BLACKSPOTS IDENTIFICATION ON NATIONAL HIGHWAY N-55(Indus highway) AND IT'S MAPPING THROUGH GIS

GIS/RS APPLICATION TO CIVIL ENGINEERING (Lab)

MINI PROJECT

Submitted By: Kashif Yaqub

Reg. No. : 7733

Submitted To: Engr. Hamza Mustafa

Module: 8

Section: B

Department: Civil Engineering

1. Introduction

Transport has a critical role to play in economic development. A modern transport and communication facilities play an important role for integrated economics development. It play a major role in the economics uplift of a country as it is promotes internal and external trade, economic use of a natural resources, mobility of skilled labor-force, increase in agriculture and industrial production etc. but on the other side as a result of accidents we have to pay the price in terms of injuries, fatal and property damage.

Road safety is a major health problem, statistics shows that worldwide due to accidents more than 3000 people die daily. Also the estimated economics uses due to traffic accidents are US $512 billion a year. The estimated economics losses in developing countries are US $100 million per year due to accidents which is twice the annual amount of development assistance in these countries.

1.1 Blackspots

Accident blackspots may be defined as

"A location on road where most of the accidents occurs"

1.2 N-55(Indus Highway)

It is a 1264 km long four line and at some location two line, national highway connecting the port city of Karachi with city of Peshawar that's runs along the Indus River in Pakistan.

1.3 Accident

Accident is an unintended event that happens when a vehicle hits a person, an object or another vehicle that induce in properly damage, injury or death.

1.3.1 Reasons for accident can be,

- Lack of education
- Lacks of driving skills
- Geometric design problems
- Inappropriate design of pedestrian crossing etc.

1.3.2 Types of Accident

a) Fatal accidents
b) Non-fatal accidents
c) Serve-injury accident
d) Moderate injury accident
e) Minor injury accident
f) Property damage only accident

1.3.3 Characterization of Accident Data

```
                          ┌─────────────────┐
                          │  Accident Data  │
                          └─────────────────┘
```

Severity Wise	Time Wise	Vehicle Wise	Cause wise
Fatal	Year	Passenger	Human
Non-Fatal	Month	Private	Mechanical
• Severe Injury accident	Day of the month	Goods	Environmental
• Moderate Injury accident	Hour		
• Minor injury accident	Day/Night		
Property Damage Only			
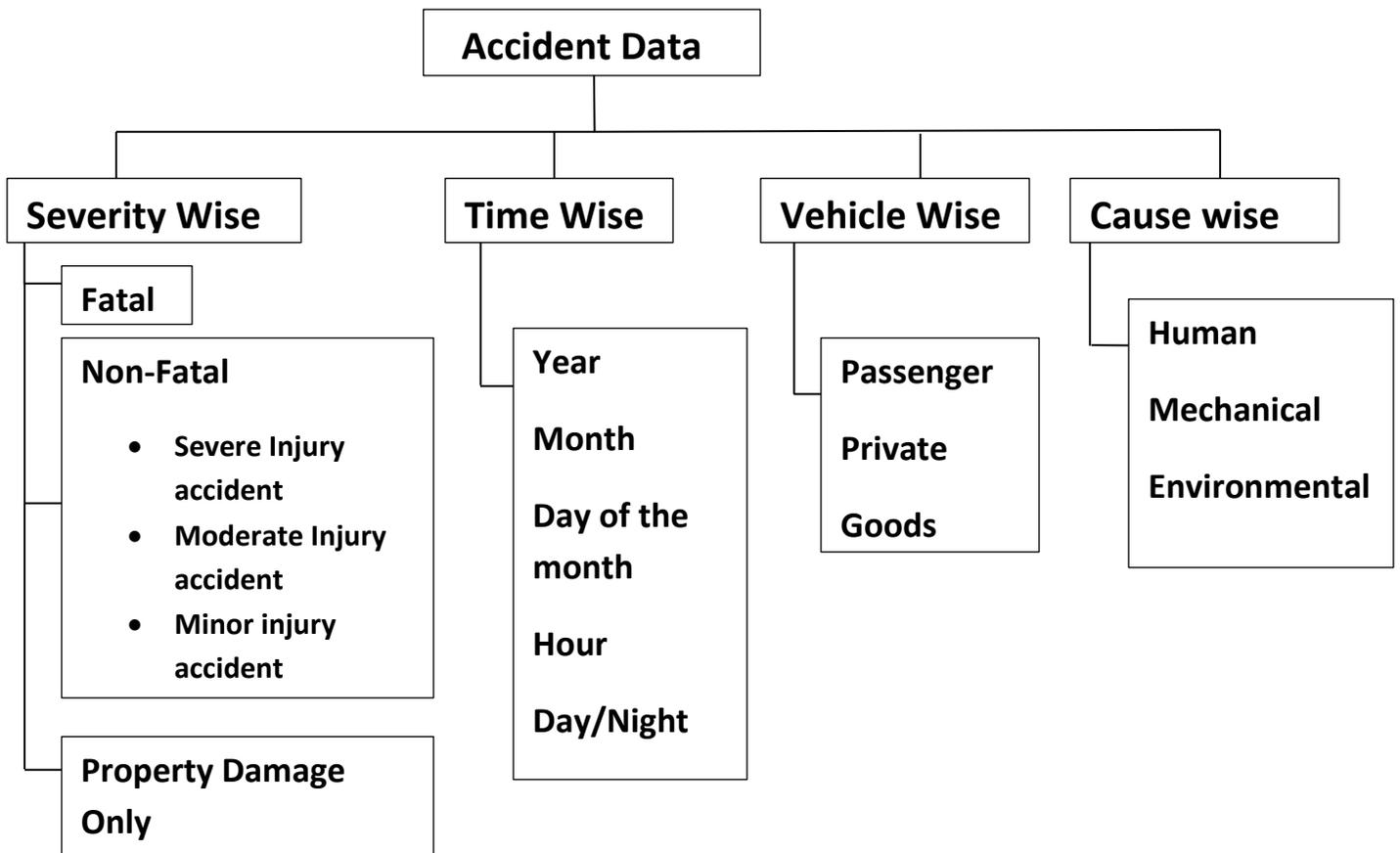
2. Aims and Objectives

