

Introduction to AZTool software

Professor David Martin

AZTool: What is it for?

- Aggregation of building block polygons into a tract polygons to best meet design criteria
- Iterative recombination of building blocks from many random starting points to produce a “best” solution, given a specified number of iterations
- One of a range of software implementations for automated zone design that have included Sage, ZDES, ZD2k, AZM

AZTool history

- Developed by David Martin, Samantha Cockings and Andrew Harfoot at the University of Southampton
- Originally based on Openshaw's (1977) Automated Zoning Procedure (AZP)
- Some of the functionality previously available as a Visual Basic 6 program called AZM
- Programmed in .NET environment – should run on any modern Windows PC, freely downloadable



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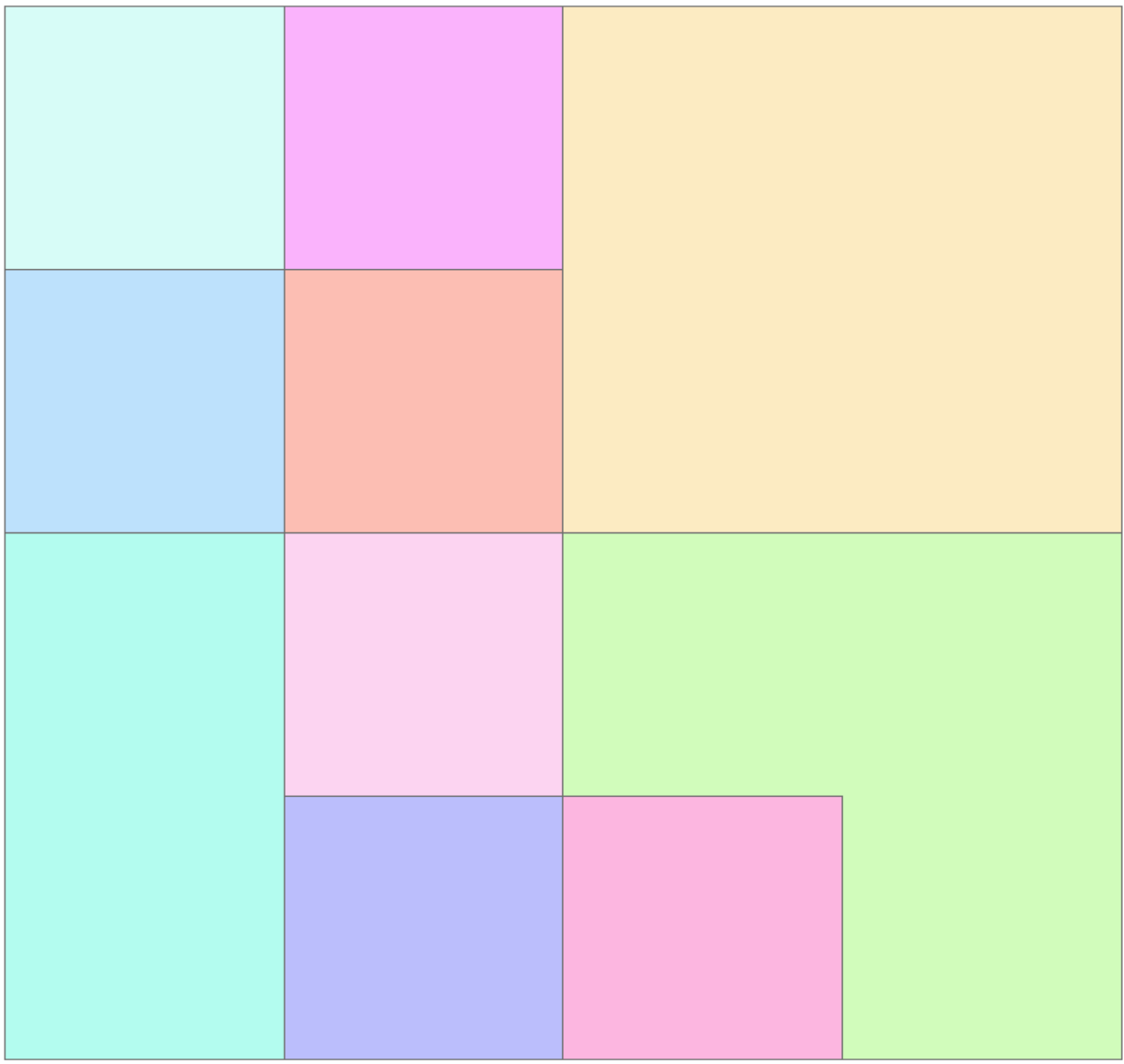
Name	Date modified	Type	Size
SHP	18/04/2016 09:52	File folder	
AZTool_M	25/08/2011 17:21	Application	96 KB
AZTool_M_Overview	26/08/2011 16:11	Microsoft Word 9...	60 KB
AZTool_M_Parameters	26/08/2011 16:11	XML Document	2 KB
AZToolChangeHistory	26/08/2011 13:17	Text Document	1 KB
bbhom2.aat	26/08/2011 15:08	AAT File	1 KB
bbhom2.pat	26/08/2011 15:08	PAT File	1 KB
Readme	26/08/2011 14:56	Text Document	2 KB
Run_AZTool_M	07/09/2010 11:48	Windows Batch File	1 KB

Input files (1)

- A set of building blocks and associated data. These are specified as .aat and .pat files
 - The arc attributes describe which building blocks are contiguous
 - No coordinates are needed, but the contiguity information and attributes of each polygon relevant to the design criteria are required

Table Of Contents

- Layers
 - \\soton.ac.uk\ude\personaff
 - bbhom2
 - <all other values>
 - BBHOM2_ID
 - 2
 - 3
 - 4
 - 5
 - 6
 - 7
 - 8
 - 9
 - 10
 - 11



```
bbhom2 - Notepad
File Edit Format View Help
0,1,100
0,3,100
0,4,0
0,10,200
1,2,100
1,3,0
1,4,100
1,10,100
2,4,100
2,6,0
2,7,200
2,10,400
3,4,100
3,5,100
3,6,0
3,10,100
4,5,0
4,6,100
4,7,0
5,6,100
5,8,100
5,10,300
6,7,100
6,8,100
6,9,0
7,8,0
7,9,200
7,10,300
8,9,100
8,10,100
9,10,100
```

