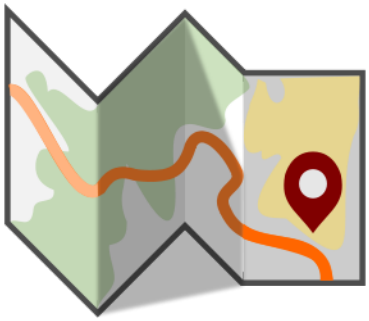
Calculating Line Lengths and Statistics

QGIS Tutorials and Tips



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Calculating Line Lengths and Statistics

QGIS has built-in functions to calculate various properties based on the geometry of the feature - such as length, area, perimeter etc. This tutorial will show how to use **Field Calculator** to add a column with a value representing length of each feature.

Overview of the task

We will use a polyline shapefile of railroads in North America and try to determine the total length of railroads in the United States.

Other skills you will learn

- Using expressions to select features.
- Re-projecting a layer from Geographic to Projected Coordinate Reference System(CRS).
- Viewing statistics for values of an attribute in a layer.

Get the data

Natural Earth has a public domain railroads dataset. Download the North America supplement zip file from the portal.

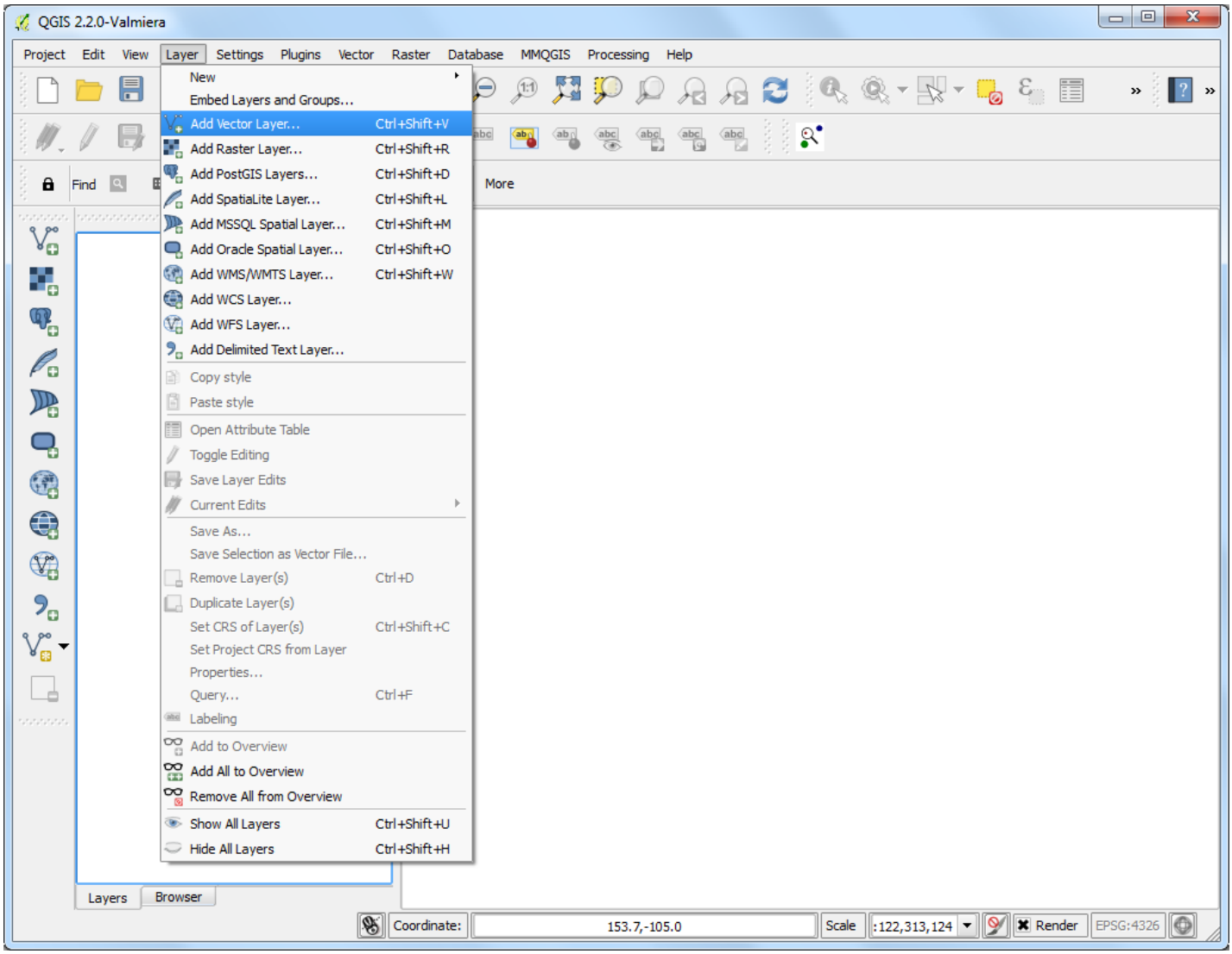
For convenience, you may directly download a copy of the dataset from the link below:

ne_10m_railroads_north_america..zip

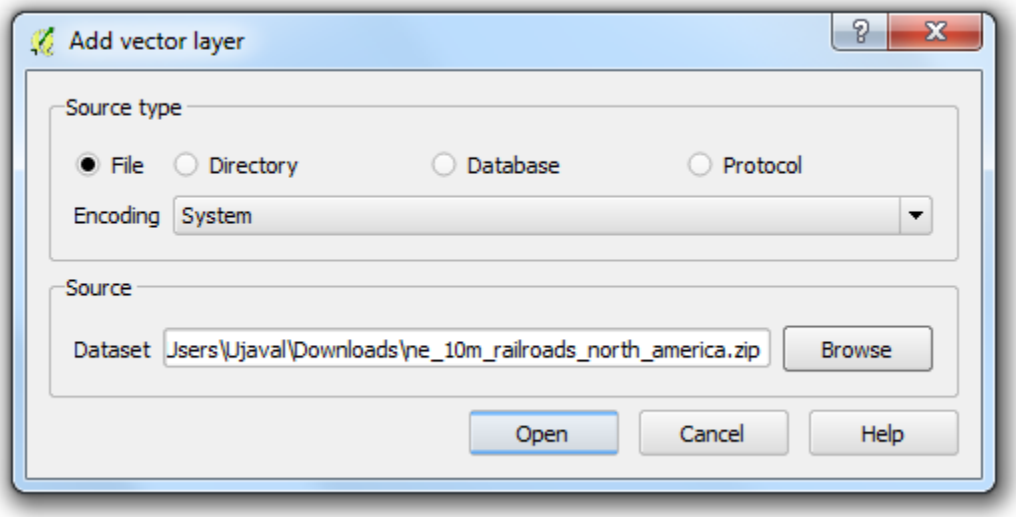
Data Source [NATURALEARTH]

Procedure

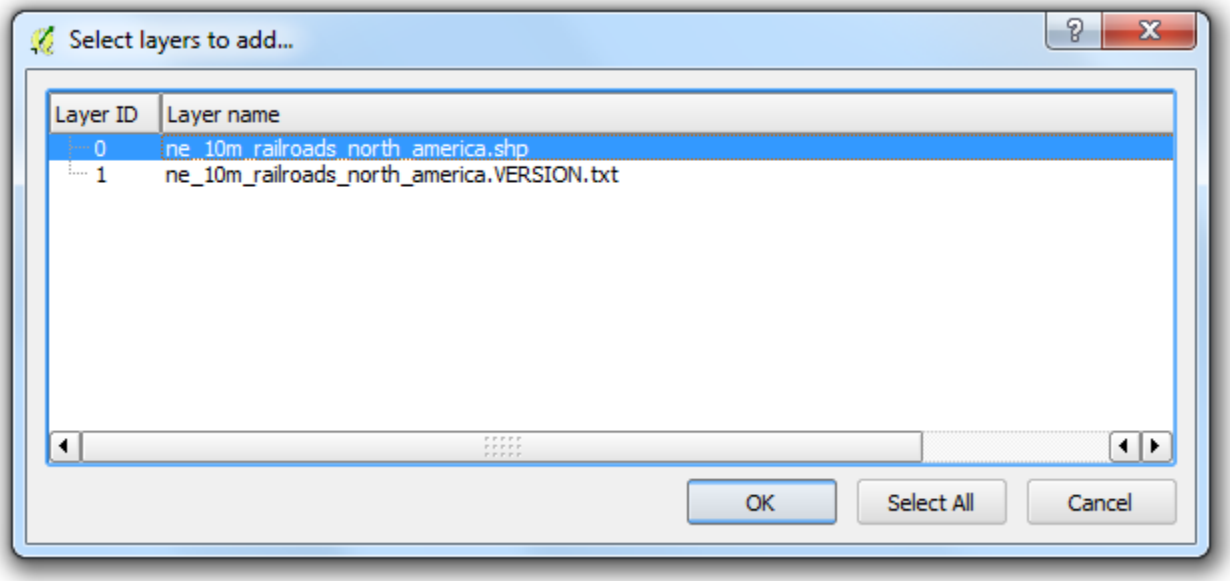
1. Go to Layer ▸ Add Vector Layer.



