011. This means that the 2011 Output Area has also increased in size and is no longer the same extent as 2001 but is made up of the same postcodes as 2001. The household and population count for each of the 2 postcodes has also changed and the 2011 totals are within the required parameters.

Output Areas, Local Characteristic and Detailed Characteristic Sectors

- 2001 Output Areas (OAs) merged to create one 2011 Output Area (OA)

  Two 2001 Output Areas: S00037776 and S00037777 merged to create Output Area 2011: S00129902

2001			2011		
Output Area	Household Count	Population Count	Output Area	Household Count	Population Count
S00037776	24	50	S00129902	45	109
S00037777	23	81			
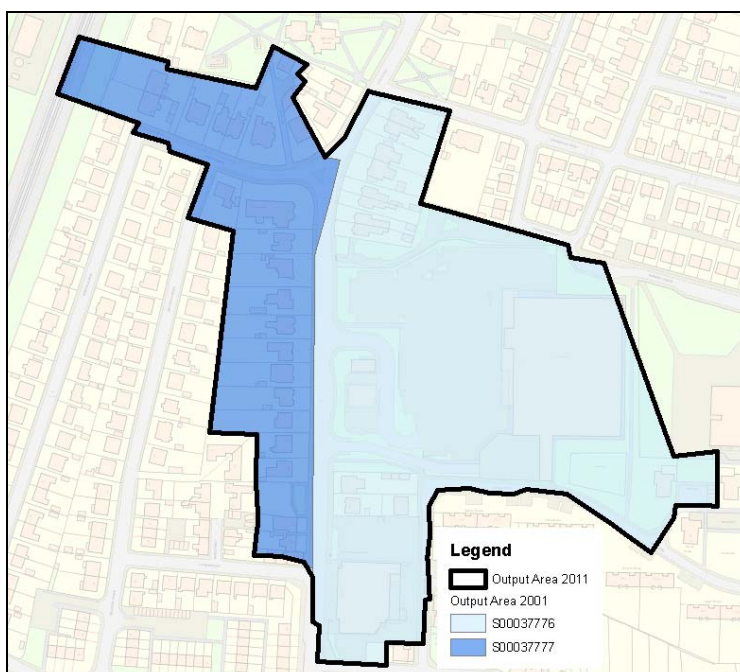
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In the above example, the 2011 population and household counts for the underlying postcodes which formed two 2001 OA have fallen below the lower limit of the 2011 Output Area parameters. It has been possible to combine the underlying 2011 postcode counts to produce a single 2011 OA that matches the combined extent of the two 2001 OAs. This will enable comparison of the census data in the area.

Output Areas, Local Characteristic and Detailed Characteristic Sectors

- 2001 Output Area (OA) split to create two 2011 Output Areas (OAs)

Output Area 2001: S00021004 split to create two 2011 Output Areas: S00111731 and S00111732

2001			2011		
Output Area	Household Count	Population Count	Output Area	Household Count	Population Count
S00021004	76	243	S00111731	26	86
			S00111732	52	167
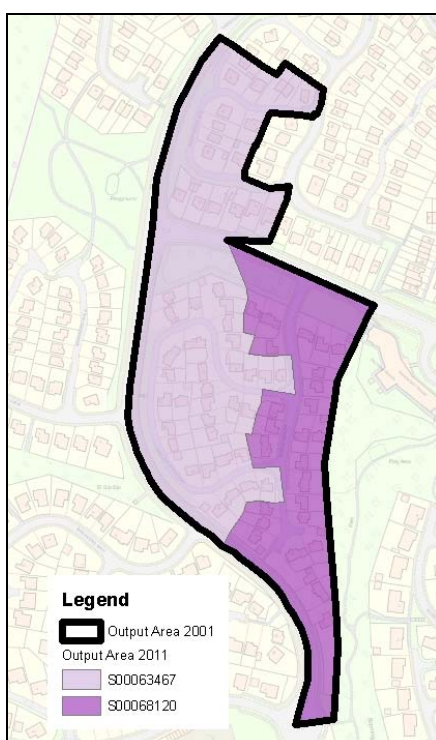
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In the above example, the combined 2011 population and household counts for the underlying postcodes that make up the 2001 (OA) have increased above the upper limit of the 2011 Output Area parameters. It has been possible to reconfigure the underlying 2011 postcodes to produce two 2011 (OAs) that match the extent of the single 2001 (OA). This will enable comparison of the census data in the area.