- The objective of this study is to identify and classify black spots 'Major accident occurring location' on highway (N-55).
- And to map the identified blackspots using GIS and also to perform different analytical tools of GIS.

3. Problem Statement

- In Pakistan on its road infrastructure there is no organized way of managing the traffic flow. In both rural and urban highways the traffic is primarily possessed by traffic police who generally fail to enforce the traffic laws.
- Traffic accidents could only the controlled by implementation of a high level of traffic laws .the extent of the problem should be clear before modifying or strict enforcement of current traffic laws.
- Provide advice on accidents prevention, highlight the key factors of safety and propose measure that can be used to reduce road accidents.

4. Literature Review

Different research papers were studied and researchers in different countries analyzed the accident data and identified the blackspots according to their methodology.

5. Methodology

5.1 Site Selection

The selected site for the project is a section of National Highway N-55 also known as Indus Highway which is 188 KM stretch that starts from Peshawar and ends at Lakki Marwat (Gandi Chok).

The geometric design of the selected section of the highway is different at different regions. At some places it is four lanes separated by median and at

some regions the highway is two lanes without median and then most of the vehicles use opposing traffic lane for overtake which results in accident.

Figure below shows the selected section of N-55
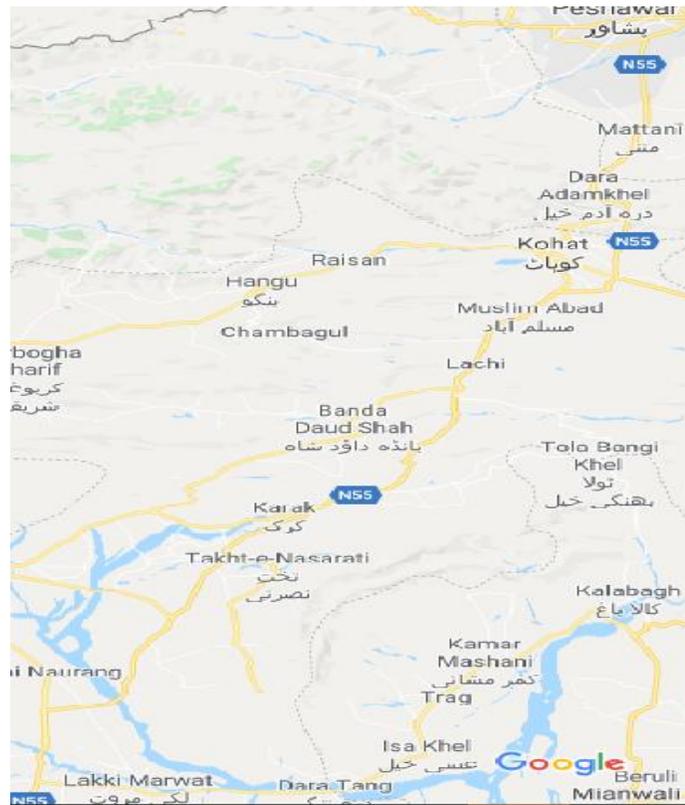
Selected Section of N-55

5.2 Data Collection

Approach for accident data was made to different sources i.e. National Highway Authority (NHA), Rescue 1122 and Local District Police.