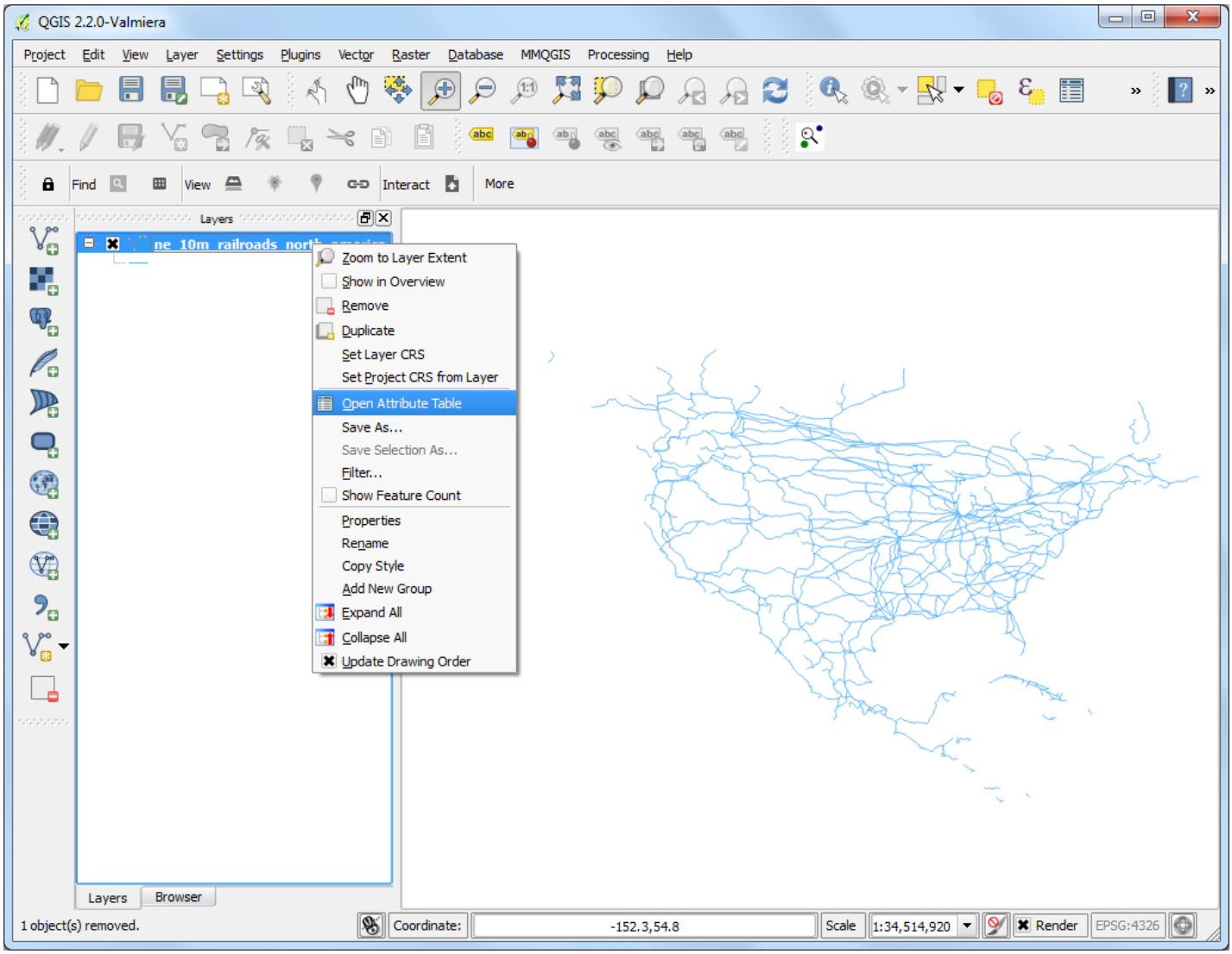
2. Browse to the `ne_10m_railroads_north_america.zip` file and click OK.



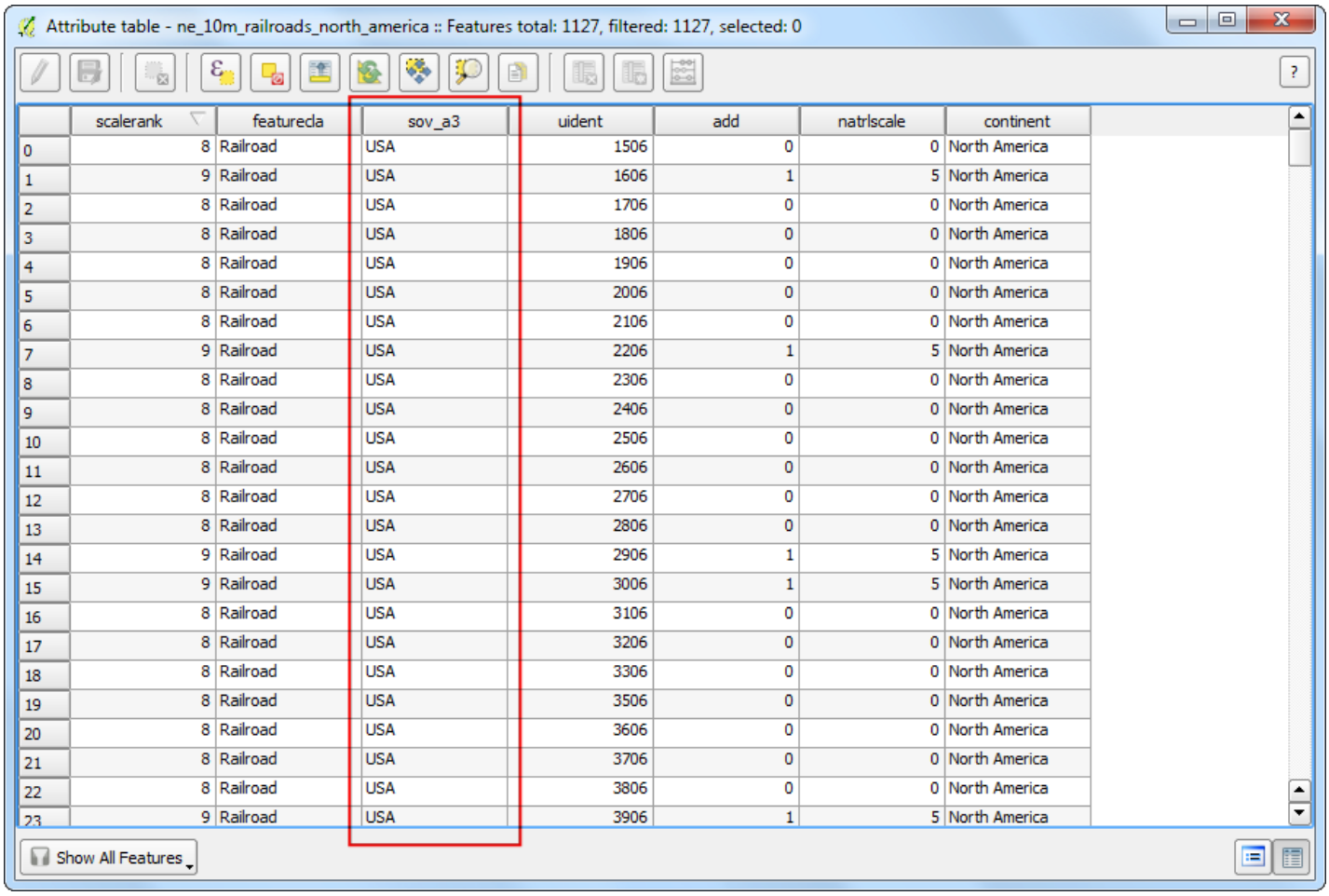
3. In the Select layers to add... dialog, choose `ne_10m_railroads_north_america.shp` layer.



4. Once the layer is loaded, you will notice that the layer has lines representing railroads for all of North America. Since we want to calculate line lengths only for United States railroads, we need to select the lines that fall in the United States. Right-click on the layer and select Open Attribute Table.

