Devon Tithe Mapping Polygonisation Project

Quality Manual

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For the attention of:

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1. Introduction

This document records the approach to the Devon Tithe Mapping Polygonisation Project, part of the Tithe Maps Online strategy. The document describes the methodology taken and steps used to validate the data.

The aim of the project was to:

- capture the tithe map boundaries as GIS polygons from the input raster mosaic;
- merge the input tithe apportionment spreadsheets;
- validate and create consistent entries for four of the tithe apportionment fields;
- match the tithe apportionment records to the GIS polygons using the plot number and parish.

2. Software Environment

Lovell Johns is part of the Esri Partner Network and undertakes the majority of its production work (data capture, updating, audit and management of data, data evaluation and analysis of data) in the Esri ArcGIS software environment. The editing tools in ArcGIS Desktop Basic were used to accurately capture boundary polygons. Advanced data management and topology tools in ArcGIS Desktop Advanced were used for Technical Quality Control.

Microsoft Excel and Microsoft Access was used to merge input spreadsheets and validate and create consistent entries for four of the tithe apportionment fields.

3. Data Inputs

The main input for the capture of geometry was the ECW (Enhanced Compression Wavelet) file: Devon_Tithe_Mosaic_v7.ecw. This is a 4Gb georeferenced file that contains merged and stitched scans of the tithe maps at a constant resolution. Blank areas are where tithe maps do not exist or were too damaged to be of use.

Individual georeferenced tithe map scans (which were used to make the mosaic) were used as a reference in parish boundary areas on the mosaic. This was to check and add any missing boundaries that are missing from the mosaic due to the edge matching process.

Original higher resolution jpeg scans where used as a reference in areas where plot numbers were difficult to decipher, or a town inset was available which did not exist on the mosaic.

The transcriptions of the apportionment data were supplied as one Excel spreadsheet per parish.

4. Geometry Capture

4.1 Capture Quality

Boundaries were captured in ArcGIS Desktop Basic. An interactive, or heads-up digitisation method was utilised for the polygonisation of to the tithe boundaries.

Following good-practise principles of digitisation, the number of vertices captured was appropriate for the shape of a boundary (i.e. more vertices were used where polygon boundaries were more curved). This ensured the lowest number of vertices were used that could accurately describe each tithe boundary. Generally the outer boundary polygon (the parish) was captured first. Boundaries were then 'cut' from the outer boundary polygon. This ensured that lines were not digitised twice, and boundary polygons did not overlap or have gaps where they were adjacent.

The boundaries were captured at an on-screen scale of approximately 1:250. This ensured that vertices and line segments are located within the width of the tithe boundary on the underlying scanned image. Capturing at such a scale guarantees that the output vector data is as accurate as the input scanned images, meaning that there was no loss of accuracy during the data capture stage. Therefore, the captured data has inherited any inaccuracies of the georeferencing of the scanned image, but has not increased the inaccuracy.

The exception to the above is where the data is edge matched against adjacent parishes. In these cases, boundaries (or potions of) will be captured from the most appropriate image (i.e. the largest scale or best quality image). Where a captured boundary is captured from more than one image, it may have been ‘smoothed’ at the join point to avoid unwanted kinks in the captured data.

4.2 Capture Decisions

Plot numbers were attributed during the initial geometry capture, and the input transcriptions of the apportionment were temporarily joined on an individual basis, so capture decisions could be made taking into account plot names and cultivation type.

For example:

- Farm buildings and approaches were included within the tithe plots that related to farm houses, yards, courtlage, homesteads etc.
- Orchards, woodland, gardens, mowplots and cultivated fields were generally captured to exclude houses, roads and major farm buildings.

Occasional tithe maps included plot numbers for hedges. These were not captured.