Output Areas, Local Characteristic and Detailed Characteristic Sectors

Non-contiguous Output Area (OA)

As stated earlier, the OA boundaries are created by aggregating a small number of neighbouring postcodes. The vast majority of individual postcodes boundaries consist of a single polygon, ie, all the addresses associated with a single postcode are contained within one continuous boundary line. However, in some situations not all the addresses cannot be contained within a single boundary. There are two reasons for this:

1. An address (or addresses) is (are) remote from the bulk of the postcode's addresses and it is impossible to draw a single boundary around them without including addresses from a different postcode.

   In these cases the addresses for one postcode are contained within two (or more) polygons. These are referred to as non-contiguous postcodes.

2. Addresses with the same postcode that are separated by a body of water. This occurs where there are some addresses on an island that have the same postcode as some addresses on the mainland or another island.

   In these situations the addresses of the same postcode are contained within two (or more) polygons. Again, they are referred to as non-contiguous postcodes.

Although both categories are referred to as non-contiguous postcodes they are fundamentally different. In the first category, the addresses are separated by another postcode; in the second category, the addresses are separated by water.

When aggregating the postcodes to create the OAs it is possible, because of the spatial configuration, that any selected group which contains a non-contiguous postcode may result in a non-contiguous Output Area, i.e. the OA will comprise of more than one polygon.

A list of multi extent OA can be found in the 2011 Census Supporting Information section of the NRS website.

Spatial Improvement

Of the 46,351 OAs created, there were 349 that were non-contiguous because the polygons were separated by other output areas. It was agreed that we remove one of the polygons to make the OA whole. This is a purely cosmetic exercise.

The OA part to be removed is the part which does not contain the master postcode. In the majority of cases this is the smaller of the 2 (or more) parts of the non contiguous OA. However, in a few instances it may be the larger part simply because the smaller part is more dense and the master postcode has been assigned to it. The parts of these non-contiguous OAs were merged with adjoining OAs to create single polygon OAs, where possible.

Output Areas, Local Characteristic and Detailed Characteristic Sectors

This did not affect the census statistics, calculation of the master postcode, the 'higher area' assignment or the area calculation for the OA all of which were based on all of the constituent parts of the OA.

In the following example, the Output Area (S00115273) is non-contiguous. The master postcode for the OA is in the larger polygon.
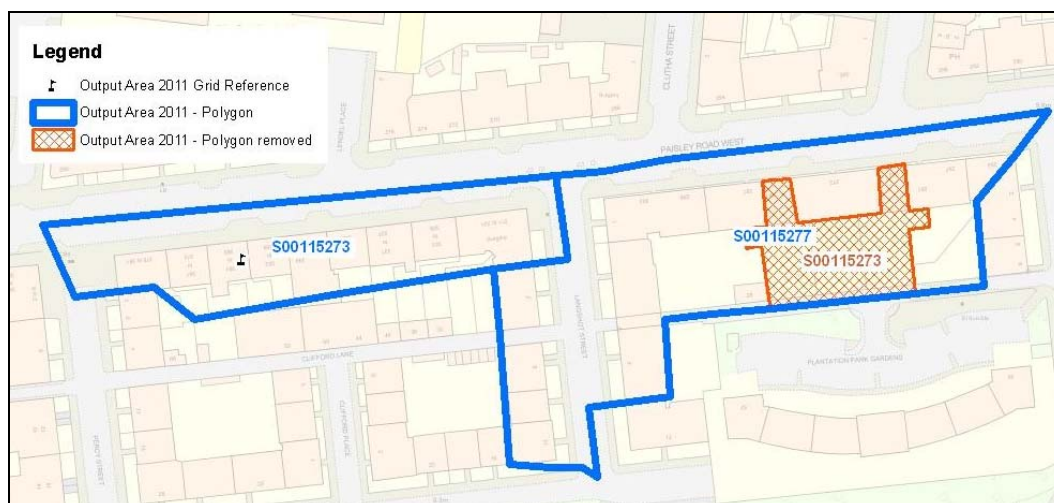

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We have split the output area spatially and the smaller polygon (the polygon that does not hold the master postcode) has been merged into the adjoining Output Area (S00115277), as shown below.

