ENV 501 / GR A3 30

Exercise session 7 (interactive): Spatial allocation of materials

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Geographical Information System

A **G**eographic **I**nformation **S**ystem (**GIS**) is a computer-based tool that enables users to **capture**, **store**, **manipulate**, **analyze**, **manage**, and **present spatial** or **geographic data**.

GIS integrates spatial data with other datasets, providing powerful insights into patterns, relationships, and geographic trends that are critical for decision-making across multiple fields.

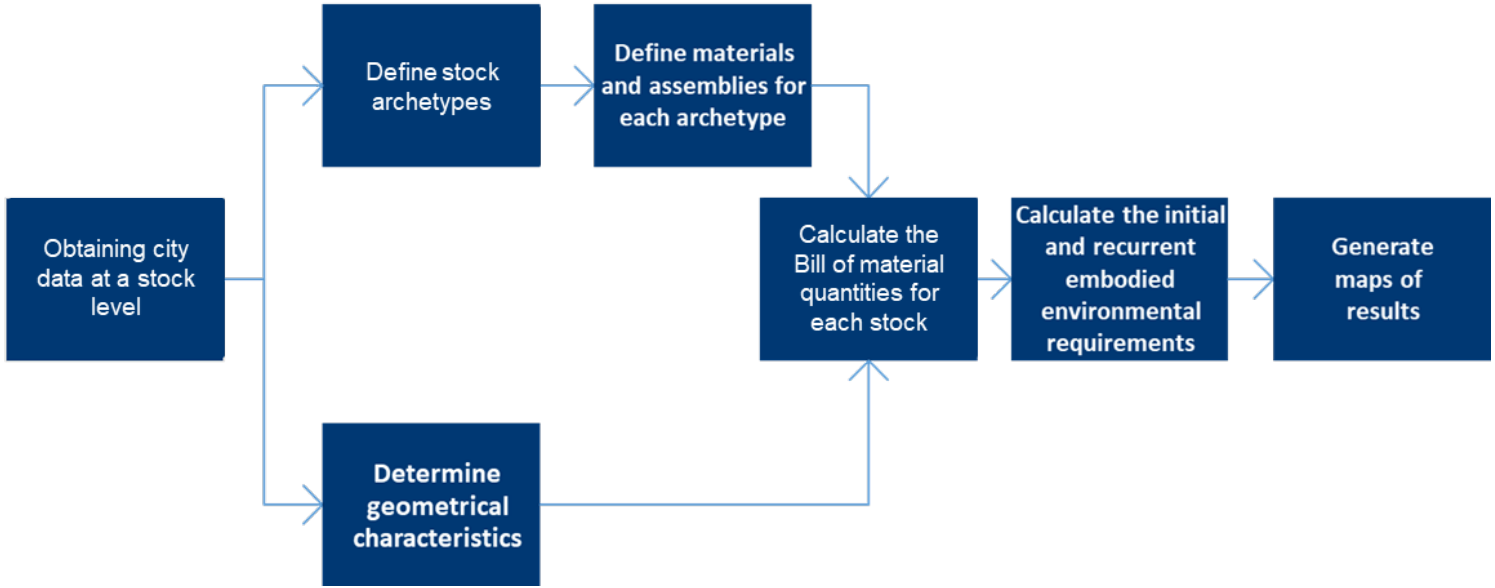
GIS in Material Flow Analysis

- Mapping Material Stocks and Flows
- Spatial Allocation of Material Stocks
- Temporal Analysis and Change Detection
- Scenario Modeling for Circular Economy Goals
- Integration with Socio-Economic Data

Exercise: Spatial allocation of materials (Bottom-up Residential buildings)

- Downloading free GIS software – QGIS. Follow this link: https://qgis.org/download/
- Click Download – Latest version
- Once downloaded, open the file and install
- Run QGIS
- Download datasets from moodle (zip files)
- Decompress and load the *.shp files into QGIS
  - Identify the type of geometry (point, line, polygon)
- Estimate the material quantities based on the information provided

Exercise: Spatial allocation of materials (Bottom-up)



- Download datasets from moodle (zip files)
- Decompress and load the “Grenada_***.shp” files into QGIS
- Identify the type of geometry (point, line, polygon)

