

ADVANCED TOPICS IN DATABASE SYSTEMS – CSE 6331 - 002

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OVERVIEW

Given are different datasets of Roadmap (Lines), countries map(Polygons), WAZE application events datasets (Points) in shapefile (.shp) format that primarily focusses on Dallas/Fort Worth/Arlington area.

SECOND MILESTONE – PART 2 – FINAL SUBMISSION

In the second milestone, GIS visualization tool i.e QGIS is used to display the maps of different area and show the results of the provided queries.

Will have to submit all the answers of queries related to second milestone by April 24, 2021 11:59pm (Updated)

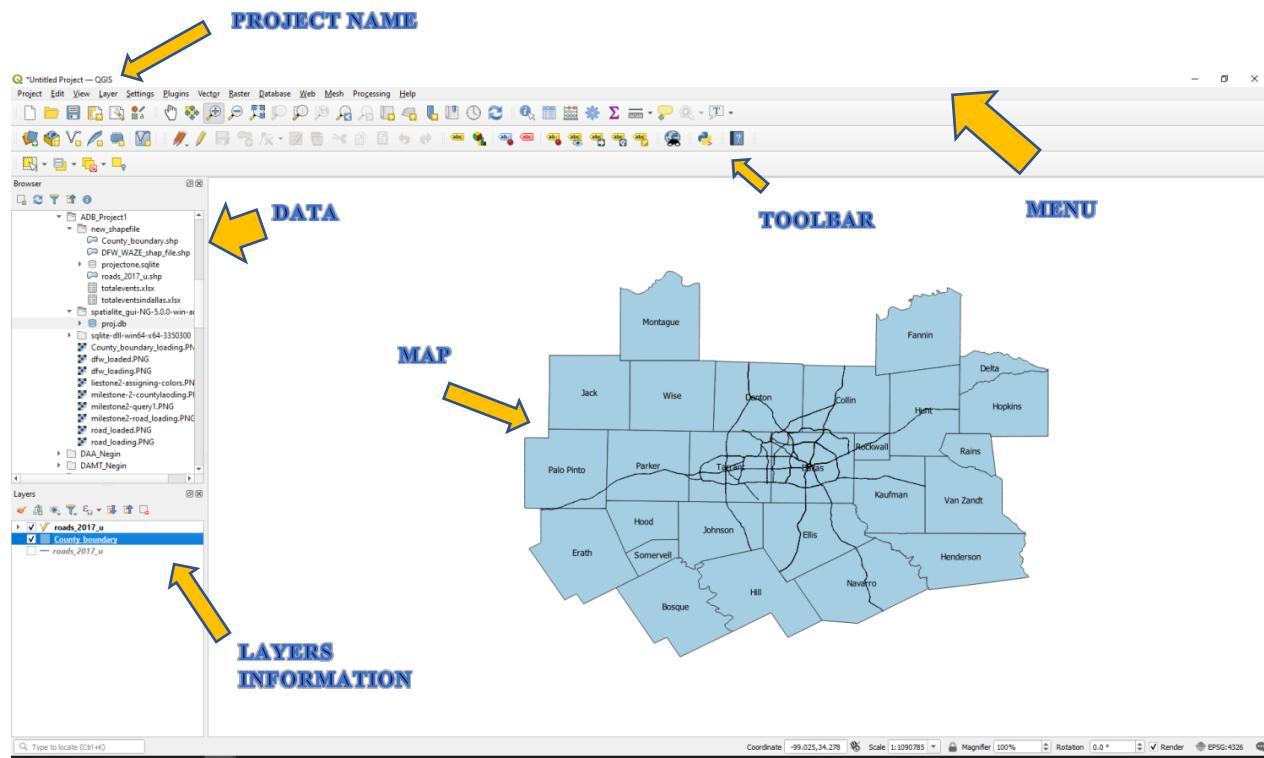
PROJECT AGENDA : LEARN TO USE A SPATIAL DATABASE (SDBMS) AND GIS VISUALIZATION TOOLS

Note : Included the previous queries too for a better understanding and then included queries required for final submission.

WHAT IS QGIS TOOL?

QGIS stands for – Geographic Information System. A tool that helps in analyzing and also editing the spatial details. So in this project this tool was used to find various parameters like roads, county, etc information in the form of maps. Also as per the queries, one can generate the information in the form of maps with different colors, pointers, etc. In addition to composing and exporting graphical maps.

- QGIS is a major open-source GIS program which is accessible and free to download and use. It's functional, i.e it has got a diverse tools that helps in combining multiple programs.
- It's used importing shapefiles, edit, etc in spatial type file formats
- One case make use of colours to emphasize certain to differentiate the features.



Main Fig : Screenshot of QGIS User Interface

PART I – INSTALLING THE QGIS TOOL

A STEP-BY-STEP PROCEDURE TO DOWNLOAD THE TOOL.

STEP 1 – Go to the website, <https://qgis.org/en/site/forusers/download.html> -> You will find various downloadable versions for OS like Windows, Linux, MAC, etc. So as our OS is Windows we downloaded under the tab Download for Windows. Make sure to download the right one that's compatible to your system 32bit/64bit. In our case it's 64bit as shown in the figure below. Your download will start shortly. Then click on the .exe file.

Download for Windows

QGIS in OSGeo4W:

- [OSGeo4W Network Installer \(64 bit\)](#)
- [OSGeo4W Network Installer \(32 bit\)](#)

In the installer choose **Desktop Express Install** and select **QGIS** to install the *latest release*.
 To get the *long term release* (that is not also the latest release) choose **Advanced Install** and select **qgis-ltr-full**
 To get the *bleeding-edge development build* choose **Advanced Install** and select **qgis-full-dev**

Standalone installers from OSGeo4W packages

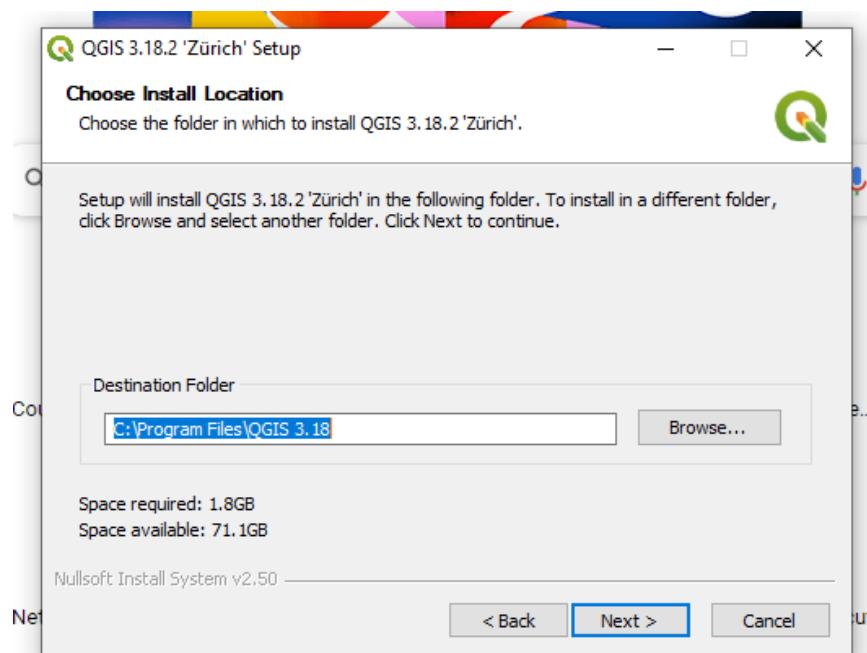
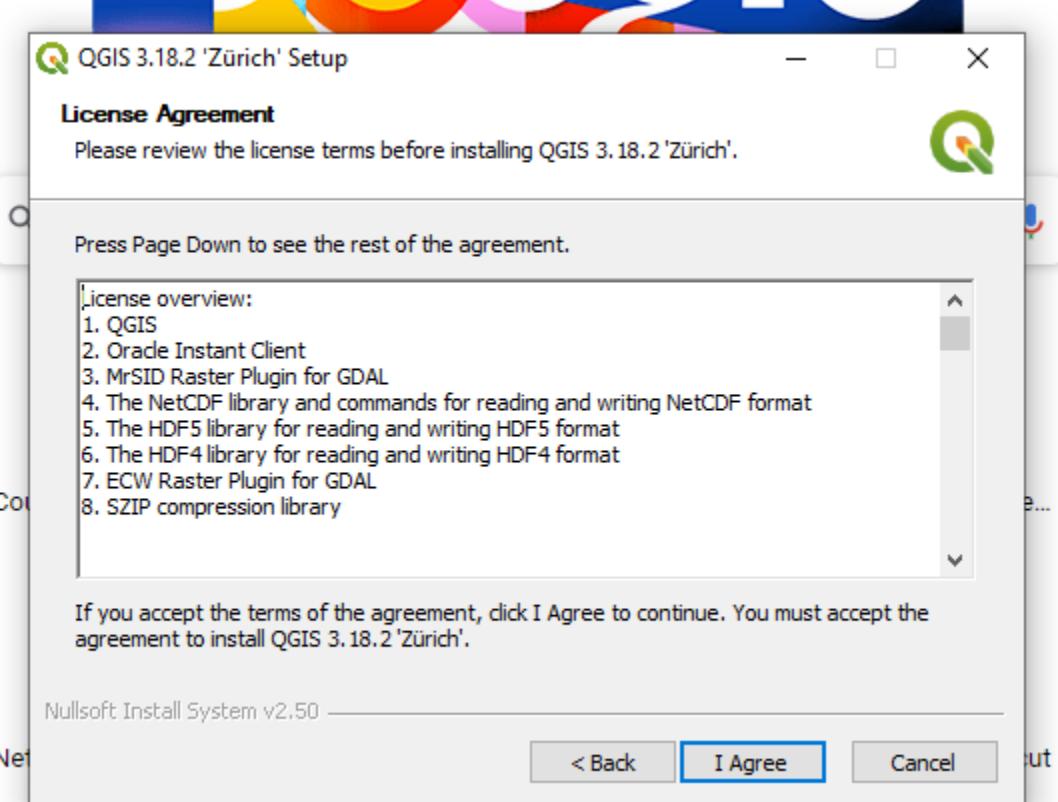
Latest release (richest on features):

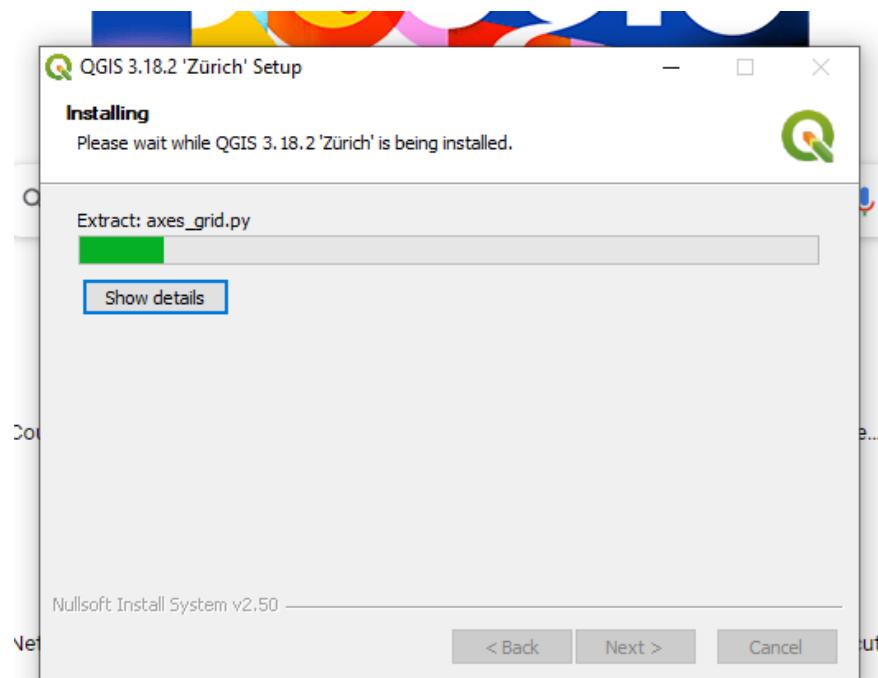
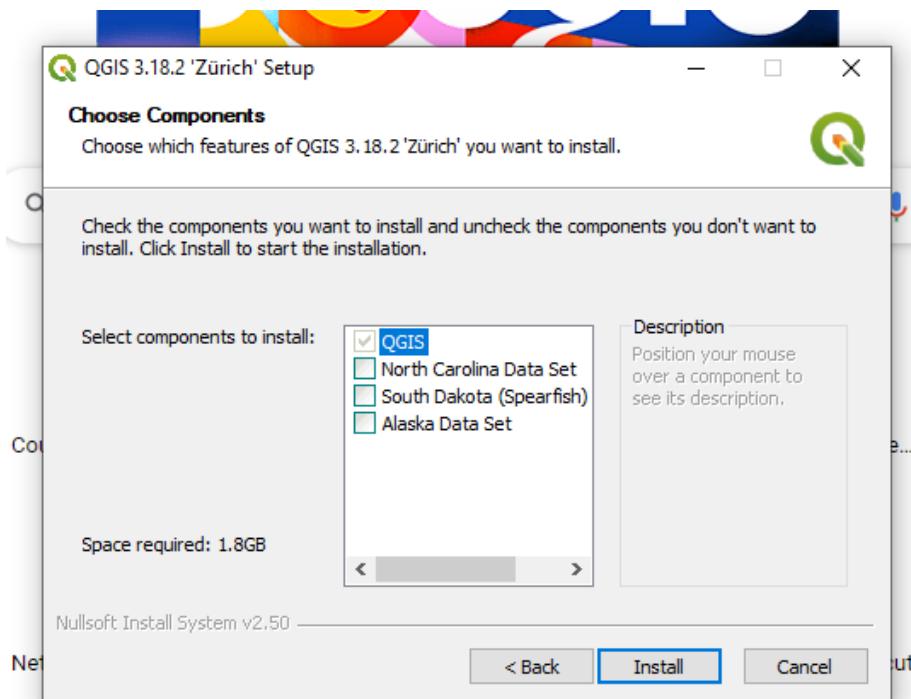
QGIS Standalone Installer Version 3.18 (64 bit)	sha256
QGIS Standalone Installer Version 3.18 (32 bit)	sha256

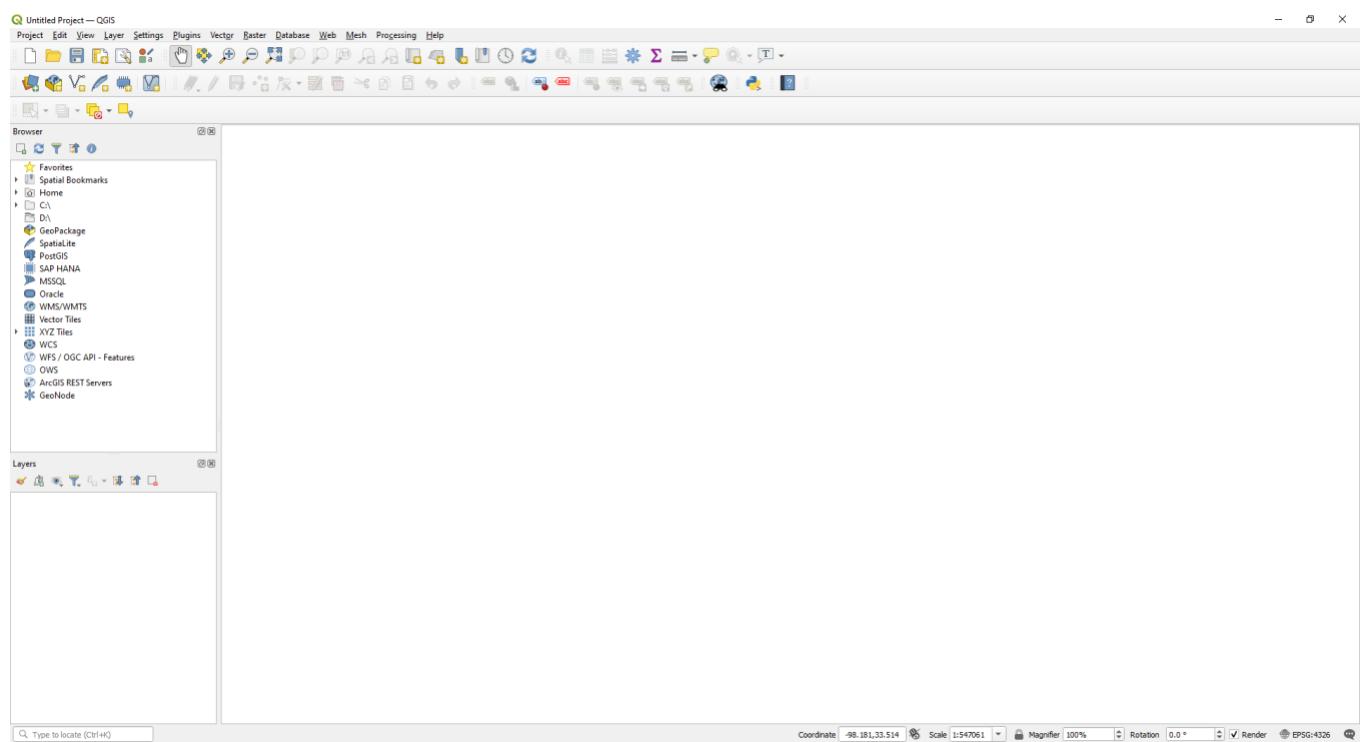
- A window pops-up as shown in the figures below (step-by-step) -> click Next -> Agree to the terms and conditions -> Then a window prompts stating the destination folder (It's recommended to leave It default) -> click Next -> Then finally Click Install (Some datasets will be prompted by default so it's user's choice to download and practice on them) -> The installation process will take about some time -> click on Finish when prompted. **PLEASE SEE THE SCREENSHOTS BELOW IN THE ORDER FOR A BETTER IDEA**











PART II – LOADING SHAPEFILES INTO QGIS TOOL

- In-order to start the process, we first loaded the shape files.
- Open the tool -> Go to Data Source Manager -> Click on Vector -> Then in the vector database -> First as a source choose the vector dataset -> then select County_boundary shapefiles.
- In the same we loaded Roads layers and DFW_WAZE file too.