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To a certain extent this was purely a cosmetic exercise, and did not affect the census statistics, calculation of the master postcode, the 'higher area' assignment or the area calculation for the OA all of which were based on all of the constituent parts of the OA. A boundary dataset detailing the OA parts which were 'removed' is available together with a lookup file listing the affected postcodes and OAs.

A document listing the affected postcodes and Output Areas (OAs) is also available on the 2011 Census Supporting Information section of the NRS website.

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Output Areas, Local Characteristic and Detailed Characteristic Sectors

Area Calculation

Warning: The area of the OA recorded in the postcode to higher area table will not agree with the area which users will be able to calculate from the shapefile. This is because the area recorded in the OA to higher area table is based on the OA and all of its constituent parts, whereas some constituent parts have been removed from the shapefile.

Revised 2011 Output Area codes

An anomaly was discovered in the 2011 Census Output Area (OA) codes which were published on 15 August 2013. The anomaly meant that, whilst all the current 2011 Census OA codes were unique, they did not always run in sequential order by council area. We understood that this was creating additional work for some users so we decided to replace the current 2011 OA codes with new ones that run sequentially within each council area. The new codes start at S00088956 and end with S00135306.

The 2011 Census geography datasets published on 15 August 2013 were removed temporarily from the NRS website while this work was going on. No shape boundaries, population or household estimates for OAs changed as a result of this work, only the 9-character S-code they were assigned.

A lookup file linking the archived 2011 OA code to the new 2011 OA code has also been published to help users who have already started work using the archived set of OA codes. The archived set of codes range from S00042605 to S00088955.

Output Areas, Local Characteristic and Detailed Characteristic Sectors

Postcode sectors

A postcode sector comprises all the unit postcodes that have the same identifier except for the last two characters, eg EH49 7 is a postcode sector. There are 978 postcode sectors in Scotland and the postcode sector has been used as a census output since 1981. However, census data is not available for these postcode sectors because their boundaries do not follow council area boundaries. Therefore, census-specific postcode sectors are created for census output to ensure that the sectors conform to a minimum threshold and also do not cross council area boundaries. There are two types of census-specific postcode sectors in census output: the Local Characteristic sector (LC) and the Detailed Characteristic sector (DC). The difference between the two types of sectors is the confidentiality thresholds.

The creation of a Local Characteristic (LC) sector

Any 'true' postcode sectors that cross council area boundaries are split and each part is treated as a postcode sector in its own right.