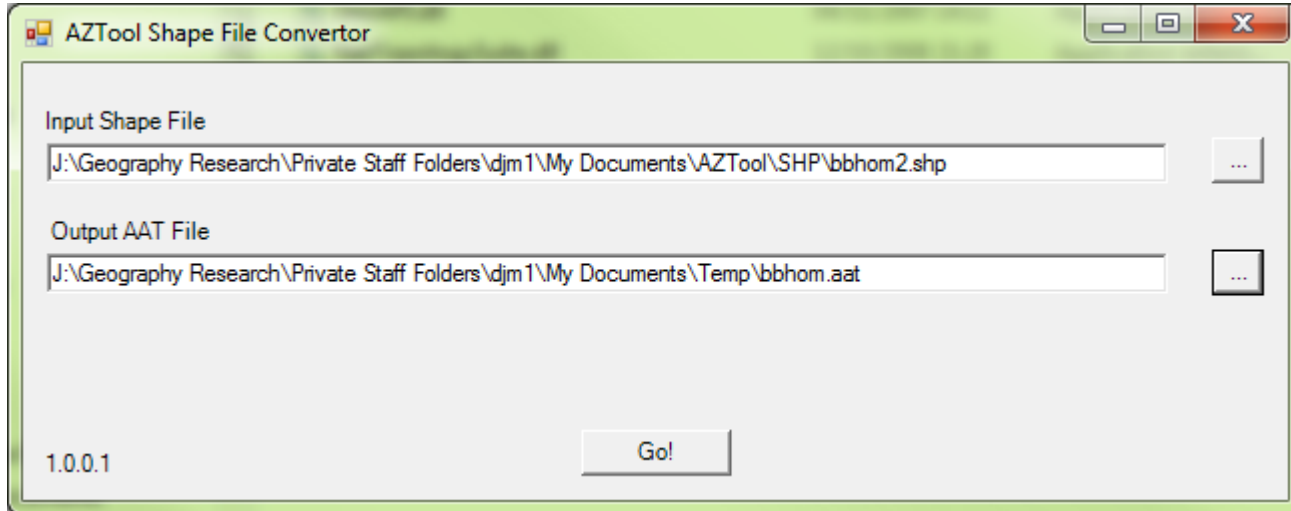
```
bbhom2 - Notepad
File Edit Format View Help
AZM_ID,AREA,PERIMETER,BBHOM2_ID,BBPOP,OWNOCC,PRENT,HARENT,DET,SEMI,FLAT,AZM_Area
0,10000,400,2,100,80,10,10,100,0,0,10000
1,10000,400,3,100,78,12,10,90,5,5,10000
2,40000,800,6,100,0,100,0,15,10,75,40000
3,10000,400,4,100,75,15,10,80,10,10,10000
4,10000,400,5,100,70,10,20,90,0,10,10000
5,20000,600,7,50,20,20,10,15,15,20,20000
6,10000,400,9,25,10,10,5,10,10,5,10000
7,30000,800,11,75,0,75,0,10,60,5,30000
8,10000,400,8,25,10,5,10,10,10,5,10000
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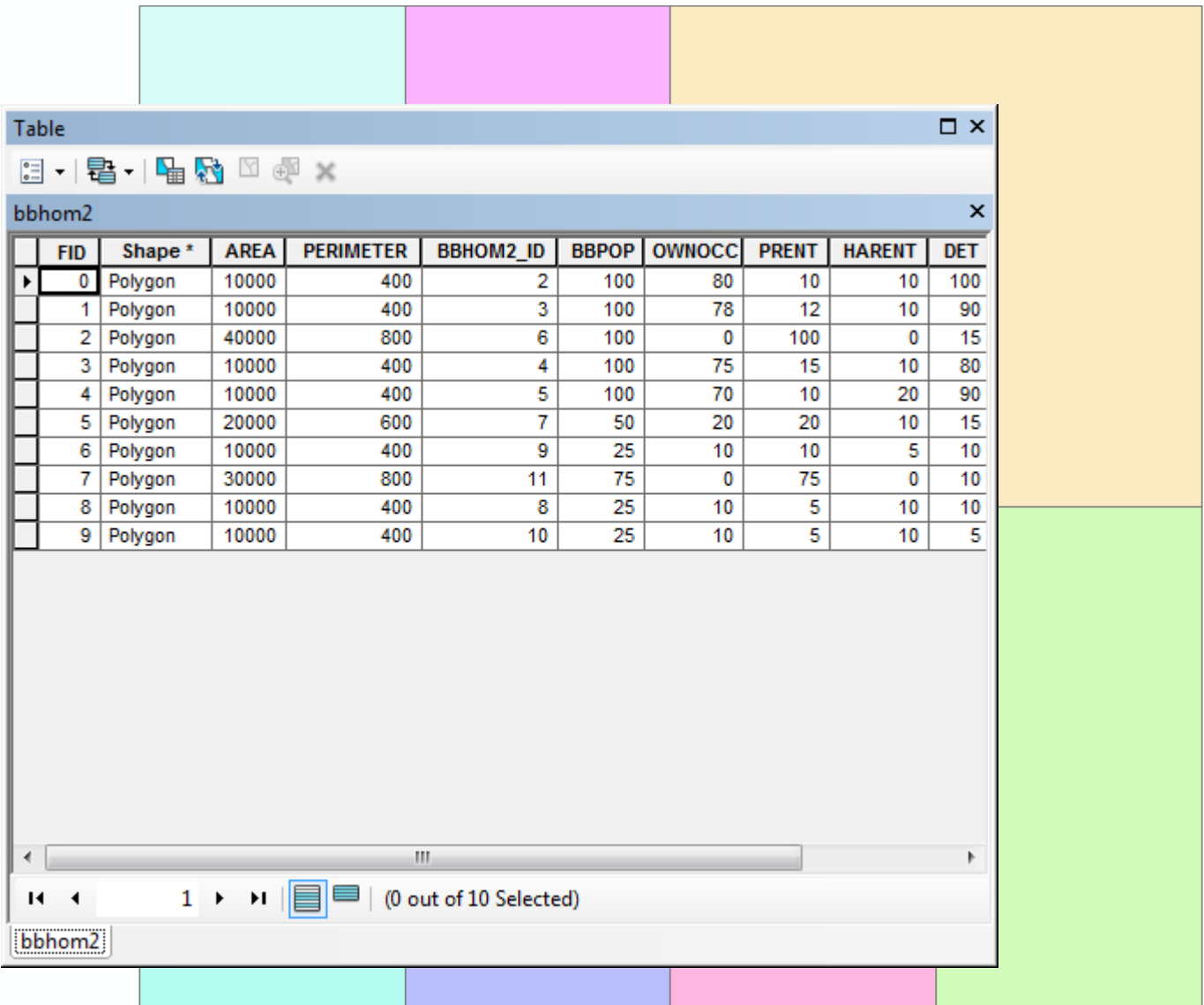
Input files (2)

- Attributes for each building block might include:
 - Population (to be used as a target and/or min/max thresholds)
 - Region (e.g. a larger area within which zones are to be constrained)
 - Homogeneity variables (e.g. tenure or accommodation type, for designing zones which are as internally homogenous as possible)

AZTImporter