Unfortunately the accident data was only available with Local District Police in form of First Investigation Reports (FIR File).

The FIR Files from year 2013 to 2019 were collected from nine (9) local district police stations along the route.

5.2.1 Data Arrangement

All the collected FIR files were read thoroughly and converted to excel sheets keeping in view the information about road accident i.e. location of the accident, date, time, fatalities and injuries in accident, vehicles involved and cause of the accident which are clearly mentioned in FIR file. Year wise excel sheets of accident data were developed from the collected FIR files. Figure below shows the excel spread sheet of accident data of Indus Highway N-55.

Year	Month	Date	Time	Location	Cause of Accident	Severiety	Deaths	Injured	Veh. 1	Veh. 2	Veh.3	Veh. 4	Pedesterian
2019	June	28/6/2019	7:30	Aamin Hotel Karak	Improper pedestrian crossing	Fatal	1	0	traaly				1
2019	Januar	2/1/2019	15:50	Aamir Cng Kohat	Careless Driving (Negligence of Motorcyclist)	Fatal	1	0	Motorcycle	MotorCycle			0
2019	August	28/8/2019	7:20	Ambiri Kala Karak	Overtake&overspeeding of Car(for overtake most veh. Uses the o|	Fatal	1	4	Car	Car			0
2019	Decem	26/12/2019	10:00	Ambiri Kala Karak	Careless Driving (Negligence of FlyenCoach Driver)	Non Fatal	0	1	Motorcycle	FlyenCoach			0
2019	July	12/7/2019	5:00	Ambiri Kala Karak	Careless Driving (Negligence of FlyenCoach Driver)	Non Fatal	0	2	FlyenCoach				0
2019	Octobe	14/10/2019	19:00	Baba Hotel Karak	Careless Driving (Negligence of Traaly Driver)	Non Fatal	0	2	Rikshaw	Traaly			0
2019	Decem	5/12/2019	13:00	Babul Khel Karak	Overtake&overspeeding of Car(for overtake most veh. Uses the o|	Non Fatal	0	3	Suzuki	Car	car		0
2019	Januar	10/1/2019	14:00	Babul Khel Karak	Overtake&overspeeding of Car(for overtake most veh. Uses the o|	Fatal	1	1	Motorcycle	Car			0
2019	June	24/6/2019	16:00	Babul Khel Karak	OverSpeeding &Careless Driving (Negligence of Both Drivers)	Non Fatal	0	4	Rikshaw	Oil Tanker			0
2019	Febura	24/2/2019	12:30	Badaber Bazar	Careless Driving (Negligence of Car Driver)	Fatal	1	1	Motorcycle	Car			0
2019	May	13/5/2019	18:45	Badaber Bazar	OverSpeeding &Careless Driving (Negligence of tanker Driver)	Non Fatal	0	3	Motorcycle	Oil Tanker			0
2019	May	9/5/2019	15:45	chichana Moor kohat	Insufficent Safety of Loaded Container(material drop on car)	Fatal	1	1	Car	Container			0
2019	May	19/5/2019	18:00	chichana Moor kohat	Improper pedestrian crossing	Non Fatal	0	1	FlyenCoach				1
2019	Septer	10/9/2019	7:10	chichana Moor kohat	Improper pedestrian crossing	Fatal	1	0	Car				1
2019	April	5/4/2019	8:00	Chungi NO.2 Karak	OverSpeeding &Careless Driving (Negligence of Both Drivers)	Fatal	1	2	Motorcycle	Pessanger Bus			0
2019	August	25/8/2019	9:30	Darozgai Mattani	OverSpeeding &Careless Driving (Negligence of Truck Driver)	Fatal	1	0	Car	Truck			0
2019	August	28/8/2019	8:45	Darulislam Karak	Careless Driving (Negligence of FlyenCoach Driver)	Non Fatal	0	1	FlyenCoach	Traaly			0
2019	May	24/5/2019	18:50	Darulislam Karak	OverSpeeding &Careless Driving (Negligence of Both Drivers)	Non Fatal	0	1	Motorcycle	Oil Tanker			0
2019	March	13/3/2019	21:50	DaryaKhan Kabab House	Overtake&overspeeding of Crane(for overtake most veh. Uses the|	Non Fatal	0	2	Truck	Crane			0
2019	August	31/8/2019	15:00	EidGaah Jarma Kohat	Careless Driving (Negligence of Flyencoach Driver)	Non Fatal	0	1	FlyenCoach	Rikshaw			0
2019	June	7/6/2019	19:10	Ejaaz Hotel Lachi	Careless Driving (Negligence of Traaly Driver)	Fatal	2	0	Truck	Traaly			0
2019	August	4/8/2019	16:50	Fateh Sheri Karak	wrong side overtake & overspeeding of Motorcyclist	Fatal	1	2	Motorcycle				1
2019	Noven	25/11/2019	15:00	Fauji Foundation Hospit;	Improper stopping/Turning or Changing Direction by Motor vehicl|	Non Fatal	0	3	PickUp	Tractor			0
2019	Febura	5/2/2019	9:20	Candrai Karak	OverSpeeding & Careless Driving (Negligence of Both Drivers)	Fatal	14	2	PickUp	FlyenCoach			0