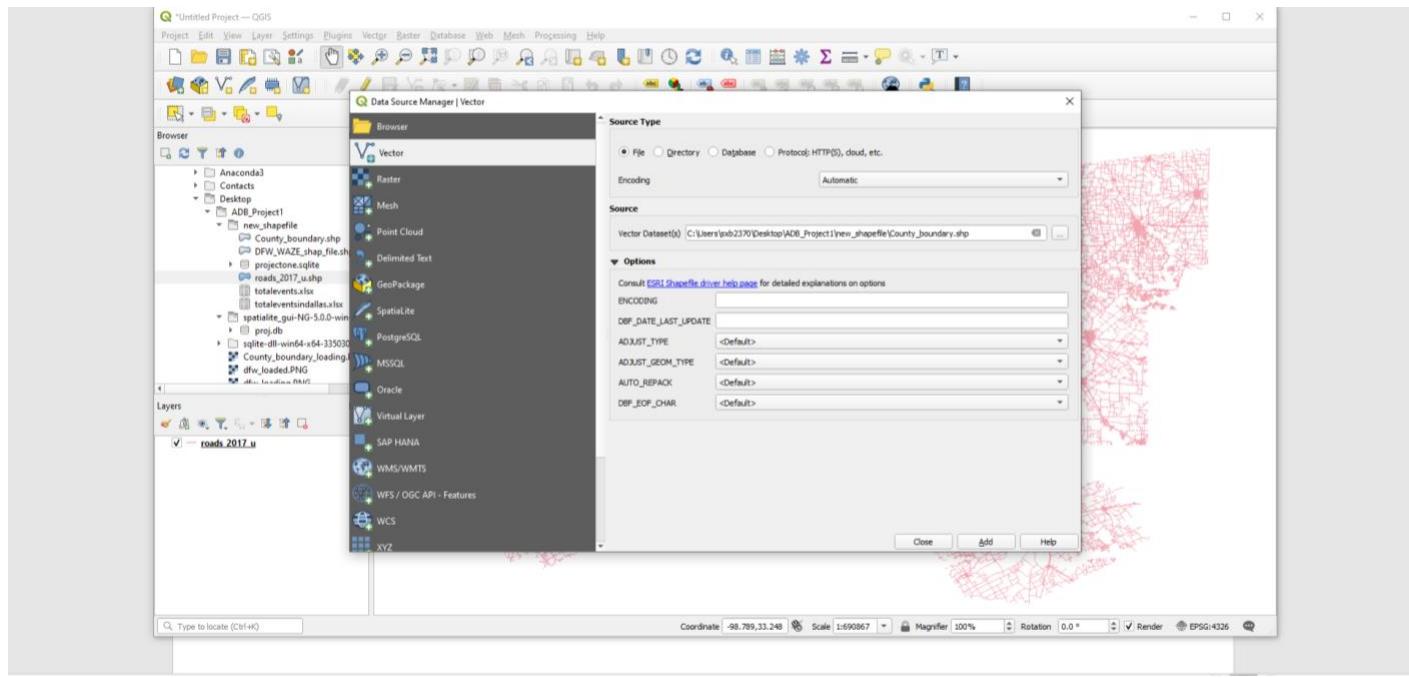


Fig I : Screenshot of how County_boundary shapefile was loaded

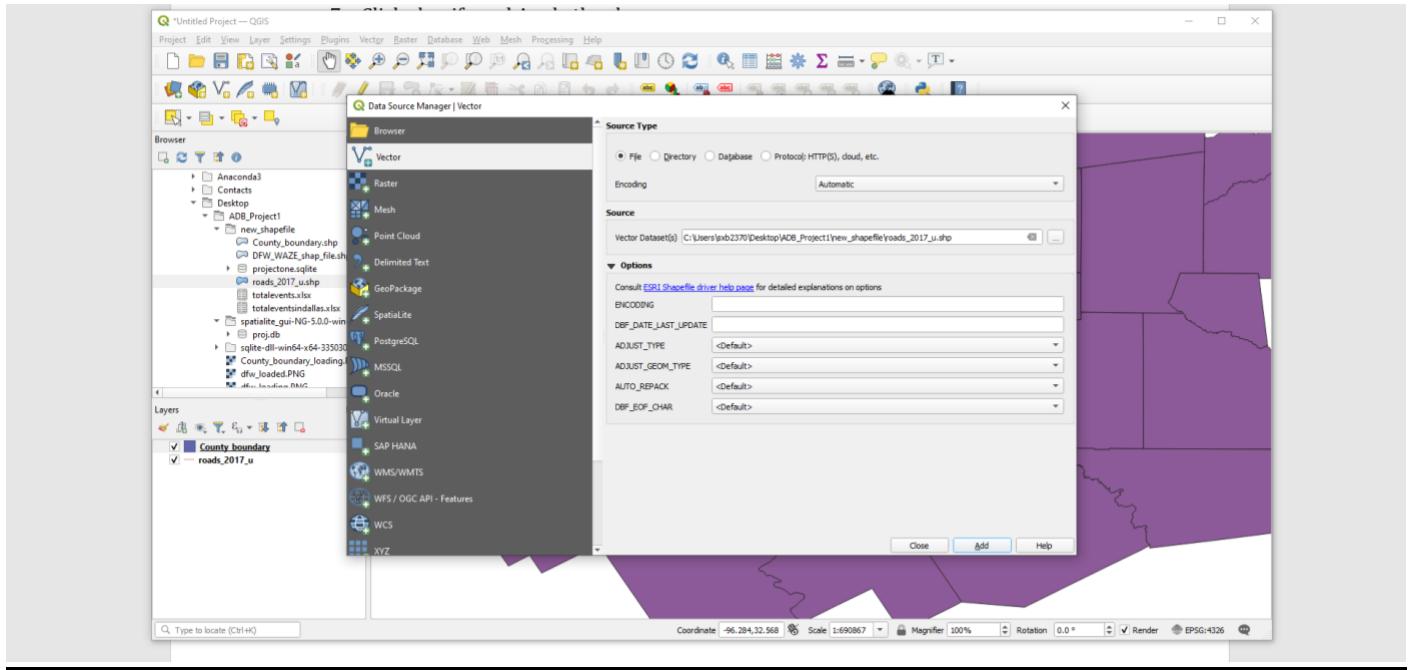


Fig II : Screenshot of how Roads shapefile was loaded

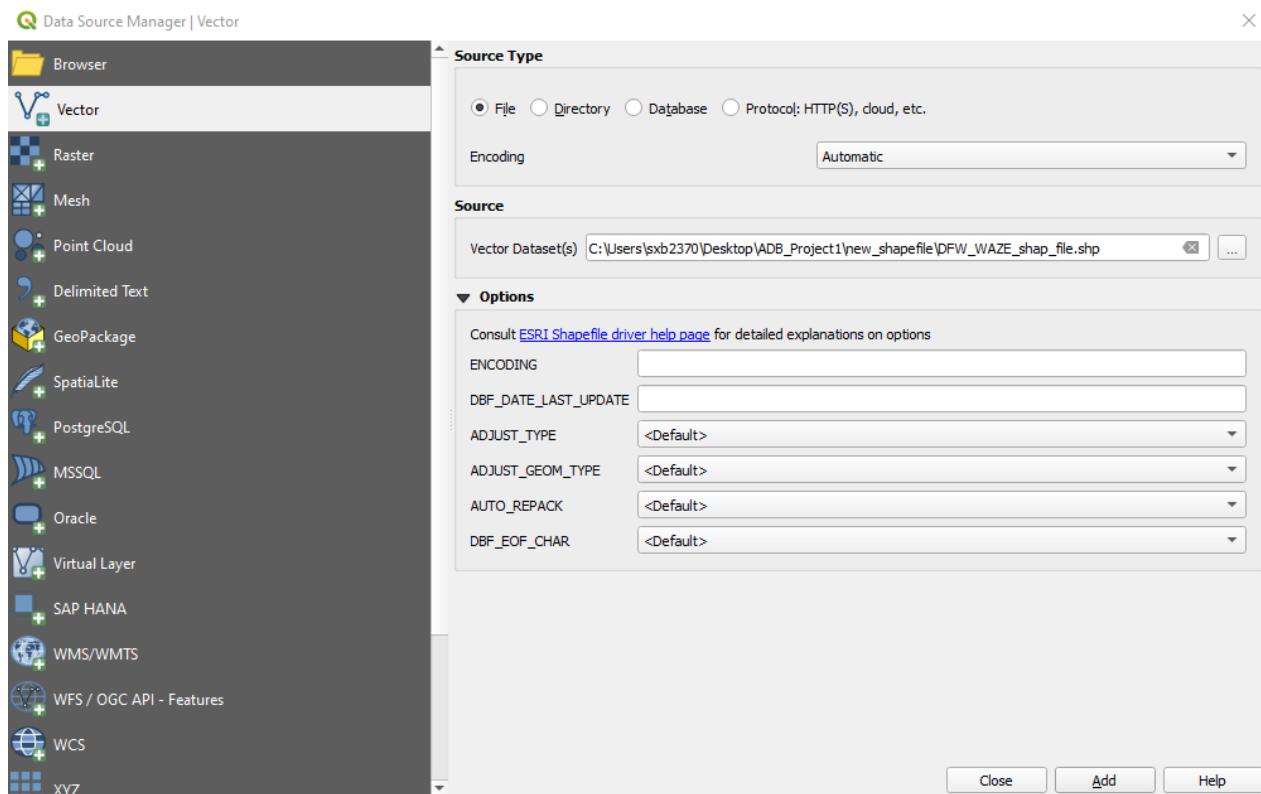


Fig III : Screenshot Of Dfw_Waze Shapefile was loaded

PART III – EXECUTING QUERIES AND DISPLAYING THE OUTPUT

PROJECT QUERIES FOR MILESTONE II – PART I

[QUESTION 1] Display the **roads** that are located in **Collin county in Red color and in Tarrant county in Black color and in Dallas County in Blue color. The rest of the counties, display the roads in Yellow color.** The example below shows Tarrant roads in red and Dallas roads in black – your query is slightly different.

HOW TO OBTAIN THE OUTPUT?

- Now as of the 1st question, we have to display roads that are located in county so make sure to load road and county shapefiles into QGIS tool successfully.
- **TO DISPLAY ROADS** - As our main goal is to display roads, uncheck County_Boundary and check roads_2017_u as shown in the screenshot below.
- **TO COLOR THE COUNTY** – Right click on roads_2017_u -> properties -> click on Symbology on the left menu -> Choose Categorized from the dropdown on the top -> In Value drop down choose “COUNTY_L” (Symbol, Value and Legend will appear)
- **NOTE** : Check every box because rest of the counties are to shown too
- Under Symbol choose **RED for Collin County, BLACK for Tarrant County and BLUE for Dallas County** as shown in the screenshot Fig 1a below.
- Classify -> Apply -> OK
- Result will be obtained as seen on Fig 1b.