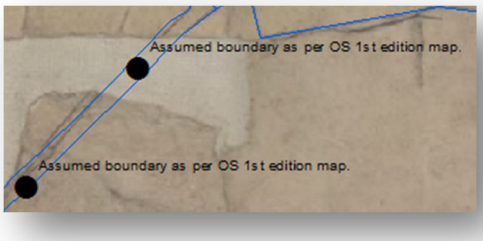
4.3 Recording Comments

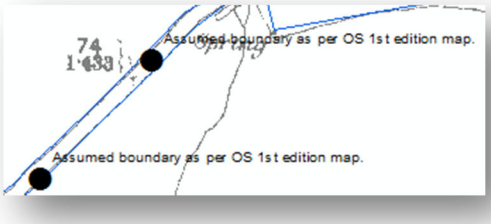
Any areas of ambiguity during digitising were marked with a 'comment' point as part of a separate GIS layer. Comments were made consistent, and most fall into a one of several types:

1. **Assumed plot number.** A plot which contains no number or where the plot number is unclear, but an assumption has been made based on evidence such as: the sequence of plot numbers, the size of the plot, the plot name or cultivation.
2. **No plot number.** A plot with no number, and there is not enough evidence to confidently identify the plot number.
3. **Unclear plot number.** A plot with a partial or unreadable number, and there is not enough evidence to confidently identify the plot number. Original input scans would have also been checked to see if the number was clearer.
4. **Incorrect plot number** or **plot number exists elsewhere in parish.** A plot whose number is duplicated within the parish. The plot number may have been removed or been corrected based on evidence such as: the sequence of plot numbers, the size of the plot, the plot name and/or cultivation.
5. **Captured as per unstitched imaged**. A plot that has been cut-off the mosaic during the edge matching process, but exists on the separate georeferenced image of the parish. Such a plot may not have been captured accurately, but the logical pattern of plots is retained. Below: plot 1406 exists on the original unstitched image (left), but is cut off the stitched image (right). It has been captured as a smaller plot slightly to the north east, retaining the general shape.

6. **Small polygon merged with plot.** A small, insignificant polygon has been included within an adjacent plot.

7. **Assumed boundary as per 1st edition OS map.** A boundary that is not clear on the mosaic (e.g. due to the deterioration of the tithe map), but can be assumed using the 1st edition OS map series.





8. **Assumed boundary.** An area where a boundary has been assumed, without being based on any particular evidence. Such a boundary may simply be a logical split of two plots.

4.4 Quality Control

Geometry Check Stage 1

The initial stage of quality control was a manual coverage check of the accuracy of the data capture and the recording of the plot number references from the scanned images.

The joined input transcriptions of the apportionment data were used to check missing or wrong reference numbers.

Geometry Check Stage 2

The second stage of Quality Control included further checks to specific area, and semi-automated checks to ensure topological consistency.

Firstly, manual spot-checks of the data captured over each scanned image were made to around 10% of the data. This ensured the general standards of the data met the quality standards set-out at the start of the project.

Further manual checks were made to areas of ambiguity and areas where edge matching was carried out.

A number of semi-automated Technical Quality Control procedures were completed. These included:

- Completeness and format of plot number attribution
- Topological Consistency - checked by creating topological rules within an Esri Geodatabase environment. These include (but are not limited to):
    - Polygons must not overlap (unless there are specific and documented exceptions)
    - Polygons must not have gaps (except where there are no plots to capture, or where there are specific and documented exceptions)
    - Polygons must not be multi-part (unless this is an inherent property of a land-parcel)
    - Polygons must not self-intersect or self-overlap

5. Global ID Creation

Transcriptions of the apportionment data were merged in Microsoft Excel. Each file was firstly checked to ensure field order was consistent, and that the parish field was complete.

5.1 ID Structure

Global ID's were created separately in both the captured plot GIS layer, and the merged Excel file. These could then be used as the master ID link.