- If needed, the AZTImporter program will generate .aat and .pat files from the widely-used ESRI Shapefile GIS format



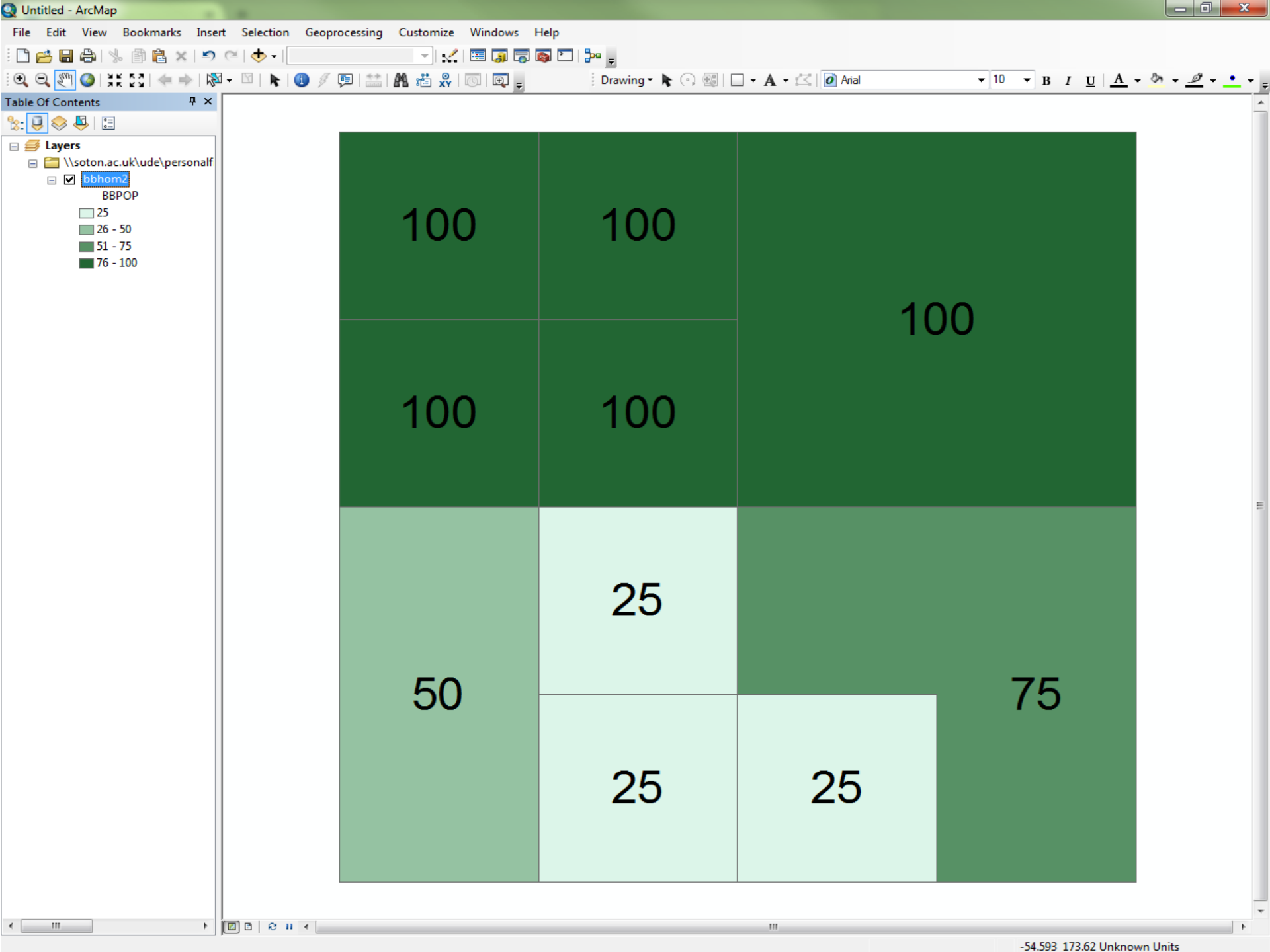


Table

bbhom2

FID	Shape *	AREA	PERIMETER	BBHOM2_ID	BBPOP	OWNOCC	PRENT	HARENT	DET
0	Polygon	10000	400	2	100	80	10	10	100
1	Polygon	10000	400	3	100	78	12	10	90
2	Polygon	40000	800	6	100	0	100	0	15
3	Polygon	10000	400	4	100	75	15	10	80
4	Polygon	10000	400	5	100	70	10	20	90
5	Polygon	20000	600	7	50	20	20	10	15
6	Polygon	10000	400	9	25	10	10	5	10
7	Polygon	30000	800	11	75	0	75	0	10
8	Polygon	10000	400	8	25	10	5	10	10
9	Polygon	10000	400	10	25	10	5	10	5

bbhom2 (0 out of 10 Selected)



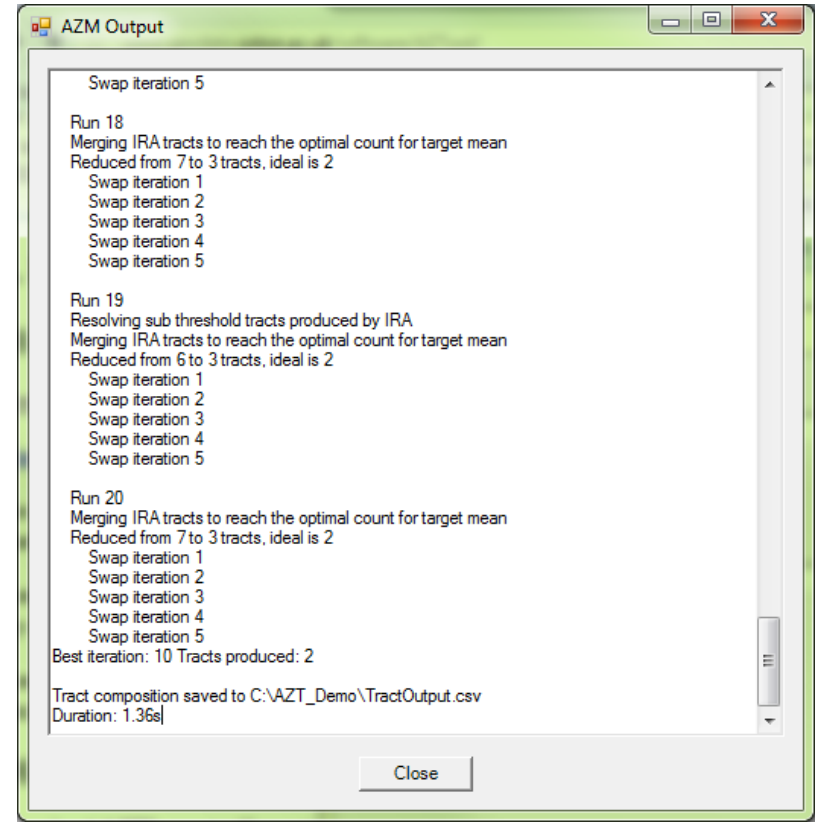
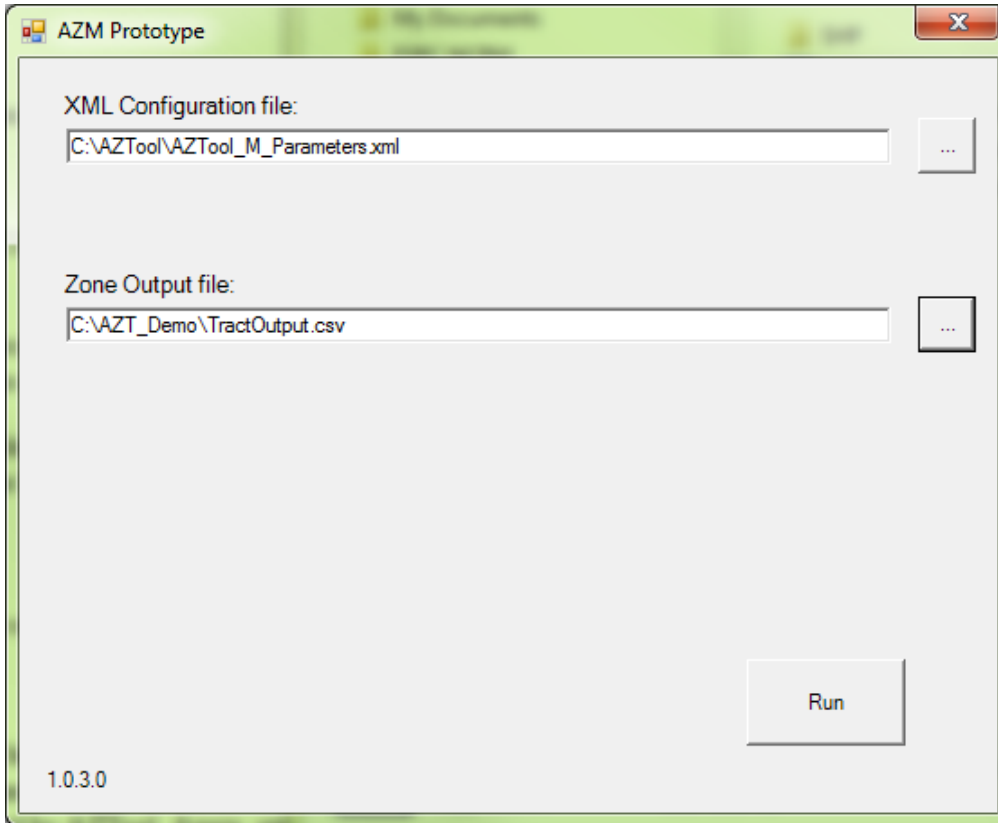
Parameter file

- An XML file containing the program run parameters. This can be edited, saved and re-used.
- Contains all necessary program control parameters for setup, specification and output
- For use in batch mode using a Windows Batch File

