University of Gothenburg
Department of Earth Sciences

Exercise 7 - Selection based on attributes and location.

The municipality of Sotenäs wants to conduct a detailed study regarding waterfront development. The aim is to get a better picture of the exploitation rate of the coastline within the boundaries of the municipality.

Hand in: A professional maps with all the necessary map features that show land use as foundation and where the selected residential properties are clearly visible. The map should bring up an A4 sheet and submitted as <u>PDF document</u> on <u>Canvas</u>.

Queries and selection
Queries and selecting are among the most fundamental and the most frequently used tools in GIS analysis. There are two main types of queries and selection are:

    a) **Selection by attribute data (aspatial queries)**
In this type we can search for objects that meet one or several criteria based on their attributes. A few examples are:
- How many street trees over 20 years old are in Gothenburg? (attribute: year of planting)
- Which rivers in Sweden are over 100 km long? (attribute: length)
- Which countries in Europe have population over 10 million inhabitants and area below 200 000 square kilometers? (attributes: population and area)

    b) **Selection by location (spatial queries)**
In this type we can search for objects that meet one or several criteria based on their location. For example:
- Which cities in Sweden are located within 50 km from the coast?
- Which buildings in Gothenburg are built at areas with elevation over 60 m a.s.l. and are located within 300 m from a nearest park?
- How many cities are in Dalarna, Västra Götaland och Skåne?

Of course these two types are often combined. For example one can search for cities with population below 10 000 inhabitants within 100 km distance from Stockholm, or buildings over 100 years old located near a forest and at least 10 km away from city borders.
In this exercise you will have a chance to learn how to use both of these types.

1. Preparations

Create a project with the point layer in **bs_64_2_11.shp** which contains buildings of various kinds. You also need **my_64_2_11.shp** which is a land use layer. Also add the shapefile **ak_14.shp** which is a polygon layer with municipality areas in Västra Götaland. The municipality seeks to answer the following question:

- How many residential properties in Sotenäs is less than 100 meters from sea or lake?

It can get a bit messy when working with multiple polygon layers. To facilitate this, you can change the appearance of **ak_14** to have no fill color. You can also give **my_64_2_11** different colors depending on the category to easily see where the coastline is located.
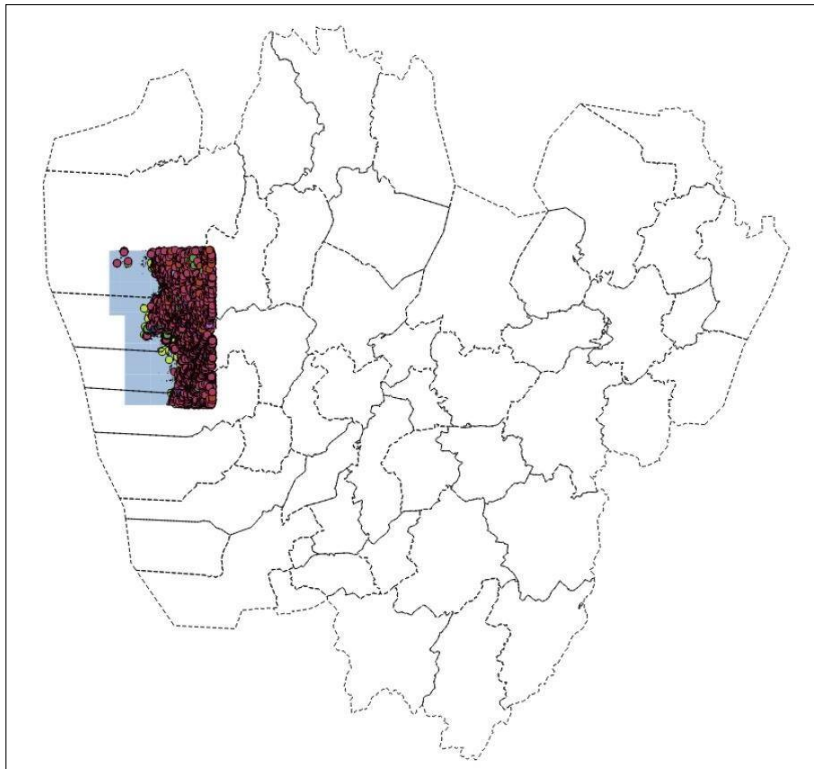
Start by locating Sotenäs. Open "Select by expression". Select Sotenäs as shown below. To zoom the map to Sotenäs press Zoom map to the selected rows in the attribute table, or toolbar.
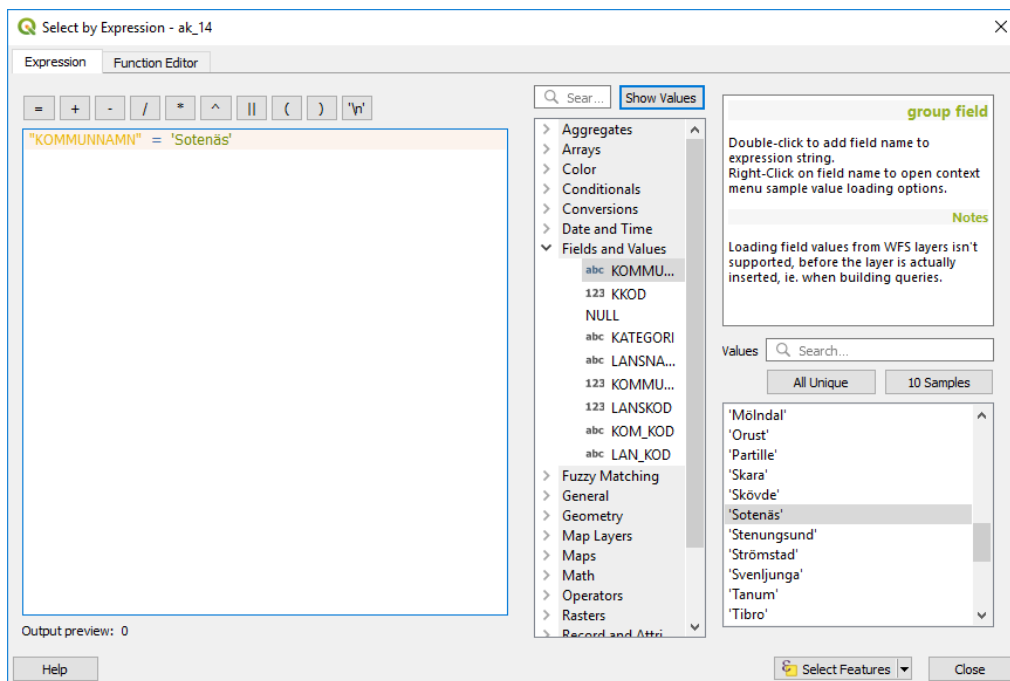