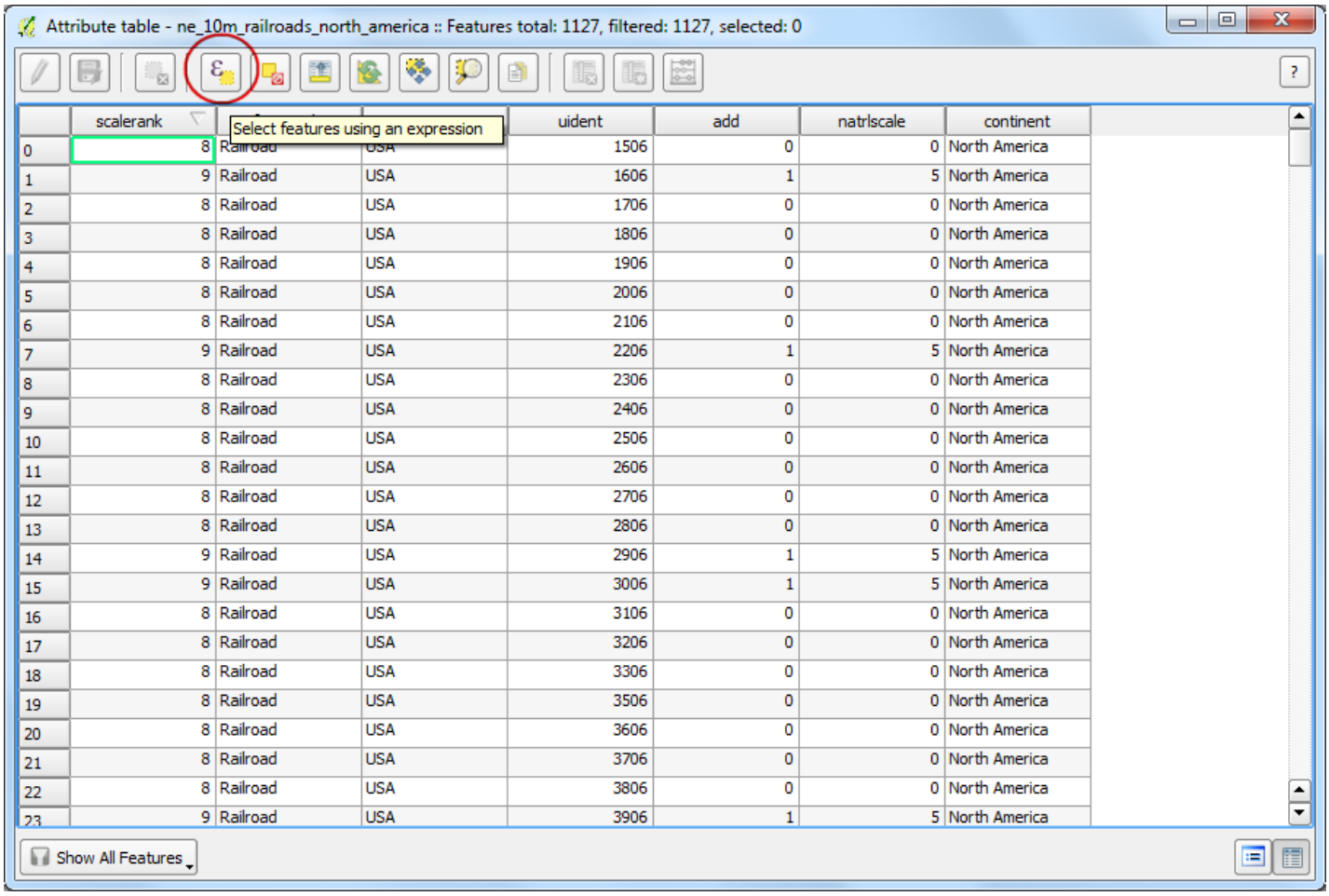


5. The layer has an attribute called sov_a3. This is the 3 letter code for the country that a particular feature falls in. We can use the value of this attribute to select features that are in USA.



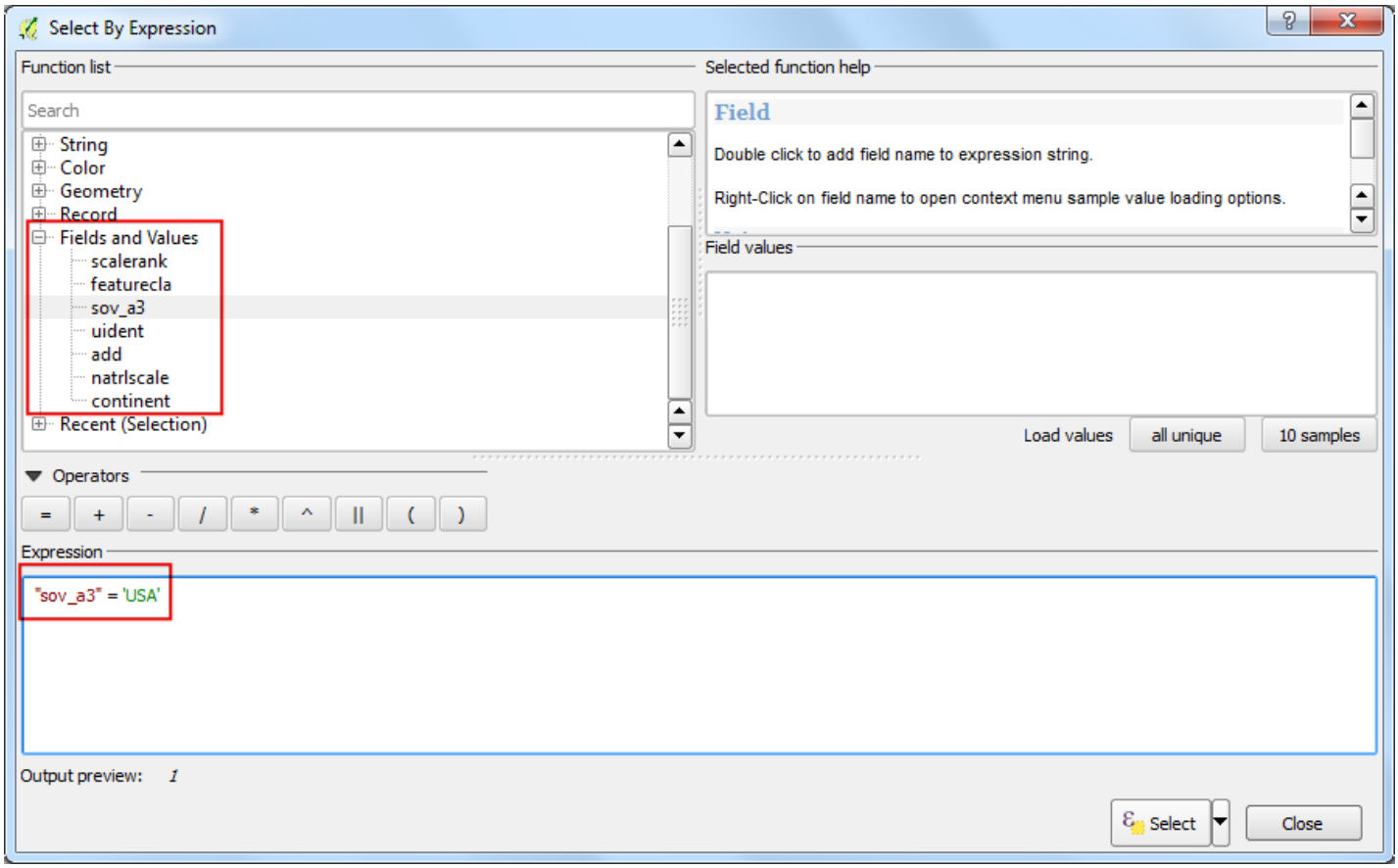
	scalerank	featurecla	sov_a3	uident	add	natrlscale	continent
0	8	Railroad	USA	1506	0	0	North America
1	9	Railroad	USA	1606	1	5	North America
2	8	Railroad	USA	1706	0	0	North America
3	8	Railroad	USA	1806	0	0	North America
4	8	Railroad	USA	1906	0	0	North America
5	8	Railroad	USA	2006	0	0	North America
6	8	Railroad	USA	2106	0	0	North America
7	9	Railroad	USA	2206	1	5	North America
8	8	Railroad	USA	2306	0	0	North America
9	8	Railroad	USA	2406	0	0	North America
10	8	Railroad	USA	2506	0	0	North America
11	8	Railroad	USA	2606	0	0	North America
12	8	Railroad	USA	2706	0	0	North America
13	8	Railroad	USA	2806	0	0	North America
14	9	Railroad	USA	2906	1	5	North America
15	9	Railroad	USA	3006	1	5	North America
16	8	Railroad	USA	3106	0	0	North America
17	8	Railroad	USA	3206	0	0	North America
18	8	Railroad	USA	3306	0	0	North America
19	8	Railroad	USA	3506	0	0	North America
20	8	Railroad	USA	3606	0	0	North America
21	8	Railroad	USA	3706	0	0	North America
22	8	Railroad	USA	3806	0	0	North America
23	9	Railroad	USA	3906	1	5	North America