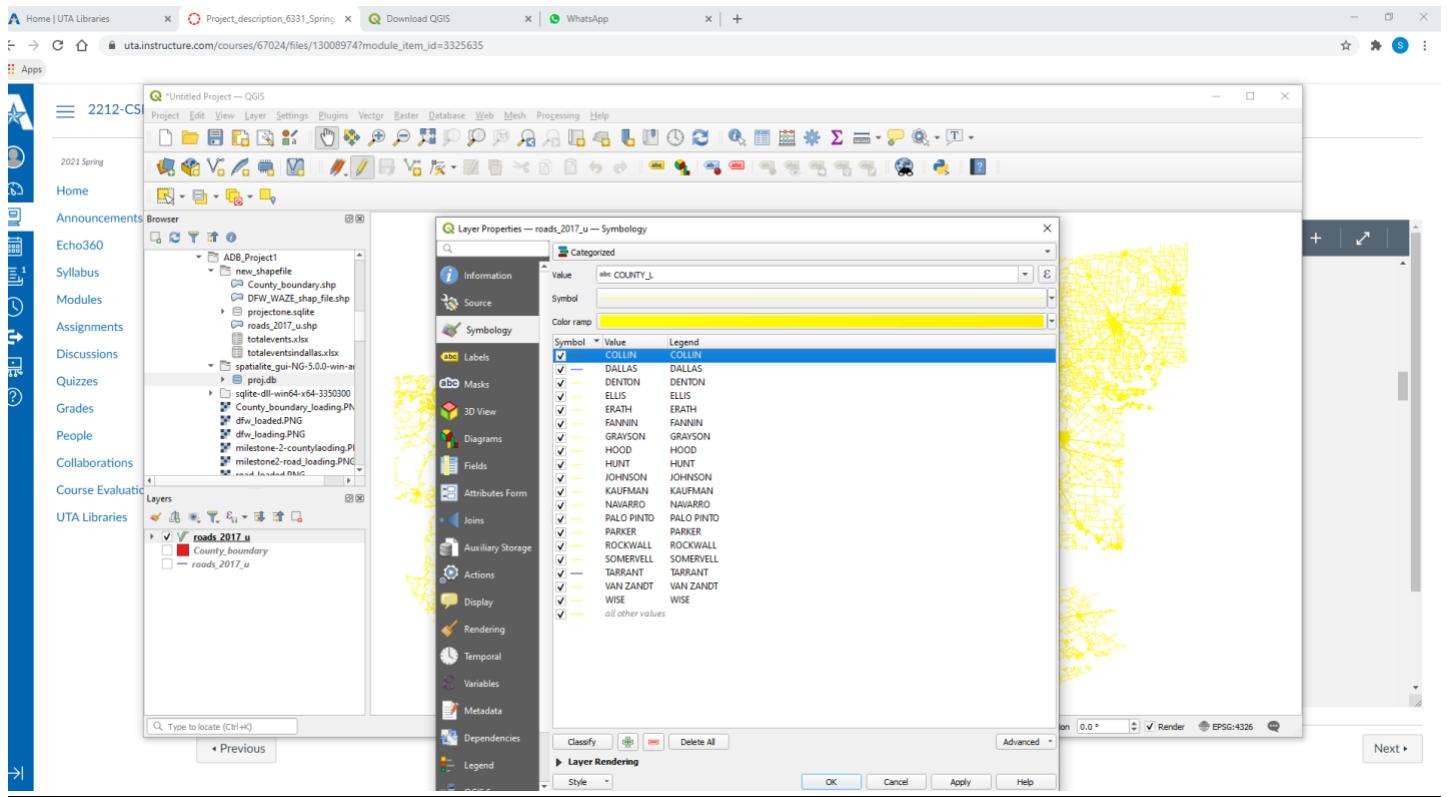


Fig 1a – Selecting color for County and choosing roads to display

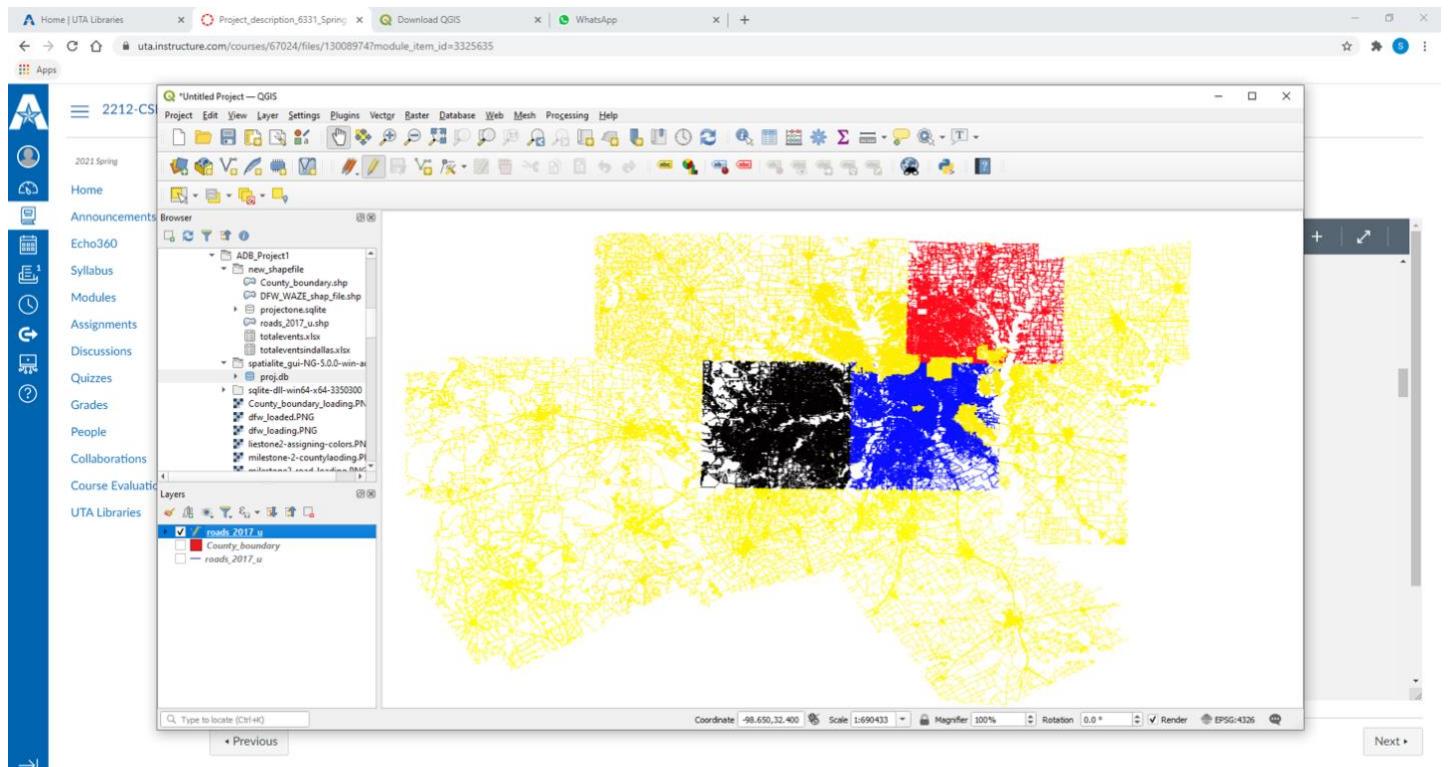


Fig 1b – Output for Query 1

[QUESTION 2] Display the roads that are in the class: ‘PRIMARY HIGHWAY’ in black with the county in the background. Here they are shown in green.

HOW TO OBTAIN THE OUTPUT?

- Now as of the 2nd question, we have to display roads that are located in county so make sure to load road and county shapefiles into QGIS tool successfully.
- **TO DISPLAY ROADS** - As our main goal is to display roads, check only the roads_2017_u
- We opened the County_boundary. Right click on it. -> Go to Properties. -> Symbology -> Assign some background color to the map.
- Later on, to display the county-names on map. Go to Properties -> Labels -> Select values as CNTY_NM. -> and then apply.
- In-order to display road lines which are PRIMARY-HIGHWAY. Go-to roads_2017_u. Right click -> Symbology -> select values as – CLASS. -> Select only the PRIMARY_HIGHWAY value. -> To give color as black. Right click and assign color as black. (as shown below in fig 2.1)
- FIG 2.2 depicts the output

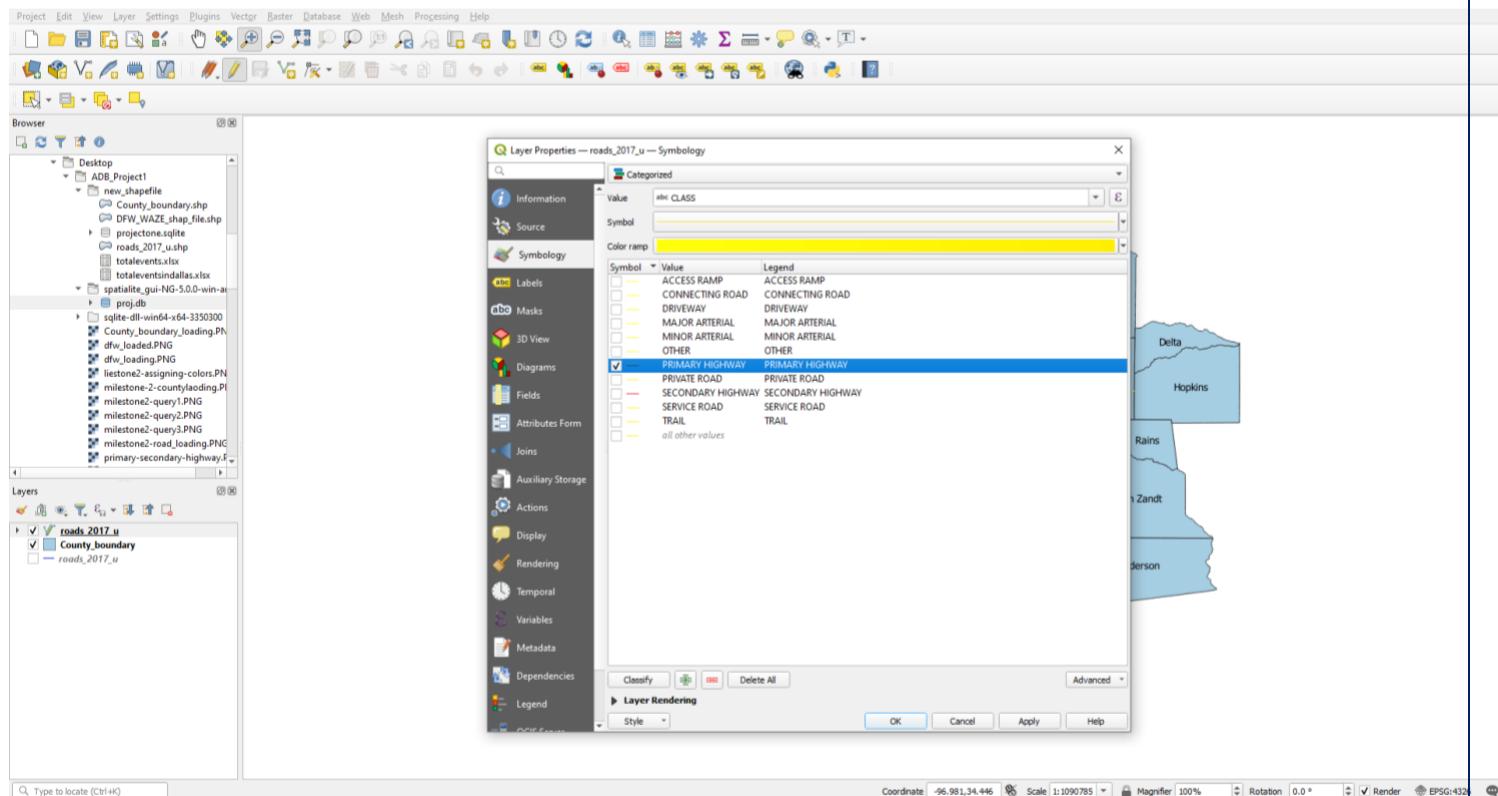


FIG 2.1 : Primary Highway Color

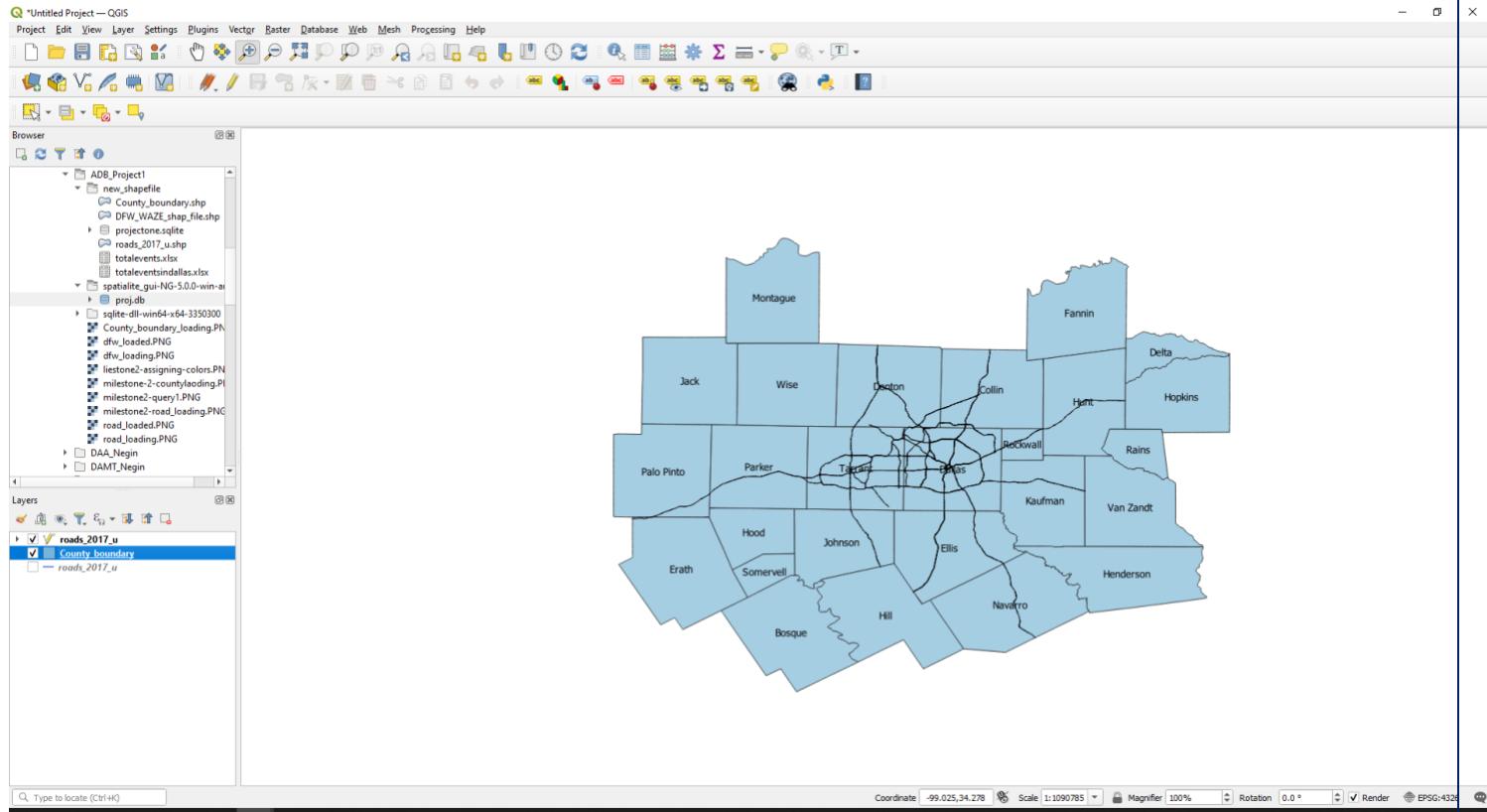


Fig 2.2 : Output for Query II

[QUESTION 3] Display the roads only with class ‘PRIMARY HIGHWAY’ and class ‘SECONDARY HIGHWAY’. Each class should be in a different color with the county in the background.

HOW TO OBTAIN THE OUTPUT?

- Now as of the 3rd question, we have to display roads that are located in county so make sure to load road and county shapefiles into QGIS tool successfully.
- **TO DISPLAY ROADS** - As our main goal is to display roads, check only the roads_2017_u.
- Right click on County_boundary -> choose color -> then choose CNTY_NM under Labels
- Come back to the window -> right click on roads_2017_u -> properties -> Symbology on left menu pane -> Choose Categorized from the dropdown on the top -> choose class under values -> then choose PRIMARY HIGHWAY and SECONDARY HIGHWAY under class attribute -> choose color for both of them (here we chose red and yellow) -> choose discrete
- Apply -> OK
- Result will be obtained as seen on Fig 3

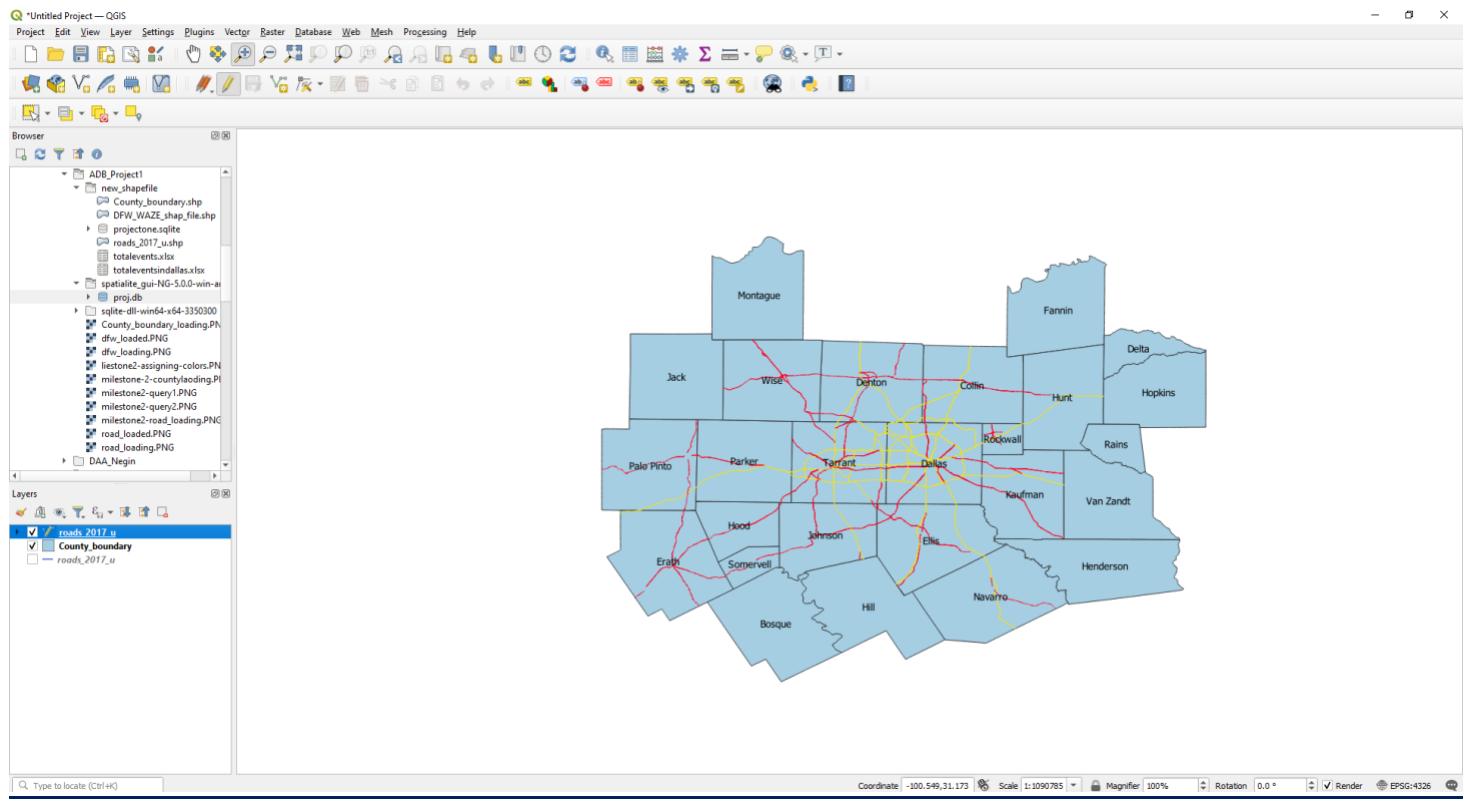


Fig 3 – Output for Query III

PROJECT QUERIES FOR MILESTONE II – PART II – FINAL SUBMISSION

IMPORTANT INFORMATION FOR EXECUTING QUERIES FROM 4-9

From query 4- query 9 all these are based on writing respective queries, so we need to create our own database in spatiallite and load our 3 respective shapefiles(Roads, county, DFW_WAZE). So the following steps depicts on how to create DB -> load our shapefiles -> execute them.