Right-click the layer and choose **Save as...** and remember to save as ESRI shapefile and select **Save only selected features**.

2. Place the values

This paragraph is based on what you learned during the exercise 2. Open the attribute table to the layer **bs_64_2_11**. There you will see that there are many types of buildings. Sotenäs has decided to treat different buildings in different ways. They believe that the residential houses and farms should have a greater influence on "the disturbance rate" Create a new field called "value".

All farms will have the value 3, all the houses regardless of size category will have the value 2 and all other construction/buildings should have a value of 1.

How can you do this best? Start by creating a new field (column) with the name "value" of the type "Integer".
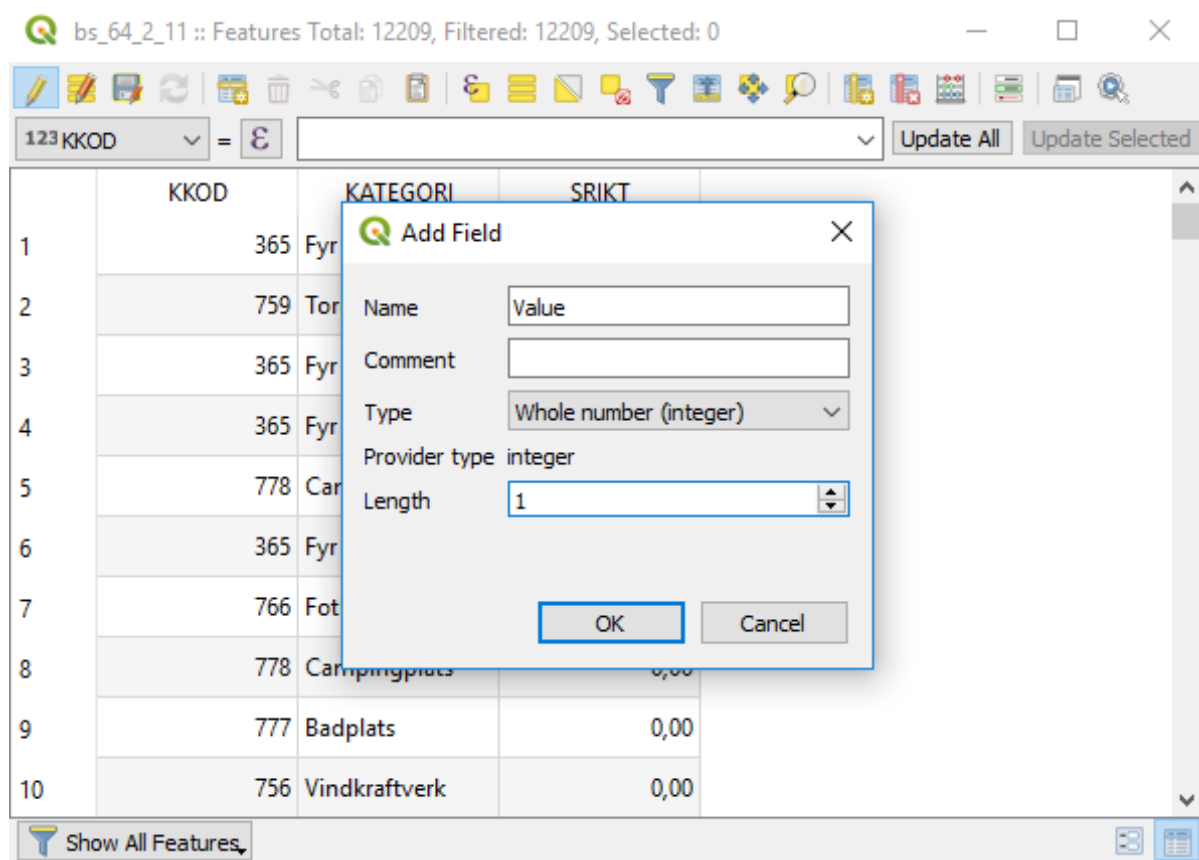
Open Field Calculator and enter the expression that appears in the image below. Make sure you select the "Varde" field and selecting Update existing fields.
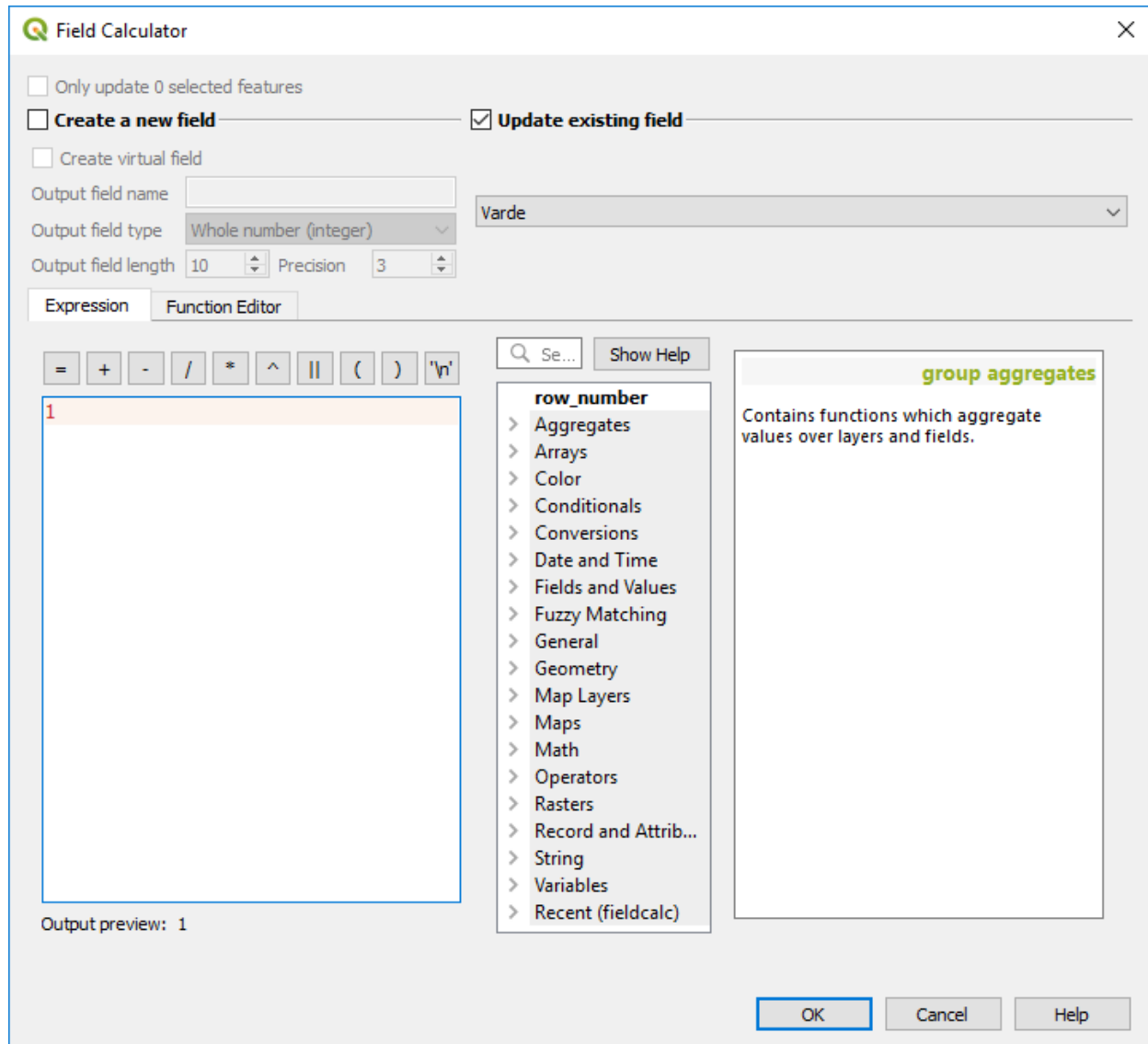
Now, all cells in the field should have the value 1. The next step is to select all the farms. If you look at the table data, you see that the features within the "KATEGORI" Farm (Gård) have a KKOD value which is 731. This you will take advantage of. **Open Select the object with an expression**. Double-click the "KKOD", press = button and enter 731 with the keyboard.