6. In the Attribute Table window, click the Select features using an expression button.

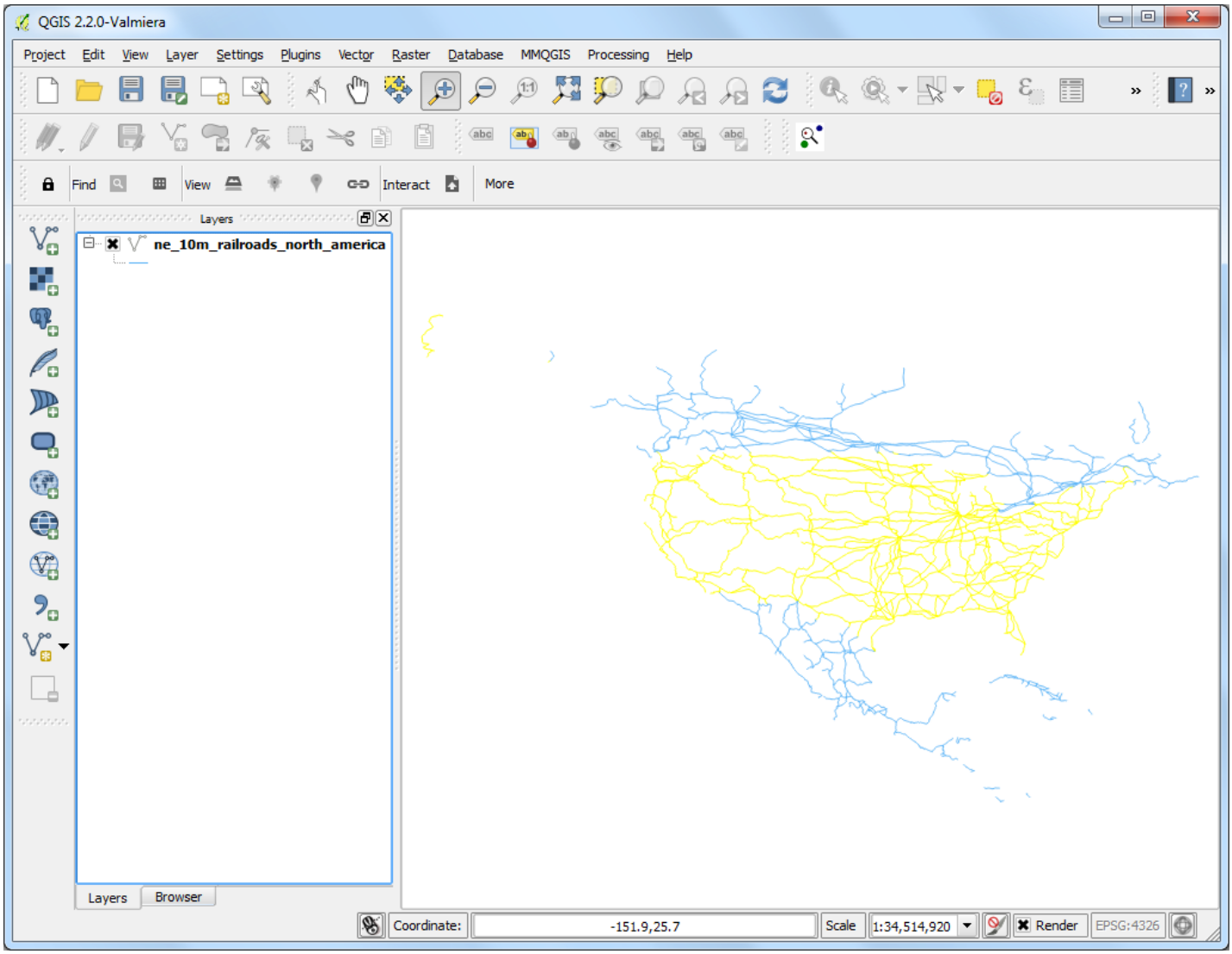


	scalerank			uident	add	natrlscale	continent
0	8	Railroad	USA	1506	0	0	North America
1	9	Railroad	USA	1606	1	5	North America
2	8	Railroad	USA	1706	0	0	North America
3	8	Railroad	USA	1806	0	0	North America
4	8	Railroad	USA	1906	0	0	North America
5	8	Railroad	USA	2006	0	0	North America
6	8	Railroad	USA	2106	0	0	North America
7	9	Railroad	USA	2206	1	5	North America
8	8	Railroad	USA	2306	0	0	North America
9	8	Railroad	USA	2406	0	0	North America
10	8	Railroad	USA	2506	0	0	North America
11	8	Railroad	USA	2606	0	0	North America
12	8	Railroad	USA	2706	0	0	North America
13	8	Railroad	USA	2806	0	0	North America
14	9	Railroad	USA	2906	1	5	North America
15	9	Railroad	USA	3006	1	5	North America
16	8	Railroad	USA	3106	0	0	North America
17	8	Railroad	USA	3206	0	0	North America
18	8	Railroad	USA	3306	0	0	North America
19	8	Railroad	USA	3506	0	0	North America
20	8	Railroad	USA	3606	0	0	North America
21	8	Railroad	USA	3706	0	0	North America
22	8	Railroad	USA	3806	0	0	North America
23	9	Railroad	USA	3906	1	5	North America

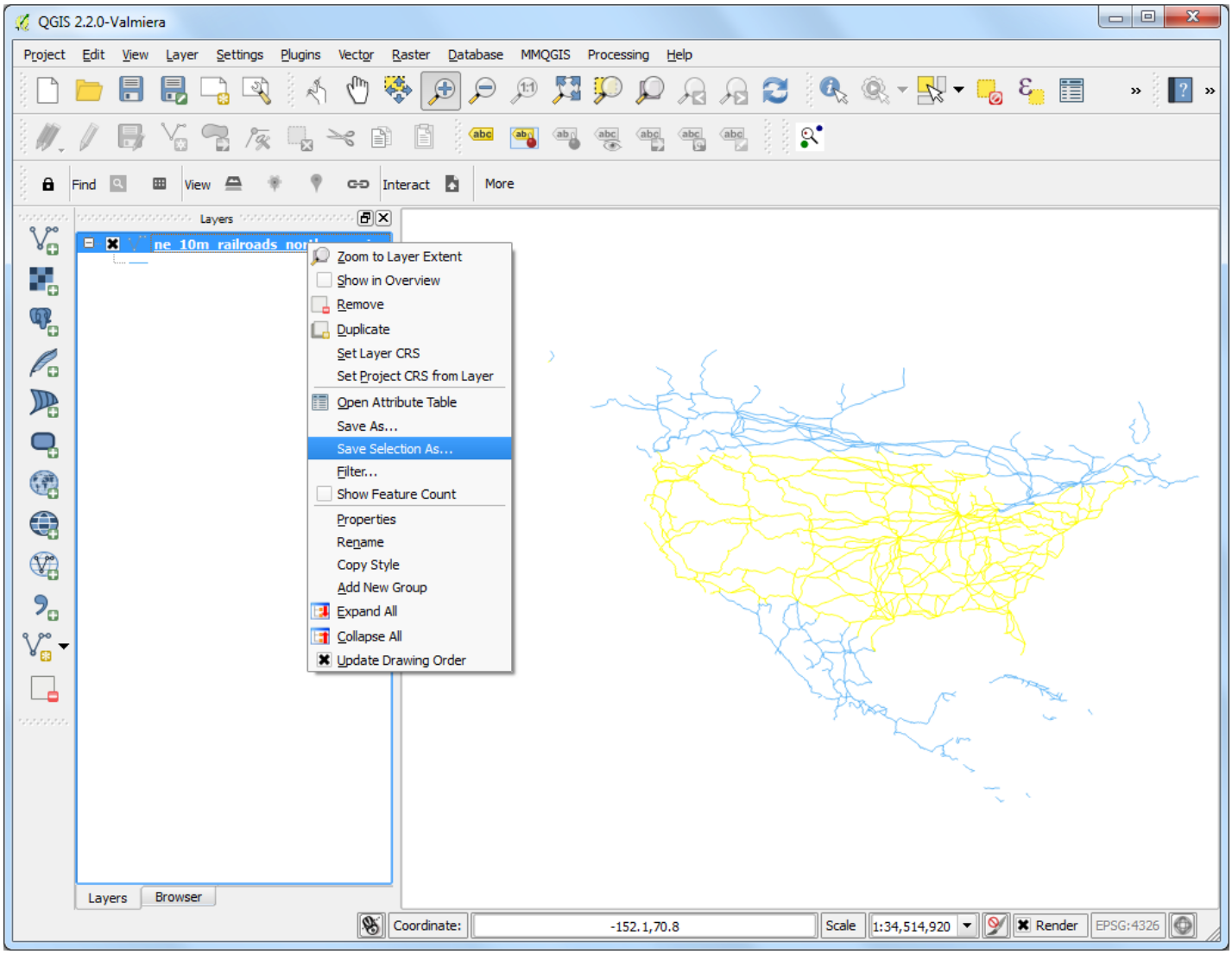
7. A new dialog Select By Expression will open. Find the attribute sov_a3 under Fields and Values in the Functions list section. Double-click on it to add it to the Expression text area. Complete the expression by typing in `"sov_a3" = 'USA'`. Click Select followed by Close.



8. Back in the main QGIS window, you will see that all lines that fall in USA are selected and appear in yellow.



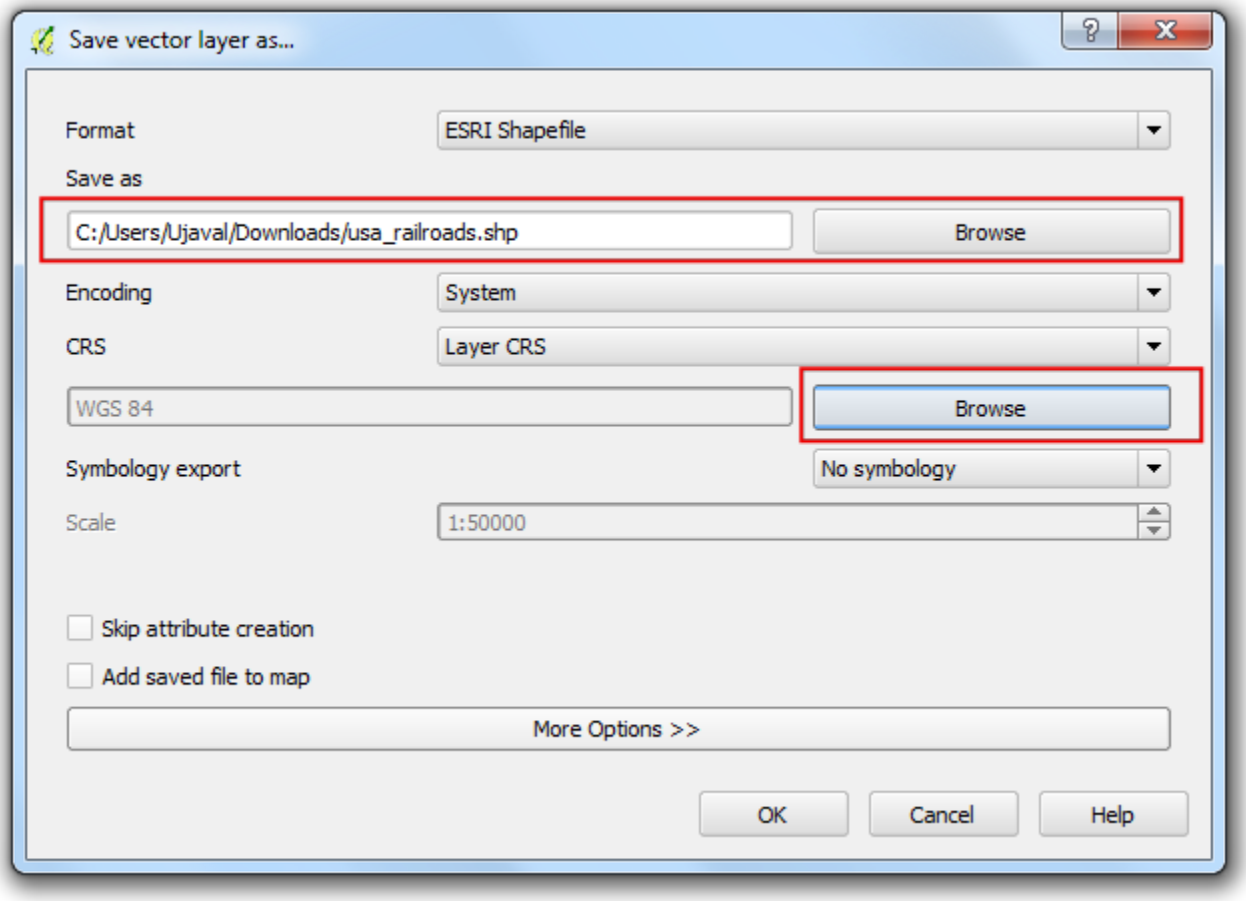
9. Now let's save our selection to a new shapefile. Right-click on the `ne_10m_railroads_north_america` layer and select Save Selection As....