- So got to spatiallite -> Right Click on it and select Create New_database. Give the name to the database. i.e. we gave the name as secondmilestone_DB.
- Now go to the database which is at title bar. Select DB-Manager. Now go to our database which is created in spatialLite. Import the all the three shap_files given and select the check box of create-spatial-index.
- As seen in figure IV. Fig. V, VI, VII shows the successful import of shapefiles.

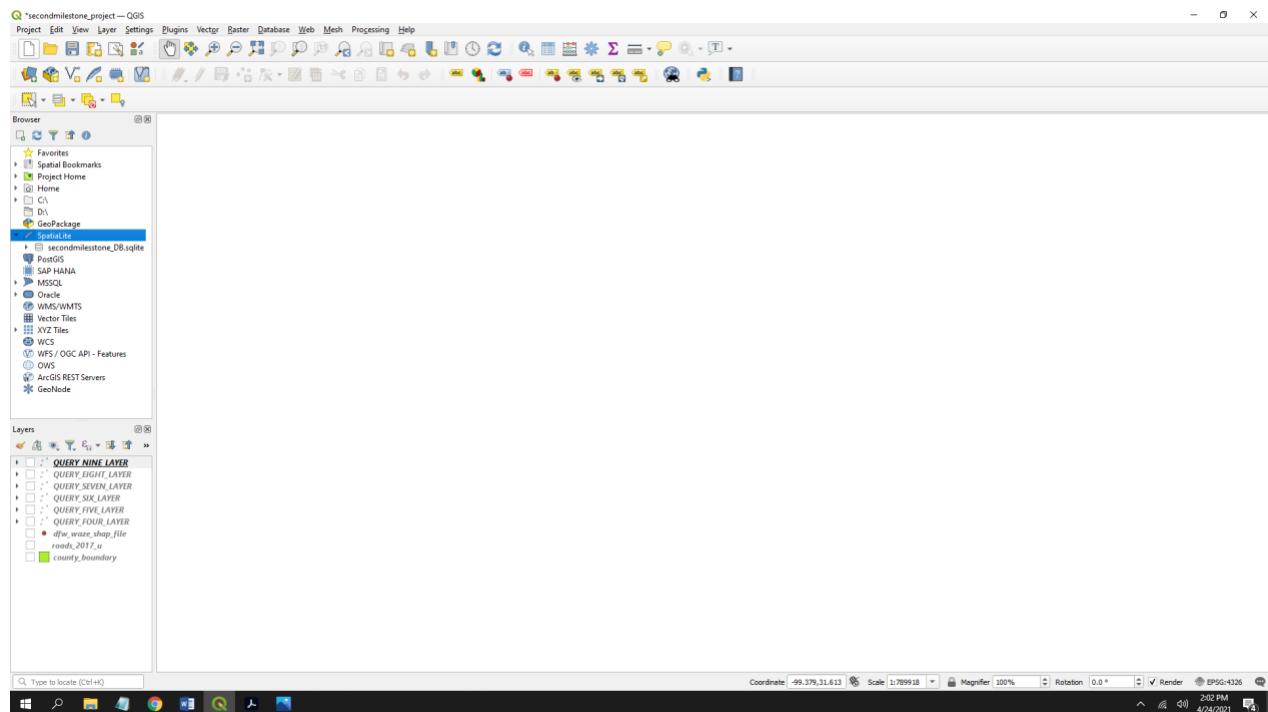


FIG IV – DEPICTION OF DATABASE CREATION

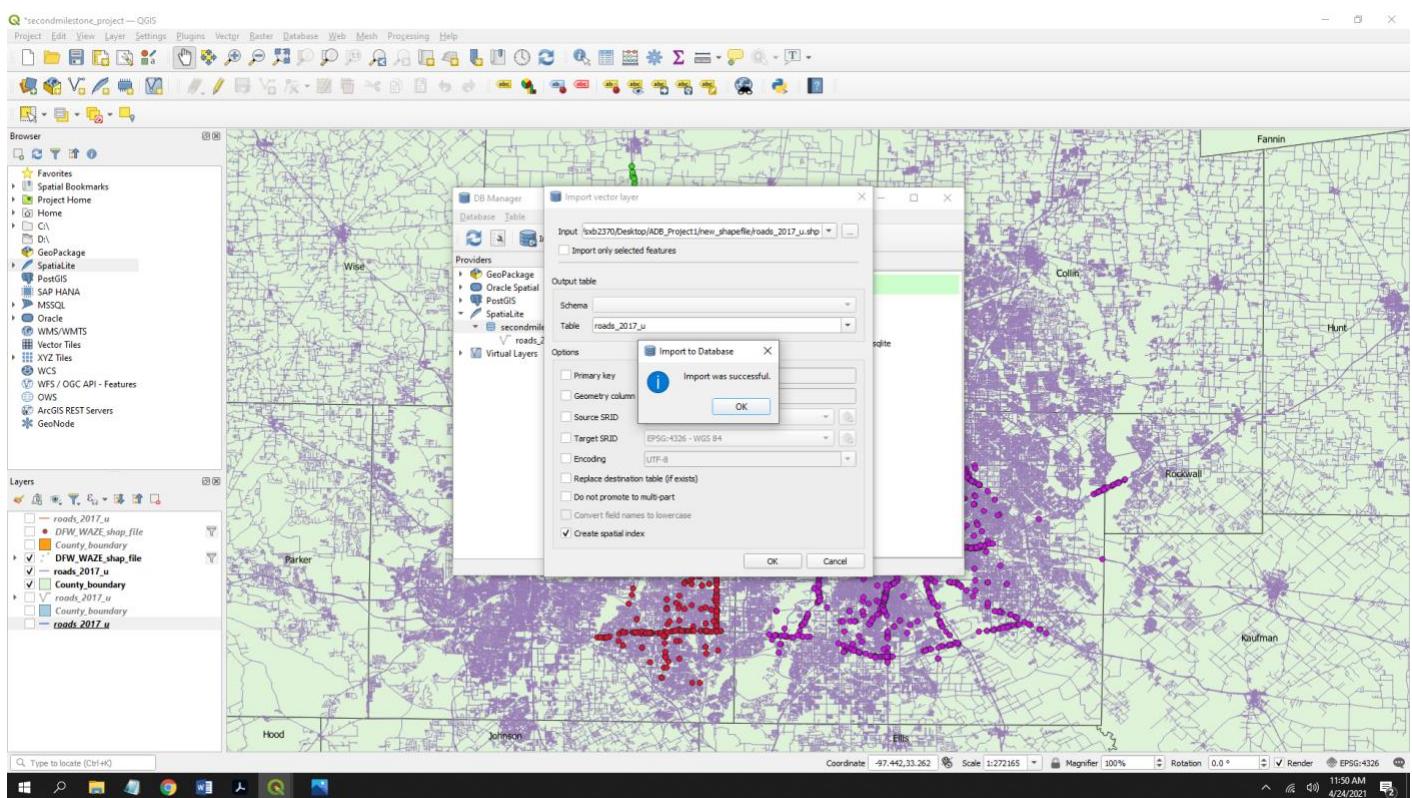


FIG V – IMPORTING ROADS SHAPEFILE

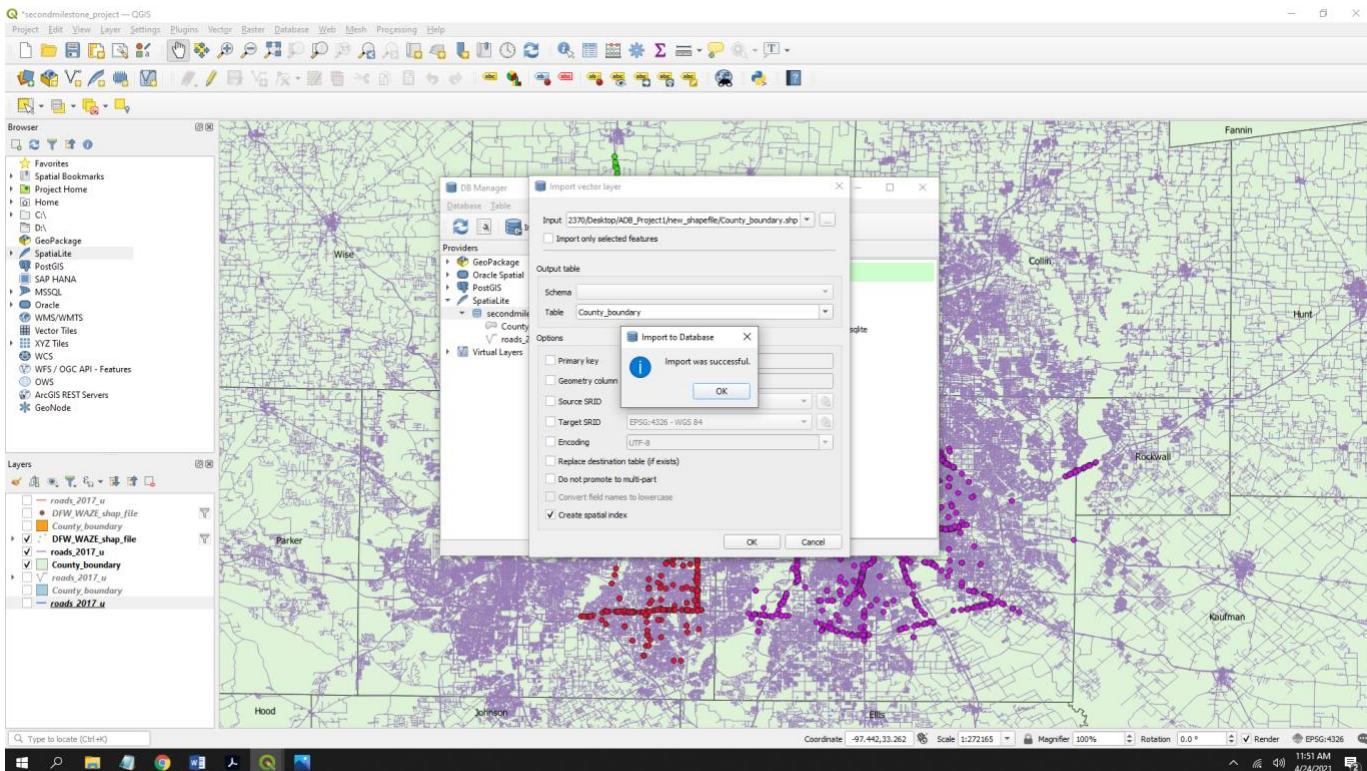


FIG VI – IMPORTING COUNTY SHAPEFILE

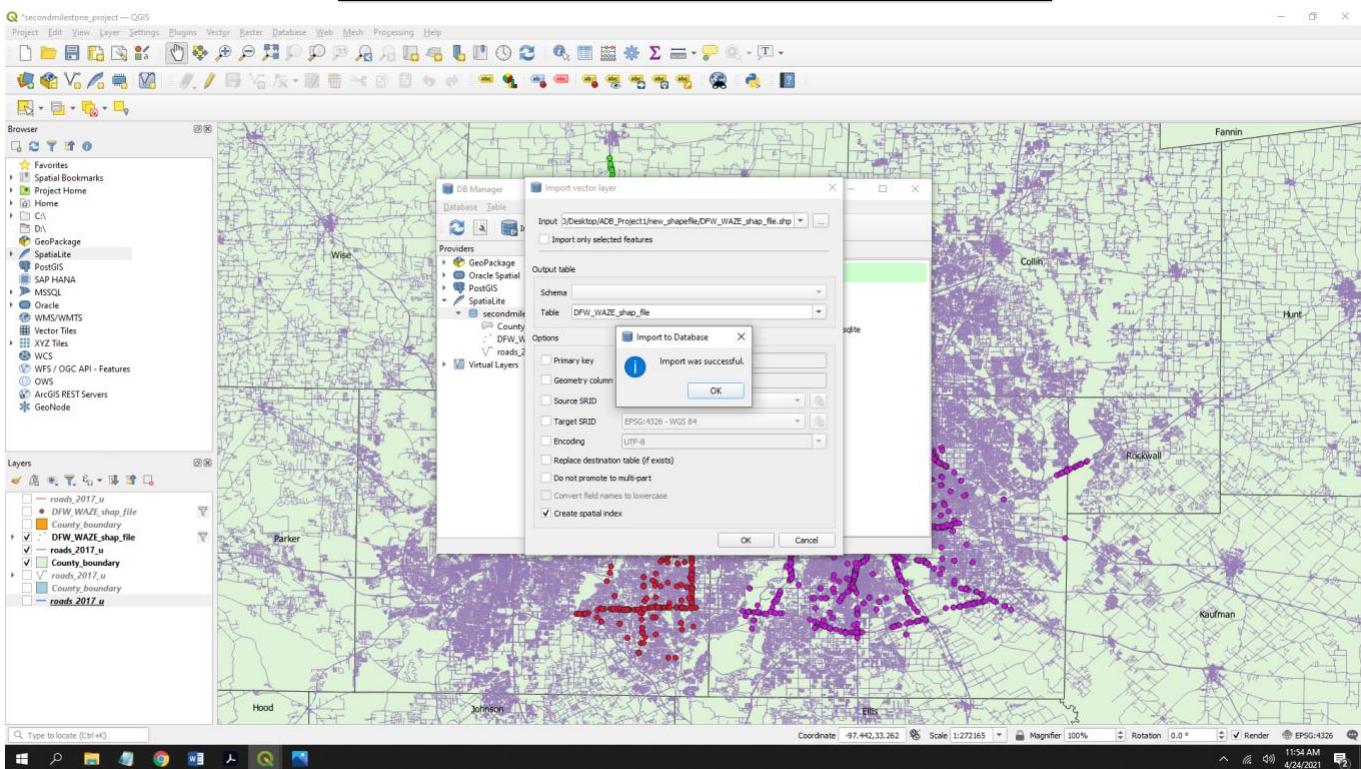


FIG VII – IMPORTING DFW_WAZE SHAPEFILE

- Now go to the intial spatialite where we have created our database. Double click on all the three shape files. So you can see those layers.
- Now right_click on DFW_WAZE_shap_file. Select Update_SQL_layer. Now go to our database which is secondmilestone_DB. Then go to SQL Window and we can enter our queries and give our specific name and then save.