Press Select! Now you see that you have got a selection of all farms. Open field calculator and check Update only selected object and Updating existing fields (make sure you update "Varde" field and not KKOD!). Now enter in 3 where you entered in 1 last time. Now all farms have the value 3. Now remains only the houses. For the houses there are three different KKOD's, 733,735 and 736. A selection of different conditions can be created either in one go or in partial steps. Begin with **Select features using an expression** again. Double-click the "KKOD" press = button, enter 733, press the **OR** button, double-click "KKOD" again, = button, enter 735, the **OR** button again, double-click on "KKOD" press = button and enter 736. Now it will be like this: "KKOD" = 733 OR "KKOD" = 735 OR "KKOD" = 736.

Alternatively, you can also use KATEGORI. In such case it will be:

"KATEGORI" = 'Hus, storleksklass 1' OR "KATEGORI" = 'Hus, storleksklass 2' OR

"KATEGORI" = 'Hus, storleksklass 3'

Press **Select**, and now all the houses selected! Use **Field Calculator** again and give all the houses value 2.
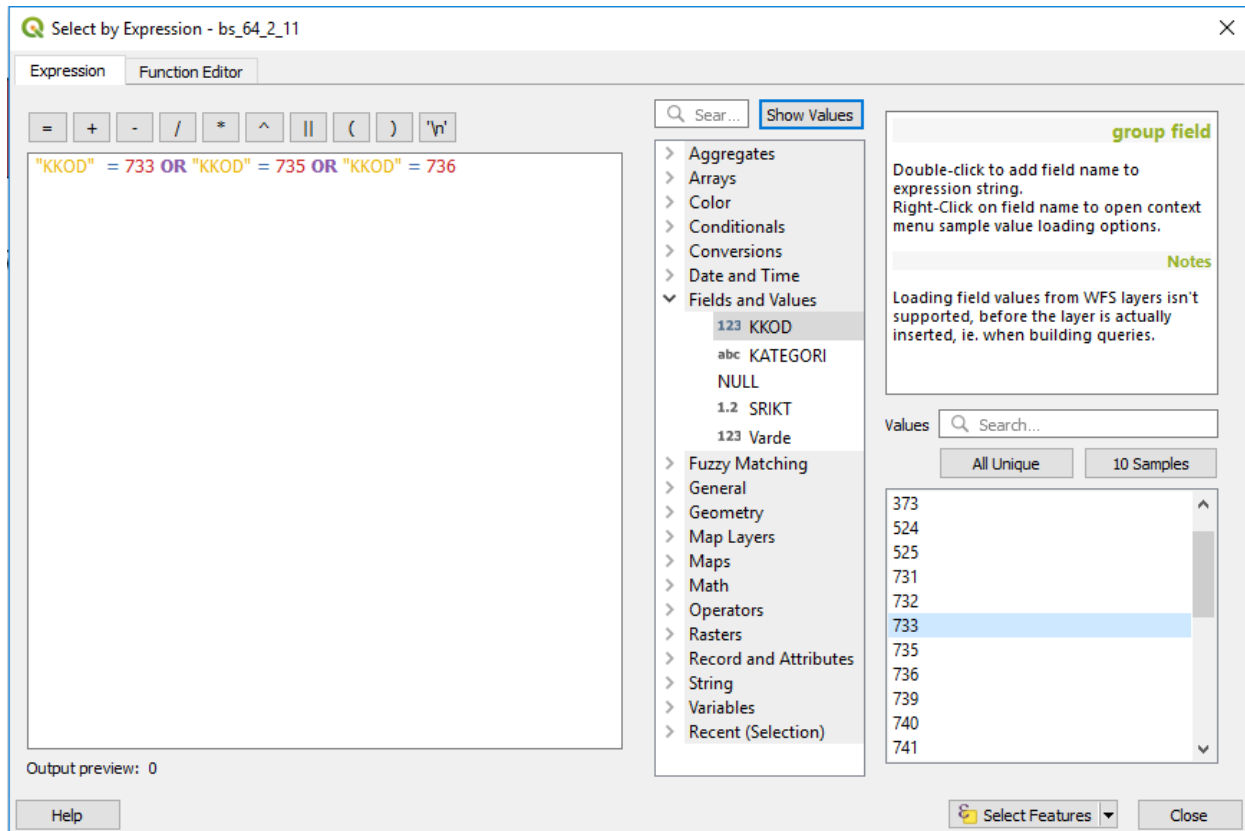