5.3 Blackspots Identification

Different people had defined and identified black spots differently in their researches. In our research we define the blackspots as **"the road section of 1 km span on which the accident frequency is high and at least five fatalities have occurred on these spots according to available data"**. The time selected for data is more but as only limited data was available therefore we defined the blackspots according to available data.

The blackspots are identified manually from excel sheets by manually counting repeated accidents at same locations at different times and also which are according to definition of blackspots of our research.

Fourteen locations were identified as blackspots whose information is given in data analysis.

5.4 Data Analysis

The mapping of identified blackspots was done using QGIS. Different analytical tools and activities were performed whose snips are mentioned below.

5.4.1 Georefrencing
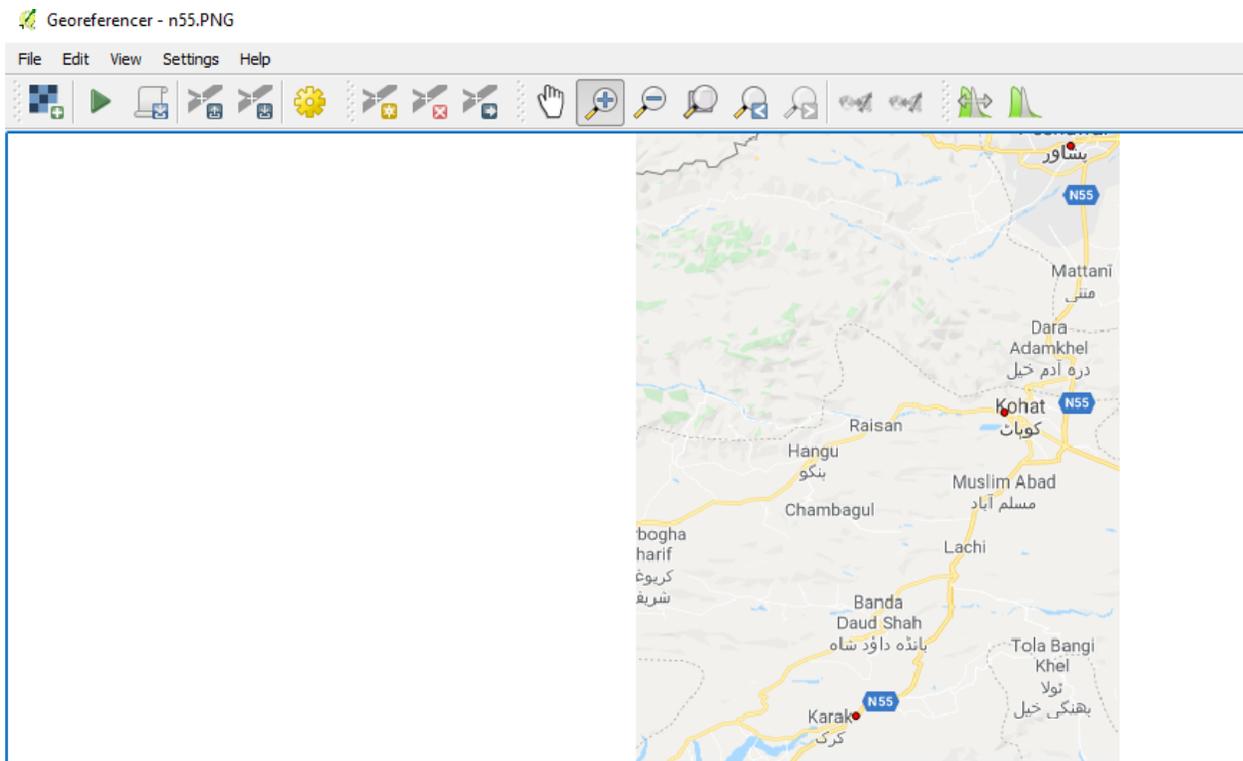
on/off	id	srcX	srcY	dstX	dstY	dX[pixels]	dY[pixels]	residual[pixels]
✖	0	292.36	-12.61	71.53	34.01	0.00	0.00	0.00
✖	1	247.69	-192.45	71.41	33.58	0.00	0.00	0.00
✖	2	147.55	-397.06	71.13	33.12	0.00	0.00	0.00
✖	3	17.15	-558.44	70.78	32.76	0.00	0.00	0.00