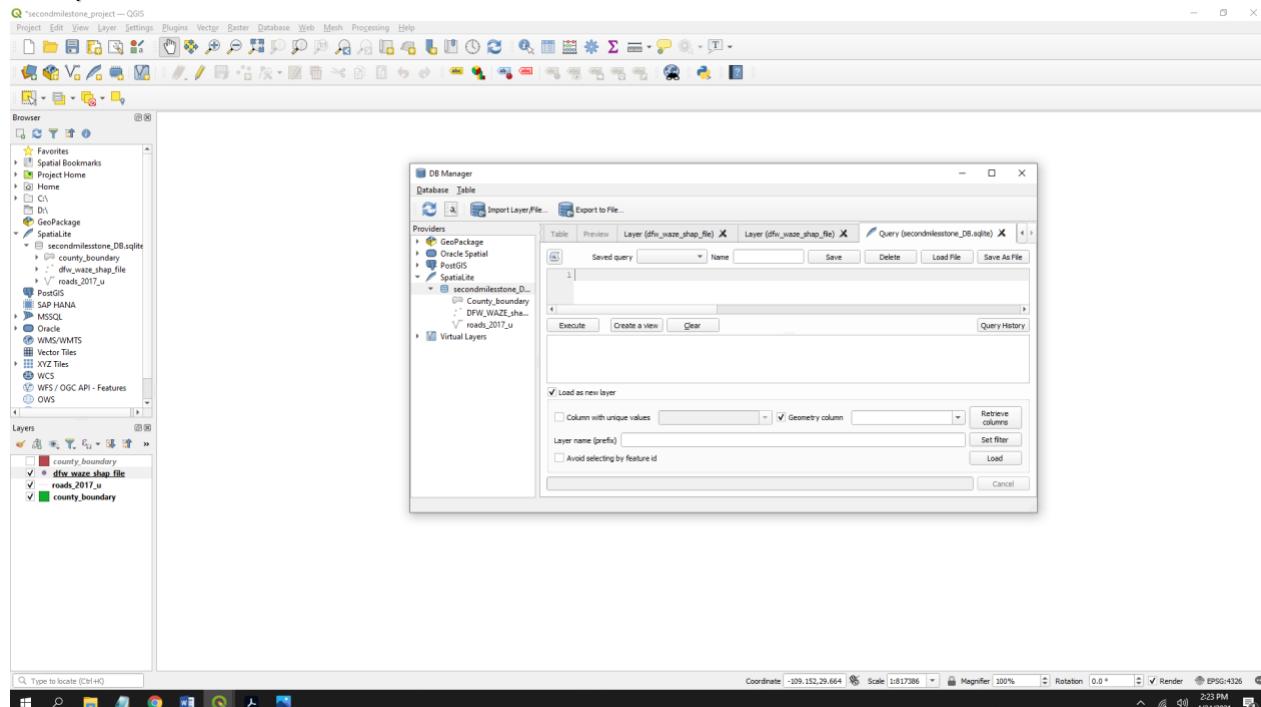


FIG VII – SQL WINDOW FOR ENTERING QUERIES

NOTE #1 : NEXT SELECT THE LOAD AS NEW LAYER AND GIVE THE LAYER NAME. HERE WE HAVE GIVEN THE QUERY_PROBLEMPHONUMBER_LAYER AS A STANDARD WAY. FOR EXAMPLE QUERY_4_LAYER FOR QUERY 4, QUERY_5_LAYER FOR QUERY 5 ETC.

NEXT CLICK ON EXECUTE AND LOAD THE LAYER.

[QUESTION 4] Display all the events (From DFW_WAZE) that happened in Arlington from 6 am to 12 pm on 12/1/2018. Each event should be displayed with different color and the background should be the roads.

HOW TO OBTAIN THE OUTPUT?

- Step-1 According to the problem we need to display all the events that are happened in the city named “Arlington” on a particular day at the given time period. In order to display the output we need to run a query.
- Step-2 Answer for the given problem: select * from DFW_WAZE_shap_file where CITY='Arlington' and CREATE_TIM between '2018-12-01 06:00:00' and '2018-12-01 12:00:00'
- Step-3 Now goto our database -> Then select the sql window -> execute our above query and load the shapefile. -> And the layer name would be QUERY_4_LAYER as of NOTE #1 (Pg 17) and the fig 4.1 given below.

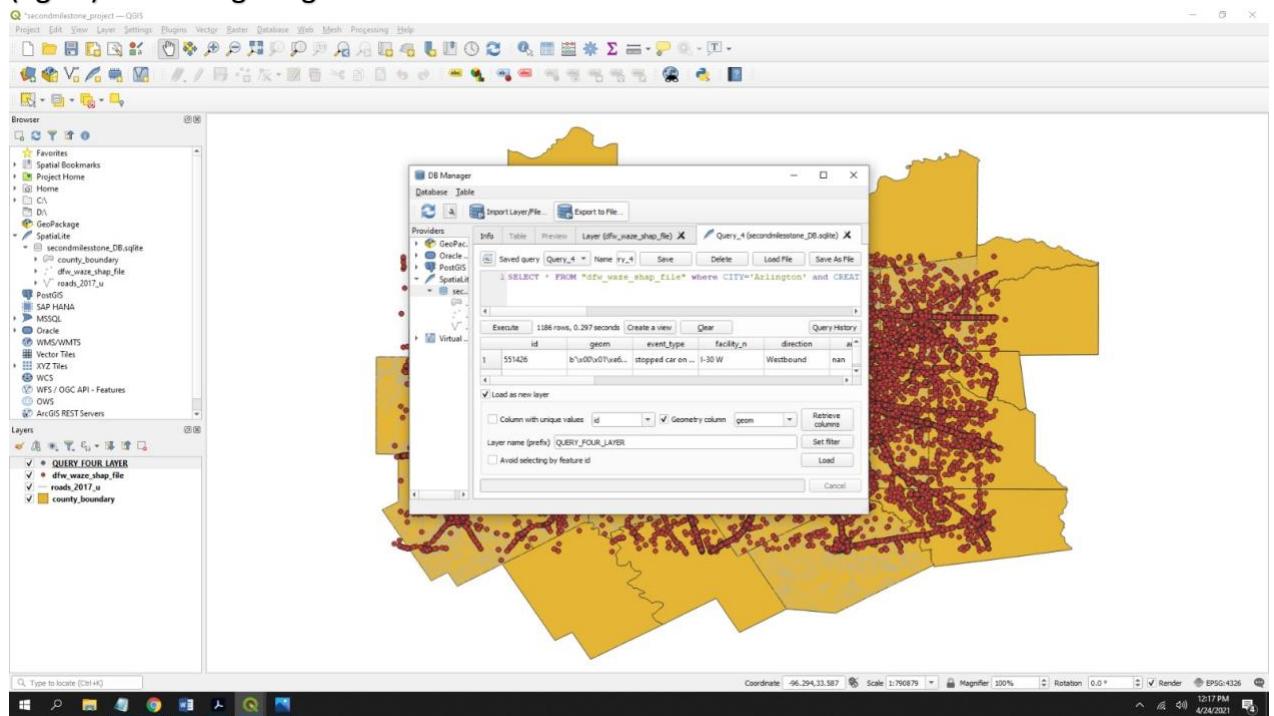


Fig 4.1 – EXECUTING THE QUERY

- Step-4 Now we need to display each event in city Arlington in different color. So, we have to go the right click on QUERY_4_LAYER. Go to the properties. Then select the symbology. Select the categorized and set the value to ‘EVENT_TYPE’. Then click on classify which is at left bottom. Now set the color ramp value to “Random Color”. So this will automatically displays all the events in Arlington city in different colors. You can refer the figure 4.2 below

- Step-5 As the background should contain the Roads, we place the roads_2017_u layer AND SET THE COLOR AS WHITE . after the QUERY_4_LAYER layer and we display all of them. You can refer the figure 4.3 - as the final OUTPUT.

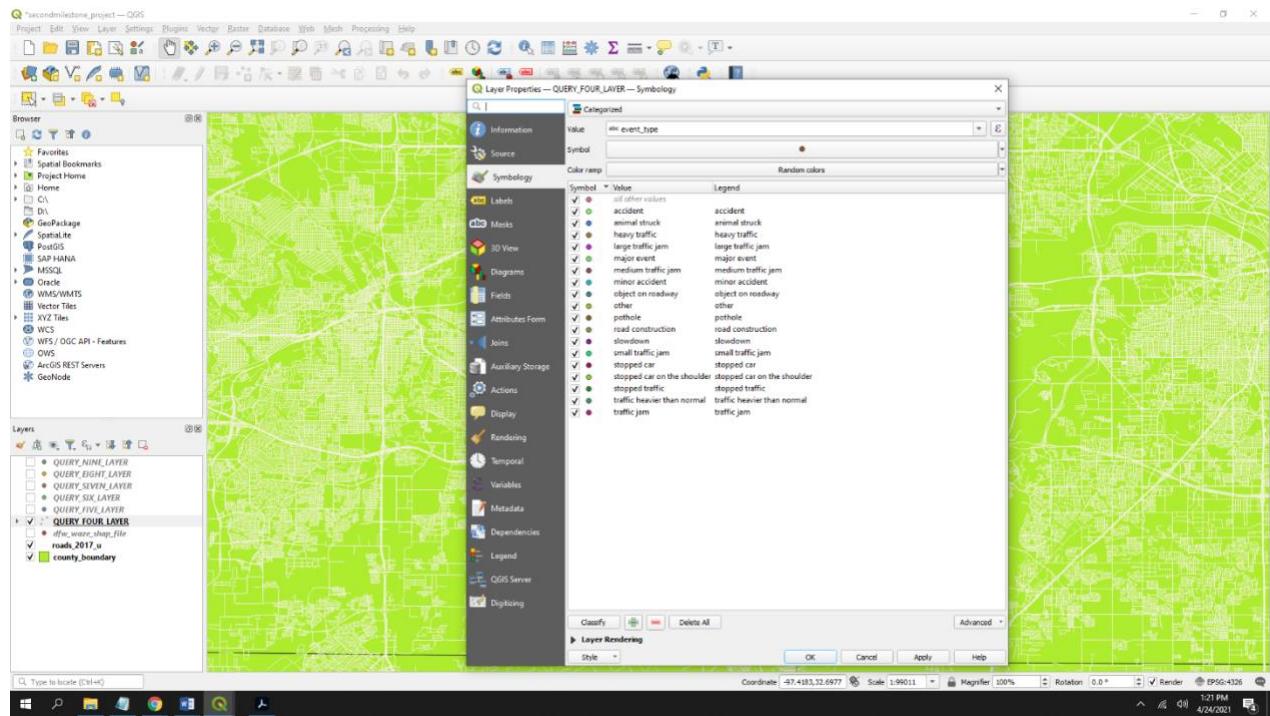


Fig 4.2 - Color Selection

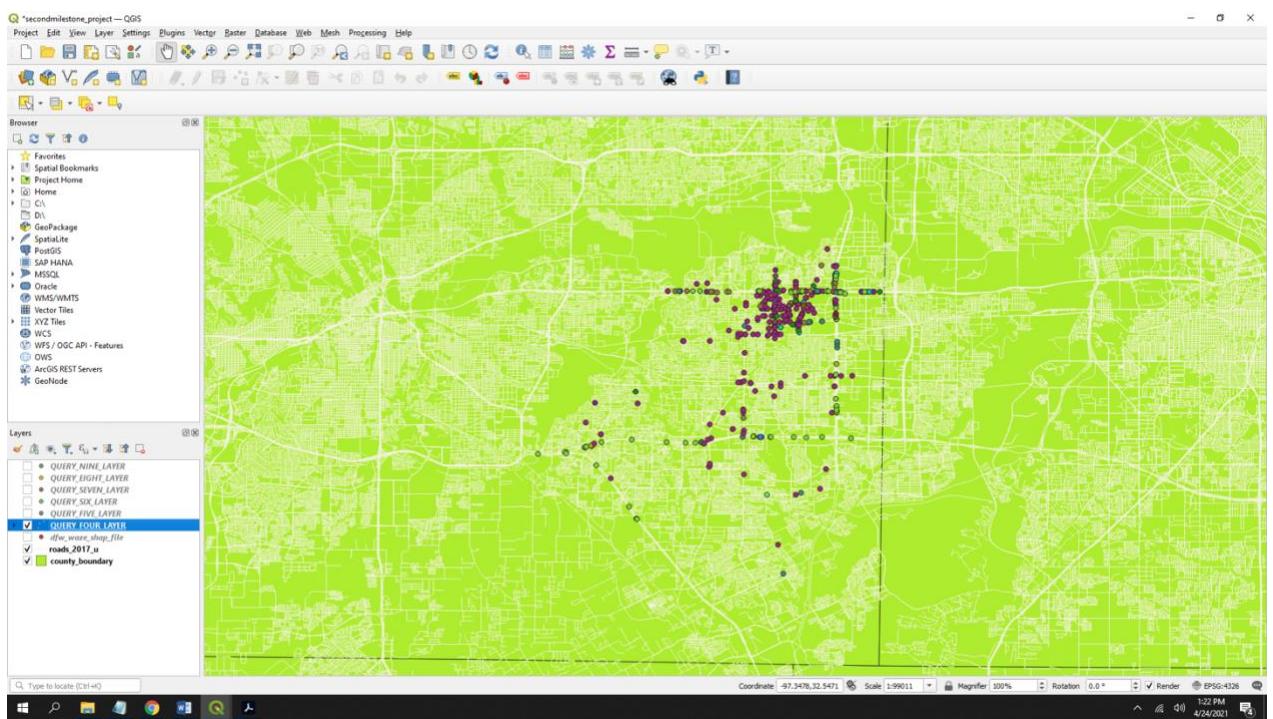


Fig 4.3 – Final Output for Query IV

[QUESTION 5] Display the accidents that happened in Arlington, Dallas, Denton. Each city event in a different color and the background is the roads and county.

HOW TO OBTAIN THE OUTPUT?

- Step-1 According to the problem, we need to display the accidents which are occurred in three different cities. i.e Arlington, Dallas, Denton in different colors. So, we have to run a query in order to display the output.
- Step-2 Answer for the given problem: select * from DFW_WAZE_shap_file where EVENT_TYPE= 'accident' and CITY in ('Dallas', 'Arlington', 'Denton')
- Step-3 Now goto our database -> Then select the sql window -> execute our above query and load the shapefile. -> And the layer name would be QUERY_5_LAYER as of NOTE #1 (Pg 17) and the fig 5.1 given below.