Tip: If you press the button all unique you will get all the possible values in the table of the field you have selected.

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Now you can set a custom icon for your three value classes on the map to help identify the spatial
distribution of different house types.
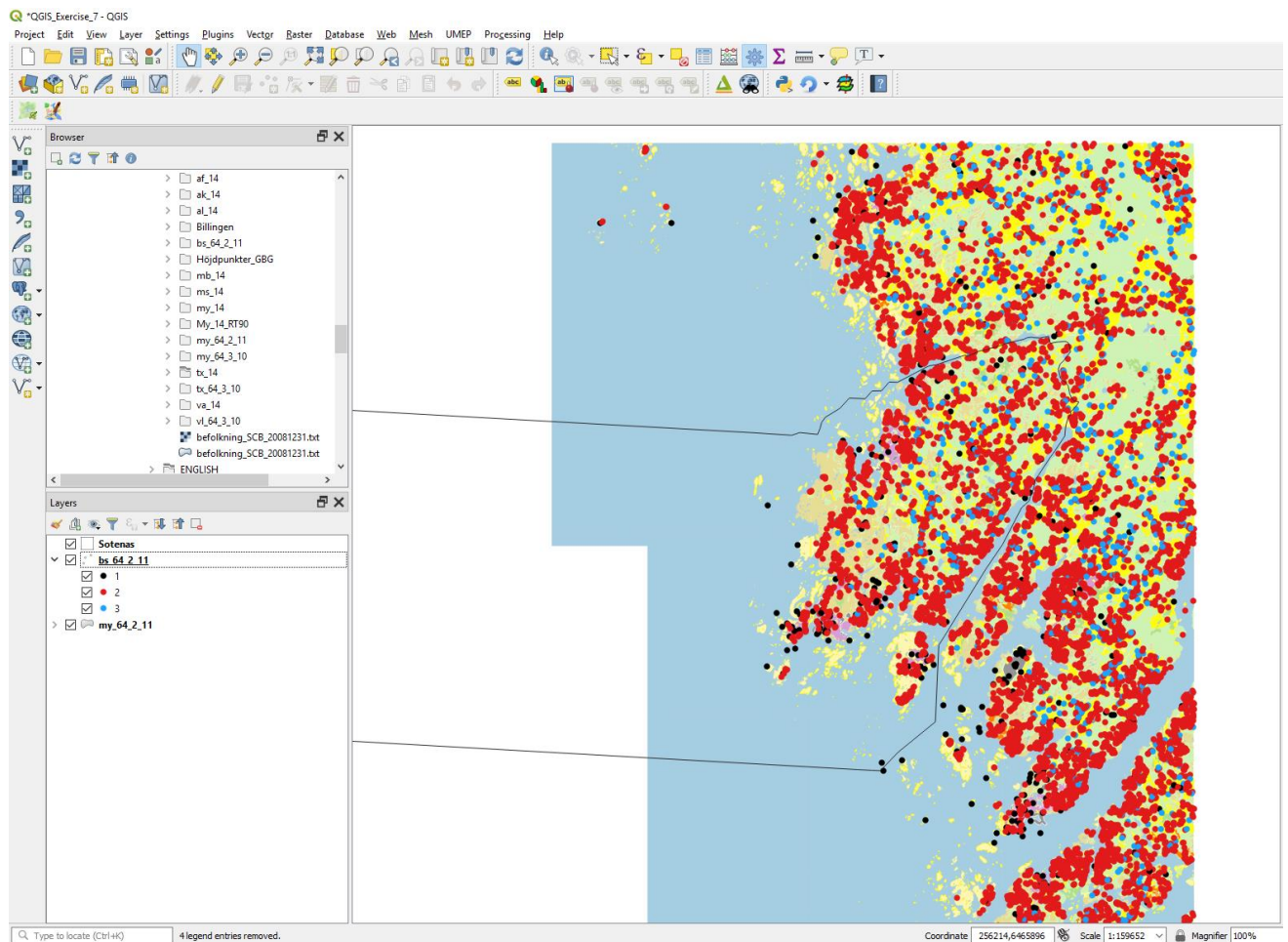
3. Selection by attribute