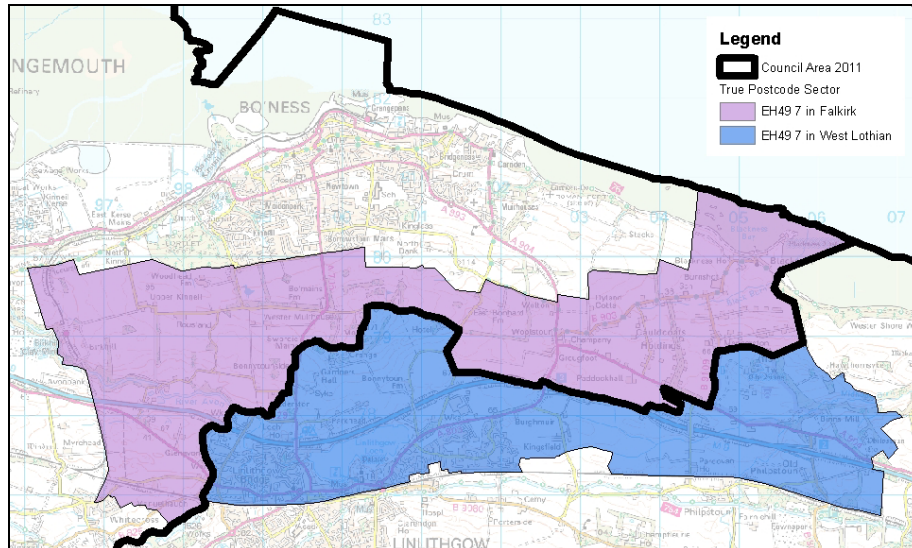Example - Postcode sector: EH49 7
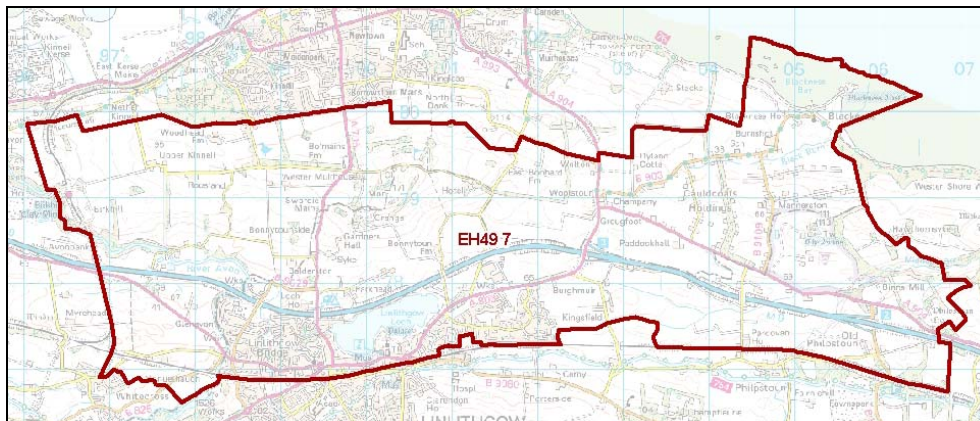
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Above - the 'true' postcode sector EH49 7 crosses council area boundaries, therefore for census purposes it is split and each part is treated as a postcode sector in its own right.
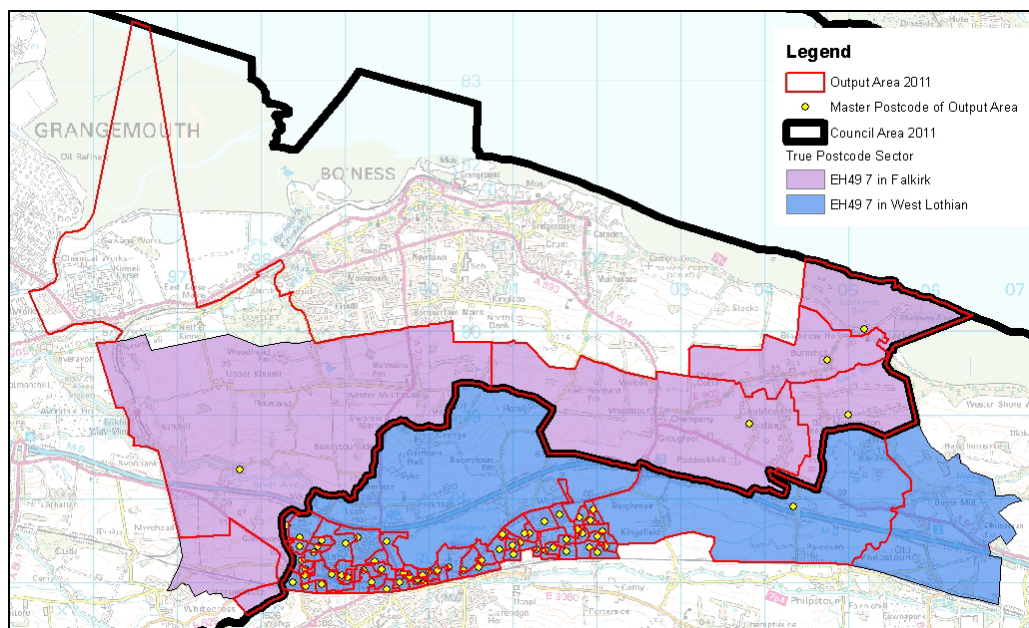
Output Areas, Local Characteristic and Detailed Characteristic Sectors

Council Areas (OAs) have been added to the example and shows the two parts of the original 'true' postcode sector with one part in Falkirk council area and the other in West Lothian council area. Each of the two parts is treated as an individual postcode sector. LC sector names that include '(part)' indicate that the original sector had to be split.

