Data Query- 1

Spatial Querying

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Objective: To get familiar with constructing spatial queries in Quantum GIS.

Software: Quantum GIS

Level: Beginner

Time required: 2 Hour

Prerequisites and Geospatial Skills:

1. Quantum GIS should be installed on the computer
2. Basic knowledge about the QGIS interface
3. Should have completed Exercise ID: IGET_QGIS_001, IGET_QGIS_007

Reading

1. Sutton, T., Dassau, O., & Sutton, M. (2009). A gentle introduction to GIS. *Chief Directorate: Spatial Planning & Information, Eastern Cape*.

**Tutorial Data:** Tutorial data can be downloaded from IGET_GIS_009

Introduction

We have already seen attribute querying in previous tutorial. Now we will learn about spatial querying. Spatial query selects geographical features based on location and spatial relationships. It uses spatial logic or spatial relationships among the data-sets such as adjacency, intersect and containment within etc. In this tutorial we will focus on building spatial queries to retrieve the information in a useful form and export the results as new shape files.

Query No 1: Find out the road segments in Maharashtra where road cross over the river.

Solution: In order to solve this query, we need road and river vector data of Maharashtra state. The shape files named 'road_maha' and 'River_Maha' are corresponds to road and river network of Maharashtra in the supplied tutorial data.

1. Start the Quantum GIS Desktop application and Open all the shape files supplied to you in the Map canvas.
2. Go to Main menu bar → *Vector* → *Spatial Query* → *Spatial Query.*
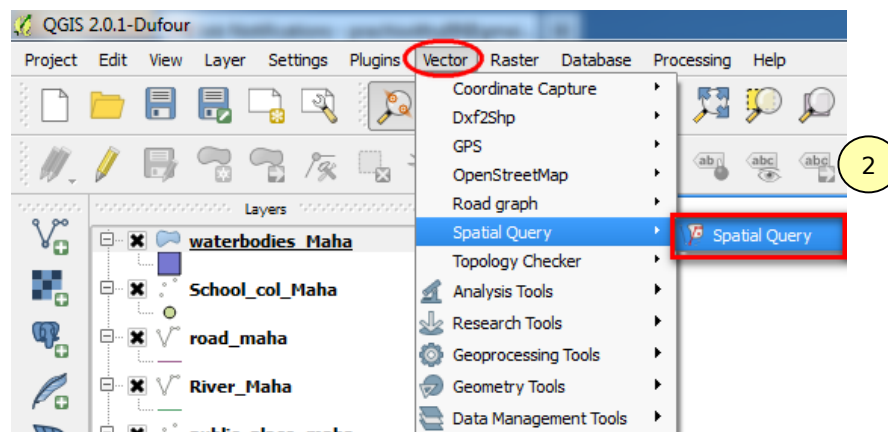
3. Spatial query window will open. This window contains four sections.

i.   The source feature needs to be added in the first section i.e., '*Select source features from*'. Source feature is the feature on which spatial query is to be carried out. In this query it will be Road dataset. So click on the arrow next to vector layer name to access dropdown list of vector files loaded to map canvas and choose '*road_maha*' from the list.
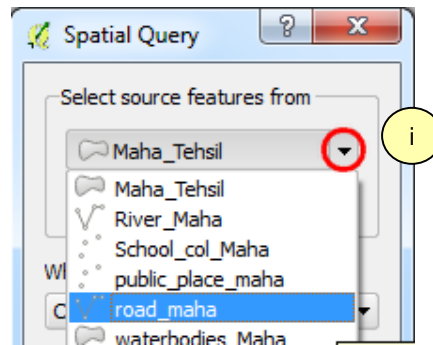
ii.   In the second section '*Where the feature*', here we have to select the spatial relationship / criteria which satisfies to carry out the query. To find where the road crosses over rivers, '*crosses*' criteria is to be selected. Therefore select '***crosses***' criteria from the scroll down list.

iii. '*Reference feature of*' is in third section, here we have to choose a vector layer which you would be using as your reference layer. In this case, it would be 'River_Maha' layer as reference feature.