Unique Global ID's use a structured numbering system. The system uses a unique ID assigned for each parish, together with the plot number, and sub-plot number, in the form:

where:

- PPP is the unique parish number, starting at 101. See Appendix 1 for the index of parish numbers
- LLLL is the plot number (with preceding zero's if applicable – e.g. 0001). Those polygons that do not have a plot number (such as roads or rivers) were assigned a number starting from 9000
- X is the sub-plot number

To enable the best possible match between apportionment data and the captured plot GIS layer, it was necessary to reformat the plot numbers and sub-plot numbers within the GlobalID's:

- Duplicate entries with in the apportionment data containing multiple plot numbers (i.,e. containing '&', or '/') were split into two separate entries with separate plot numbers, but duplicate apportionment attributes.
- Sub-plot numbers were converted to numeric characters (a=1, b=2, c=3 etc., 0 if not applicable)
- Sub-plot entries ½, 1/2, or 'part of' were converted to 1.

Polygons with no plot number were given an ID within the parish where the plot number part of the ID (LLLL) ranged from 9000 to 9999 (outside the range of recorded plot numbers). Corresponding Records were added to the apportionment data where cultivation equalled 'Roads', 'Rivers' or 'Unknown'.

5.2 Data Model

Global ID's in the captured polygon file are unique. Multipart-polygons (single records) are created in instances where separate polygons share the same plot number within a small area (i.e. where obviously part of the same plot). Other instances of duplicate plot numbers are resolved.

Conceptually, Global ID's in the merged transcription file should be unique. However, although many duplicate plot numbers were resolved (i.e. where sub-plot numbers had not been properly assigned in the

apportionment data, even though they existed on the tithe maps), it was beyond the scope of this project to resolve all instances of duplicate plot numbers within the apportionment data. Therefore, although in the vast majority of cases a 1-1 relationship is sufficient, the true relationship between the final captured polygon layer and the final apportionment data is 1-to-many. This should be taken into account when using the data in future online services. The join field is GlobalID.

6. Consistent Values

New attribute fields containing more consistent attributes for cultivation, estate, landowner and occupier were created. The purpose is to aid future searching of the attribute data by decreasing the number of unique entries as far as possible whilst avoiding incorrect assumptions. The original fields are also kept so the user can refer to the original entry in the apportionment data.

6.1 Cultivation

It should be noted that during initial discussions, 'cultivation' was taken to mean land use. As it included values such as cottages, yards, roads and churches.

A new 'Cultivation' field was created, with the original field being renamed 'Cultivation_Original'. All original values were copied across to the new field.

A number of automated and manual adjustments were made to the cultivation values in the new 'Cultivation' field to make the data more consistent:

- Square brackets were removed
- Curly brackets (braces) were removed
- Leading and trailing spaces were removed
- Double spaces were replaced with to single spaces
- The word 'And' was made a consistent case ('and')
- The abbreviation 'etc' was made a consistent case and always with a full stop ('etc.')
- The abbreviation '&c' was made a consistent case and always with a full stop ('&c.')
- The abbreviation '&' was replaced with 'and'
- Commas preceding the word 'and' or abbreviation 'etc.' were removed
- The word Furse was replaced with Furze
- The word 'Occasionally' was made a consistent spelling and case.
- Plural entries for trees were made singular (e.g. Fir, Willow, Alder)
- Obvious spelling errors of frequent words were corrected

Where occurrences of multiple cultivation types existed in difference orders, they were changed to alphabetical order (e.g. 'Furze and Arable' changed to 'Arable and Furze').

The cultivation field was then made richer: Where there was no cultivation value, the cultivation field was populated (where applicable) with values from all or part of the plot name. For instance, there are many instances of the plot name ‘Garden’, not all of which were repeated in the cultivation field. Part names were also checked, so for example, the cultivation of the plot ‘Meadow adjoining Hillsborough Terrace’ was populated with ‘Meadow’. Cultivation was not assumed where the cultivation type could have been part of a name (e.g. ‘Great Meadow’ was not assumed to be an meadow at the time).