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Then, using the master postcodes, the OAs are assigned to the individual postcode sectors. You can see that the assigned OAs do not align exactly with the two postcode sectors.
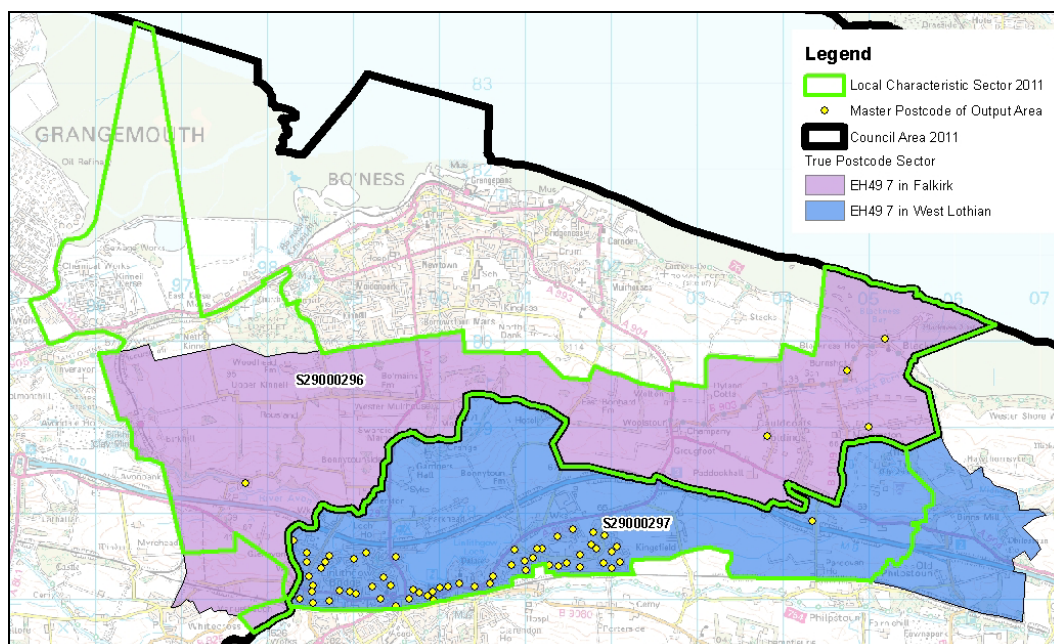

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Output Areas, Local Characteristic and Detailed Characteristic Sectors

When Output Areas (OAs) have been assigned to the postcode sectors, the Output Area (OA) boundaries are dissolved to create Local Characteristic (LC) Sectors (example below)

LC Sector Code	LC Sector Name	Council Area Name	Postcode Sector
S29000296	EH49 7 (part)	Falkirk	EH49 7
S29000297	EH49 7 (part)	West Lothian	EH49 7

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In 2011 there were 978 'true' postcode sectors. When these were split by council area boundaries this resulted in 1,123 individual sectors. Some sectors will have disappeared if they have not been assigned a master postcode.

The process of assigning OAs to the sectors resulted in the creation of 1,012 LC sectors that met the minimum threshold (20 households and 50 persons – the same minimum threshold for Output Areas).

Output Areas, Local Characteristic and Detailed Characteristic Sectors

The creation of Detailed Characteristic (DC) sectors

In order to release more in-depth census information, DC sectors have been created with a minimum threshold of 400 households and 1,000 persons. Any Local Characteristic (LC) sector that fails to meet the thresholds is merged with its smallest adjacent neighbours(s) within the same council area until the DC sector requirements are satisfied.

There were 167 LC sectors which did not meet the threshold for the DC sectors and were merged with the smallest adjacent LC sector (in the same council area) containing the lowest population.