Binder, Félix Martín del Campo, Hecher, Campfens

Exercise: Spatial allocation of materials (Bottom-up Residential buildings)

	Aggregate	Timber	Concrete	Steel	Relevant occupancy classes
Concrete Structure type 1					Urban-area single-family dwelling;
Foundation - Pad footings	45	0	45	1	Rural-area single-family dwelling;
Foundation - Posts	0	0	300	5	Residential-area single-family dwelling
Floors	0	0	450	10	
Walls	0	0	520	1	
Roof - Frame	0	40	0	0	
Roof - Covering	0	0	0	10	
Total	**45**	**40**	**1315**	**27**	

TOTAL = 1427 Kg/m2

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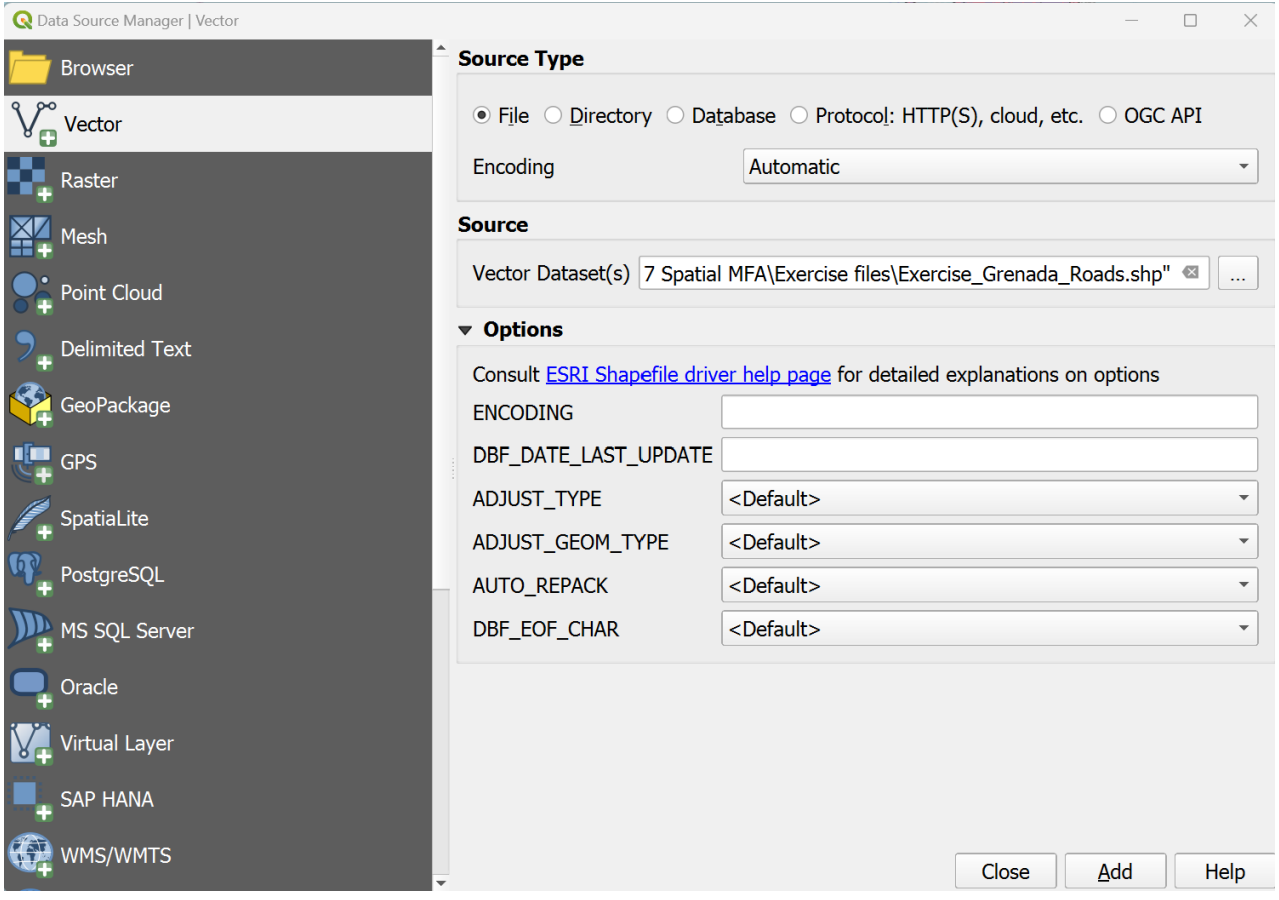
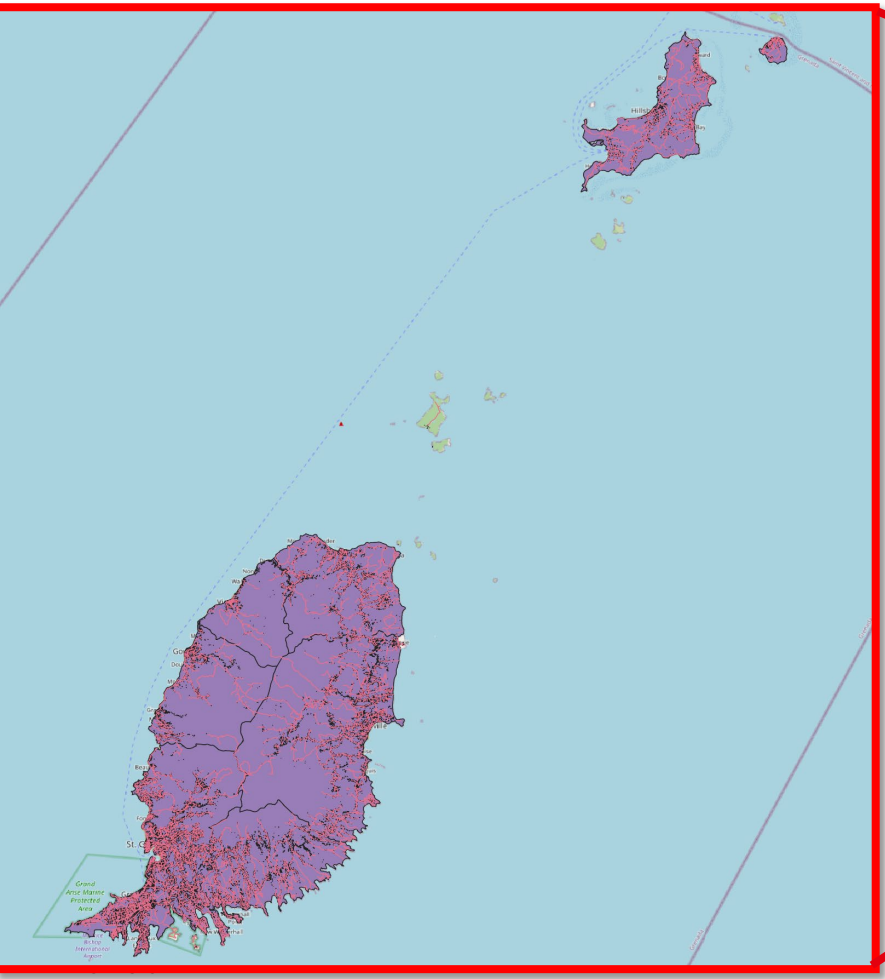
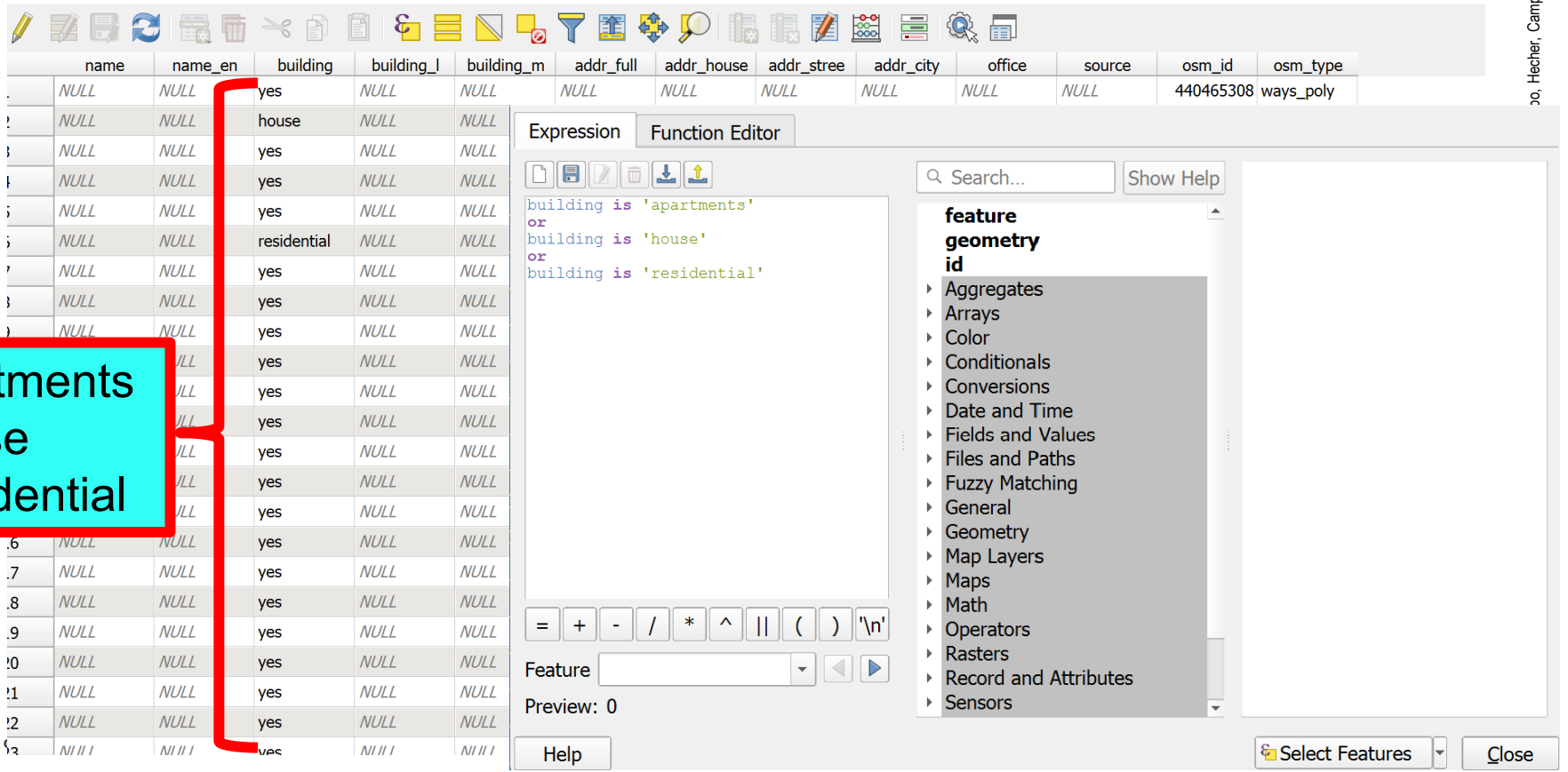
Layer – Add Layer – Add Vector Layer