iv.   In the fourth section '*And Use the result to*', select Create new selection
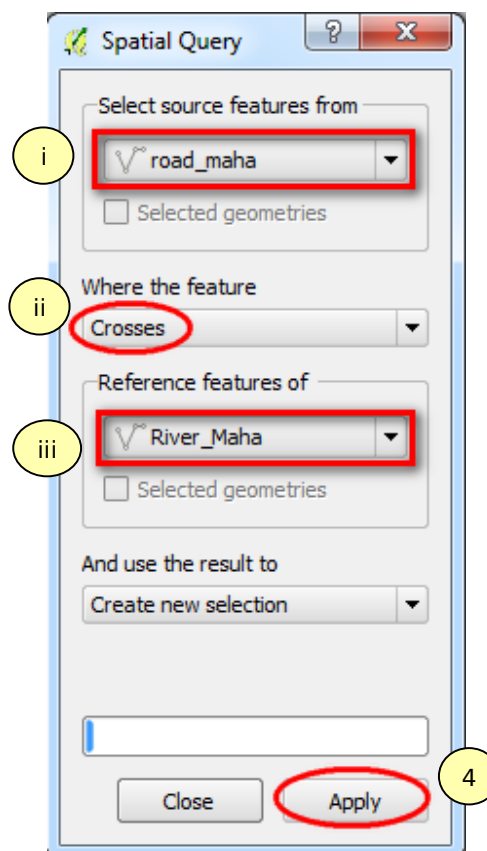
4. Once the required inputs filled out, Click '***Apply'.*** Now you will be presented with the '*Spatial Query*' window.
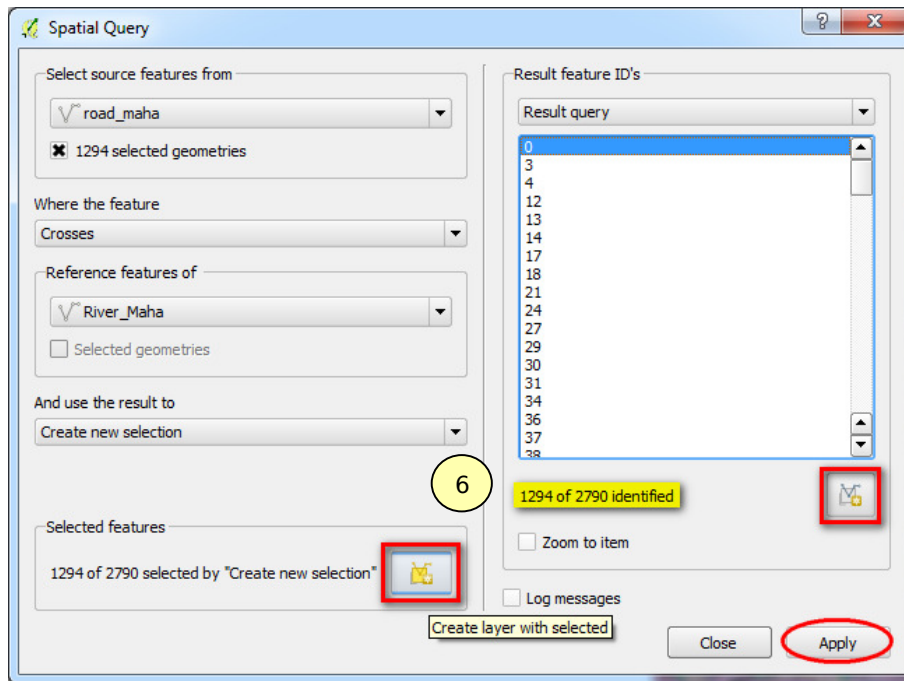
5. The features satisfying the criteria will be marked in yellow color. If you see the map canvas the lines marked in yellow are roads segments which cross over rivers. By this query we can find out the road segments which pass over the rivers and also we could check whether bridges are existing on these road segments or not?
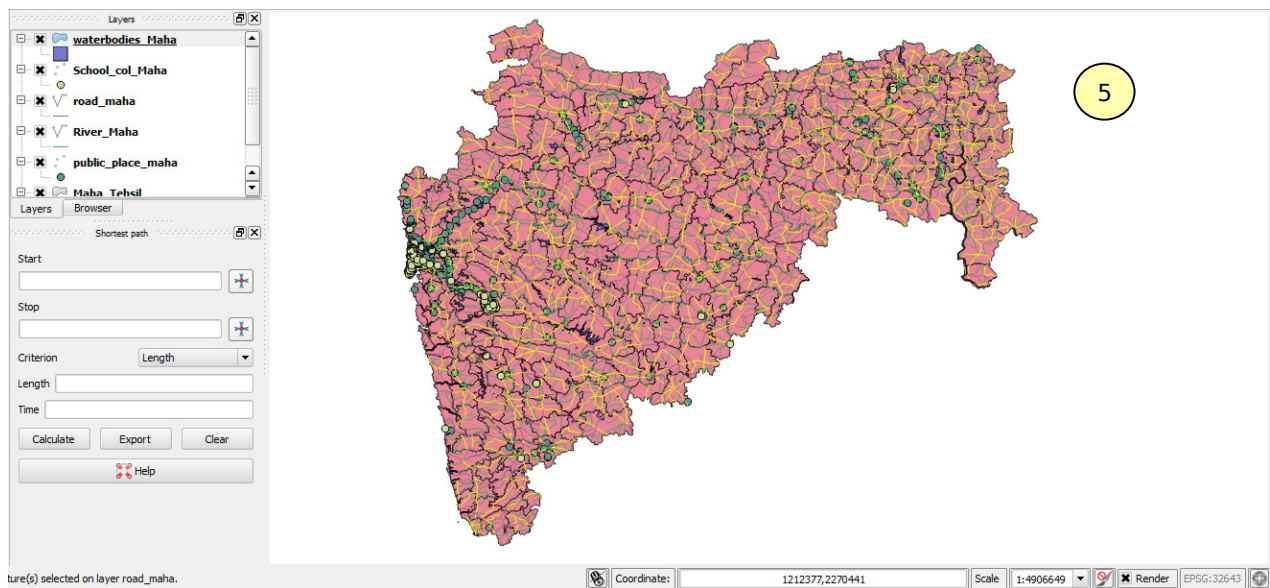
6. The '*spatial Query*' window gives you the number of selected features along with their feature ID's. We can save these selected features in to a new layer with the help of / icon. Click on / icon, it will create new layer of the selected features→ Click '***Apply***'→ '***Close***'.