```
<?xml version="1.0" encoding="UTF-8"?>
- <ProgramOptions xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <InputPATFile>C:\AZT_Demo\bbhom2.pat</InputPATFile>
  <InputAATFile>C:\AZT_Demo\bbhom2.aat</InputAATFile>
  <Header>true</Header>
  <IDIndex>1</IDIndex>
  <RegionIndex>0</RegionIndex>
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  <RespectRegions>>false</RespectRegions>
- <TargThreshVars>
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    <Target>300</Target>
    <Tolerance>1000000</Tolerance>
    <Weight>100</Weight>
    <MinThreshSet>true</MinThreshSet>
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    <MaxThresh>625</MaxThresh>
  </TargetThresholdVar>
</TargThreshVars>
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  <IACSet>true</IACSet>
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  <MinBdyLenPerc>10</MinBdyLenPerc>
  <IgnoreBishopsContig>true</IgnoreBishopsContig>
  <AllowDonuts>>false</AllowDonuts>
  <IRATargetBasedTractCount>true</IRATargetBasedTractCount>
  <TestSpreadsheetReqd>>false</TestSpreadsheetReqd>
  <ReportStatistics>>false</ReportStatistics>
  <NumberSwapIterations>5</NumberSwapIterations>
  <NumberRuns>20</NumberRuns>
  <UseLogDomainScores>>false</UseLogDomainScores>
  <IgnoreTractsWithUnbreachedBB>>false</IgnoreTractsWithUnbreachedBB>
  <RandomSeed>0</RandomSeed>
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```
- <TargThreshVars>
  - <TargetThresholdVar>
    <Name>Population</Name>
    <FileIndex>5</FileIndex>
    <TargetSet>true</TargetSet>
    <Target>300</Target>
    <Tolerance>1000000</Tolerance>
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    <MinThreshSet>true</MinThreshSet>
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    <MaxThresh>625</MaxThresh>
  </TargetThresholdVar>
</TargThreshVars>
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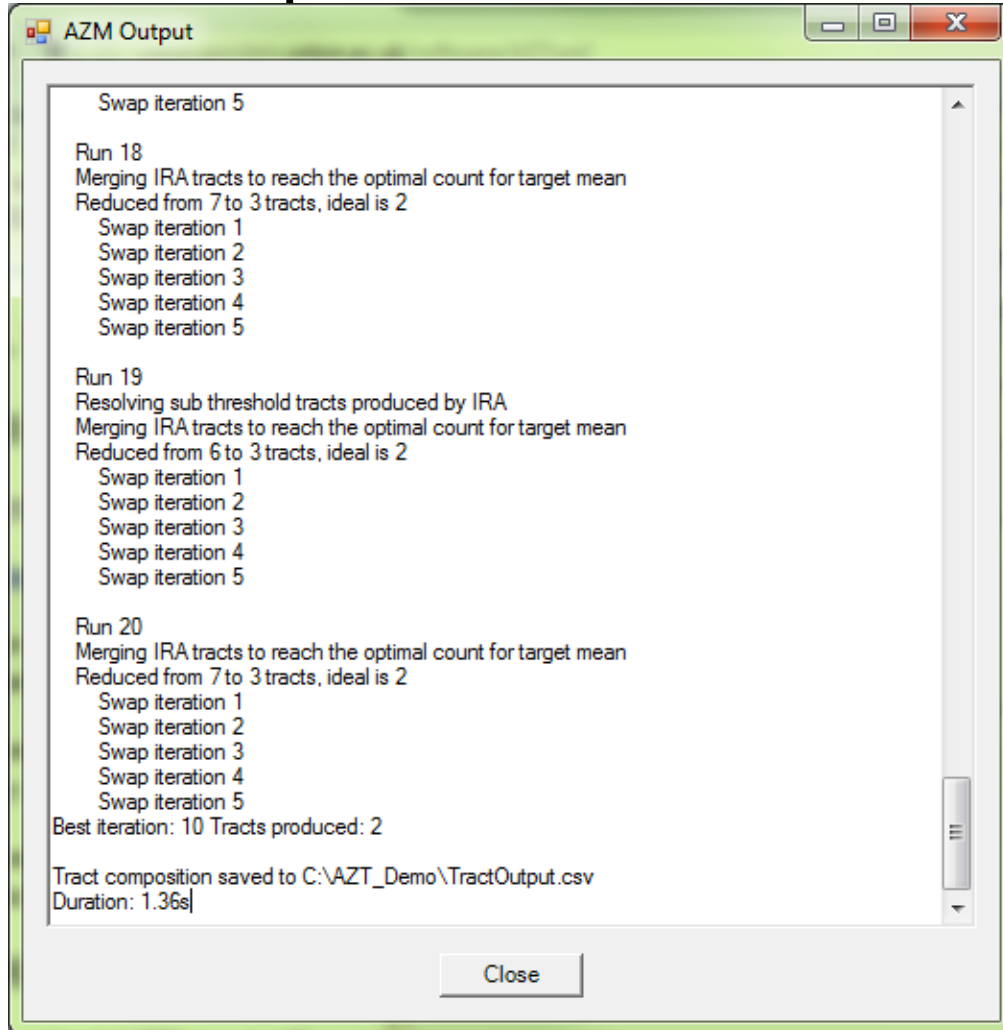
A program run