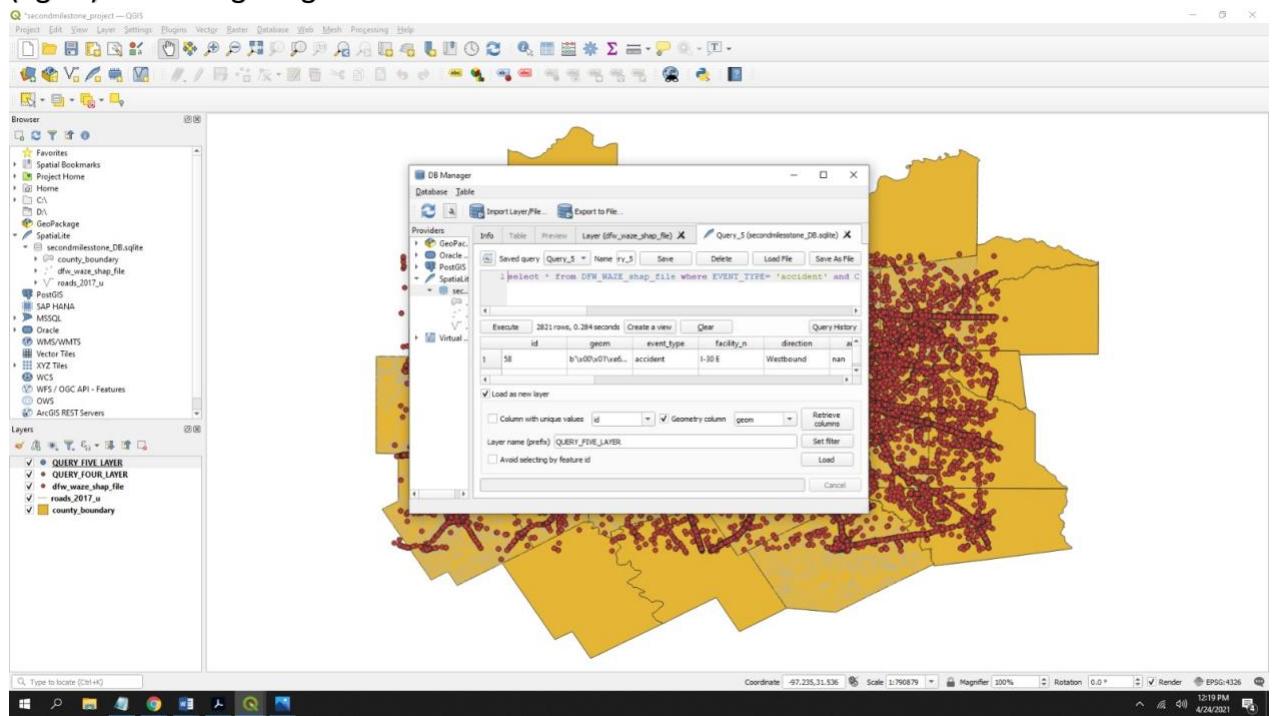


Fig 5.1 – EXECUTING THE QUERY

- Step-4 Now we need to display all the accidents events in these three cities in different colors as mentioned. So, we have to go the right click on Query_5_Layer. Go to the properties. Then select the symbology. Select the categorized and set the value to 'CITY'. Then click on classify which is at left bottom. Keep red to Arlington, purple to Dallas and green to Denton, by right click on it to change the color. You can refer the figure 5.2
- Step-5 As the background should contain the Roads and Counties, we place the roads_2017_u and county_boundary layers after Query_5_Layer and we display all of them. You can refer the figure - as the final 5- OUTPUT fig 5.3

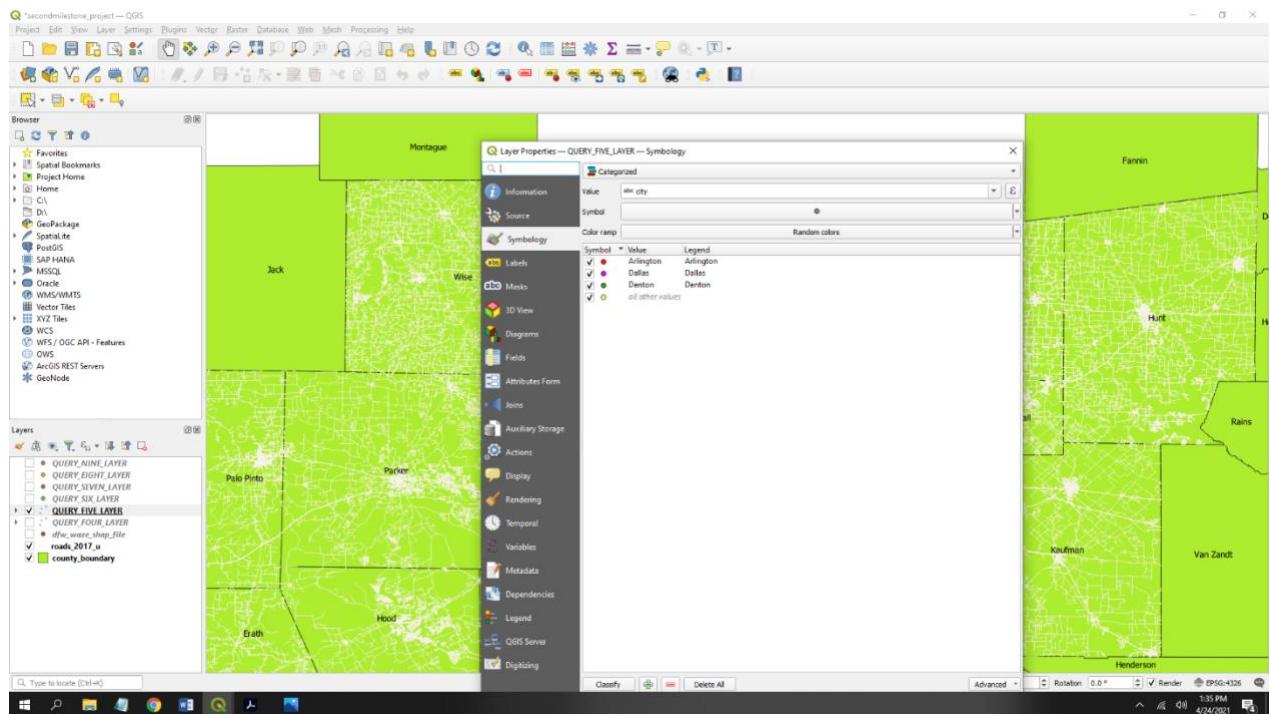


Fig 5.2 – ASSIGNING COLORS TO THE ROADS

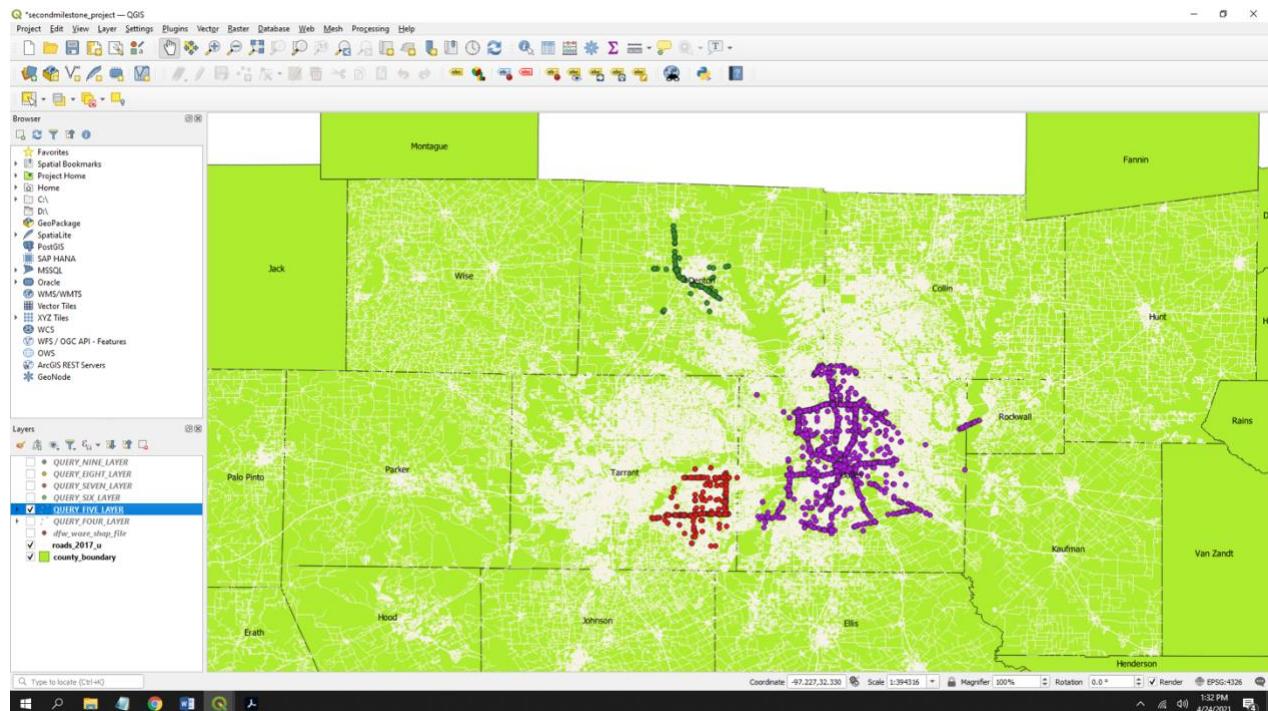


Fig 5.3 – FINAL OUTPUT FOR THE QUERY V

[QUESTION 6] Display the event type “accident” that happened in Tarrant county on 12/09/2018 between 6:00 and 19:00 where each city accidents are displayed with different color. Roads and counties need to be in the background.

HOW TO OBTAIN THE OUTPUT?

- Step-1 As given in the question, we need to display the event type called ‘accident’ that happened in county named ‘Tarrant’ on a particular day and in a given period of time. In order to display this output we need to run a query.
- Step-2 Answer for the given problem: select * from DFW_WAZE_shap_file where COUNTY='Tarrant' and EVENT_TYPE = 'accident' and CREATE_TIM between '2018-12-09 06:00:00' and '2018-12-09 19:00:00'
- Step-3 Now goto our database -> Then select the sql window -> execute our above query and load the shapefile. -> And the layer name would be QUERY_6_LAYER as of NOTE #1 (Pg 17) and the fig 6.1 given below.

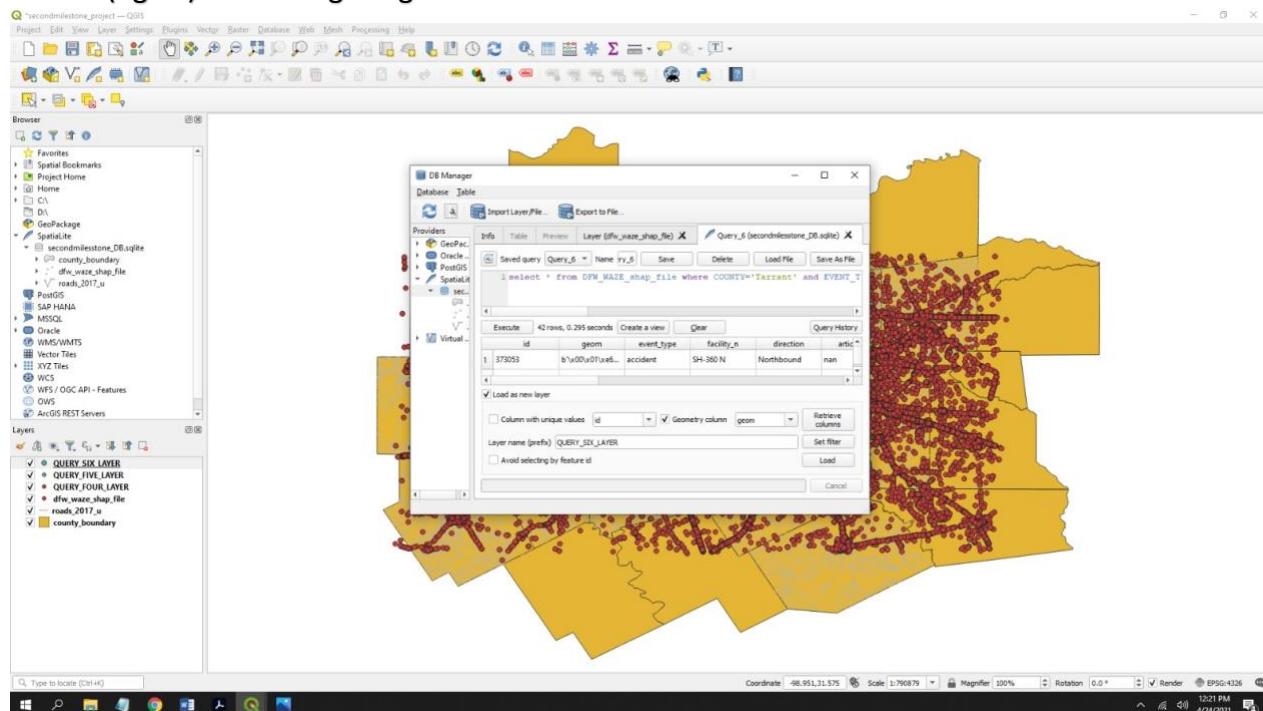


Fig 6.1 – EXECUTING THE QUERY

- Step-4 Now we need to set different color for each city accidents. So, we have to go the right click on Query_6_Layer. Go to the properties. Then select the symbology. Select the categorized and set the value to ‘CITY’. Then click on classify which is at left bottom. Now keep the color ramp to ‘Random color’. So it will automatically keeps some random colors to it. You can refer the figure - 6.2
- Step-5 As the background should contain the Roads and Counties, we place the roads_2017_u and county_boundary layers after the Query_6_Layer layer and we display all of them. And also, in order to display the county names on background. Go to the

properties of county_boundary by right click on it. Select the label and keep single-label.
 Now set the value as 'CNTY_NM'. You can refer the figure 6.3 - as the final OUTPUT

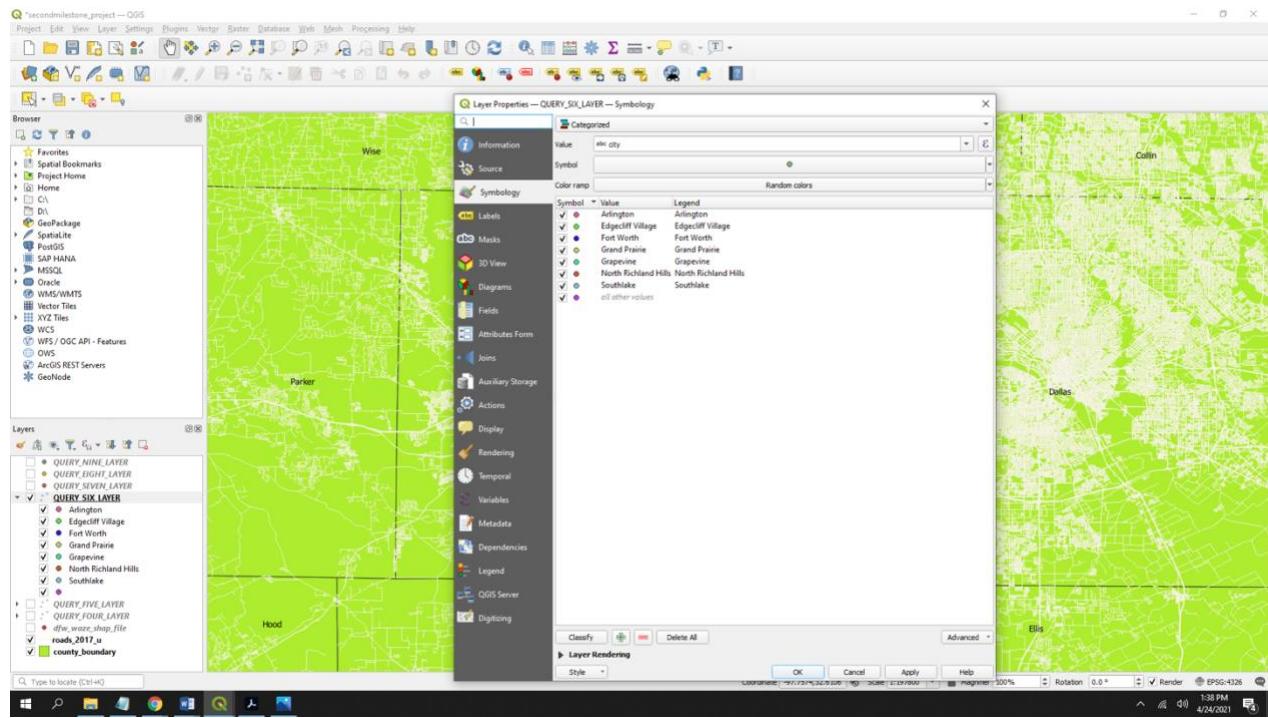


Fig 6.2 – ASSIGNING COLORS TO THE ROADS

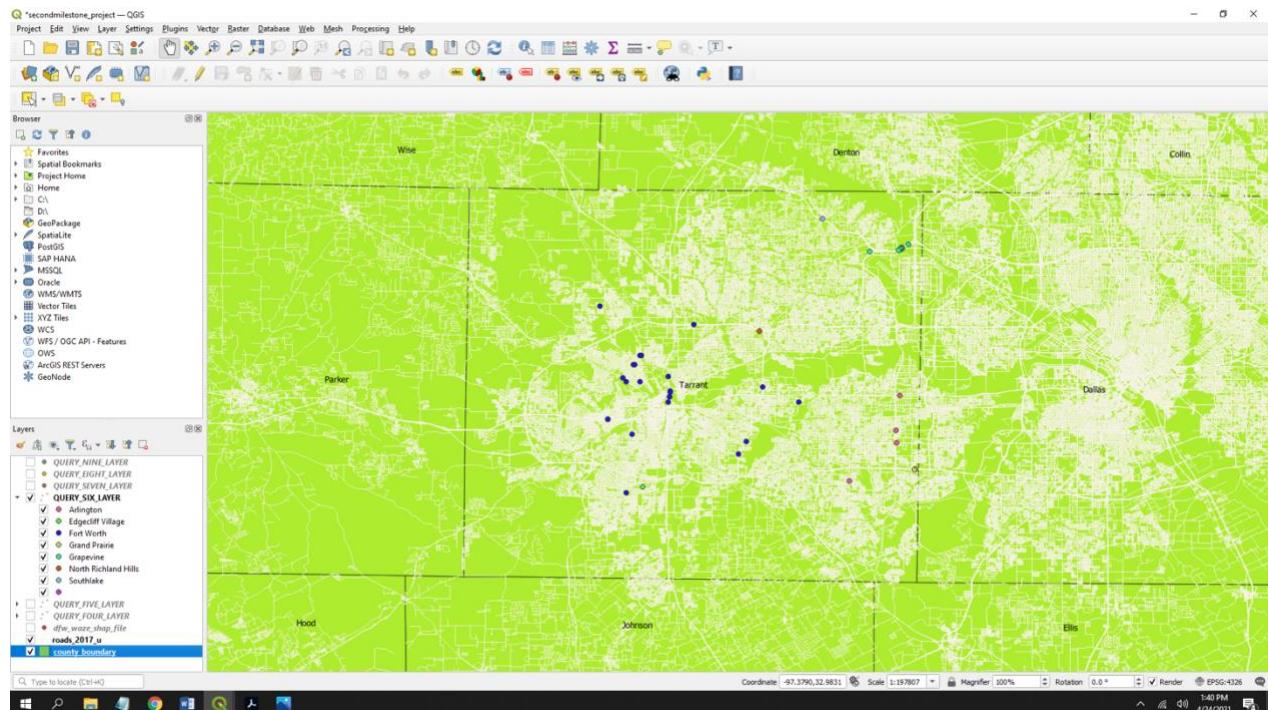


Fig 6.3 – FINAL OUTPUT FOR THE QUERY VI

[QUESTION 7] Display the “traffic jam” in Collin county on 12/27/2018 between 7:00:00 and 15:00:00 and the background is the roads with county.