7. We can save the selected features as a separate layer and create a presentable map along with road network layer. Now save the layer into desired location.

Note 1: Before proceeding to the next query deselect all the selected features. Click on 'Deselect feature from All Layers' tool from Attribute toolbar.
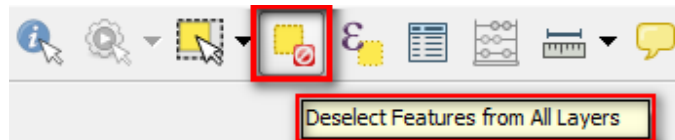

Query No 2: Find out the river channels that are not flowing through Ahmadnagar District.

Solution: To answer the above query, we will use Maharashtra's Tehsil and River shape files, i.e, 'Maha_teshil.shp', 'river_maha.shp' respectively.
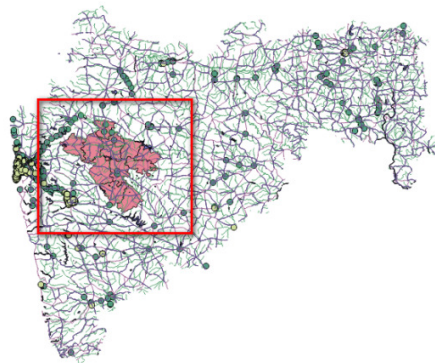
1. Since we want rivers flowing outside Ahmadnagar, firstly we will select Ahmadnagar district from the Maharashtra state, this can be done by using attribute query and we will perform spatial query on the selected data from attribute query. Right click on 'maha_Tehsil' and select '*Filter...*'. You will be presented with '*Query Builder*' window.
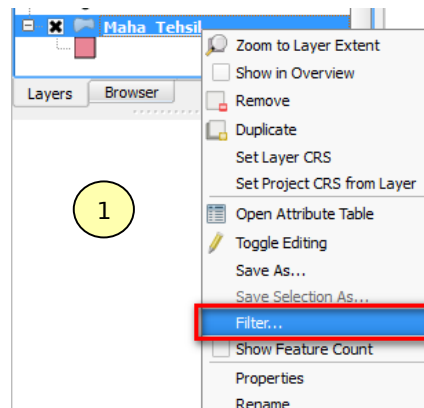
2. Select all the tehsils of Ahmadnagar district by using attribute query[1], i.e., double click on **"NAME_2"** from fields window and click on click on *'='* in the *'Operators' section*

3. Then to see all the values in *Name_2* field click on '***All***' in '*Values*' section in window and select **Ahmednagar** from values.