6.2 Land Owner and Occupier

New fields were created for Land Owner and Occupier, and the original values copied over. The original fields were maintained (renamed ‘Landowner_Original’ and Occupier_Original’).

A number of automated and manual adjustments were made to the new fields to make the data more consistent:

- Leading and trailing spaces were removed
- Double spaces were replaced with to single spaces
- The word ‘And’ was made a consistent case (‘and’)
- The case, spelling and any abbreviations for ‘Esquire’ were made consistent and always placed at the end of the name following a comma (e.g. ‘Robert Davey, Esquire’).
- The case, spelling and any abbreviations for ‘Junior’ and ‘Senior’ were made consistent and always placed at the end of the name following a comma (e.g. ‘William Upcott, Junior’).
- The case, spelling and any abbreviations for ‘Reverend’ were made consistent and always placed at the end of the name following a comma (e.g. ‘Thomas Melhuish, Reverend).
- The words ‘Glebe’, ‘Lessee’ and ‘Leasehold’ were made consistent case.
- The order of titles such as ‘Sir’, ‘Baronet’, ’Earl’, ‘Lord’ and ‘Right Honourable’ were also made consistent to reduce the number of unique entries (e.g. ‘Earl Fortescue, Right Honourable’. Where identical names occurred with differing titles, they were only changed when a very small percentage of entries looked incorrect. Otherwise they were left in as in case they were actually different people or relatives.
- Upper case names were converted to title case.

6.3 Estate

A new field was created for Estate, and the original values copied over. The original field was maintained (renamed ‘Estate_Original’).

A number of automated and manual adjustments were made to the new fields to make the data more consistent:

- Leading and trailing spaces were removed

- Double spaces were replaced with to single spaces
- The word ‘And’ was made a consistent case (‘and’)
- The abbreviation ‘etc’ was made a consistent case and always with a full stop (‘etc.’)
- The abbreviation ‘&c’ was made a consistent case and always with a full stop (‘&c.’)
- The abbreviation ‘&’ was replaced with ‘and’
- Upper case names were converted to title case.
- There was a general check for spelling errors between similarly sounding estates within the same parish.

Appendix 1 – Unique Parish Numbers

Name	GlobalID Prefix
Abbots Bickington	115
Abbotsham	116
Abbotskerswell	117
Allington, East	118
Alphington	119
Alverdiscott	120
Alverdiscott (Bulworthy)	121
Alwington	122
Arlington	123
Ashburton	124
Ashbury	103
Ashcombe	125
Ashford	126
Ashprington	127
Ashreigney	128
Ashton	129
Ashwater	104
Atherington	130
Aveton Gifford	131
Awliscombe	132
Axminster	133
Axminster (Wycroft Tithing or Park)	134
Axmouth	135
Aylesbeare	136
Bampton	137
Barnstaple	138
Beaford	139
Beaworthy	105
Belstone	140
Bere Ferrers	141
Berry Pomeroy	142
Berrynarbor	143
Bickington	144
Bickleigh (Borough)	145
Bickleigh (Hayridge)	146
Bicton	147
Bideford	148
Bigbury	149
Bishops Nympton	150
Bishops Tawton	151

Cheriton Fitzpaine	101
Chittlehampton	201
Chivelstone	202
Christow	203
Chudleigh	204
Chulmleigh	205
Churchstow	206
Churston Ferrers	207
Clannaborough	208
Clawton	112
Clayhanger	569
Clayhidon	209
Clovelly	210
Clyst Honiton	211
Clyst Hydon	239
Clyst St George	240
Clyst St Lawrence	241
Clyst St Mary	242
Cockington	243
Coffinswell	244
Colaton Raleigh	212
Coldridge	213
Colebrooke	214
Colyton	237
Combe Martin	215
Combe Raleigh	216
Combeinteignhead	217
Combpyne	218
Compton Gifford	245
Cookbury	219
Cornwood	220
Cornworthy	221
Coryton	222
Cotleigh	223
Countisbury	224
Creacombe	225
Crediton	226
Cruwys Morchard	246
Cullompton	247
Cullompton (Upton Weaver) - Apportionment Records Only	537
Culmstock	248
Dalwood	249
Dartington	250
Dawlish	251
Dean Prior	253
Denbury	254
Diptford	255
Dittisham	256
Dodbrooke	257
Doddiscombsleigh	258
Dolton	259
Dotton	227
Dowland	260
Down St Mary	261
Drewsteignton	262
Dunchideock	263
Dunkeswell	264
Dunsford	265
Dunterton	266
East Anstey	228