Detailed Characteristic Sector S28000226 contains 5 Local Characteristic Sectors: S29000223, S29000224, S29000225, S29000226 and S29000251
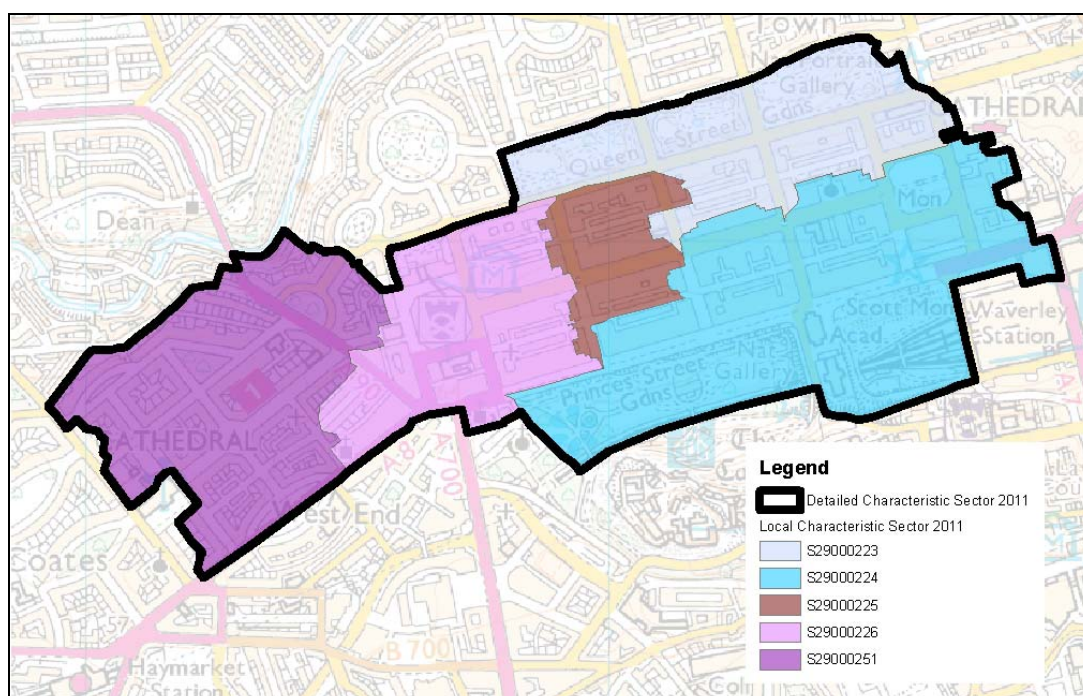
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DC Sectors that are mergers of LC sectors are labelled in the style of 'DD1 1;DD1 3' with a semi-colon to indicate the merger in the lookup file, as shown below.

DetailedCharacteristicSector2011Code	PostcodeSector2011	CouncilArea2011Code	Label	AbsorbedOther	OtherSectors
S28000226	EH3 7	S12000036	EH3 7; EH2 1; EH2 2; EH2 3; EH2 4	YES	EH2 1,EH2 2,EH2 3,EH2 4

Output Areas, Local Characteristic and Detailed Characteristic Sectors

Non-contiguous sectors

National Records of Scotland (NRS) create all census output geographies using the Output Area (OA) as the building brick. During processing of Local Characteristic (LC) and Detailed Characteristic (DC) Sectors, some non-contiguous census sectors have been created i.e. they are split by another area of the same type, or by water.

Details of the areas affected are:-

- LC Sectors: 268 of 1,012 areas have two (or more) polygons.
- DC Sectors: 210 of 866 areas have two (or more) polygons.

Non-contiguous (split by water)