5.4.2 Loading CSV file in GIS

5.4.3 Map Showing Identified Blackspots
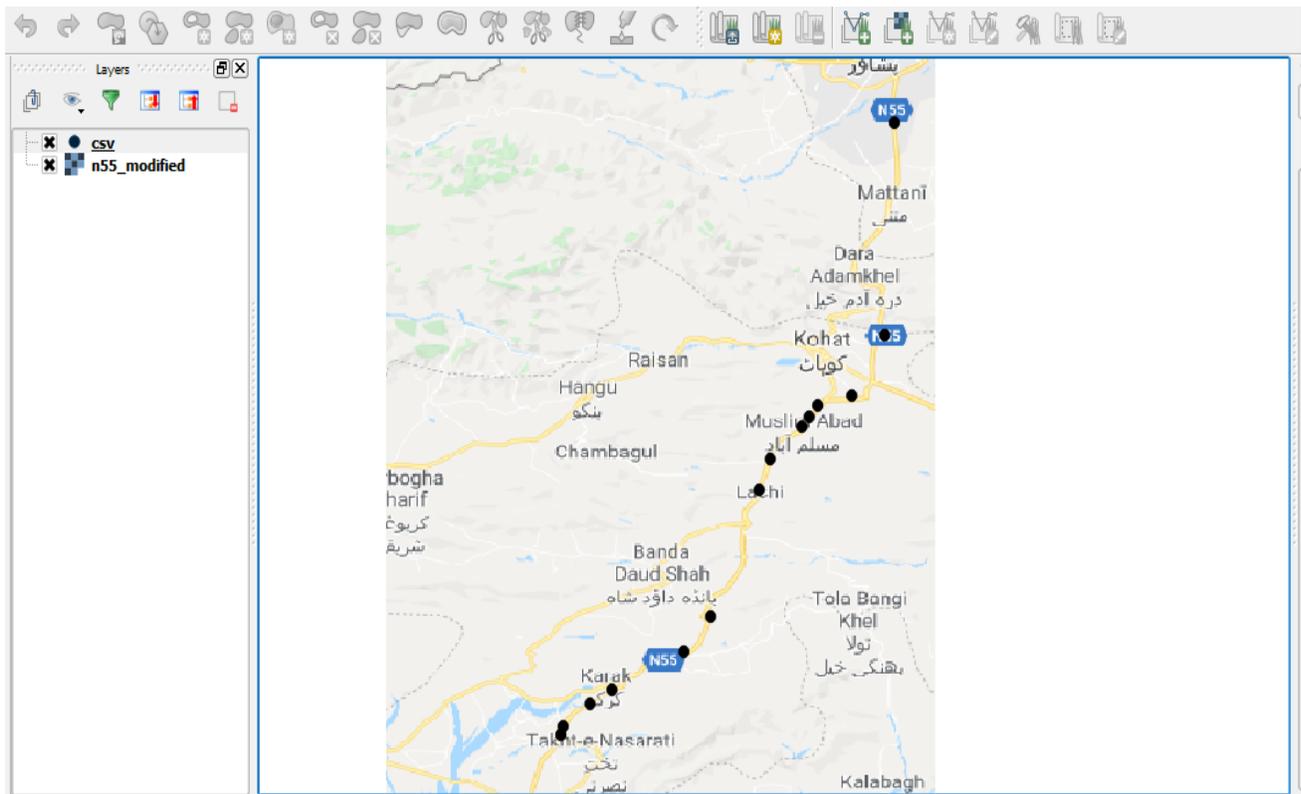

5.4.4 Attribute Table

Attribute table - csv :: Features total: 14, filtered: 14, selected: 0

|	Latitude N	Longitude E	point name	Number of accidents	Fatalities	Injuries
0	33.908	71.558	1 KM span from Sofyan Gohar Hotel To Badaber Bazar	10	7	14