Output files

- A .txt format log file, reporting progress of the program run and identifying any problems, e.g. with the input data
- A .csv format results file, showing the output tract to which each building blocks has been assigned
- Zoning results can be re-imported to GIS and used to dissolve boundaries between building blocks

Output files



AZM Output

Swap iteration 5

Run 18
Merging IRA tracts to reach the optimal count for target mean
Reduced from 7 to 3 tracts, ideal is 2
Swap iteration 1
Swap iteration 2
Swap iteration 3
Swap iteration 4
Swap iteration 5

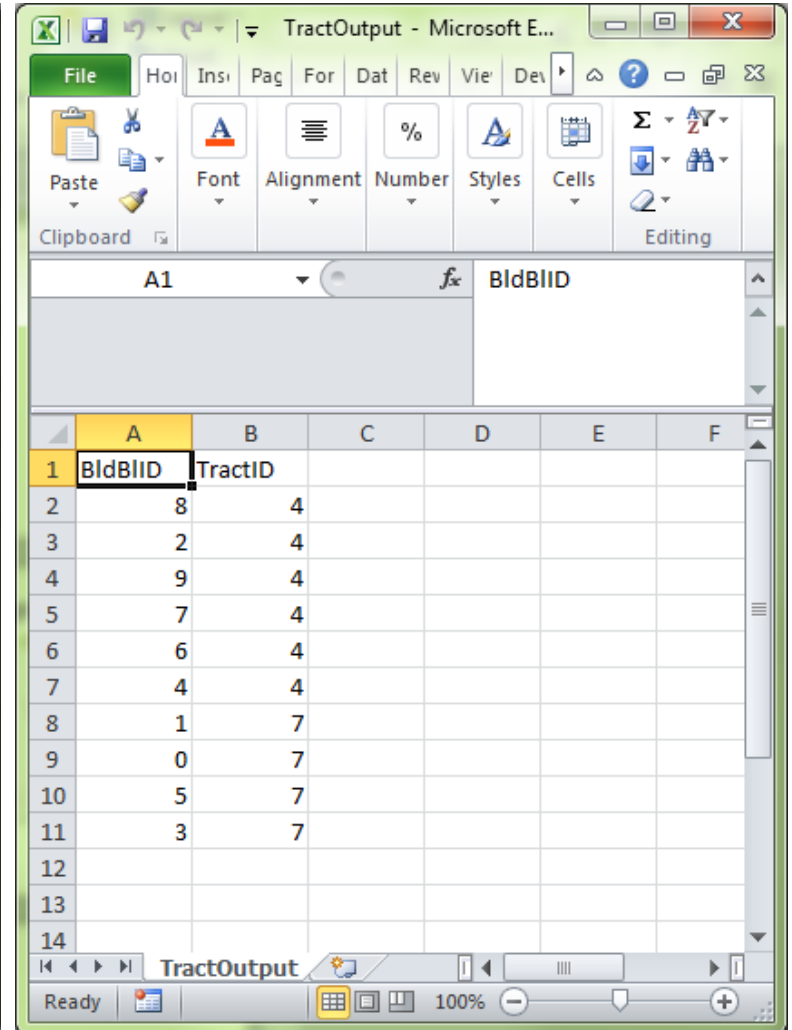
Run 19
Resolving sub threshold tracts produced by IRA
Merging IRA tracts to reach the optimal count for target mean
Reduced from 6 to 3 tracts, ideal is 2
Swap iteration 1
Swap iteration 2
Swap iteration 3
Swap iteration 4
Swap iteration 5

Run 20
Merging IRA tracts to reach the optimal count for target mean
Reduced from 7 to 3 tracts, ideal is 2
Swap iteration 1
Swap iteration 2
Swap iteration 3
Swap iteration 4
Swap iteration 5

Best iteration: 10 Tracts produced: 2

Tract composition saved to C:\AZT_Demo\TractOutput.csv
Duration: 1.36s

Close



TractOutput - Microsoft E...

	A	B	C	D	E	F
1	BldBlID	TractID				
2	8	4				
3	2	4				
4	9	4				
5	7	4				
6	6	4				
7	4	4				
8	1	7				
9	0	7				
10	5	7				
11	3	7				
12						
13						
14						