Now you will begin the selection process. To reset all selections, select "**deselect features from all layers**". You will also select all "vattenytor" from **my_64_2_11**. Save "vattenytor" as a new layer by right-clicking on **my_64_2_11** and select Save As ... and **save only selected objects**.
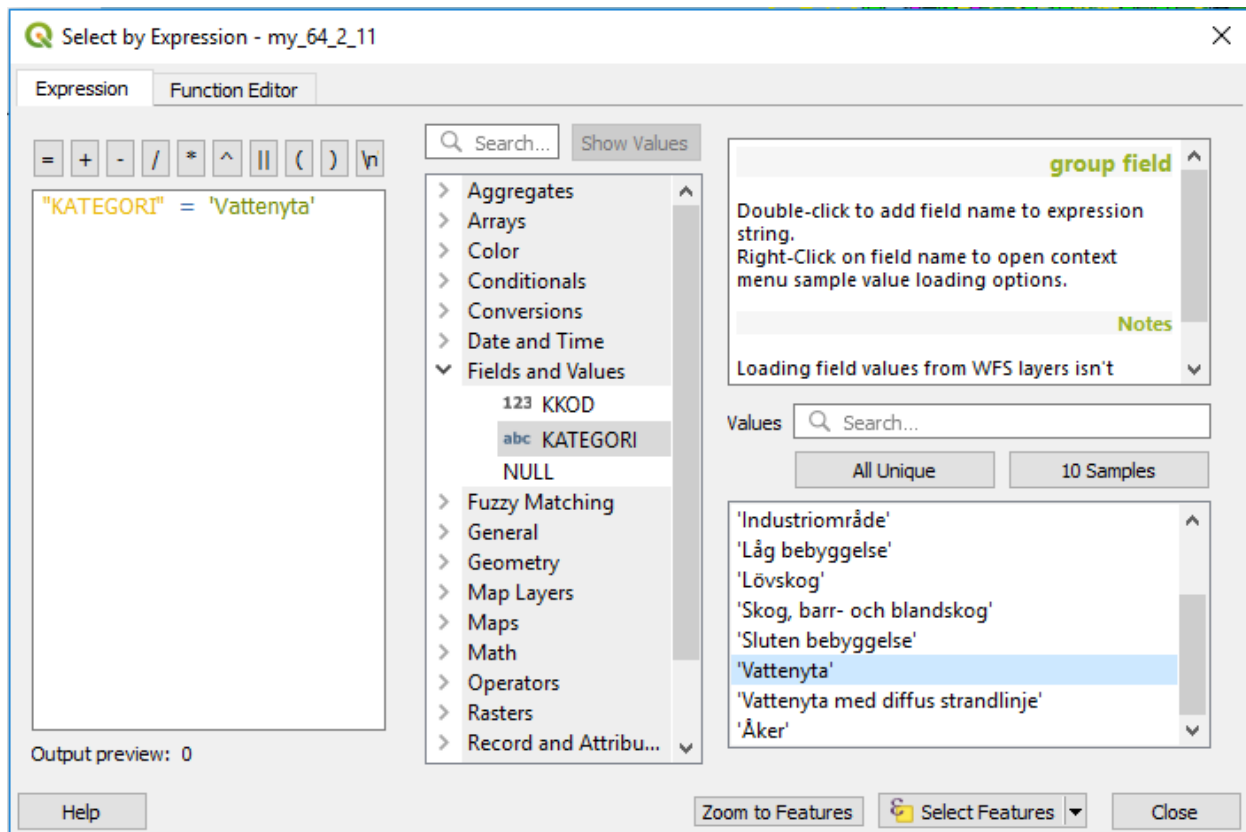

To get the distance of 100 meters from the water, you will use the tool **Fixed-distance buffer**. It can be found under **Vector → Geoprocessing Tools → Buffer**. Fill in according to the figure:
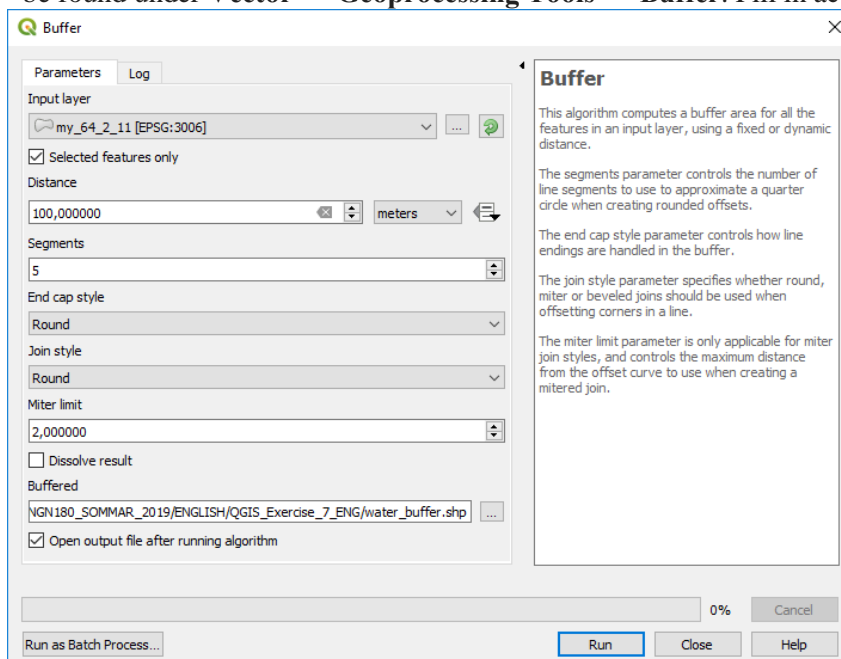
4. Selection based on location

The municipality is interested only in residential buildings. Therefore, we want to select all the houses (value = 2) from **bs_64_2_11**. Create a new layer with only buildings with value 2. You do this in the attribute table by using "**select features using an expression**", and right click and press the **Save As**...