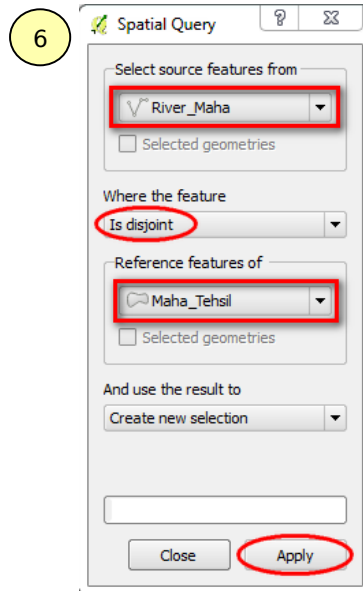4. In short we need to create an expression **"NAME_2" = 'Ahmednagar'** and Click '***OK***'.
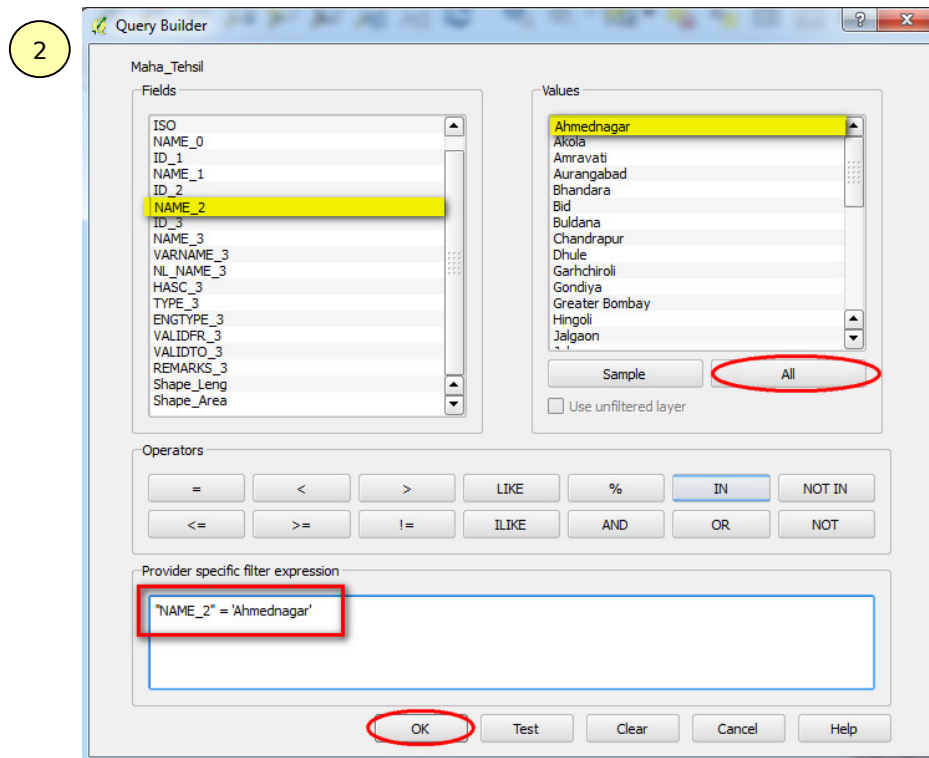
5. This will select all the tehsils from Ahmednagar district.

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6. Open *spatial* query window(Refer *Query. 1*), give source layer as 'R*iver_maha'* and reference feature as **'**maha_Tehsil**'** and select '***Is disjoint'*** as spatial criteria under '*where the feature*' section→ Click '***Apply*'**.

7. Now you will be presented with the '*Spatial Query*' window. You will find the number of feature selected along with feature ID's. At the same time the river channels which are not flowing through Ahmadnagar would be highlighted in yellow color in map canvas.
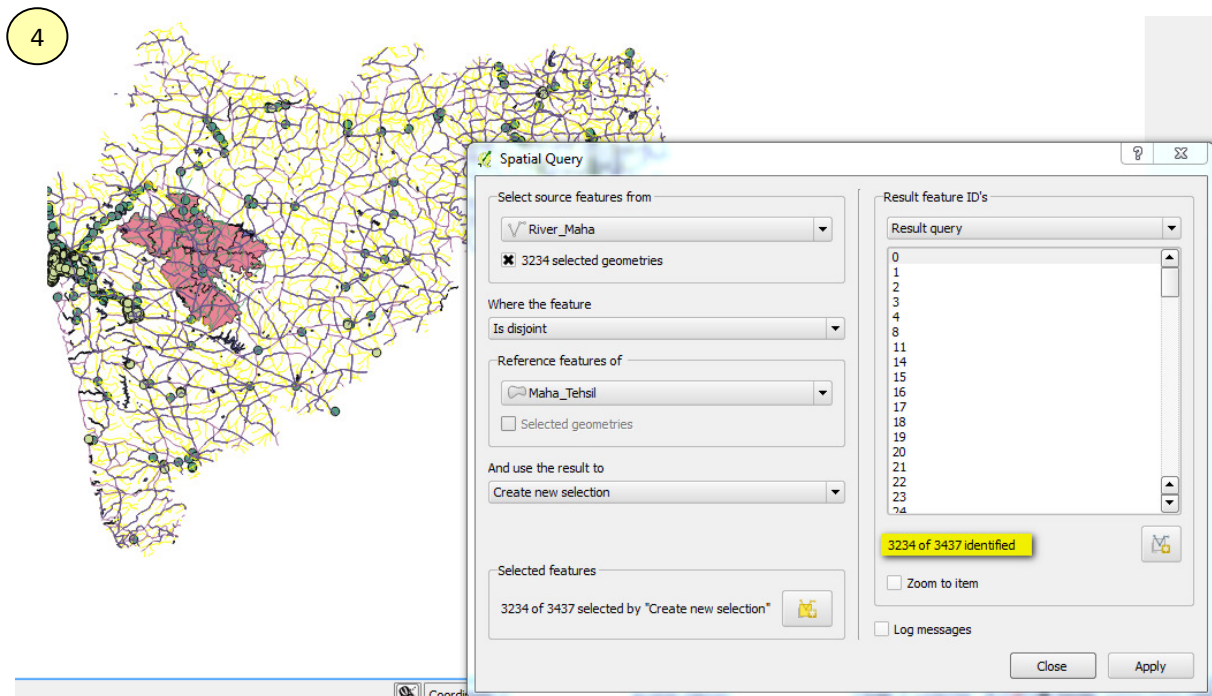
8. Save the selection as separate layer and create a map. Close the *'Spatial Query'* window.