HOW TO OBTAIN THE OUTPUT?

- Step-1 According to the given question, we must display the event type ‘traffic jam’ in the county named ‘collin’ on a particular day between a given period of time. In order to display we have to execute a query.
- Step-3 Answer for the given problem: select * from DFW_WAZE_shap_file where COUNTY='Collin' and EVENT_TYPE = 'traffic jam' and CREATE_TIM between '2018-12-27 07:00:00' and '2018-12-27 15:00:00'
- Step-3 Now go to our database -> Then select the sql window -> execute our above query and load the shapefile. -> And the layer name would be QUERY_7_LAYER as of NOTE #1 (Pg 17) and the fig 7.1 given below.

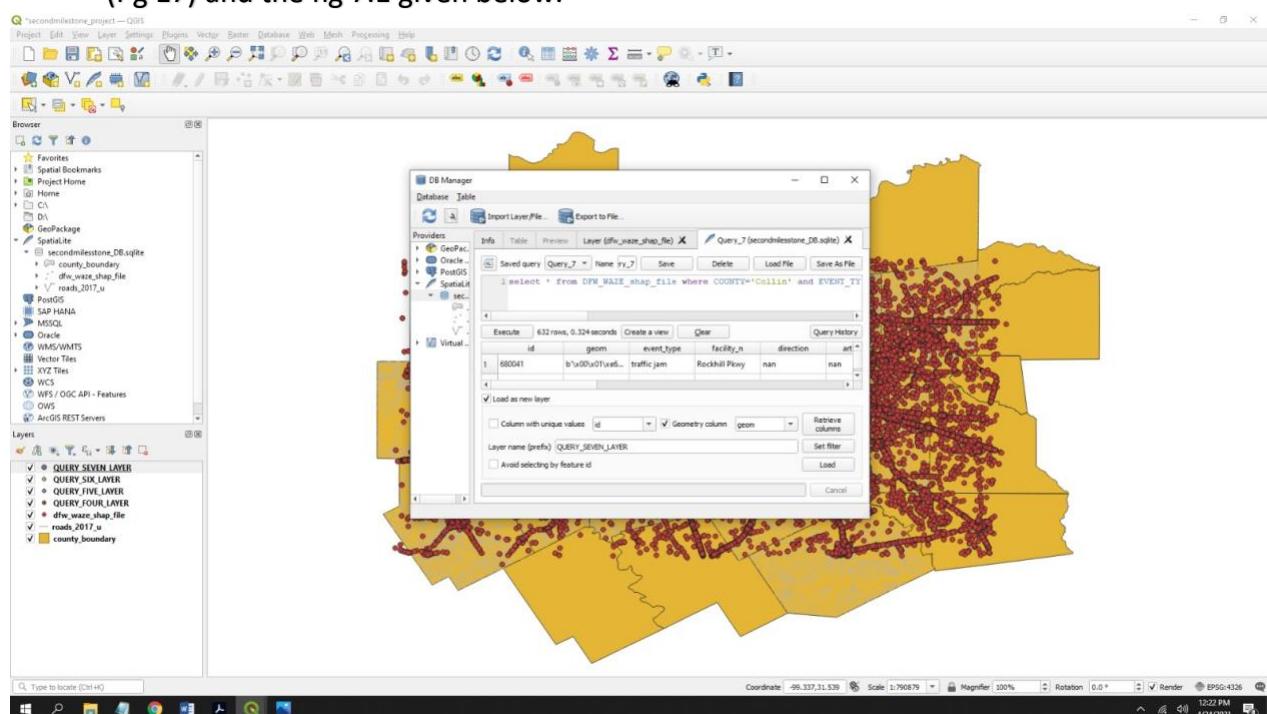


Fig 7.1 – EXECUTING THE QUERY

- Step-4 So, to show all the traffic jam points in a different color for example I set the color to purple. So go the QUERY_7_LAYER right click on it. Go to properties. Then select symbology. Select the Categorized and put the value as ‘EVENT_TYPE’. Select the classify which is at left bottom and set the color purple to the traffic jam. You can refer the figure- 7.2.
- Step-5 As the background should contain the Roads and Counties, we place the roads_2017_u and county_boundary layers after the Query_7_Layer layer and we display all of them. You can refer the figure - as the final 7- OUTPUT figure 7.3

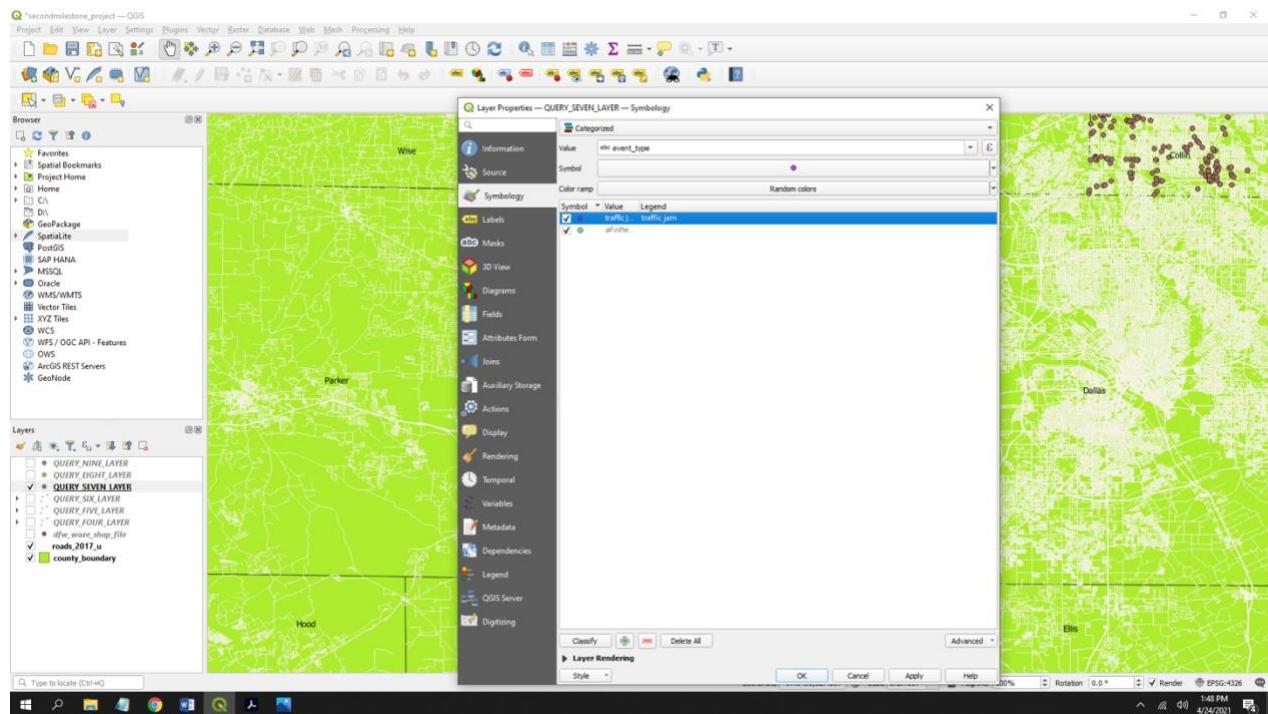


Fig 7.2 – ASSIGNING COLORS

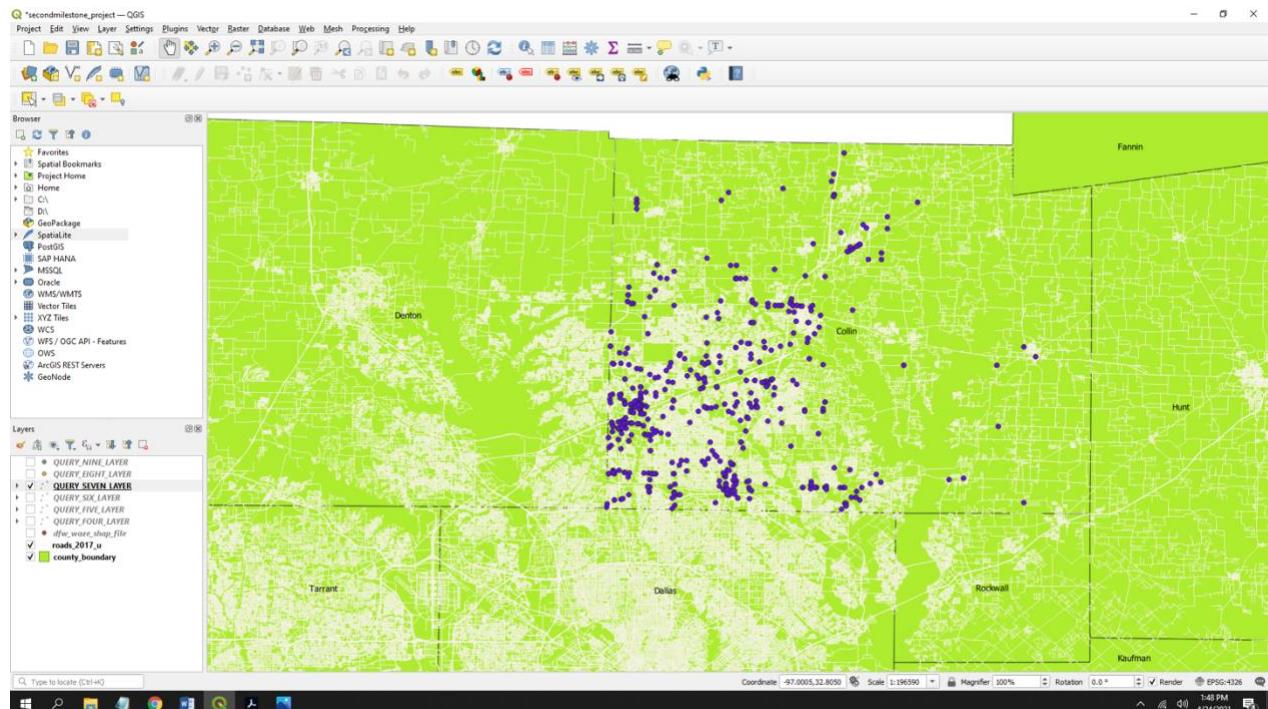


Fig 7.3 – FINAL OUTPUT FOR THE QUERY VII

[QUESTION 8] For each county, display the event type ‘traffic jam’ on 12/24/2018. Each county with different color.

HOW TO OBTAIN THE OUTPUT?

- STEP-1 Here we need to display the event type traffic jam of all the counties on a particular day. So, in order to display the result we need to run the query.
 - STEP-2 Answer for the given problem: select * from DFW_WAZE_shap_file where EVENT_TYPE='traffic jam' and CREATE_TIM between '2018-12-24 00:00:00' and '2018-12-24 23:59:59'
- Step-3 Now go to our database -> Then select the sql window -> execute our above query and load the shapefile. -> And the layer name would be QUERY_8_LAYER as of NOTE #1 (Pg 17) and the fig 8.1 given below

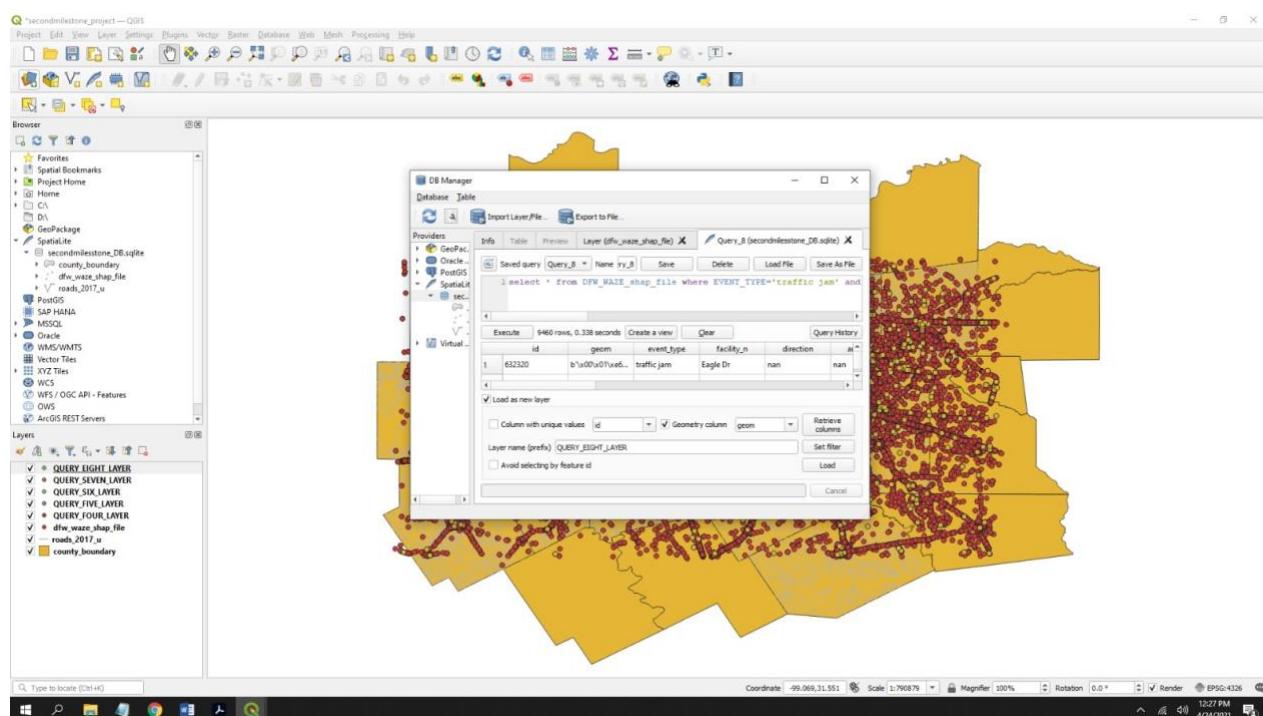


Fig 8.1 – EXECUTING THE QUERY

- STEP-4 Each county need to be display in different color's as mentioned in the question. So, go the properties of Query_8_Layer. Select the symbology. Then select Categorized and give the value as 'COUNTY'. Now select the Classify which is at left bottom and select the color ramp as – Random colors and then click OK. So automatically some random colors will be assigned as seen in the fig. 8.2 below
- STEP-5 As the background should contain the Roads and Counties, we place the roads_2017_u and county_boundary layers after the Query_8_Layer layer and we display all of them. You can refer the figure - as the final output in fig. 8.3