Just to get the selected buildings in Sotenäs municipality use the tool **Intersection**. It can be found under Vector → Geoprocessing Tools → Intersect. Input vector layer should be the layer of houses that have value 2, and the Overlay layer to be Sotenäs municipality. Save layer on a suitable location and rename it to sotenas_varde2. See the figure below.
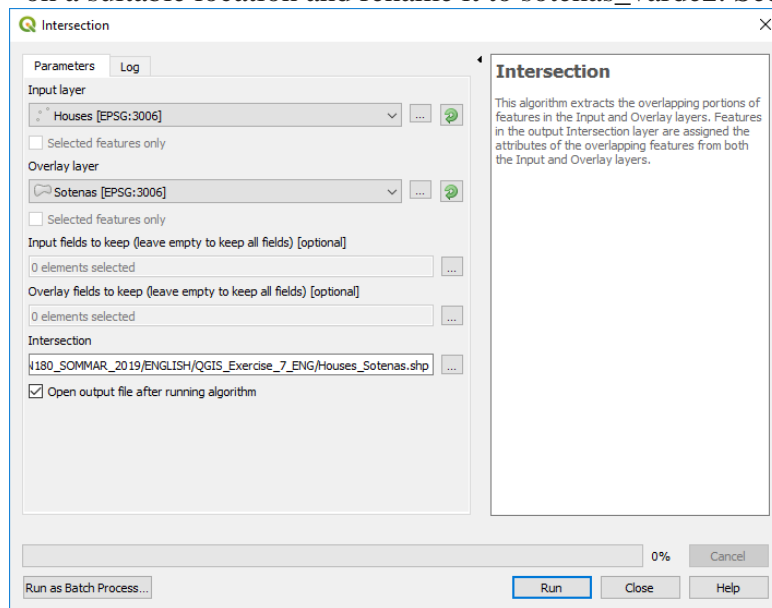
To see which of the buildings located within 100 meters of water surfaces, use the tool **Intersect** again. Input vector layer should be the layer containing buildings with value 2 in Sotenäs municipality. Intersect layer should be the layer of the water surfaces that you have buffered to 100 meters. Save the layer at a suitable location and rename it to buildings_100m.

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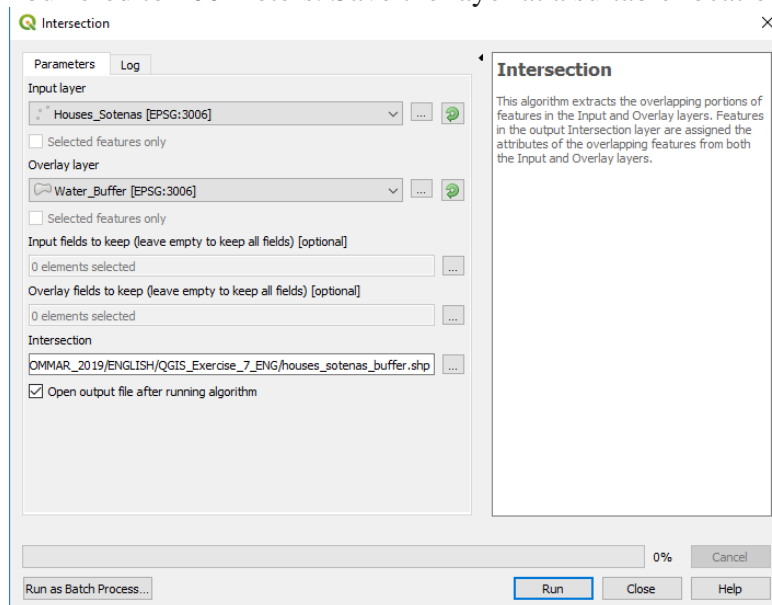
This may take some time for the program to process. Have patience, your final map will look like this:
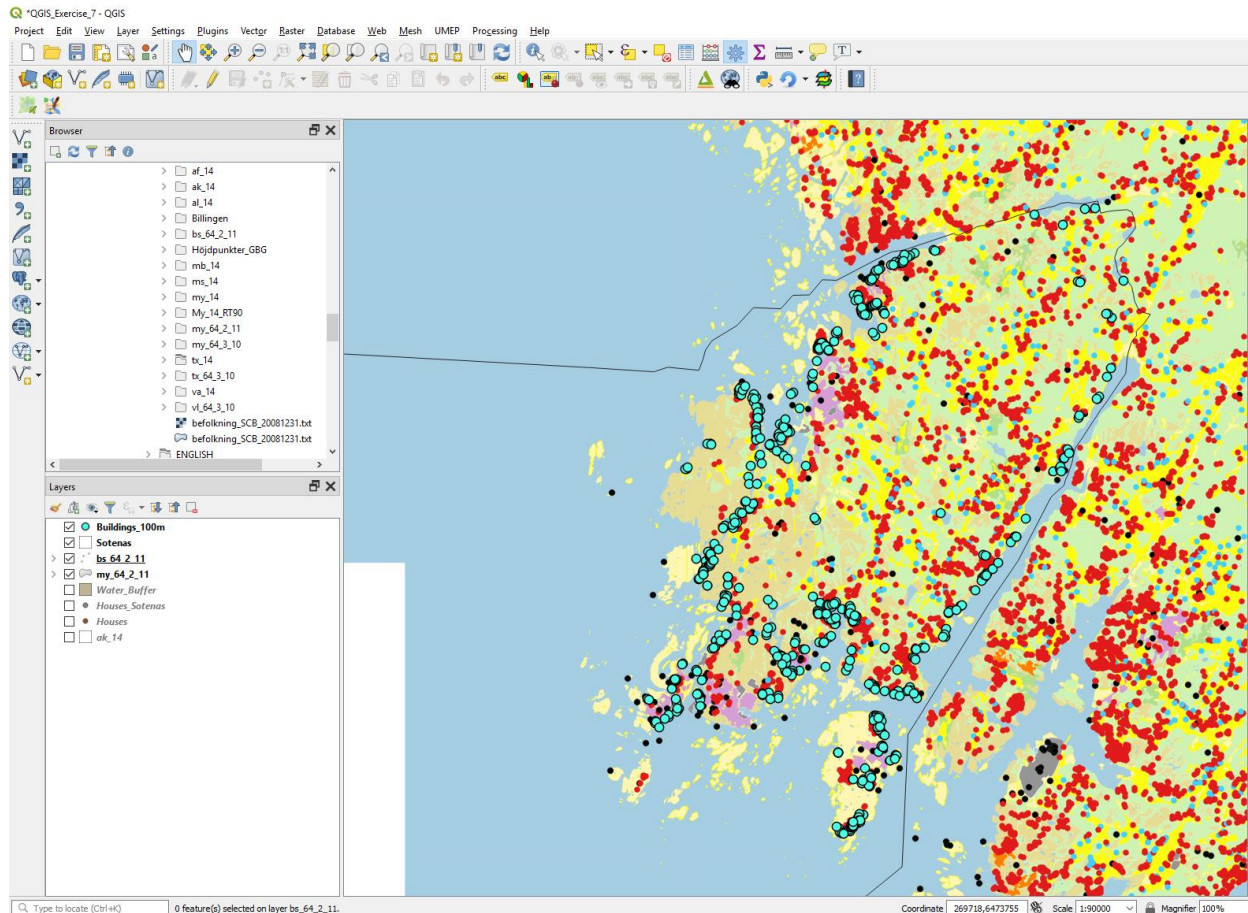