1	33.607	71.543	Kohat Tunnel New Toll Plaza, Sharp turn and steep down slope before toll plaza within 1KM	22	13	73
2	33.52	71.489	Amir CNG Kohat	9	6	21
3	33.507	71.434	Kohat Central Jail	28	14	66
4	33.491	71.42	SurGul Chok Kohat	14	7	41
5	33.477	71.407	MuslimAbad Kohat	15	6	21
6	33.431	71.356	Sumari Cross (Chok) Kohat	10	7	23
7	33.386	71.338	Lachi Bazar	13	8	20
8	33.207	71.258	Speena Curve sharp turn Karak	7	5	15
9	33.157	71.214	Niazi Stop/Serekhawah bus stop Karak	7	5	17
10	33.103	71.097	Hassan Filling Station Karak	6	7	11
11	33.084	71.061	ToorDand Karak	6	9	33
12	33.052	71.016	Ambiri Kala Chok Karak	9	5	18
13	33.039	71.013	AhmedAbad Chok Karak	8	5	21

5.4.5 Basic Statistics
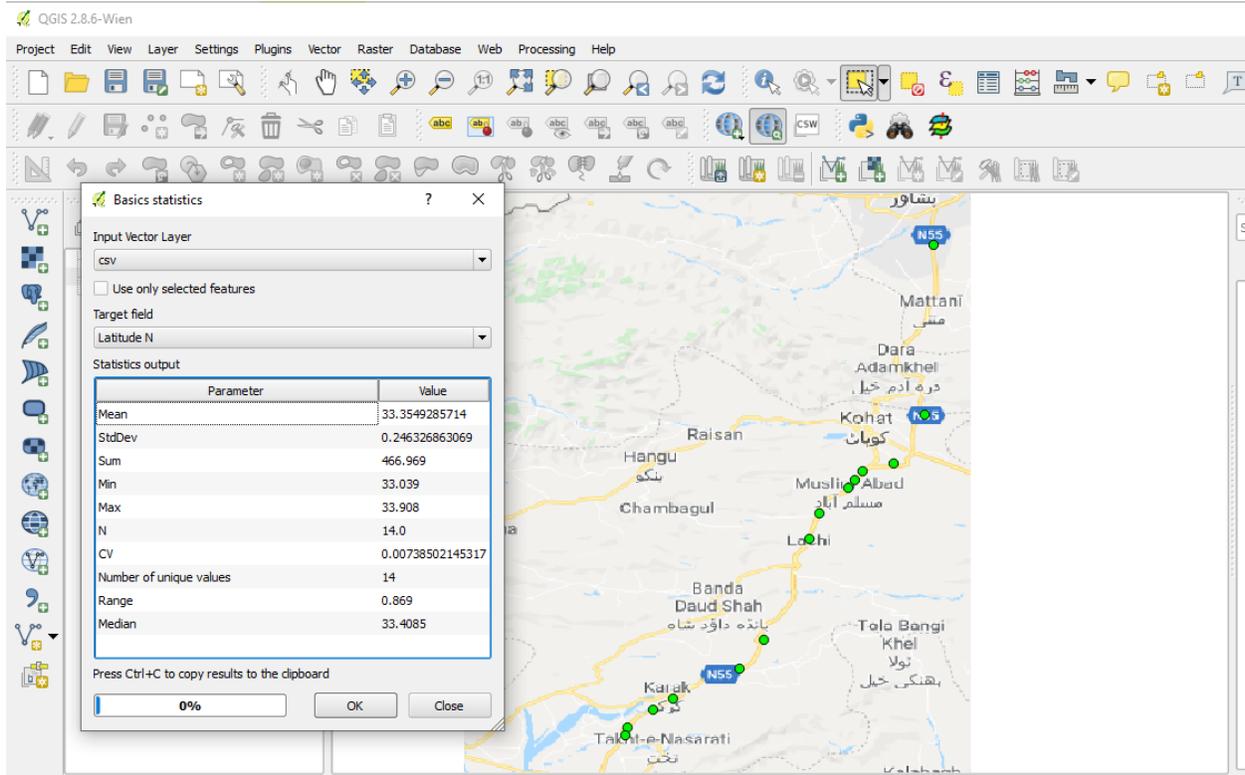
5.4.6 Convex Hull
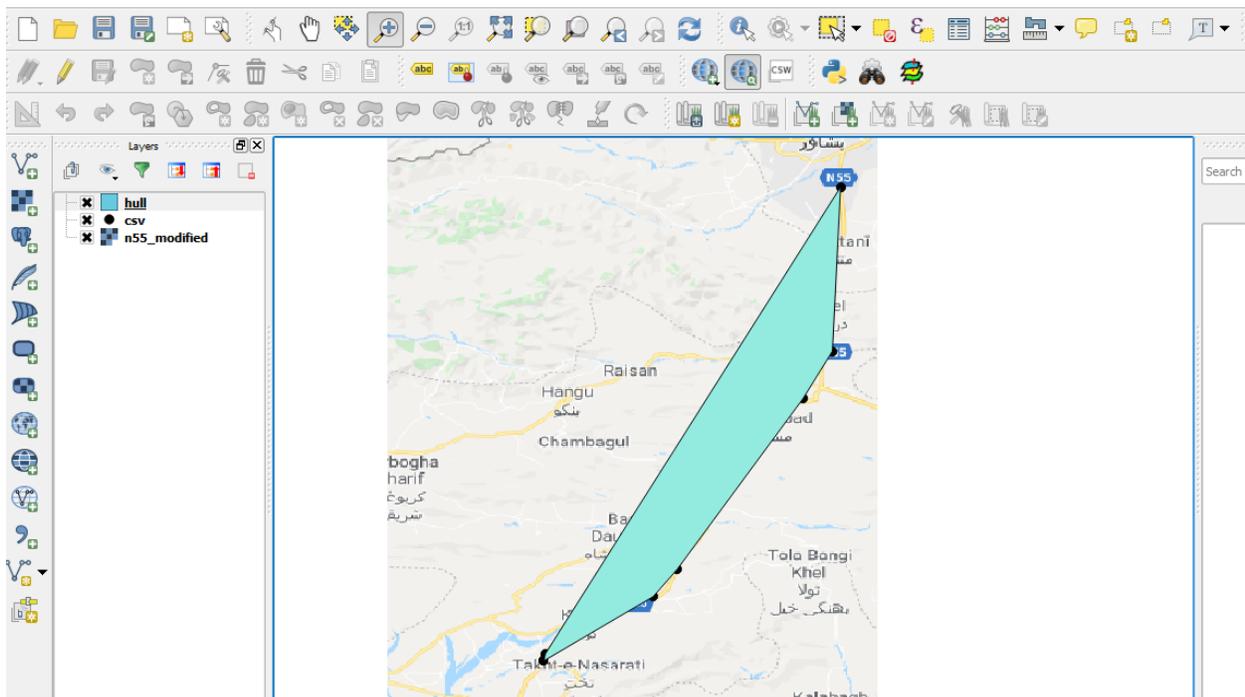
### 5.4.7 Buffer