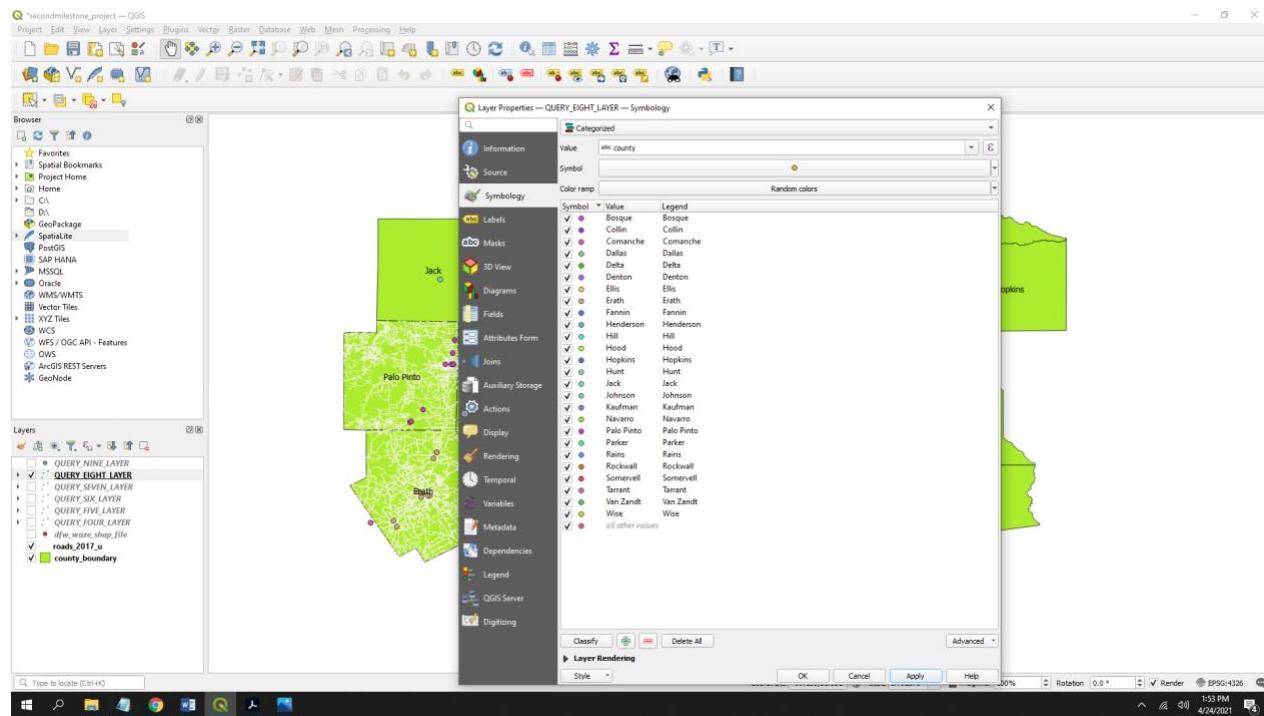


Fig 8.2 – ASSIGNING COLORS

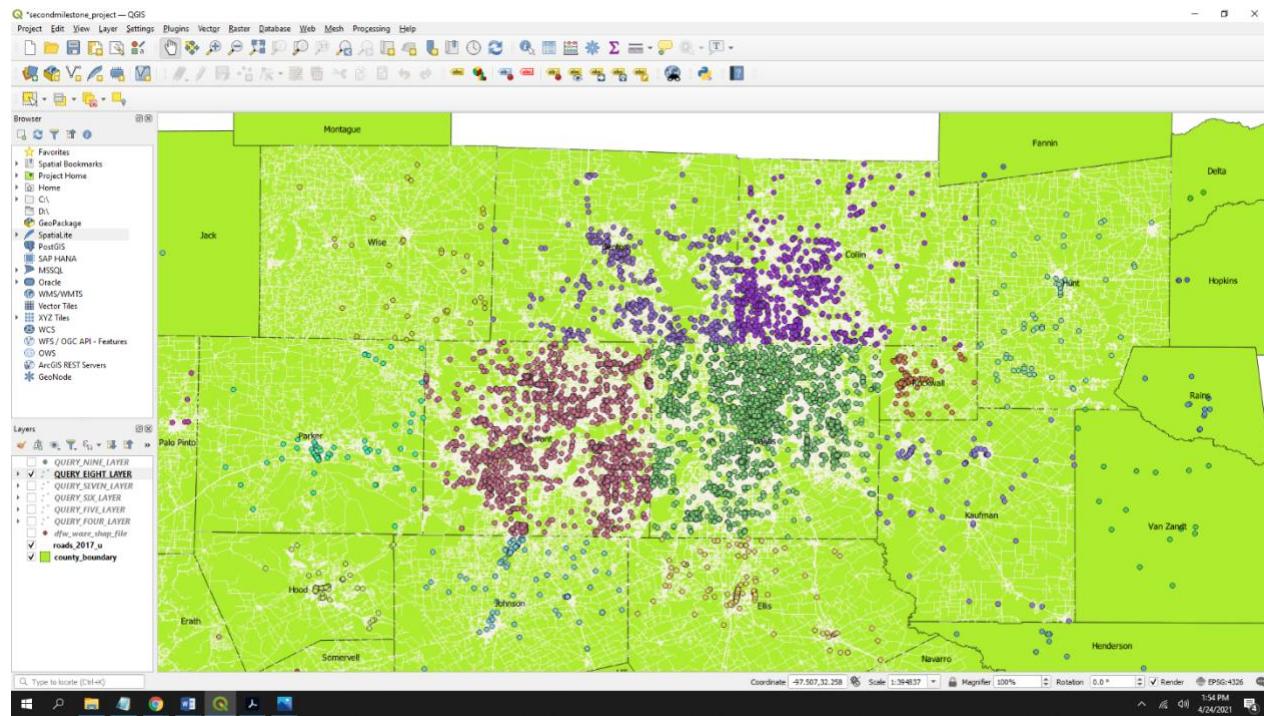


Fig 8.3 – FINAL OUTPUT FOR QUERY VIII

[QUESTION 9] Display all the events on the road 'I-20 E' and 'I-30 E' on 12/9/2018 from 9 am to 12pm. Events on 'I-20 E' should be in different color than event in 'I-30 E'.

HOW TO OBTAIN THE OUTPUT?

- STEP-1 : According to the question, we need all the events on the roads at a particular point of times. So, in order to get the output i.e. displaying the map, we need to run a query.
- Step 2 : Answer for the given problem: select * from DFW_WAZE_shap_file where FACILITY_N in('I-20 E', 'I-30 E') and CREATE_TIM between '2018-12-09 09:00:00' and '2018-12-09 12:00:00'
- Step-3 Now go to our database -> Then select the sql window -> execute our above query and load the shapefile. -> And the layer name would be QUERY_9_LAYER as of NOTE #1 (Pg 17) and the fig 9.1 given below

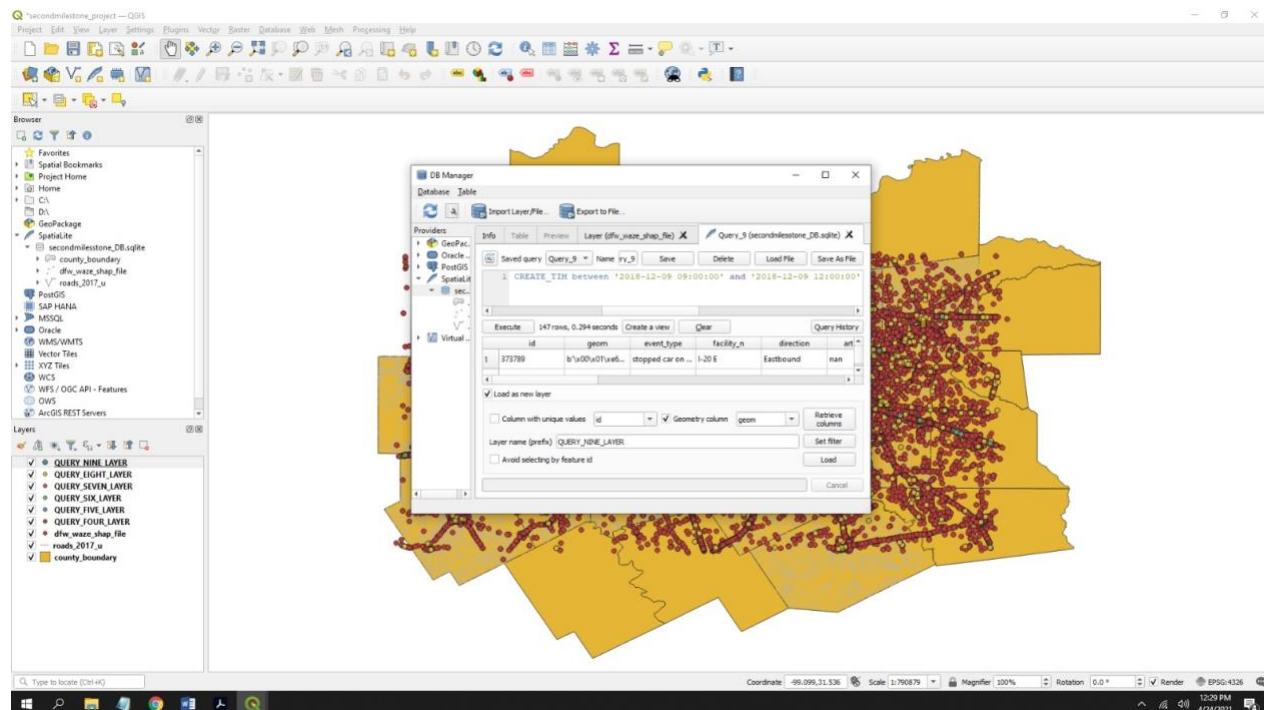


Fig 9.1 – EXECUTING THE QUERY

- Step-4. In order to differentiate the roads i.e I-20 and I-30, we assign different colors to it. For example here we have taken color red for I-20 and color green for I-30. So, go the properties of Query_9_Layer. Select the symbology. Then select Categorized and give the value as 'FACILITY_N'. Now select the Classify which is at left bottom and assign colors to the roads by right click on it. You can refer the figure – 9.2

- STEP-5 As the background should contain the Roads and Counties, we place the roads_2017_u and county_boundary layers after the Query_9_Layer layer and we display all of them. You can refer the figure - as the final output in fig. 9.3

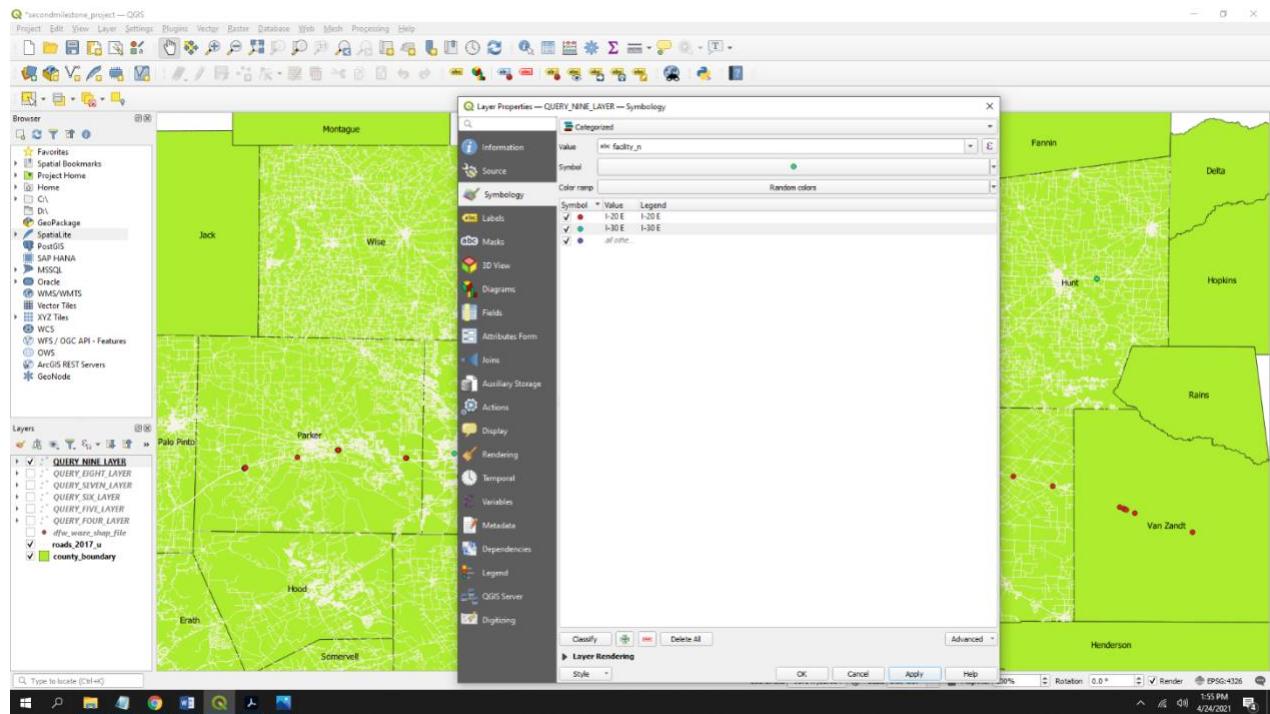


Fig 9.2 – ASSIGNING COLORS TO THE ROADS

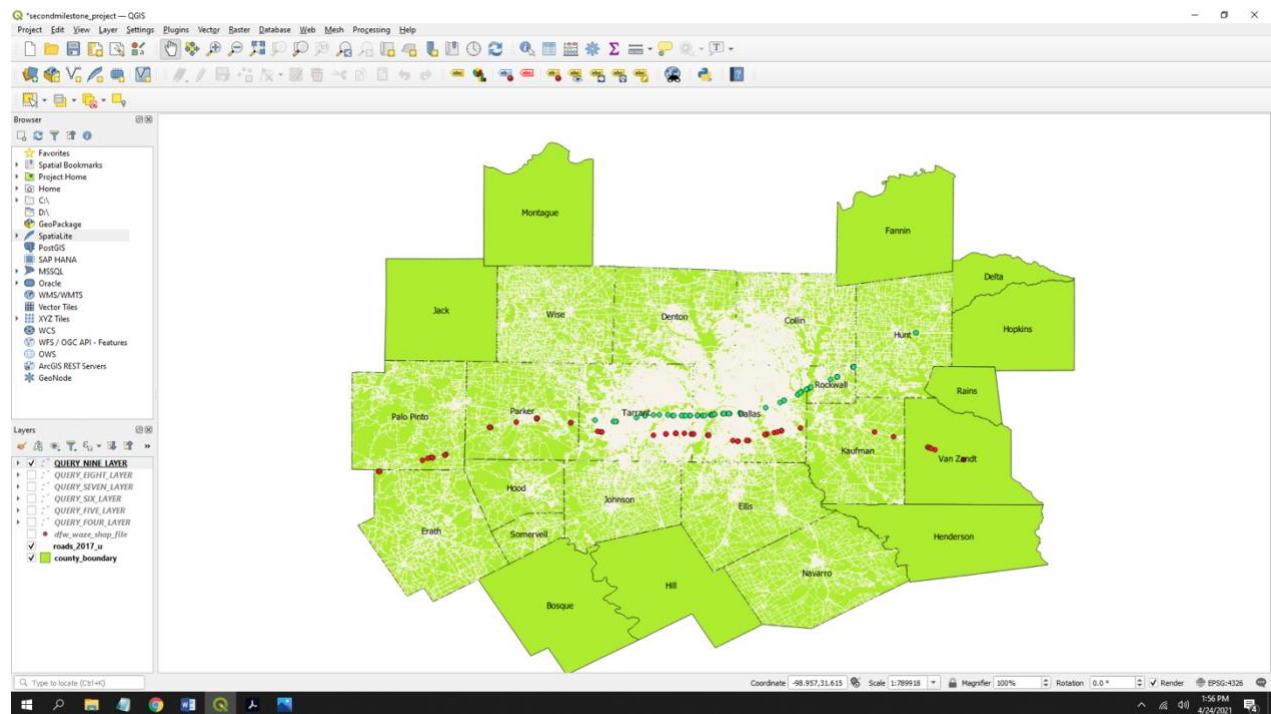


Fig 9.3 – FINAL OUTPUT FOR QUERY IX