TractOutput

Ready 100%

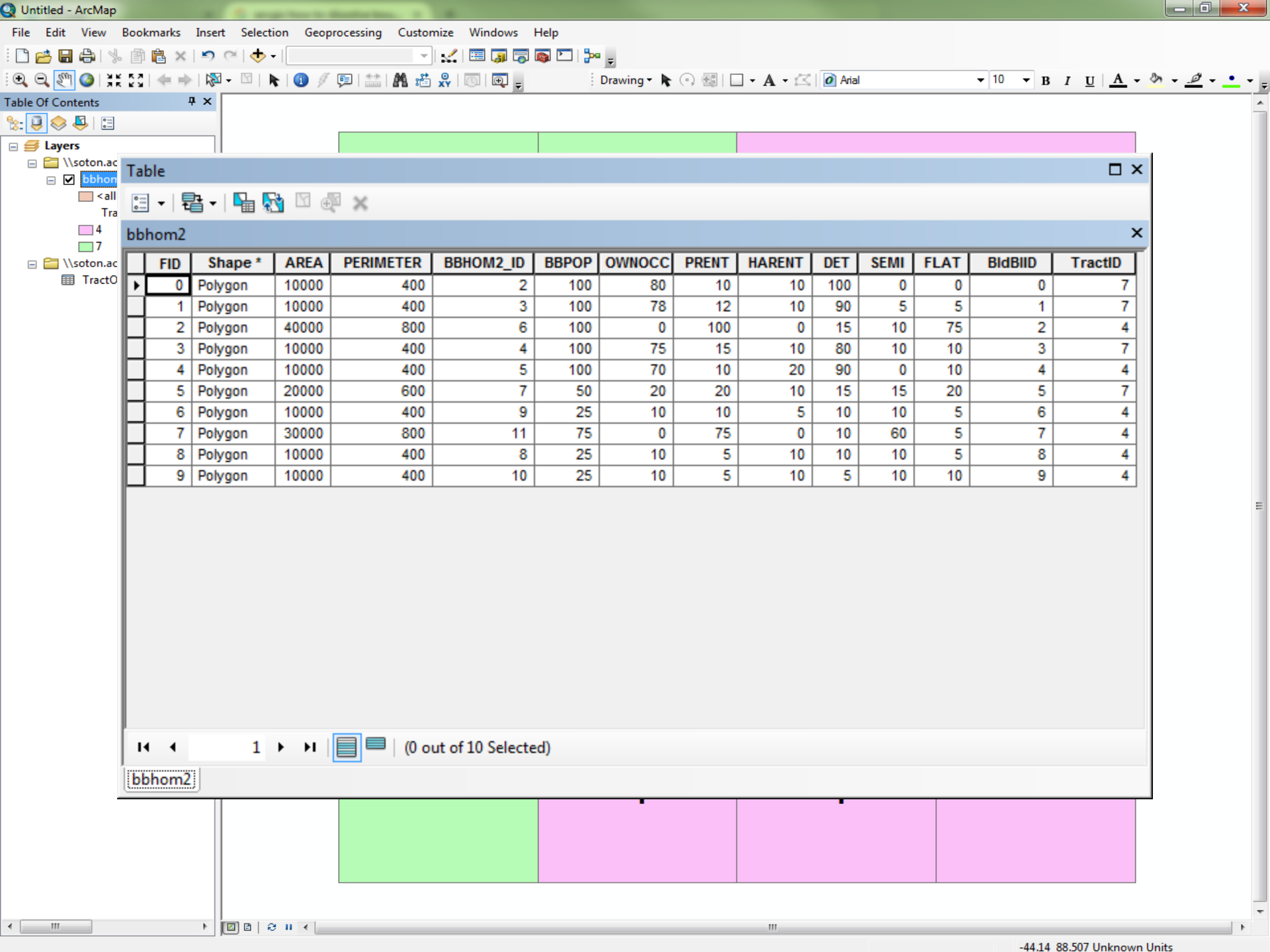


Table Of Contents

- Layers
- \\soton.ac
- bbhom
- <all
- Tra
- 4
- 7
- \\soton.ac
- Tract0

Table

bbhom2

FID	Shape *	AREA	PERIMETER	BBHOM2_ID	BBPOP	OWNOC	PRENT	HARENT	DET	SEMI	FLAT	BldBIID	TractID
0	Polygon	10000	400	2	100	80	10	10	100	0	0	0	7
1	Polygon	10000	400	3	100	78	12	10	90	5	5	1	7
2	Polygon	40000	800	6	100	0	100	0	15	10	75	2	4
3	Polygon	10000	400	4	100	75	15	10	80	10	10	3	7
4	Polygon	10000	400	5	100	70	10	20	90	0	10	4	4
5	Polygon	20000	600	7	50	20	20	10	15	15	20	5	7
6	Polygon	10000	400	9	25	10	10	5	10	10	5	6	4
7	Polygon	30000	800	11	75	0	75	0	10	60	5	7	4
8	Polygon	10000	400	8	25	10	5	10	10	10	5	8	4
9	Polygon	10000	400	10	25	10	5	10	5	10	10	9	4

1 (0 out of 10 Selected)

bbhom2

Table Of Contents

- Layers
 - \\soton.ac.uk\ude\personalf
 - bbhom2
 - <all other values> TractID
 - 4
 - 7
 - \\soton.ac.uk\ude\personalf
 - TractOutput.csv