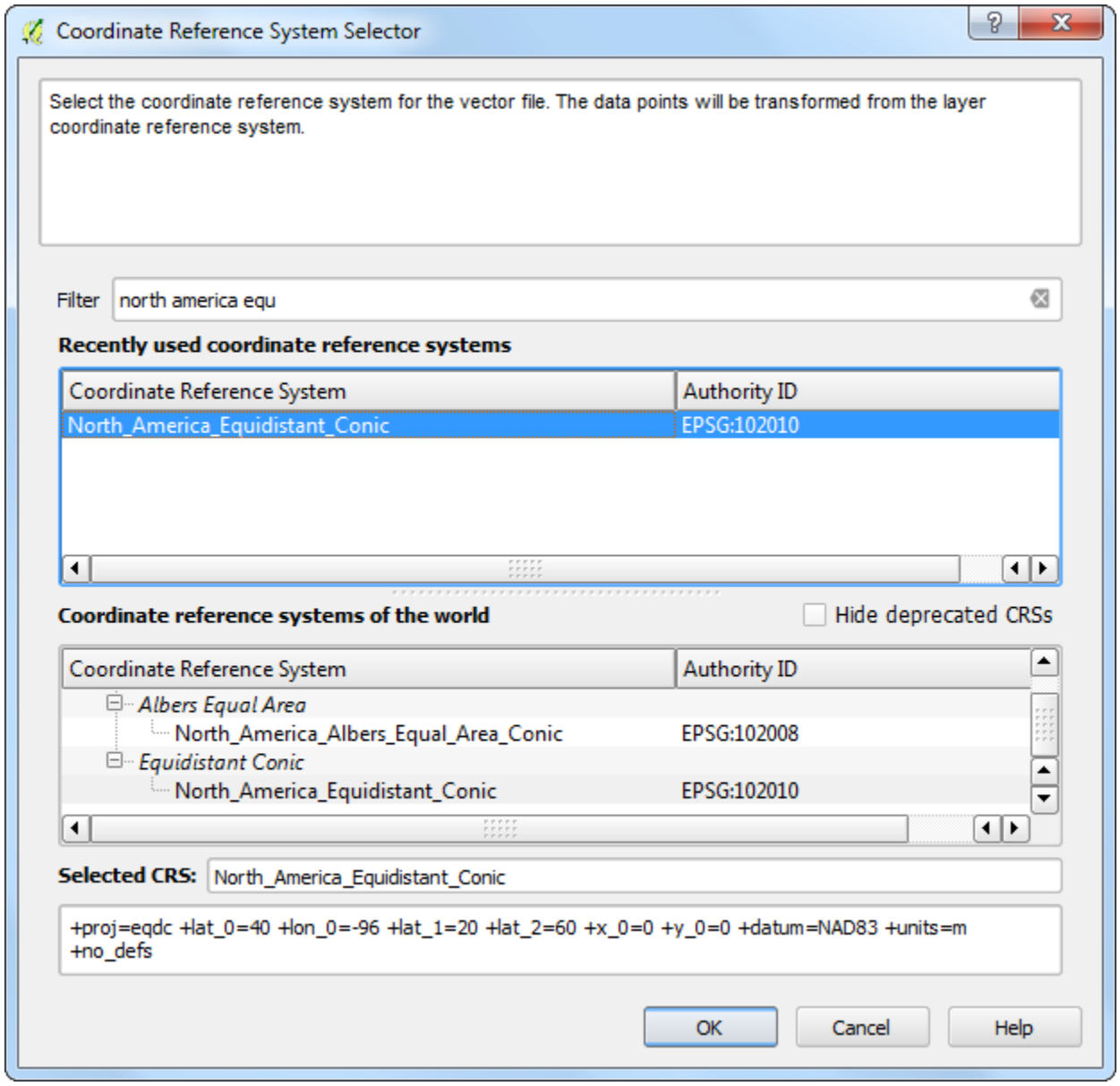
10. Click Browse and name the output file as `usa_railroads.shp`. We also want to change the CRS of the layer. Click on Browse next to CRS.

Note

The built-in functions that use a feature's geometry for calculation use the units of the layer's CRS. Geographic Coordinate Reference System(CRS) such as *EPSG:4326* have **degrees** as units - so the length of the feature would be in **degrees** and area in **square degrees** - which is meaningless. You need to use a Projected Coordinate Reference System with units of **meters** or **feet** to perform such calculations.



11. Since we are interested in calculating length, let's select an equidistance projection. Type north america equ in the Filter search box. In the results pane below, select North_America_Equidistant_Conic EPSG:102010 as the CRS. Click OK.



12 In the Save vector layer as... dialog, check the Add saved file to map and click OK.
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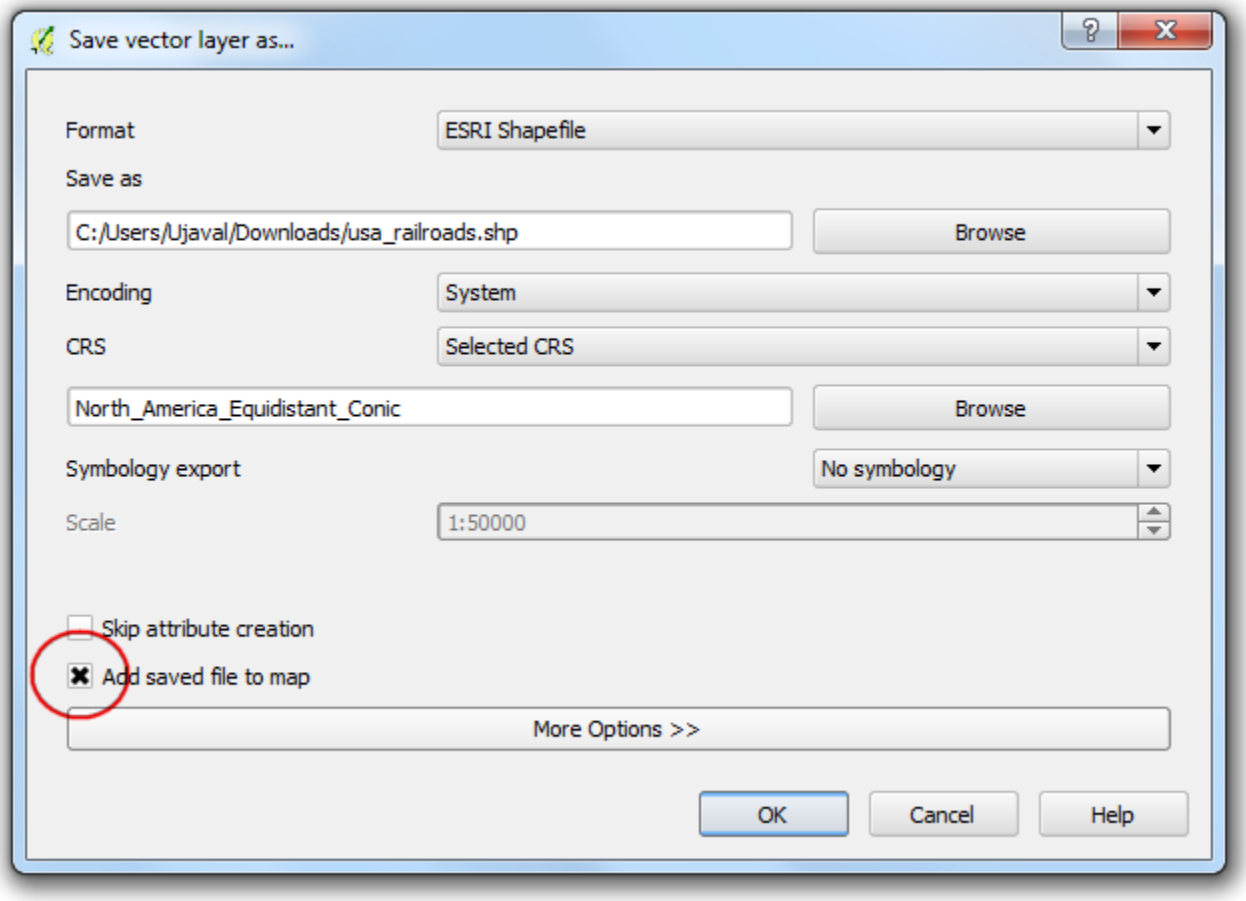
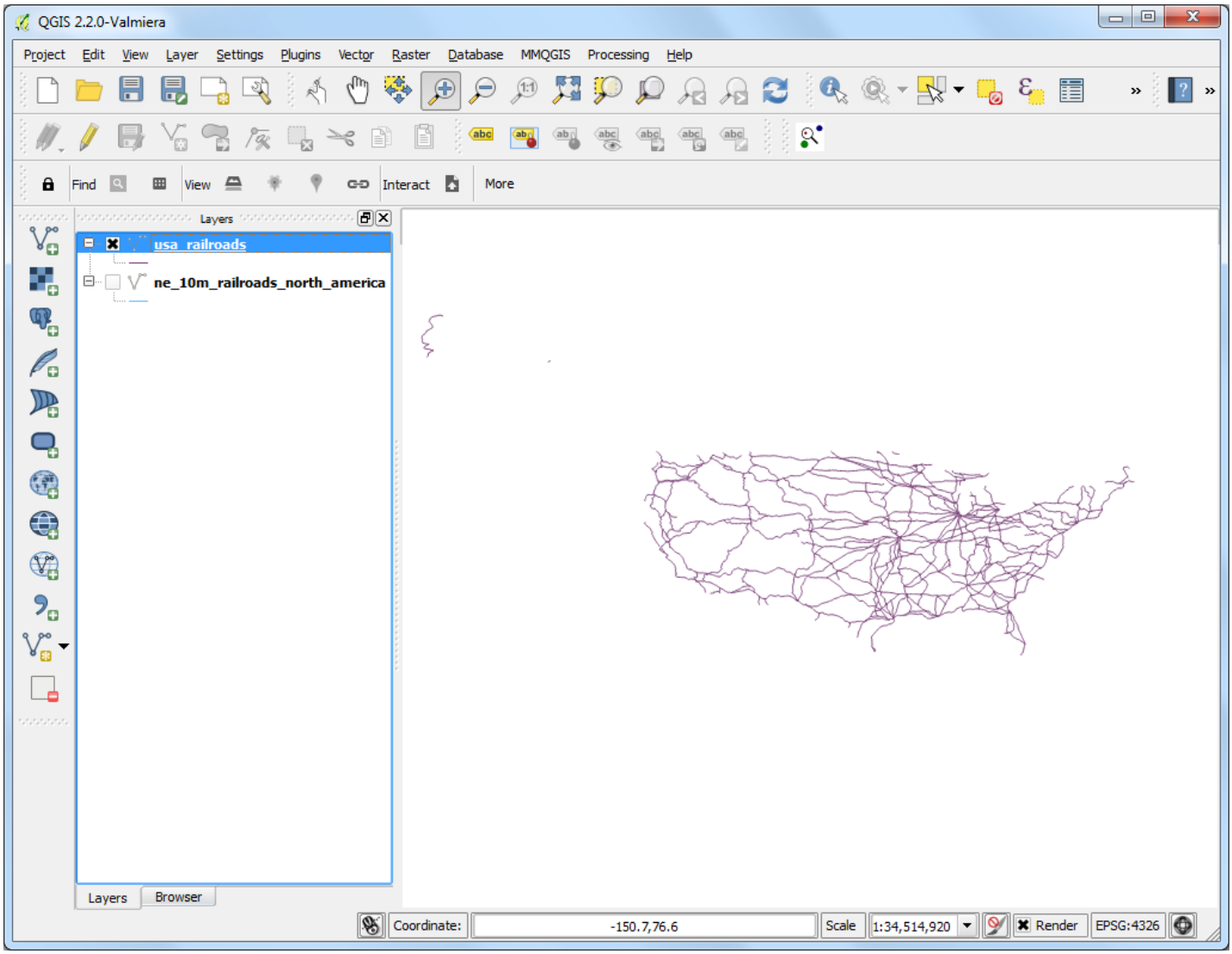