*Note 2: Before proceeding to the next query, click on **'Clear'➔'OK'** in the Query builder 'Maha_Tehsil'. It unselects the Ahmadnagar districts and returns the whole tehsil of Maharashtra andclick on 'Deselect feature from All Layers' tool from Attribute toolbar.*

Query No 3: Find out the public places that are within Greater Mumbai.

Solution: To solve this query we need 'Maha_Tehsil' layer and 'public_places_maha' layer. In this query you have to follow the same steps as in query 2.
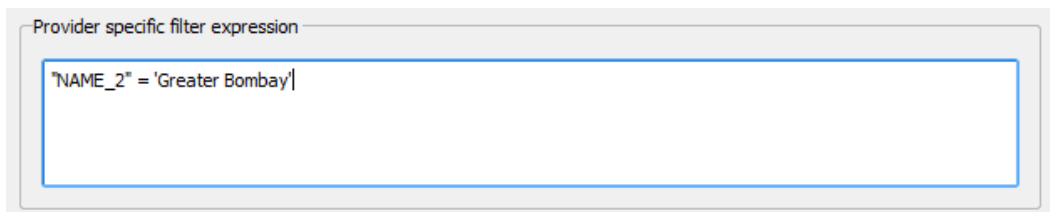

Use spatial criteria '***Within***' instead of '***Is disjoint'***. The Result would be look like below.
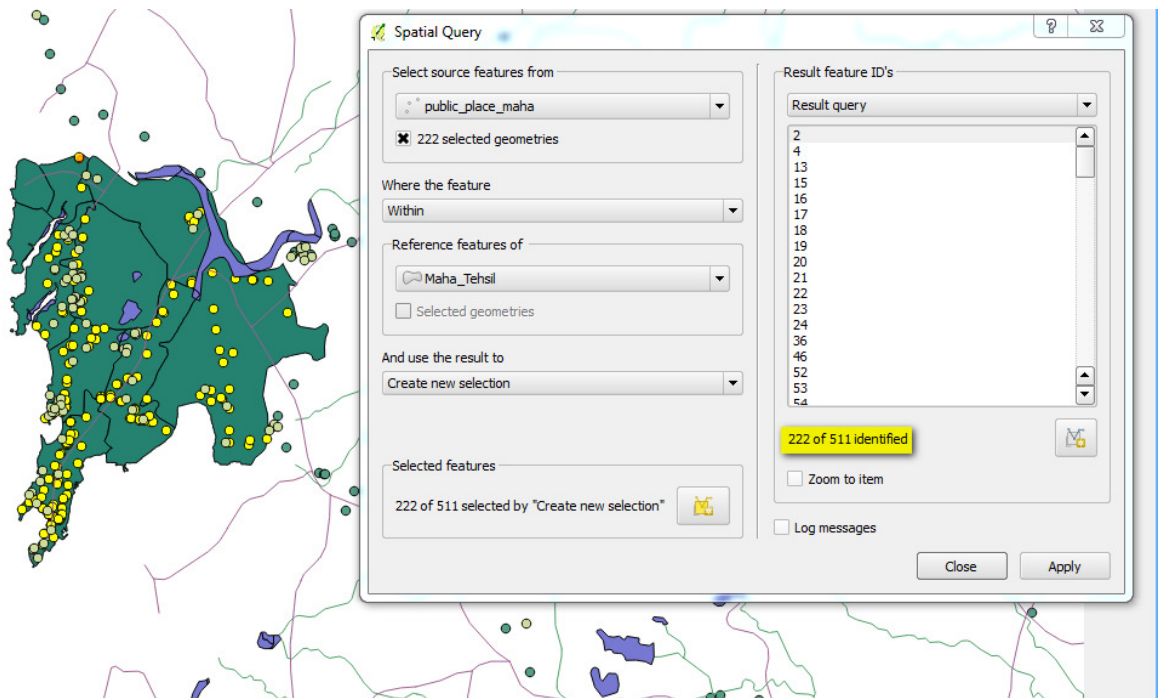
Query No 4: Find out the schools in Maharashtra that could be affected by floods? Let assume the flood zone is at about 3 km from the river bank.