5. Summarize

To sum up the number of residential buildings located closer than 100 meters from sea or lake, just open the attribute table to buildings_100m and read the total number of items. It should say 595.

If you look through the attribute table you can see that the layer consisting almost merely of Code 753 that is House size class 1. You can also obtain more detailed statistics by selecting Vector → Analysis → Basic Statistics.

6. Layout preparations

The map should be as easy to read as possible, to accomplish this a good idea can be to reduce the number of classes displayed in the map and legend. This can be done by merging similar classes in a layer. Open **Layer properties** for **my_64_2_11.** Select similar classes through CTRL + left click. Right click and select **Merge categories** and give the new class a suitable name. It is possible to reverse this step.
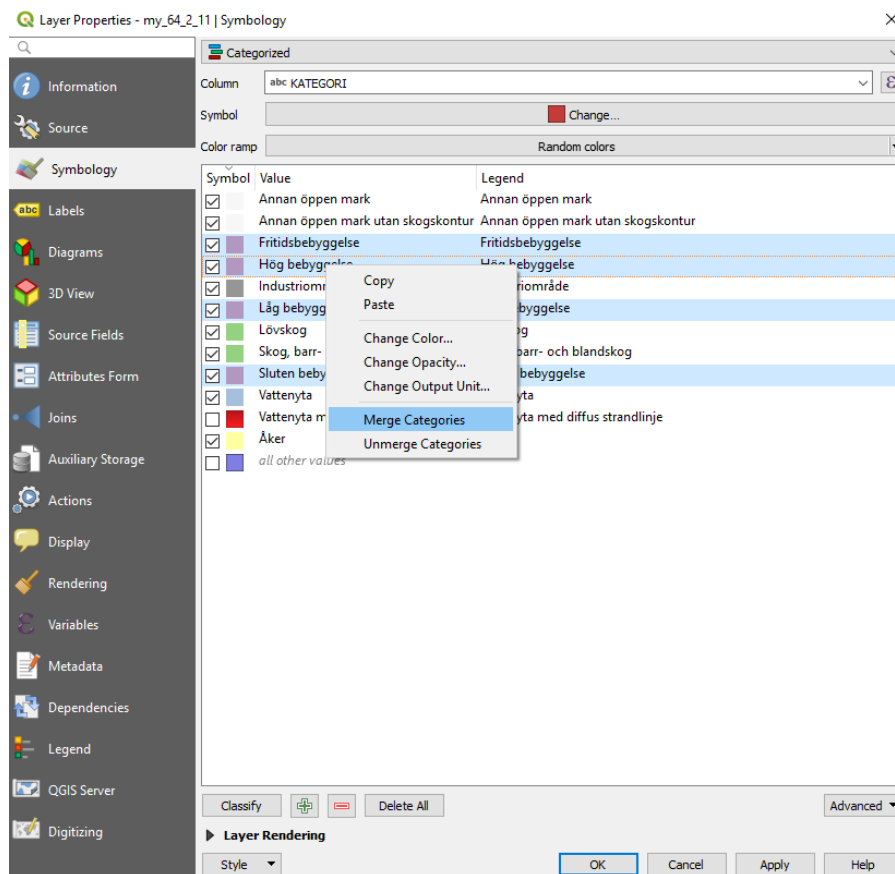
Previously you learned how to turn off the grid in the map by changing the **Stroke color**. This can also be done by **Dissolving** the land use layer and chose **Kategori** under **Dissolve Field(s)**. See *Exercise 6* for a step by step instruction.

Note. Sometimes when you use a tool you can have a problem with *Invalid geometries.* If you get this error message you can use a tool called **Fix geometries.** Use your layer as Input and then continue to work with the new layer that you created.