Relations in Urban Systems


name
name_en
building
building_l
building_m
addr_full
addr_house
addr_stree
addr_city
office
source
osm_id
osm_type
NULL NULL yes NULL NULL NULL NULL NULL NULL NULL NULL 440465308 ways_poly
NULL NULL house NULL NULL
NULL NULL yes NULL NULL
NULL NULL yes NULL NULL
NULL NULL yes NULL NULL
NULL NULL residential NULL NULL
NULL NULL yes NULL NULL
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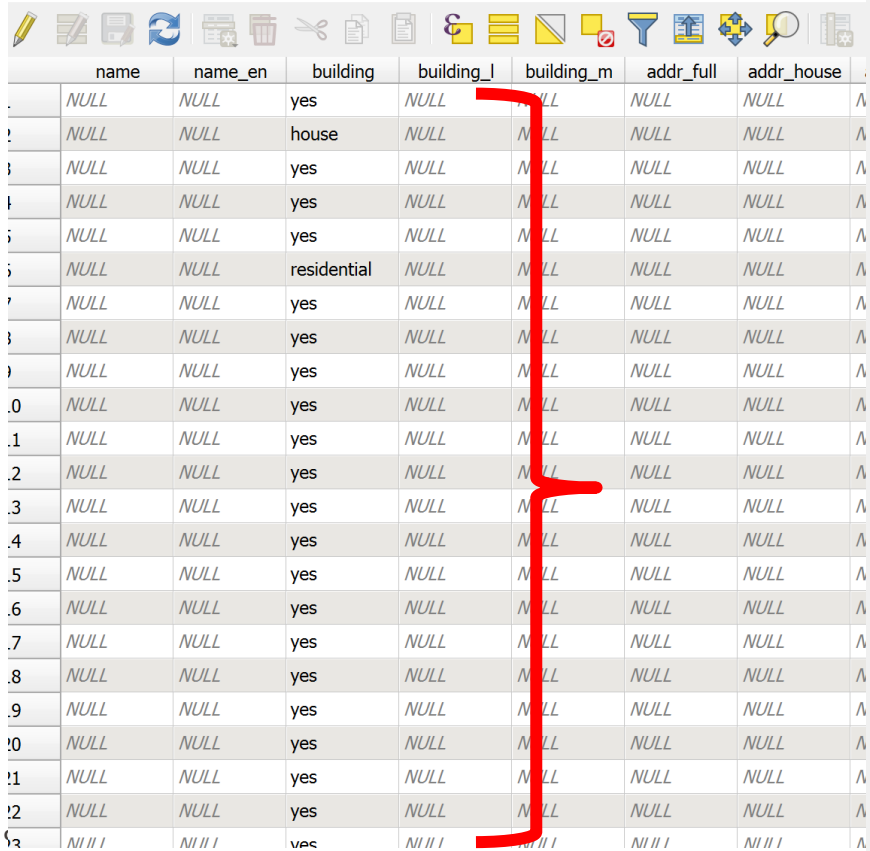
NULL NULL yes NULL NULL
NULL NULL yes NULL NULL
NULL NULL yes NULL NULL
NULL NULL yes NULL NULL
NULL NULL yes NULL NULL
NULL NULL yes NULL NULL
Apartments
House
Residential
Expression
Function Editor
building is 'apartments'
or
building is 'house'
or
building is 'residential'
Search...
Show Help
feature
geometry
id
Aggregates
Arrays
Color
Conditionals
Conversions
Date and Time
Fields and Values
Files and Paths
Fuzzy Matching
General
Geometry
Map Layers
Maps
Math
Operators
Rasters
Record and Attributes
Sensors
= + - / * ^ || ( ) '\n'
Feature
Preview: 0
Help
Select Features
Close



	name	name_en	building	building_l	building_m	addr_full	addr_house	
	NULL	NULL	yes	NULL	NULL	NULL	NULL	N
2	NULL	NULL	house	NULL	NULL	NULL	NULL	N
3	NULL	NULL	yes	NULL	NULL	NULL	NULL	N
4	NULL	NULL	yes	NULL	NULL	NULL	NULL	N
5	NULL	NULL	yes	NULL	NULL	NULL	NULL	N
6	NULL	NULL	residential	NULL	NULL	NULL	NULL	N
7	NULL	NULL	yes	NULL	NULL	NULL	NULL	N
8	NULL	NULL	yes	NULL	NULL	NULL	NULL	N
9	NULL	NULL	yes	NULL	NULL	NULL	NULL	N
10	NULL	NULL	yes	NULL	NULL	NULL	NULL	N
11	NULL	NULL	yes	NULL	NULL	NULL	NULL	N
12	NULL	NULL	yes	NULL	NULL	NULL	NULL	N
13	NULL	NULL	yes	NULL	NULL	NULL	NULL	N
14	NULL	NULL	yes	NULL	NULL	NULL	NULL	N
15	NULL	NULL	yes	NULL	NULL	NULL	NULL	N
16	NULL	NULL	yes	NULL	NULL	NULL	NULL	N
17	NULL	NULL	yes	NULL	NULL	NULL	NULL	N
18	NULL	NULL	yes	NULL	NULL	NULL	NULL	N
19	NULL	NULL	yes	NULL	NULL	NULL	NULL	N
20	NULL	NULL	yes	NULL	NULL	NULL	NULL	N
21	NULL	NULL	yes	NULL	NULL	NULL	NULL	N
22	NULL	NULL	yes	NULL	NULL	NULL	NULL	N
23	NULL	NULL	yes	NULL	NULL	NULL	NULL	N