Solution: To answer this task we need school and river data of Maharashtra. '*School_col_Maha.shp*' contains the school location and '*River_Maha.shp*' contains River network of Maharashtra.

1. To find out Rivers that could be affecting the schools in case floods, firstly we have to create a flood zone around the rivers with 3 Km by using *Buffer* function. To create a buffer around the river, Menu bar → *Vector* → *Geoprocessing tools* → *Buffer (s)*.
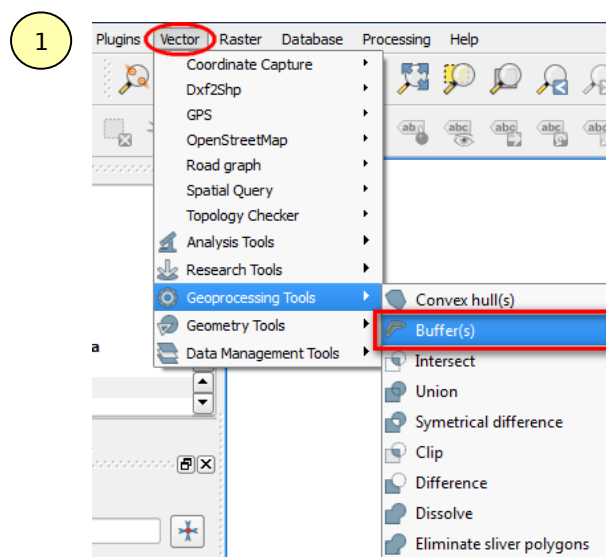