7. Layout

Now create a map layout according to the instructions for submitting and submit your final map as a PDF (Layout - Export as PDF) on Canvas. Be aware that the legend should only contain object that are shown in the map and vice versa, sometimes a project might contain many layers that are not needed in the legend. To verify this, use the **Filter legend by map content** in the legend properties.
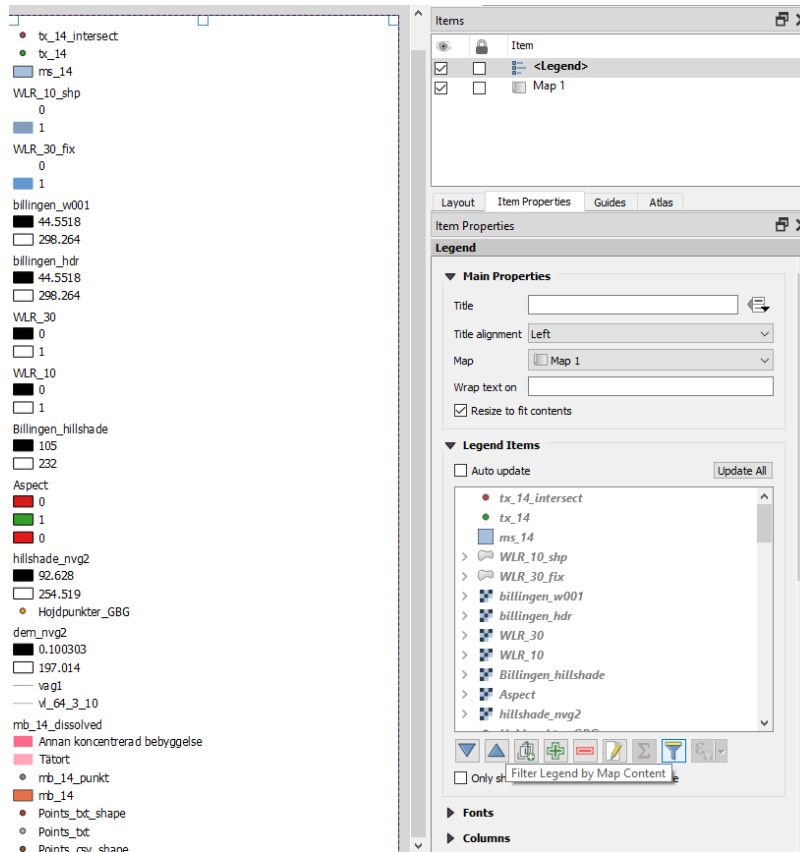
End of Exercise 7, see an example map on the next page!

En informativ titel
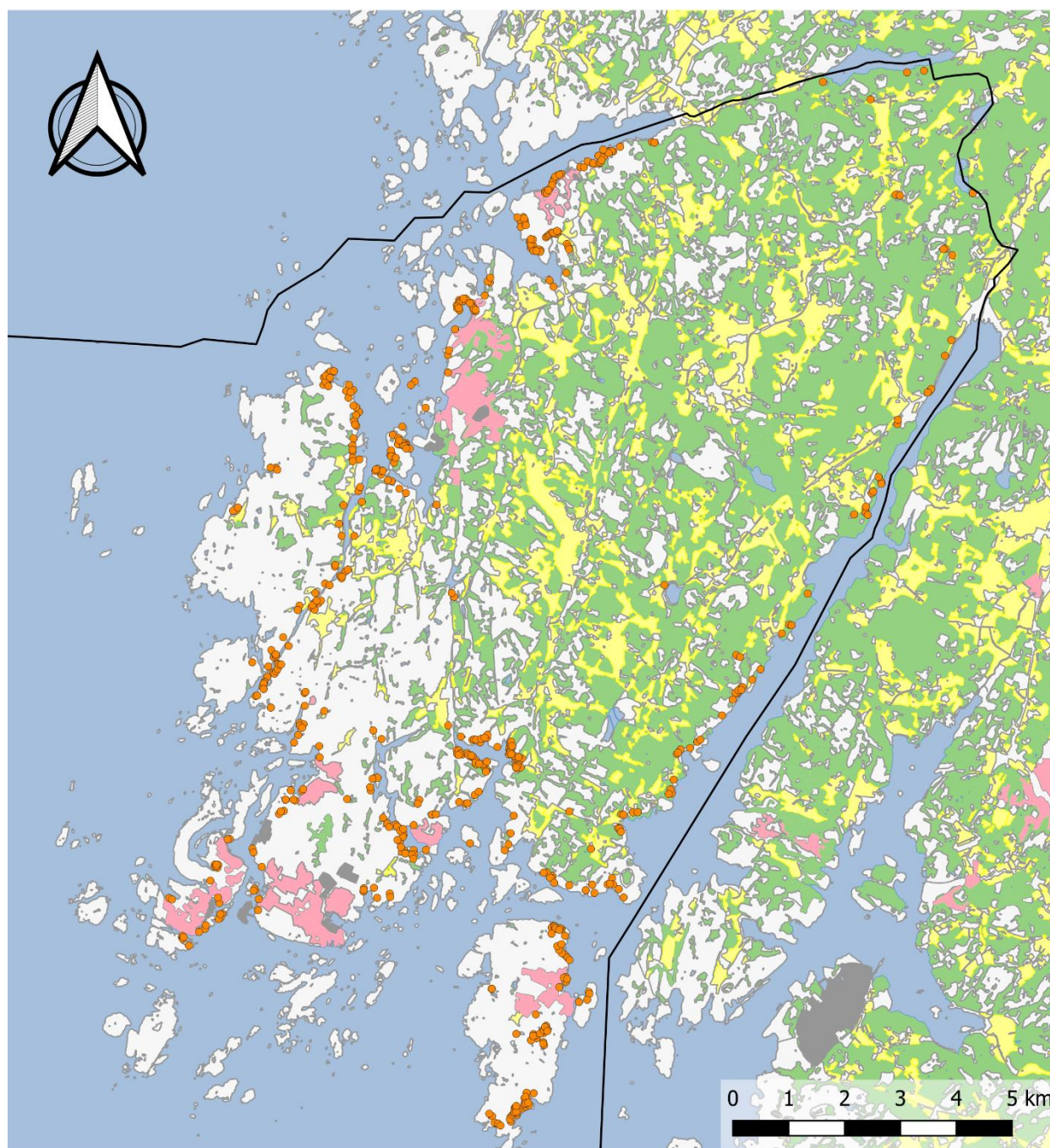
Legend

——	Sotenäs kommun	🟩	Skog
•	Strandnära hus	🟦	Vattenyta

Marktyp

🟪	Bebyggelse	🟨	Åker
⬛	Industriområde	⬜	Öppen mark

Eventuell beskrivning av kartan

Ditt namn