13. Once the export process finishes, you will see a new layer `usa_railroads` loaded in QGIS. You can uncheck the box next to `ne_10m_railroads_north_america` layer to turn it off as we don't need it anymore.



14 Right-click on the `usa_railroads` layer and select Open Attribute Table.
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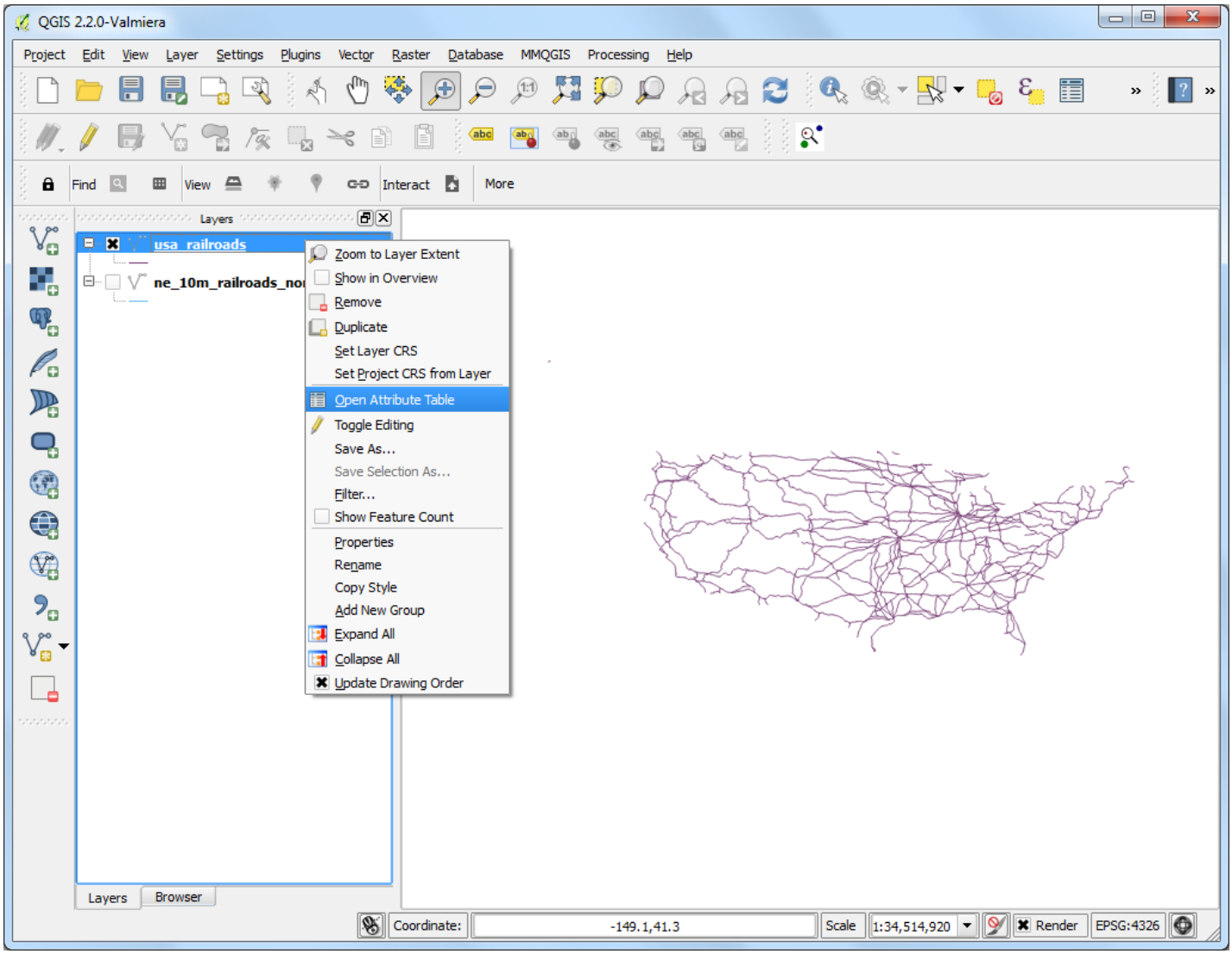
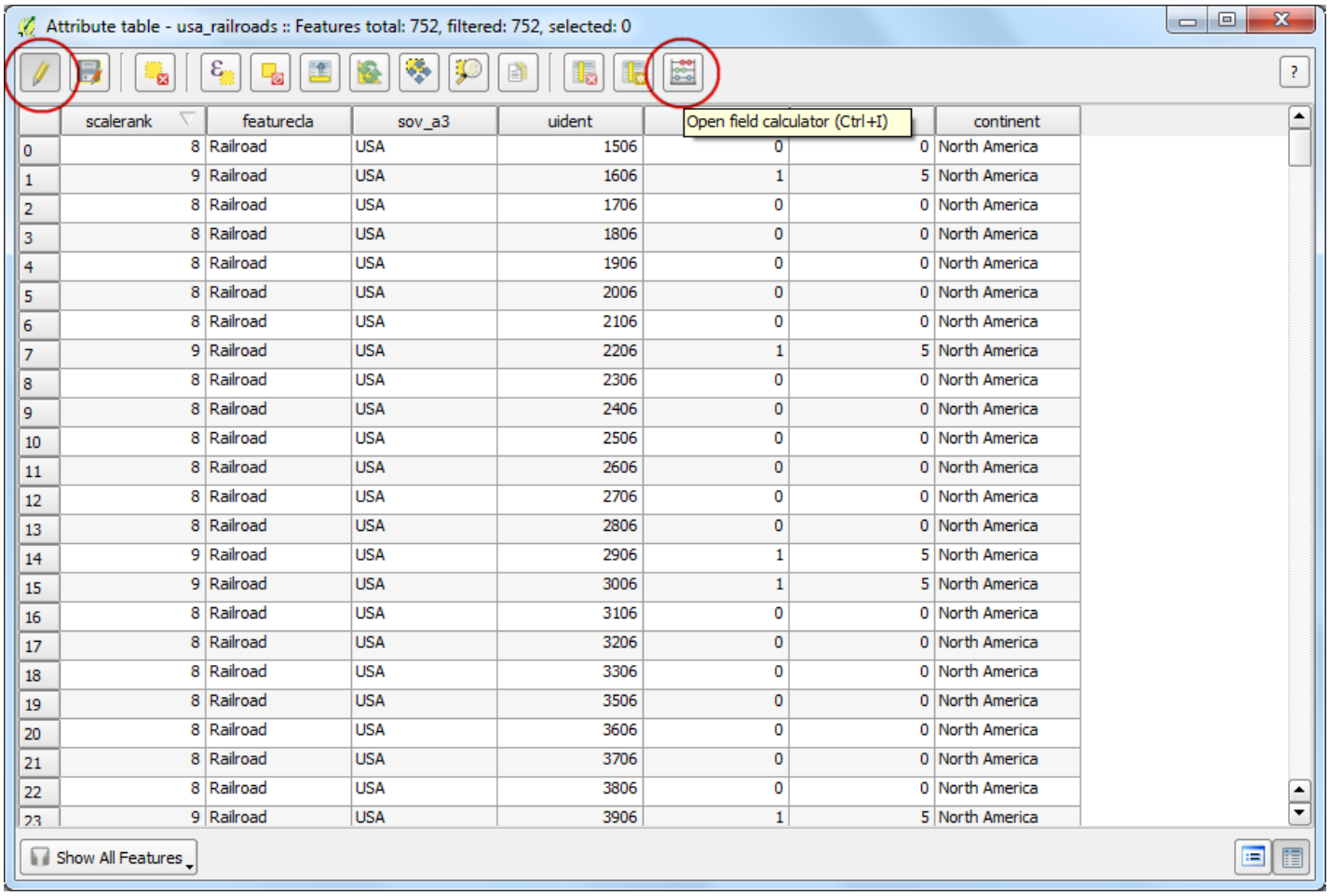
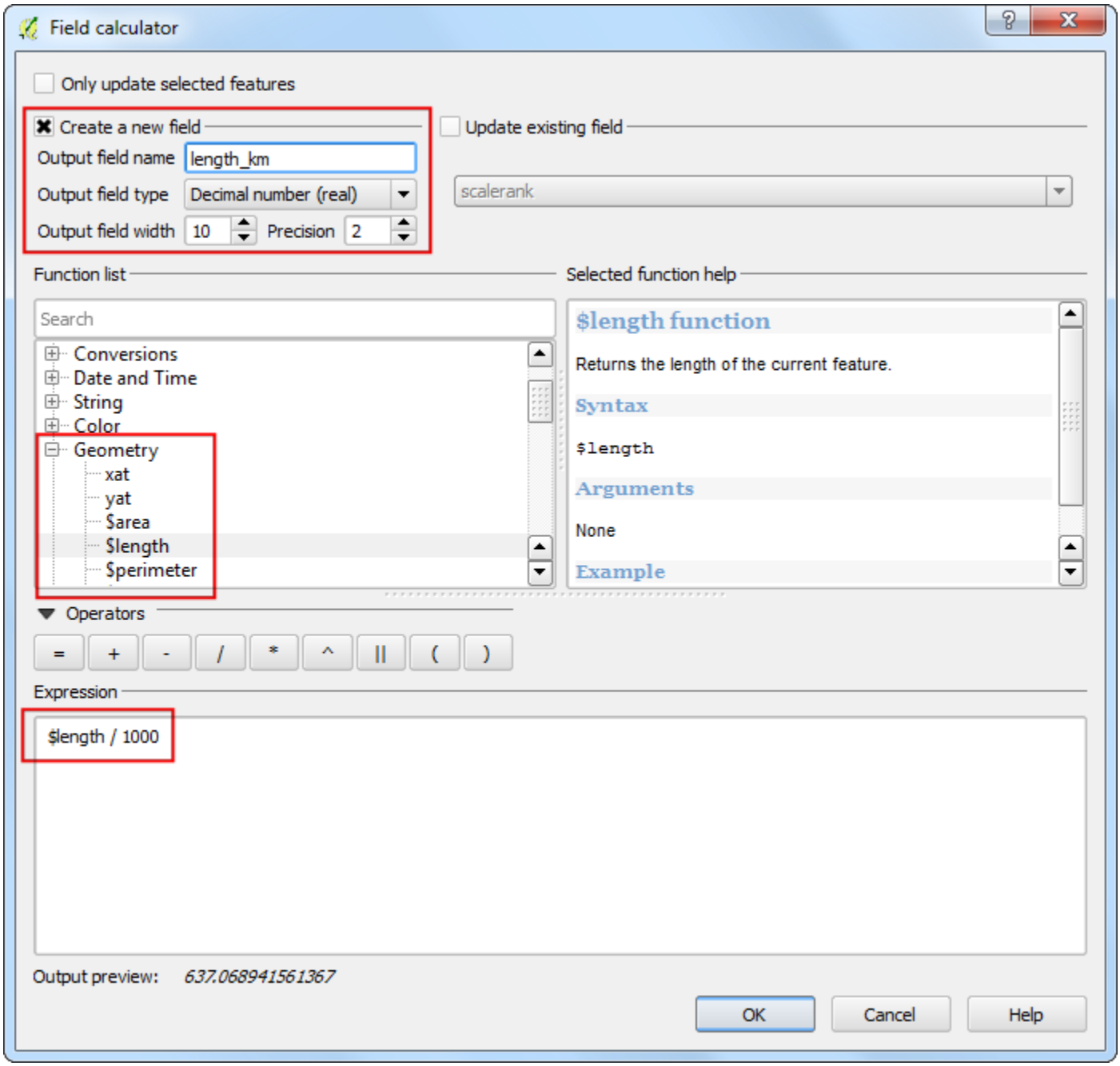