2. The '***Buffer(s)***' window will open. Select **Input vector layer** as '***River_Maha'.***
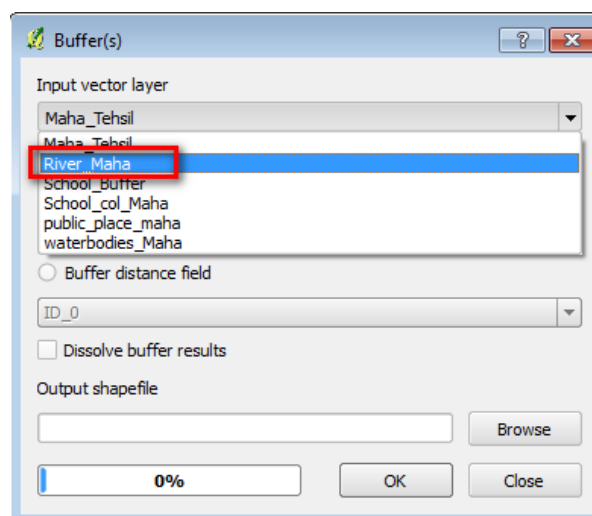
3. Specify 'Buffer Distance' as '**3000**' i.e 3km (Since our working unit is meter in UTM projection)
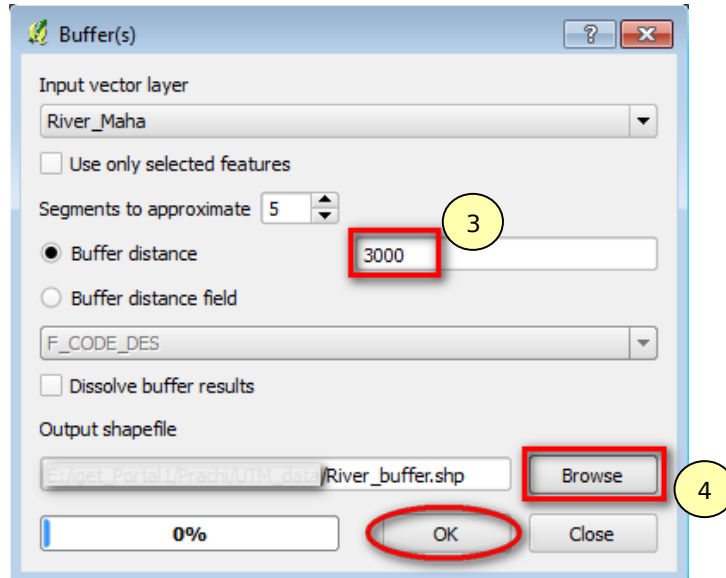
4. Save the output shapefile in desired location in local drive with a proper name. This can be done with the help of browse button. Once the inputs are given properly click on '**OK**'. If you asked to add the output layer to map canvas click on yes. The output will look as follows. Close the '*Buffer(s)*' window after the buffer done.
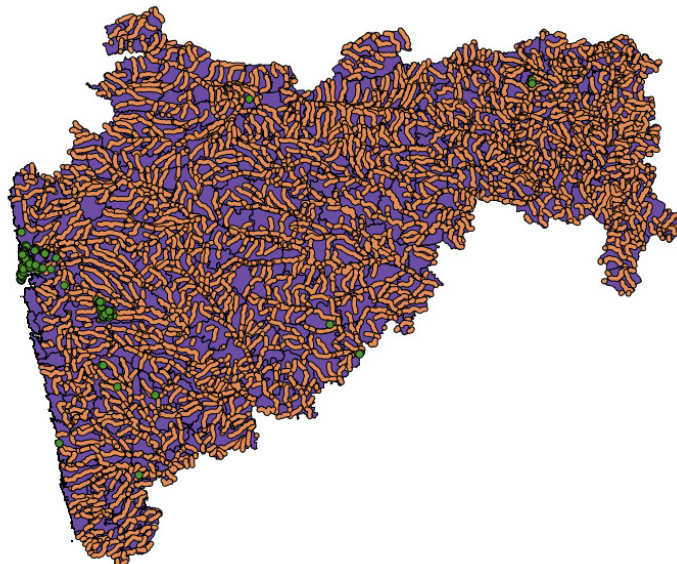
5. Since we are interested in finding the schools that could be affected by floods, we will run a spatial query with the '***within***' criteria to solve our problem. In '*Spatial query*' So the *source layer* will be '***School_col_Maha***'; fuction as '***within***' and *reference feature* as '***River_buffer***'
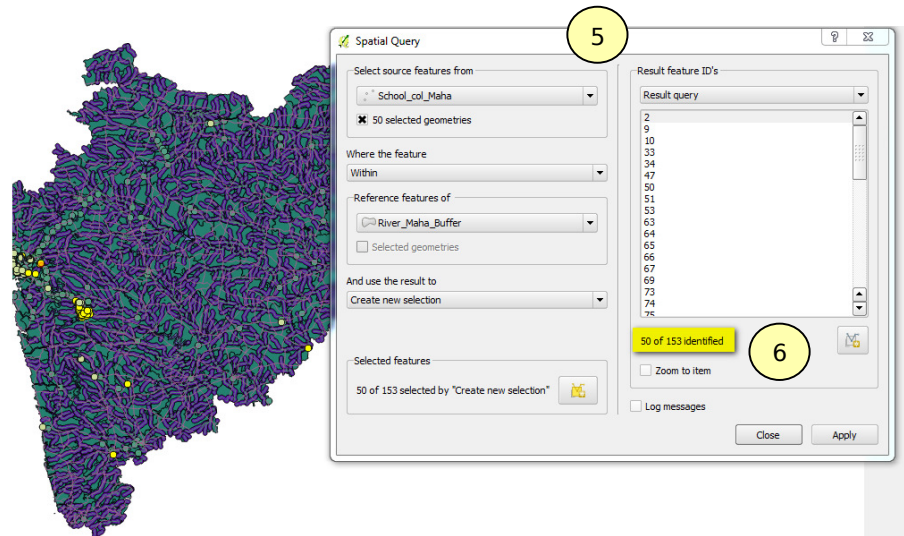