Only update 0 selected features

Create a new field

Create virtual field

Output field name

Output field type: Integer (32 bit)

Output field length: 10 Precision: 3

Update existing field

building_l

Expression | Function Editor

```
CASE

When building_l is NULL
then 1

Else building_l

END
```

= + - / * ^ || ( ) \n

Feature

Preview: 1

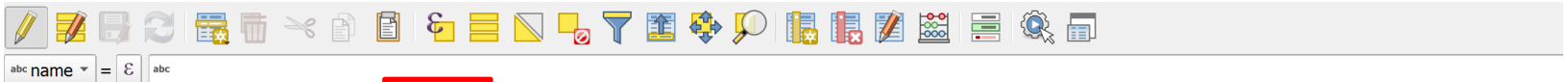
Show Help

feature
geometry
id
row_number

- Aggregates
- Arrays
- Color
- Conditionals
- Conversions
- Date and Time
- Fields and Val...
- Files and Paths
- Fuzzy Matching
- General
- Geometry
- Map Layers
- Maps
- Math
- Operators
- Rasters
- Record and A...
- Sensors
- String
- Variables
- Recent (fieldc...

You are editing information on this layer but the layer is currently not in edit mode. If you click OK, edit mode will automatically be turned on.

OK | Cancel | Help



abc name = ε abc

	name	name_en	building	building_l	building_m	addr_full	addr_house	addr_stree	addr_city	office	source	osm_id	osm_type
1	NULL	NULL	yes	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	440465308	ways_poly
2	NULL	NULL	house	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	440487227	ways_poly
3	NULL	NULL	yes	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	440487641	ways_poly
4	NULL	NULL	yes	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	440490127	ways_poly
5	NULL	NULL	yes	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	440490130	ways_poly
6	NULL	NULL	residential	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	440490464	ways_poly
7	NULL	NULL	yes	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	442419602	ways_poly
8	NULL	NULL	yes	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	568587141	ways_poly
9	NULL	NULL	yes	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	568587148	ways_poly
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11	NULL	NULL	yes	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	568587161	ways_poly
12	NULL	NULL	yes	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	568587165	ways_poly
13	NULL	NULL	yes	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	568587171	ways_poly
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20	NULL	NULL	yes	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	568587211	ways_poly
21	NULL	NULL	yes	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	568587229	ways_poly
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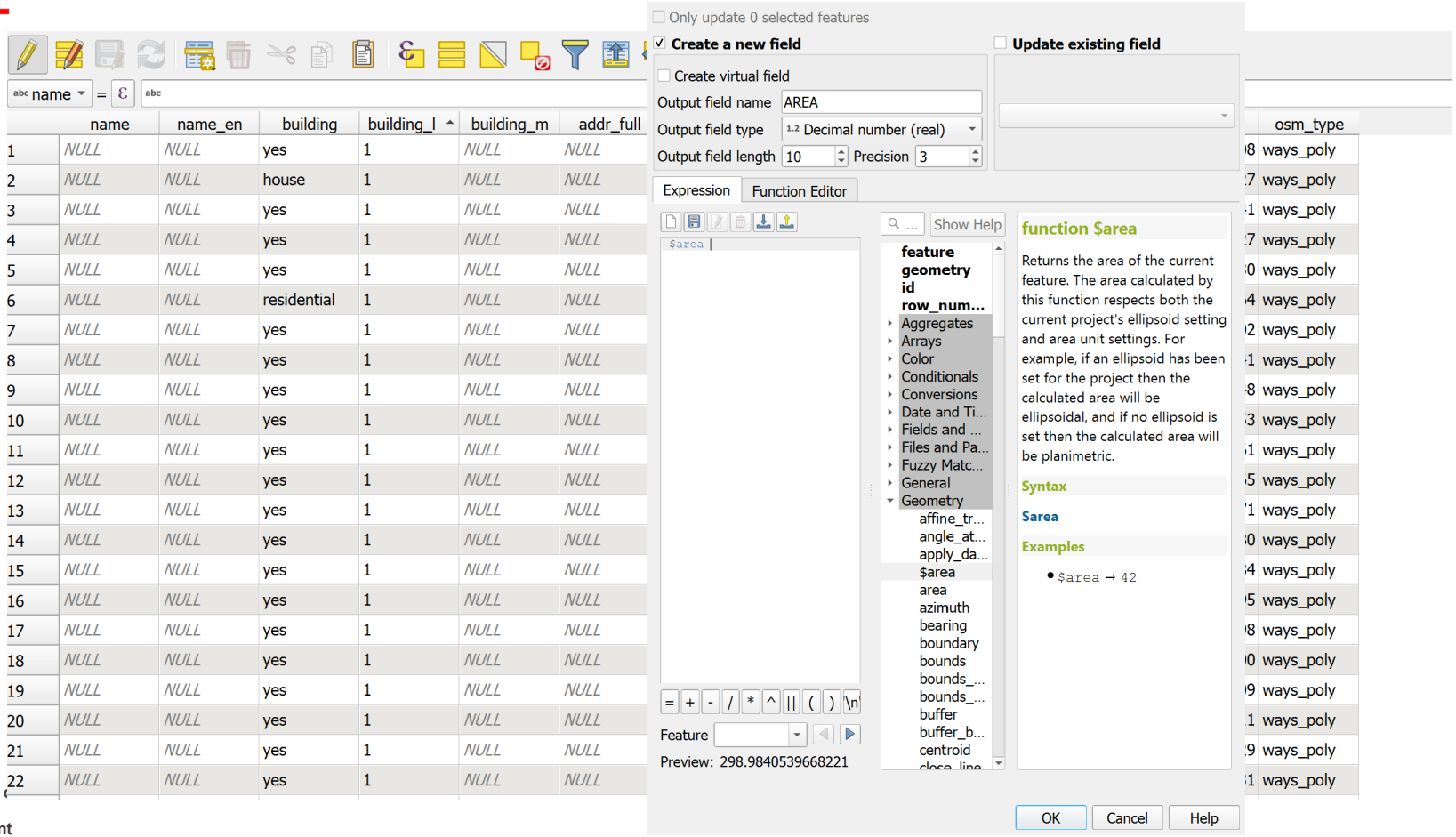
Only update 0 selected features
Create a new field
Update existing field
Create virtual field
Output field name AREA
Output field type Decimal number (real)
Output field length 10 Precision 3
Expression
Function Editor
$area
Show Help
function $area
Returns the area of the current feature. The area calculated by this function respects both the current project's ellipsoid setting and area unit settings. For example, if an ellipsoid has been set for the project then the calculated area will be ellipsoidal, and if no ellipsoid is set then the calculated area will be planimetric.
Syntax
$area
Examples
$area → 42
Feature
Preview: 298.9840539668221
OK
Cancel
Help