15. Now it is time to add a column with length of each feature. Put the layer in editing mode by clicking on the Toggle editing button. Once in editing mode, click the Open field calculator button.

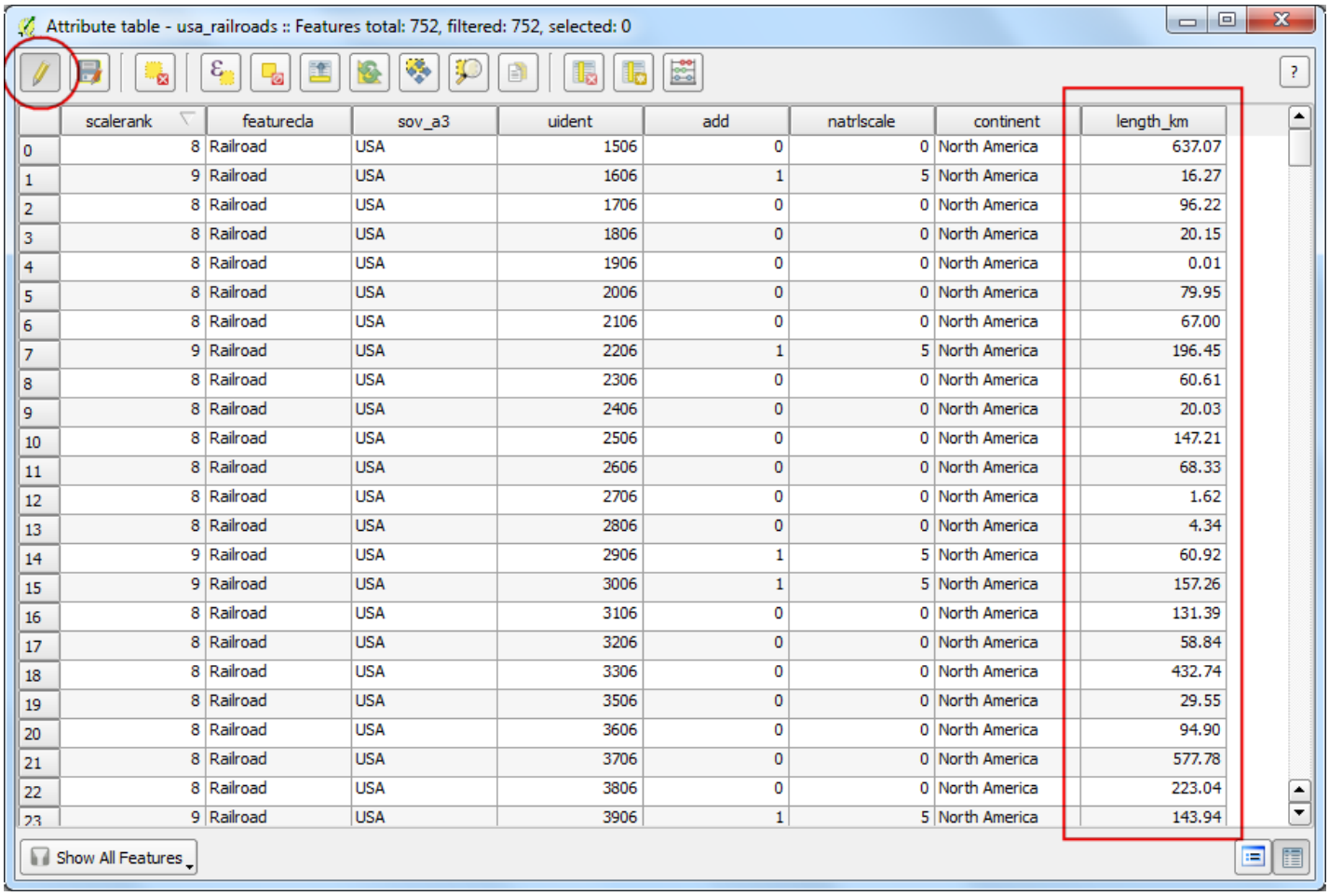


	scalerank	featurecla	sov_a3	uident			continent
0	8	Railroad	USA	1506	0	0	North America
1	9	Railroad	USA	1606	1	5	North America
2	8	Railroad	USA	1706	0	0	North America
3	8	Railroad	USA	1806	0	0	North America
4	8	Railroad	USA	1906	0	0	North America
5	8	Railroad	USA	2006	0	0	North America
6	8	Railroad	USA	2106	0	0	North America
7	9	Railroad	USA	2206	1	5	North America
8	8	Railroad	USA	2306	0	0	North America
9	8	Railroad	USA	2406	0	0	North America
10	8	Railroad	USA	2506	0	0	North America
11	8	Railroad	USA	2606	0	0	North America
12	8	Railroad	USA	2706	0	0	North America
13	8	Railroad	USA	2806	0	0	North America
14	9	Railroad	USA	2906	1	5	North America
15	9	Railroad	USA	3006	1	5	North America
16	8	Railroad	USA	3106	0	0	North America
17	8	Railroad	USA	3206	0	0	North America
18	8	Railroad	USA	3306	0	0	North America
19	8	Railroad	USA	3506	0	0	North America
20	8	Railroad	USA	3606	0	0	North America
21	8	Railroad	USA	3706	0	0	North America
22	8	Railroad	USA	3806	0	0	North America
23	9	Railroad	USA	3906	1	5	North America

16. In the Field Calculator, check Create a new field. Enter **length_km** as the Output field name. Choose **Decimal number (real)** as the Output field type. Change the output Precision to **2**. In the Function list panel, find the $length under Geometry. Double-click it to add it to the Expression. Complete the expression as `$length / 1000` because our layer CRS is in **meters** unit and we want the output in **km**. Click OK.