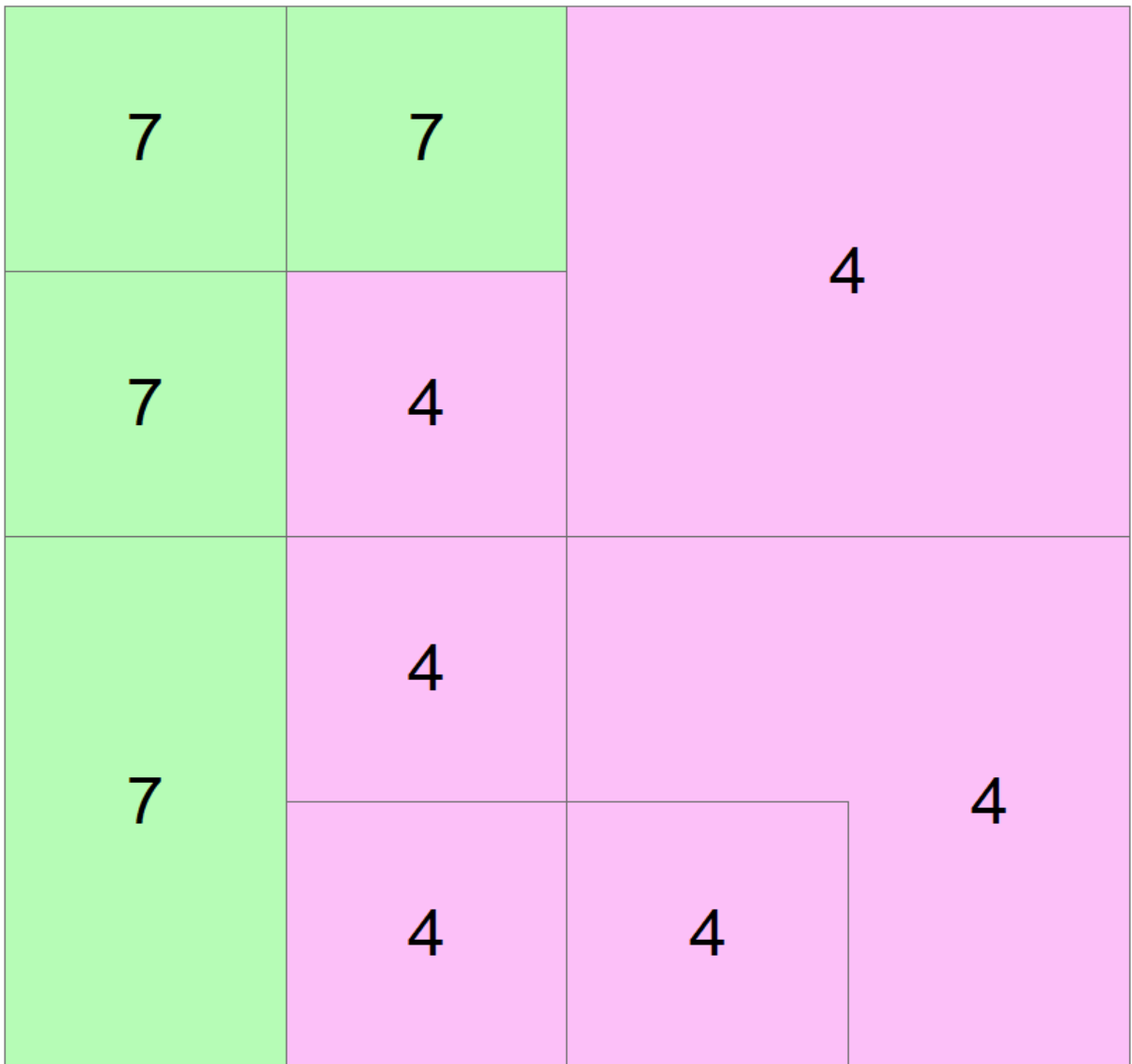
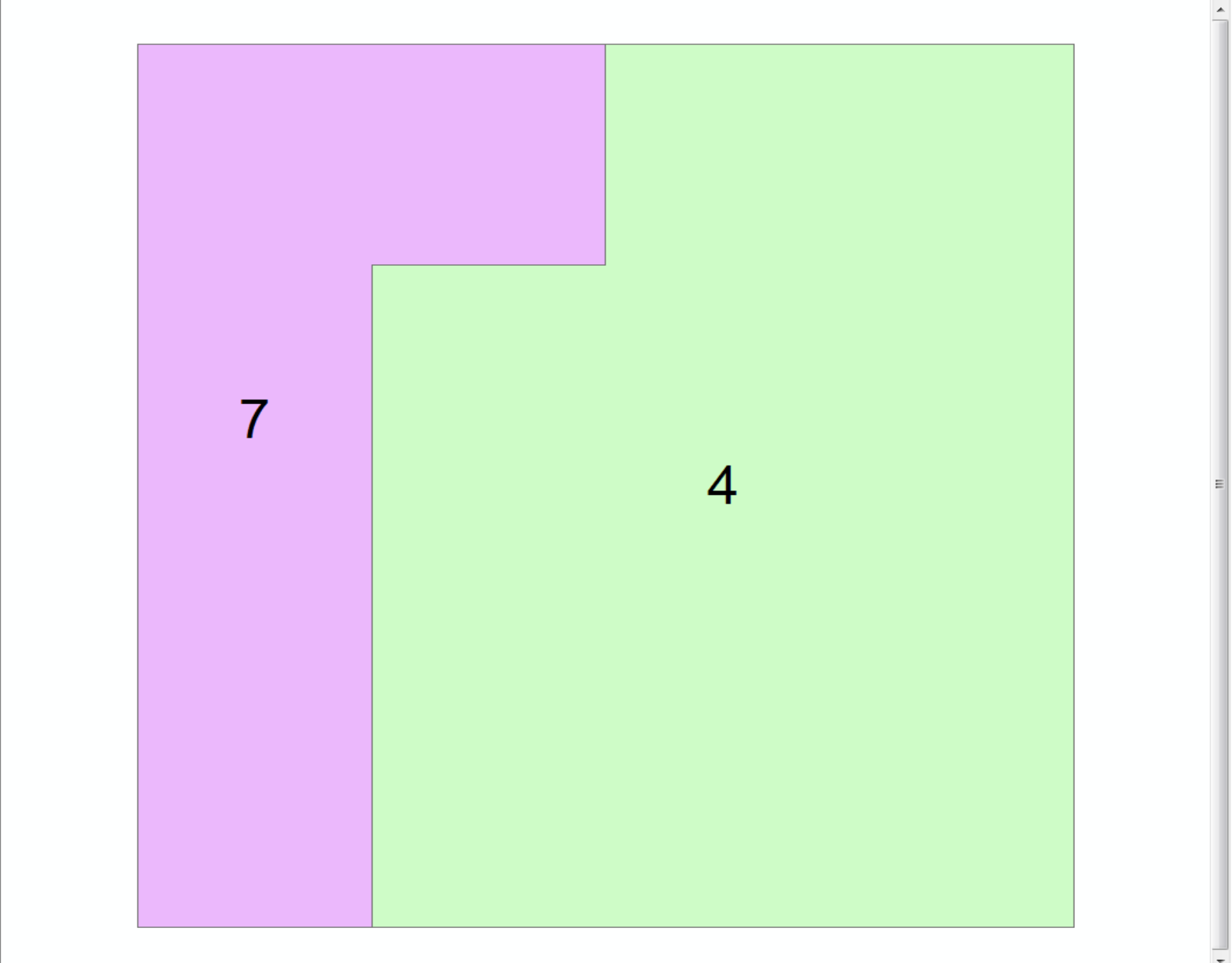