East Buckland	229
East Budleigh	268
East Down	269
East Ogwell	270
East Portlemouth	271
East Putford	272
East Worlington	273
Egg Buckland	274
Eggesford	275
Ermington	362
Exbourne	363
Exeter, Holy Trinity	276
Exeter, St David	278
Exeter, St Edmund	277
Exeter, St Leonard	279
Exeter, St Mary Steps	280
Exeter, St Sidwell	281
Exeter, St Thomas	282
Exminster	283
Farringdon	284
Farway	364
Feniton	365
Filleigh	285
Fremington	286
Frithelstock	287
George Nympton	288
Georgeham	289
Germansweek	290
Gidleigh	291
Gittisham	292
Goodleigh	293
Great Torrington	525
Haccombe	294
Halberton	366
Halwell	295
Halwill	296
Harberton	367
Harford	297
Harpford	298
Hartland	299
Hatherleigh	300
Hawkchurch - Apportionment Records Only	368
Heanton Punchardon	301
Heavitree	302
Hemyock	303
Hennock	369
High Bickington	370
High Bray	304
Highampton	305
Highweek	371
Hittisleigh	306
Hockworthy	307
Holbeton	308
Holcombe Burnell	372
Holcombe Rogus	309
Hollacombe	310
Holne	311
Holsworthy	312
Honeychurch	313
Honiton	314

Horwood	315
Huish	316
Huntsham	317
Huntshaw	318
Huxham	319
Iddesleigh	320
Ide	321
Idford	322
Ilfracombe	323
Ilsington	324
Instow	325
Inwardleigh	326
Ipplepen	327
Jacobstowe	328
Kelly	329
Kenn	373
Kennerleigh	330
Kentisbeare	331
Kentisbury	332
Kenton	333
Kilmington	374
Kings Nympton	375
Kingskerswell	334
Kingsteignton	335
Kingston	336
Kingswear	337
Knowstone	338
Lamerton	339
Landcross	340
Landkey	341
Langtree	376
Lapford	377
Lewtrenchard	342
Lifton (North)	571
Lifton (South)	572
Little Torrington	526
Littleham	378
Littleham (Bideford)	343
Littlehempston	379
Loddiswell	380
Loxbear	573
Loxhore	381
Luppitt	382
Lustleigh	574
Lydford	383
Lydford (Dartmoor Forest)	344
Lympstone	384
Lynton	345
Hawkchurch - Apportionment Records Only - Apportionment Records Only	385
Malborough	386
Mamhead	387
Manaton	388
Mariansleigh	389
Marldon	390
Martinhoe	346
Marwood	391
Mary Tavy	392
Marystow	393
Meavy	394