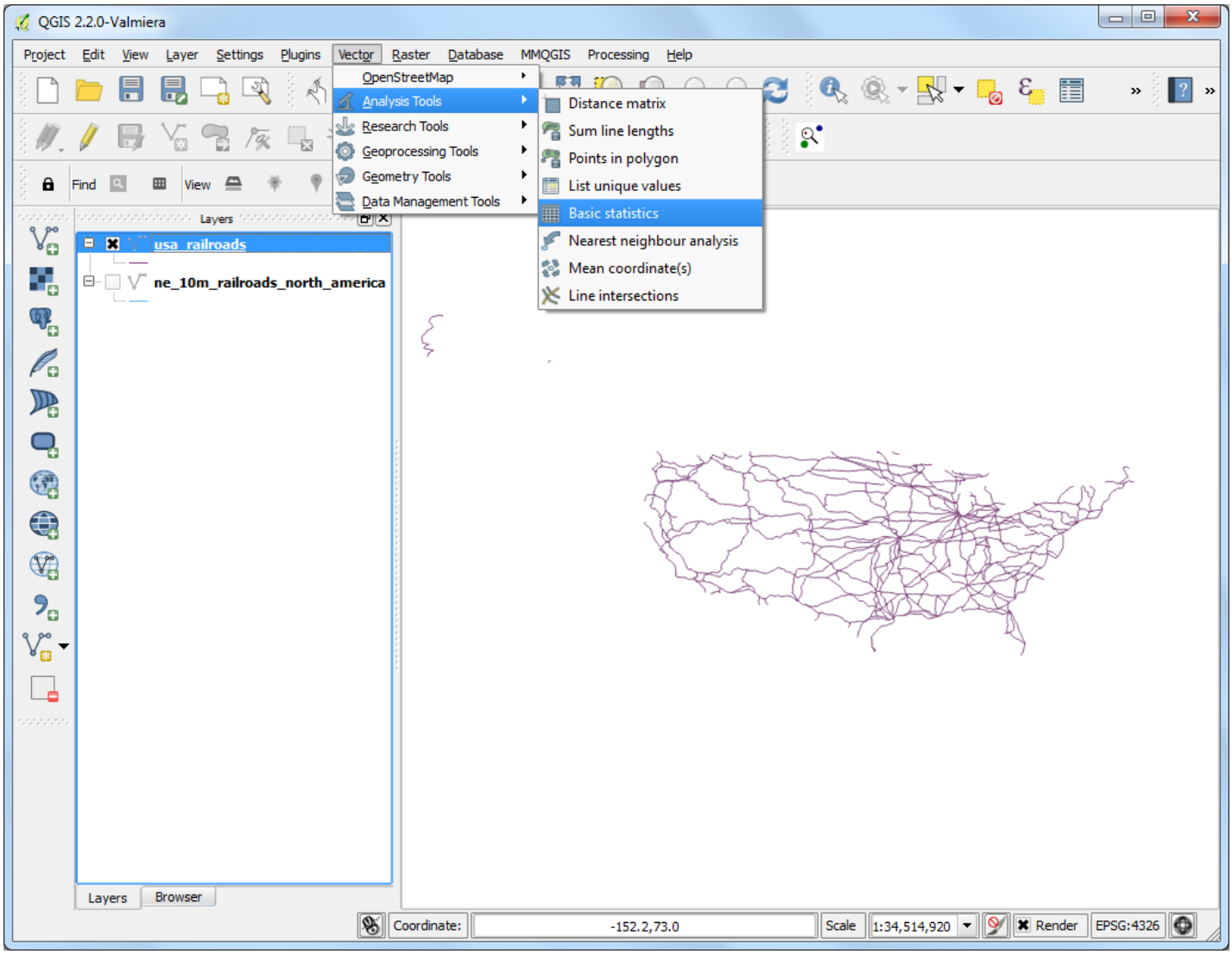


17 Back in Attribute Table, you will see a new column length_km appear. Click the . Toggle editing button to save the changes to the attribute table.



	scalerank	featurecla	sov_a3	uident	add	natrlscale	continent	length_km
0	8	Railroad	USA	1506	0	0	North America	637.07
1	9	Railroad	USA	1606	1	5	North America	16.27
2	8	Railroad	USA	1706	0	0	North America	96.22
3	8	Railroad	USA	1806	0	0	North America	20.15
4	8	Railroad	USA	1906	0	0	North America	0.01
5	8	Railroad	USA	2006	0	0	North America	79.95
6	8	Railroad	USA	2106	0	0	North America	67.00
7	9	Railroad	USA	2206	1	5	North America	196.45
8	8	Railroad	USA	2306	0	0	North America	60.61
9	8	Railroad	USA	2406	0	0	North America	20.03
10	8	Railroad	USA	2506	0	0	North America	147.21
11	8	Railroad	USA	2606	0	0	North America	68.33
12	8	Railroad	USA	2706	0	0	North America	1.62
13	8	Railroad	USA	2806	0	0	North America	4.34
14	9	Railroad	USA	2906	1	5	North America	60.92
15	9	Railroad	USA	3006	1	5	North America	157.26
16	8	Railroad	USA	3106	0	0	North America	131.39
17	8	Railroad	USA	3206	0	0	North America	58.84
18	8	Railroad	USA	3306	0	0	North America	432.74
19	8	Railroad	USA	3506	0	0	North America	29.55
20	8	Railroad	USA	3606	0	0	North America	94.90
21	8	Railroad	USA	3706	0	0	North America	577.78
22	8	Railroad	USA	3806	0	0	North America	223.04
23	9	Railroad	USA	3906	1	5	North America	143.94

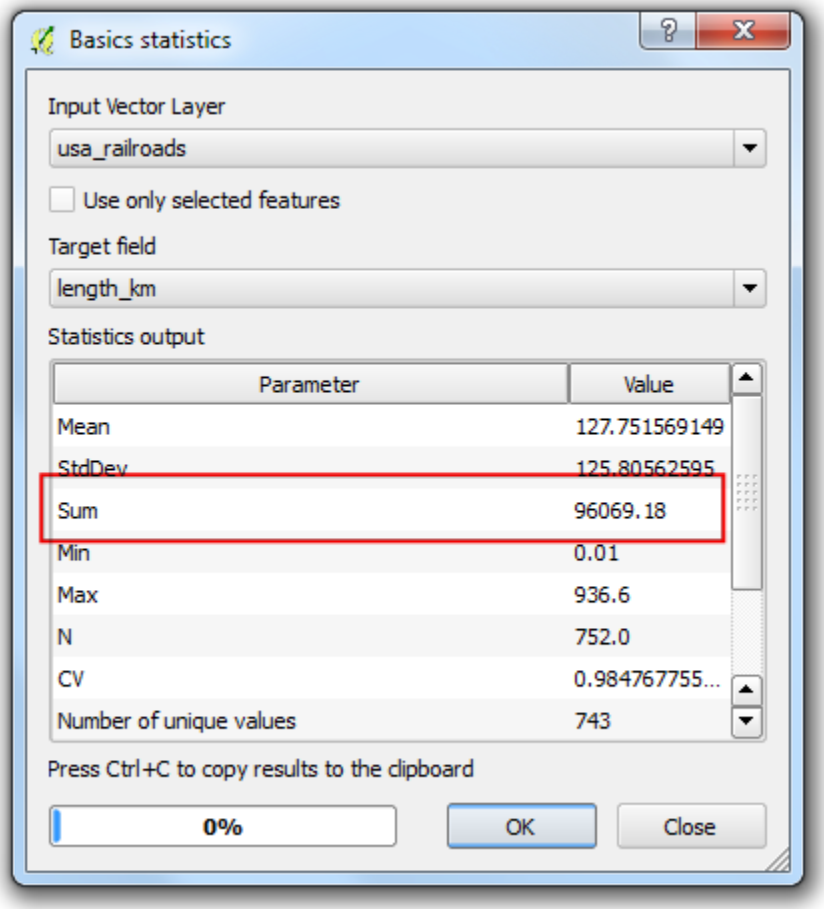
18. Now that we have length of each individual line in our layer, we can easily add it all up and find the **Total** length. Go to Vector ▸ Analysis Tools ▸ Basic Statistics.



19. Select the Input Vector layer as `usa_railroads`. Choose the Target field as `length_km` and click OK. You will see various statistics appear. The Sum value is the total length of the railroads that we are looking to find.

Note

This answer will vary slightly if a different projection is chosen.In practice, line lengths for roads and other linear features are measured on the ground and provided as attributes to the dataset. This method works in absence of such attribute and as an approximation of actual line lengths.


Basics statistics
Input Vector Layer
usa_railroads
Use only selected features
Target field
length_km
Statistics output
Parameter
Value
Mean
127.751569149
StdDev
125.80562595
Sum
96069.18
Min
0.01
Max
936.6
N
752.0
CV
0.984767755...
Number of unique values
743
Press Ctrl+C to copy results to the clipboard
0%
OK
Close