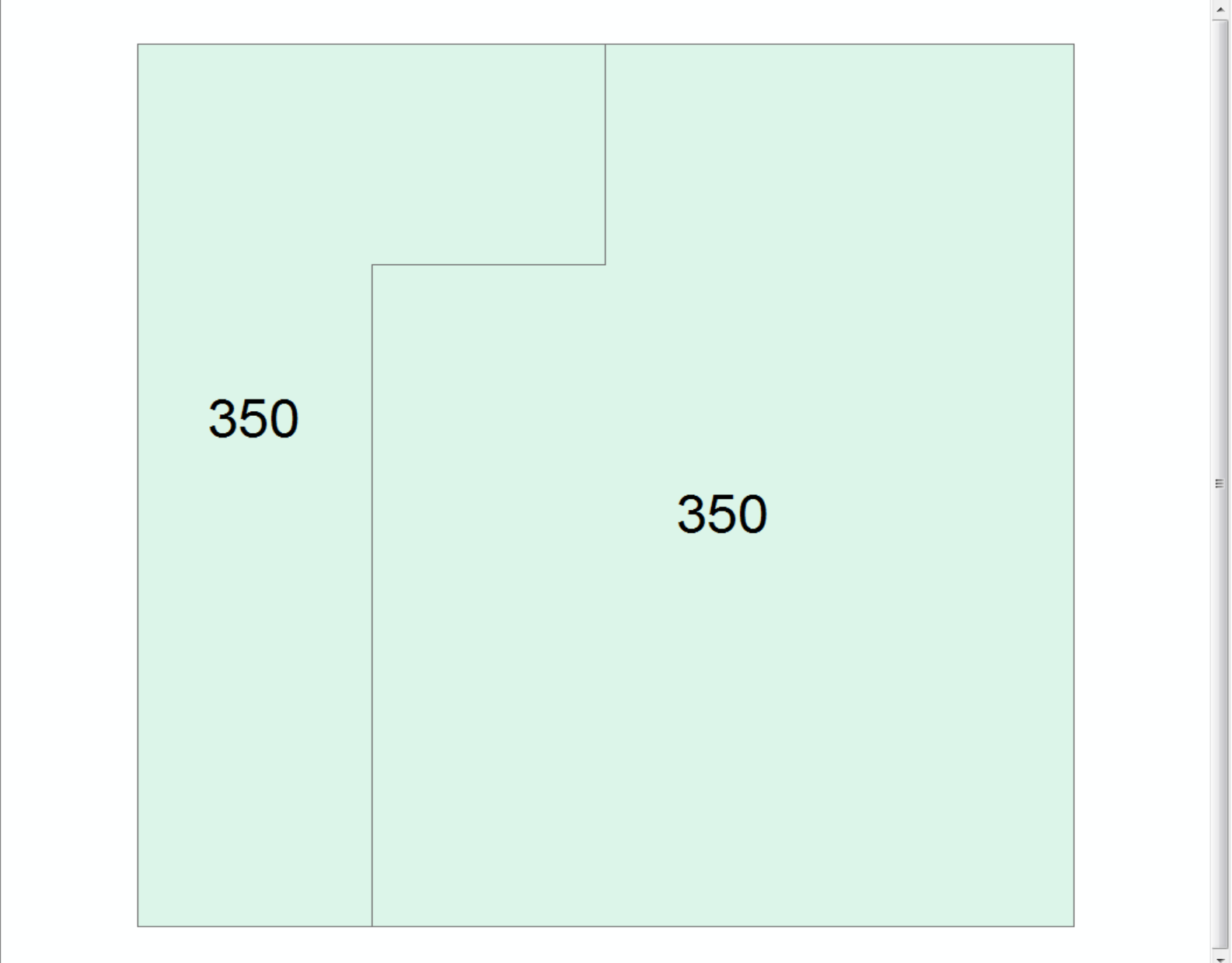
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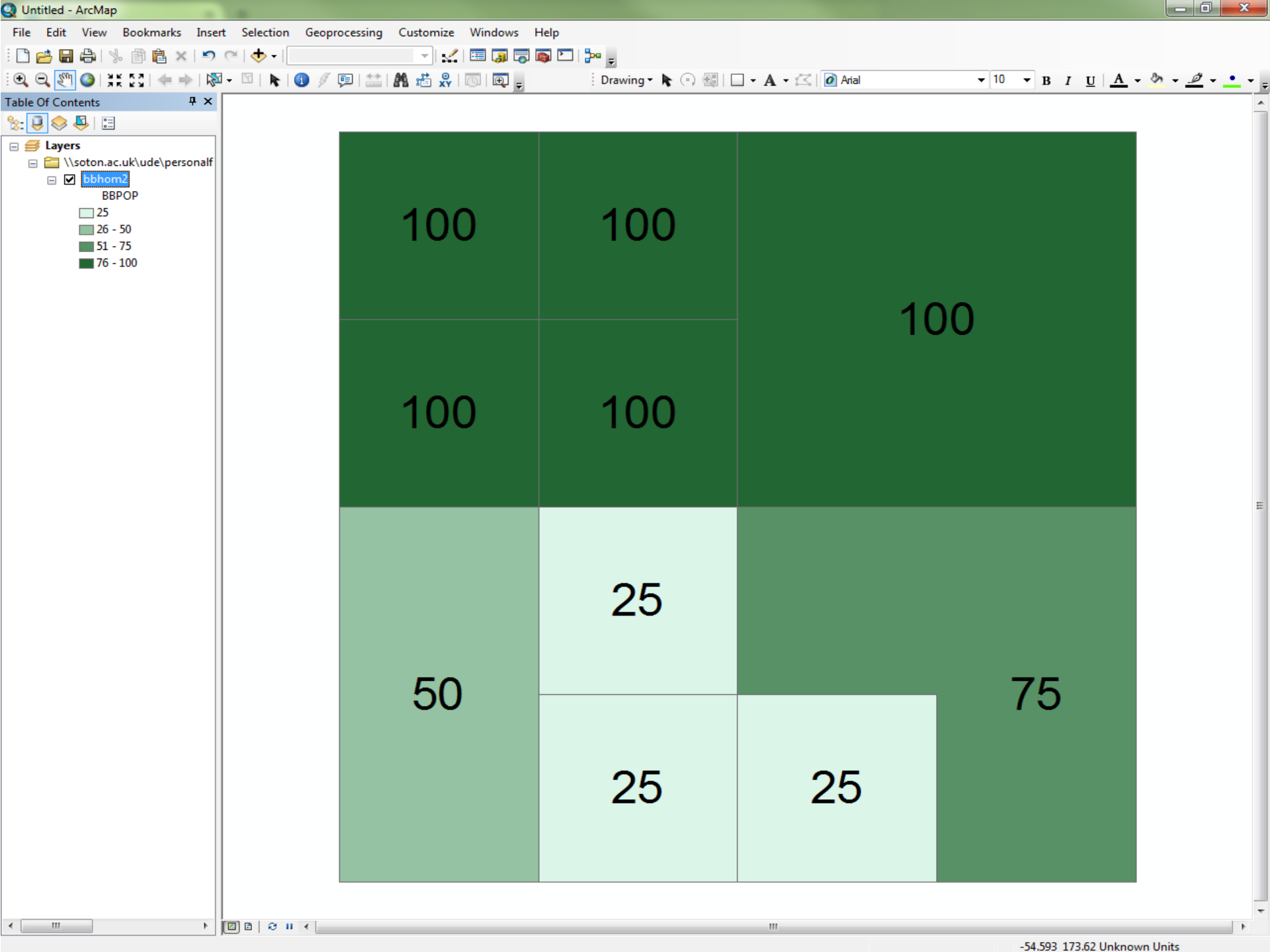
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 - bbhom2_Dissolve
 - <all other values>
 - TractOutput_csv_Trac
 - 4
 - 7
 - \\soton.ac.uk\ude\personalf
 - bbhom2
 - <all other values>
 - \\soton.ac.uk\ude\personalf
 - TractOutput.csv



Layers

- \\soton.ac.uk\ude\personalfiles\user:
 - bbhom2_Dissolve
 - Field2
 - 350
 - \\soton.ac.uk\ude\personalfiles\user:
 - bbhom2
 - <all other values>
 - \\soton.ac.uk\ude\personalfiles\user:
 - TractOutput.csv
 - sums.csv





AZTool design constraints

- Constraint within higher level regions
- Population targets and thresholds
- Shape compactness
- Intra-area correlation measures
- New accessibility/network connectivity measures
(April 2016)

Summary

- AZTool free Windows software application which aggregates a set of building block polygons into output tracts to best meet a set of zone design criteria
- Input arc and polygon attributes
- Run controlled by an XML parameter file
- Output log files and tract composition files
- Data usually sourced from and imported back into GIS

For more information please visit
www.ncrm.ac.uk