Meeth	395
Membury	396
Merton	397
Meshaw	398
Milton Abbot	399
Milton Damarel	400
Modbury	401
Molland	347
Monkleigh	402
Monkokehampton	403
Monkton	404
Morchard Bishop	405
Morebath	406
Moretonhampstead	407
Morley	408
Mortehoe	409
Musbury	410
Newton Ferrers	411
Newton St Cyres	412
Newton St Petrock	413
Newton Tracey	414
North Bovey	230
North Huish	348
North Molton	349
North Petherwin - Apportionment Records Only	415
North Tawton	416
Northam	417
Northam (Northam Ridge)	418
Northleigh	419
Northlew	420
Nymet Rowland	421
Oakford	422
Offwell	423
Okehampton - Apportionment Records Only	424
Otterton	425
Ottery St Mary	426
Paignton	427
Pancraswike	428
Parkham	429
Parracombe	430
Payhembury	431
Peter Tavy	432
Peters Marland	433
Petrockstowe	434
Pilton	435
Pinhoe	575
Plymouth, Charles	436
Plymouth, St Andrew	350
Plymouth, St. Budeaux	454
Plympton, St Mary	437
Plympton, St Maurice	351
Plymstock	438
Plymtree	439
Poltimore	440
Poughill	441
Powderham	352
Puddington	442
Pyworthy	443
Rackenford	444
Rattery	445

Revelstoke	446
Rewe	447
Ringmore	448
Roborough	449
Rockbeare	450
Romansleigh	463
Rose Ash	464
Rousdon	353
Salcombe Regis	465
Salcombe Regis Chilston	354
Sampford Courtenay	466
Sampford Peverell	467
Sampford Spiney	468
Sandford	451
Satterleigh	469
Seaton	231
Shaldon	355
Shaugh Prior	470
Shebbear	471
Sheepstor	472
Sheepwash	473
Sheldon	474
Sherford	475
Sherwill	476
Shillingford	356
Shobrooke	452
Shute	477
Sidbury	478
Sidmouth	479
Silverton	480
Slapton	357
Sourton	481
South Brent	482
South Huish	483
South Milton	453
South Molton	485
South Pool	486
South Sydenham	504
South Tawton	509
Southleigh	484
Sowton	487
Spreyton	488
St Giles in the Wood	490
St Giles on the Heath - Apportionment Records Only	491
St Marychurch	496
Staverton	489
Stockland	492
Stockleigh English	455
Stockleigh Pomeroy	456
Stoke Canon	493
Stoke Damerel	494
Stoke Fleming	495
Stoke Gabriel	232
Stoke Rivers	499
Stokeinteignhead	497
Stokenham	498
Stoodleigh	500
Stowford	501
Sutcombe	502
Swimbridge	503

Talaton	505
Tamerton Foliot	506
Tavistock	507
Tawstock	508
Tedburn St Mary	457
Teigngrace	358
Teignmouth East	359
Templeton	511
Tetcott	512
Thelbridge	458
Thornbury	513
Thorncombe	459
Thorverton	514
Throwleigh	515
Thrushelton	460
Thurlestone	516
Tidcombe	517
Tiverton	520
Tiverton All Fours	518
Tiverton Clare	519
Tiverton Priors	521
Topsham	522
Torbryan	523
Tormoham	524
Totnes	527
Townstall	570
Trentishoe	528
Trusham	529
Twitchen	530
Uffculme	531
Ugborough	532
Uplowman	533
Uplyme	534
Upottery	535
Upton Hellions	461
Upton Pyne	536
Venn Ottery	538
Virginstowe - Apportionment Records Only	539
Walkhampton	540
Warkleigh	541
Washfield	542
Washford Pyne	543
Weare Gifford	544
Welcombe	545
Wembury	546
Wembworthy	547
Werrington	548
West Alvington	233
West Anstey	234
West Buckland	549
West Down	550
West Ogwell	252
West Putford	552
West Teignmouth	510
West Worlington	553
Westleigh	551
Weston Peverell (alias Pennycross)	267
Whimple	554
Whitchurch	555
Whitestone - Apportionment Records Only	462

Widecombe	556
Widworthy	557
Willand	558
Winkleigh	559
Witheridge	560
Withycombe Raleigh	561
Wolborough	562
Woodbury	563
Woodland	235
Woodleigh	564
Woolfardisworthy (East)	361
Woolfardisworthy (West)	565
Yarcombe	566
Yarnscombe	567
Yealmpton	568
Zeal Monachorum	236