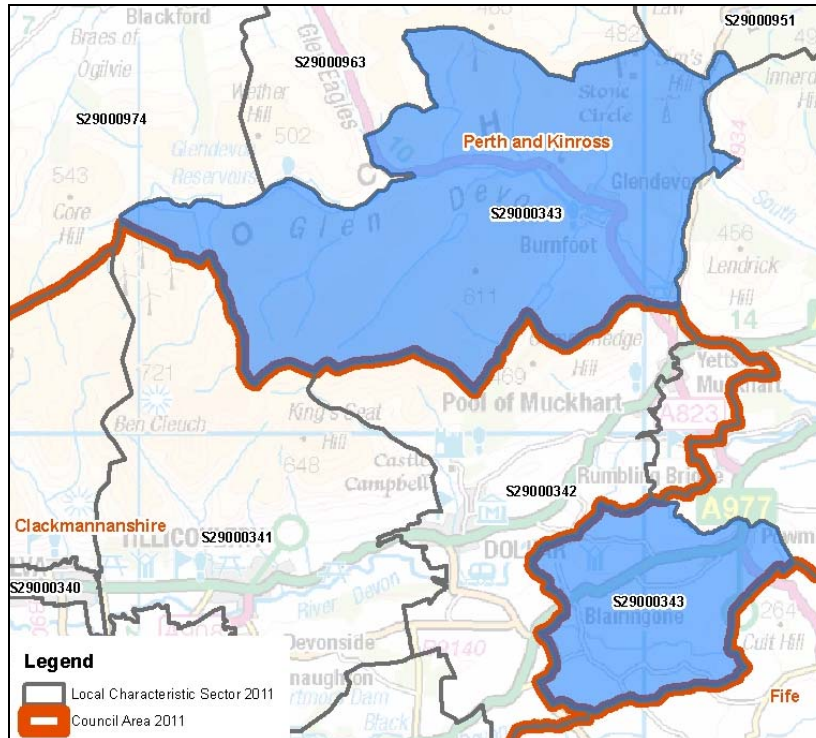Local Characteristic Sector S29000696 (highlighted in blue) is a non-contiguous sector due to an island.
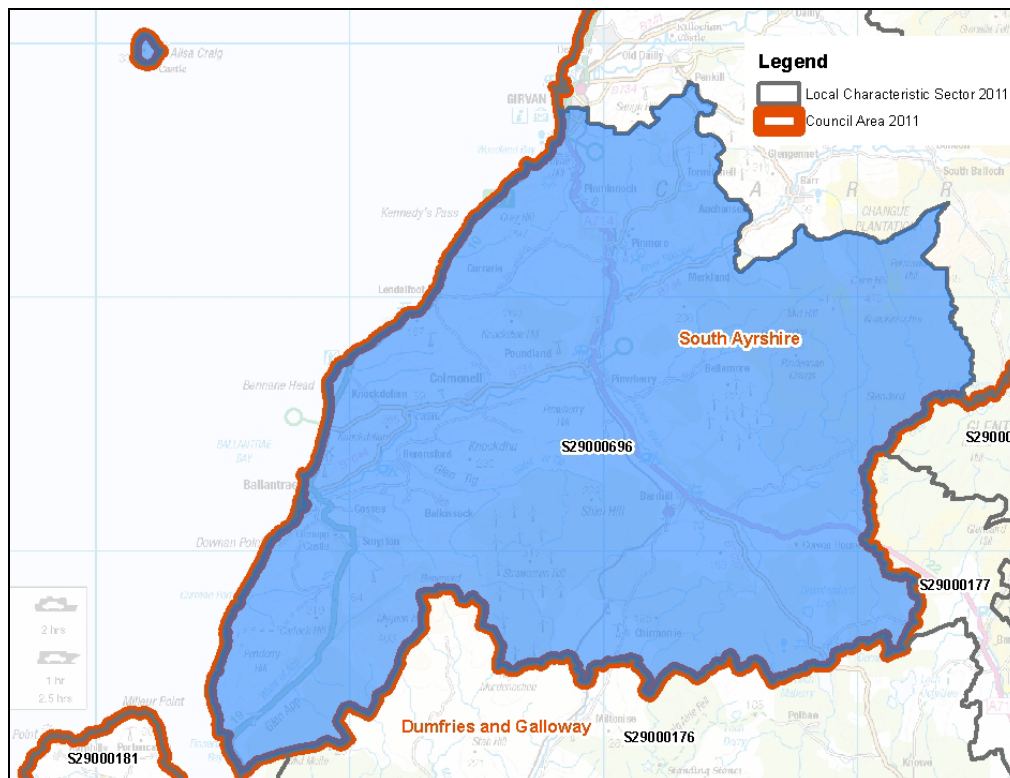
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Output Areas, Local Characteristic and Detailed Characteristic Sectors

Non-contiguous (split by land)

Local Characteristic Sector S29000343 (highlighted in blue) is a non-contiguous sector as the 'true' postcode sector straddles council areas.

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Output Areas, Local Characteristic and Detailed Characteristic Sectors

Potentially Disclosive Slivers

Detailed Characteristic(DC) statistics will be made available for geographies containing polygons which have no fewer than 1,000 persons and 400 households. Some boundaries of the different higher geographies are not coterminous and could therefore potentially create 'slivers' when the two geographies are differenced which are beneath the 2011 minimum thresholds. This could increase the risk of potentially identifying individuals within the differenced sliver. In order to eliminate these potentially disclosive slivers, the higher area assignment for Output Areas (OAs) within the slivers was changed.

In the example below, the area shaded yellow could potentially provide statistics that would be disclosive, so the four master postcodes A to D have been reassigned, effectively creating coterminous boundaries for Geographies 1 and 2.