6. Unfortunately, there are 50 schools that could be affected in case of floods. Create a separate layer and make a meaningful map with the help of extracted layer and school data.
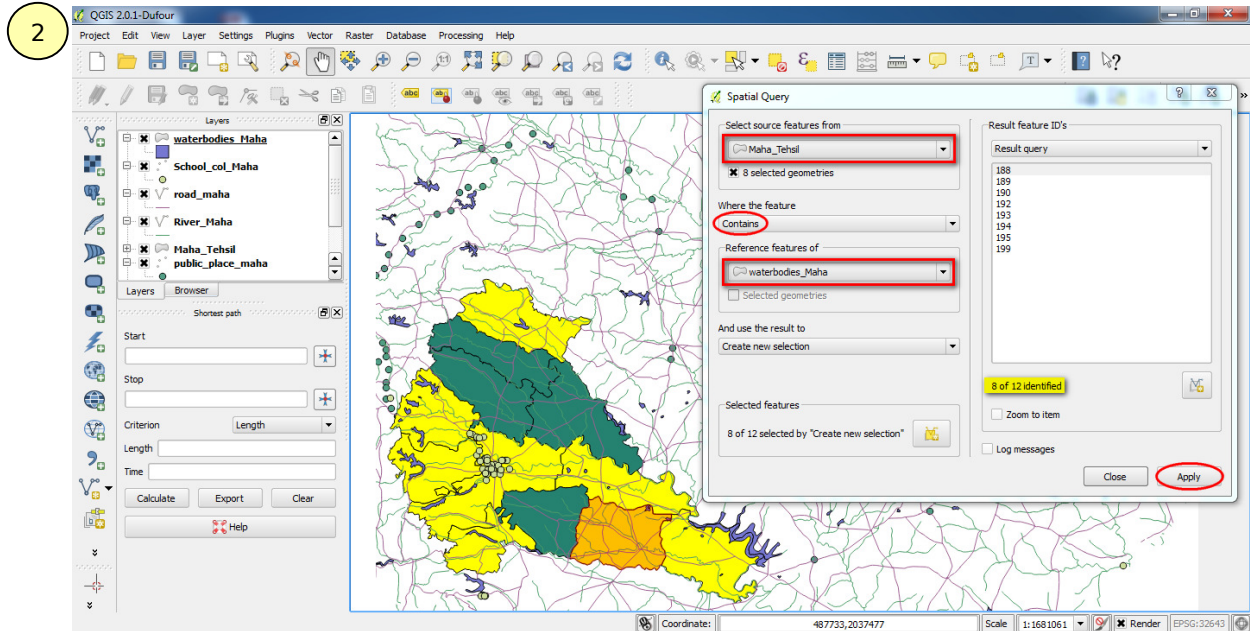
Query No 5: Find out the tehsils in Pune which contains water bodies such as lakes and Dams?

Solution: We will need 'Maha_Tehsil' and 'waterbodies_maha' layer to solve this query.

1. Select the Pune District by using attribute query (See *Query No: 2* for help).
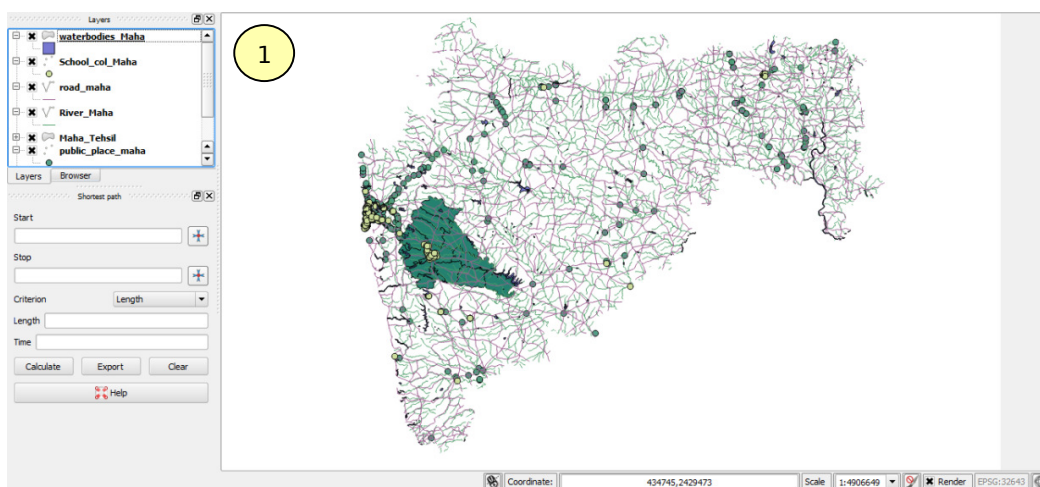
2. Open the '*Spatial query*' window and give source layer as '***Maha_Tehsil***', function as '***contains***' and reference layer as '***waterbodies_maha***' and click ***Apply.***

3. This will select all the tehsils in Pune which contains the water bodies. Create a separate layer and make a meaningful map.

Exercises:

1. Find out the river channels flowing in Akole district.
2. Find out the road network that intersects the water bodies within Ratnagiri district.

Hint: First find out water bodies that that are within Ratnagiri district. Save it as separate layer and then find out road network that intersects these water bodies.