	name	name_en	building	building_l	building_m	addr_full	addr_house	addr_stree	addr_city	office	source	osm_id	osm_type	AREA
1	NULL	NULL	house	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	440487227	ways_poly	181.853
2	NULL	NULL	residential	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	440490464	ways_poly	129.914
3	NULL	NULL	house	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	462559914	ways_poly	87.234
4	NULL	NULL	residential	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	672995300	ways_poly	86.729
5	NULL	NULL	residential	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	672995301	ways_poly	49.960
6	NULL	NULL	residential	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	1272171332	ways_poly	196.539
7	NULL	NULL	residential	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	25588193	ways_poly	240.750
8	NULL	NULL	residential	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	440350673	ways_poly	254.280
9	NULL	NULL	residential	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	440350689	ways_poly	432.695
10	NULL	NULL	residential	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	440350691	ways_poly	283.139
11	NULL	NULL	residential	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	440350715	ways_poly	550.325
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14	NULL	NULL	residential	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	440870242	ways_poly	29.568
15	NULL	NULL	residential	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	1274493462	ways_poly	559.918
16	NULL	NULL	house	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	711686078	ways_poly	163.721
17	NULL	NULL	house	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	711686107	ways_poly	108.933
18	NULL	NULL	house	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	711686108	ways_poly	265.296
19	NULL	NULL	house	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	711686109	ways_poly	156.647
20	NULL	NULL	house	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	711686110	ways_poly	110.184
21	NULL	NULL	house	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	711686111	ways_poly	69.130
22	NULL	NULL	house	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	711686119	ways_poly	107.186