a) Buffer of Convex Hull
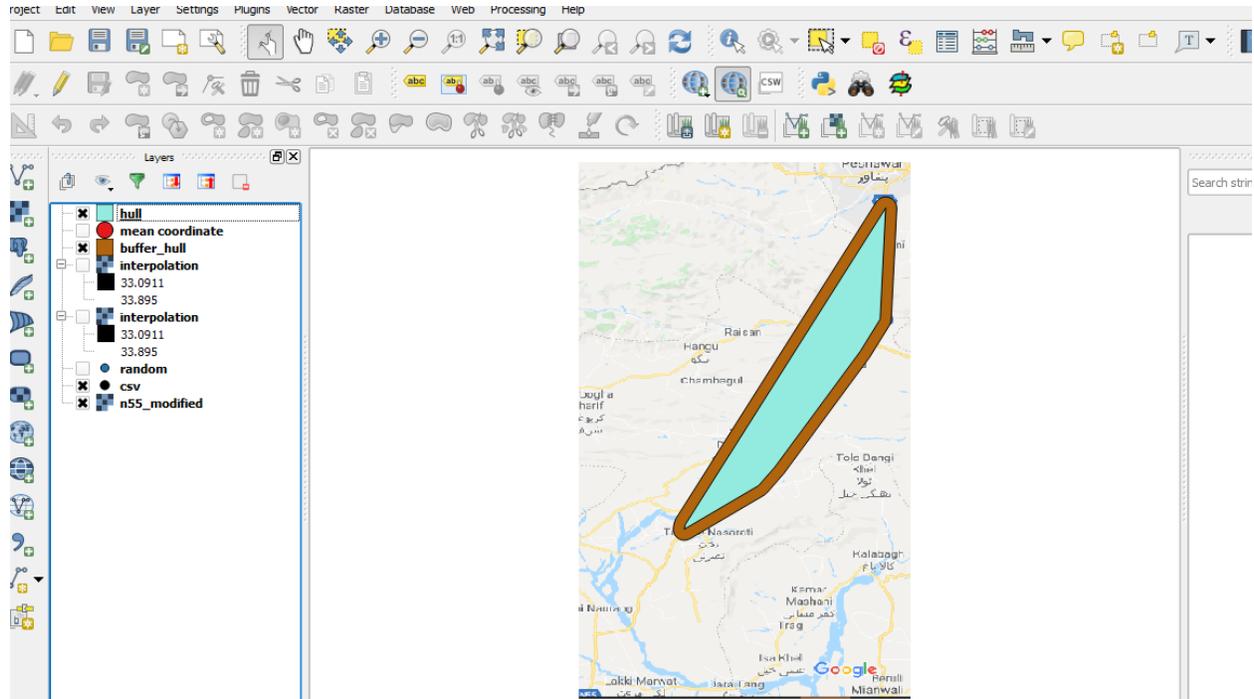
b) Buffer of Blackspots
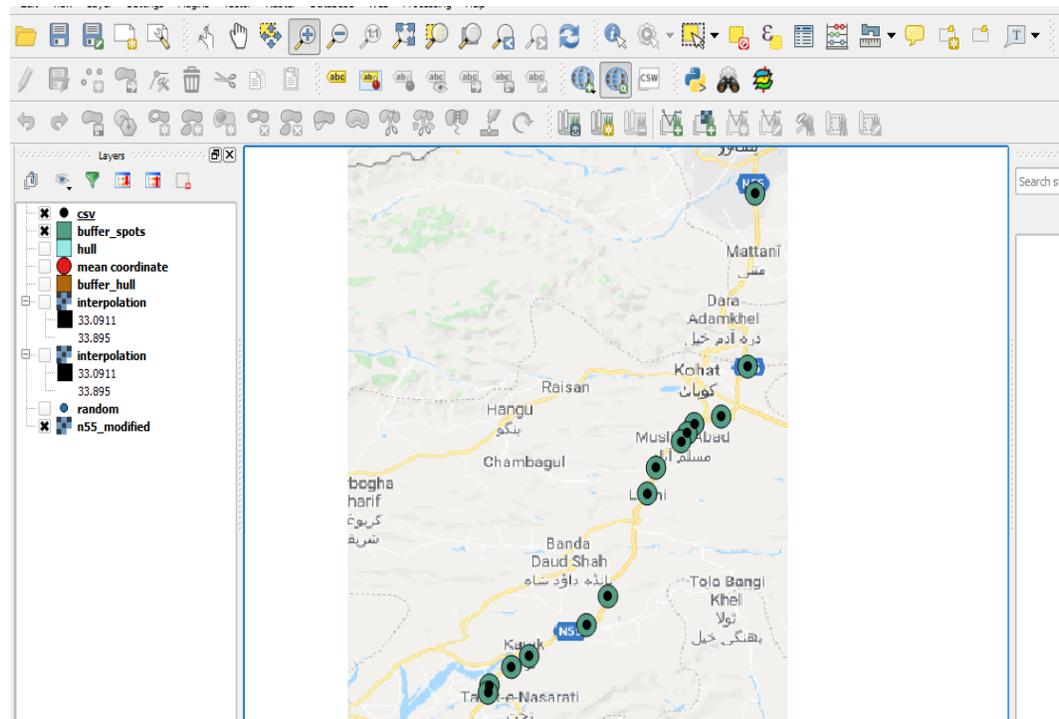
5.4.8 Distance Matrix

|	A	B	C	D	E	F	G	H	I	J
1	InputID	MEAN	STDDEV	MIN	MAX					
2	1 KM span from Sofyan Gohar Hotel To Badaber Bazar	0.301374	0	0.301374	0.301374					
3	Kohat Tunnel New Toll Plaza, Sharp turn and steep down slope before toll plaza within 1KM	0.102396	0	0.102396	0.102396					
4	Amir CNG Kohat	0.056515	0	0.056515	0.056515					
5	Kohat Central Jail	0.02126	0	0.02126	0.02126					
6	SurGul Chok Kohat	0.019105	0	0.019105	0.019105					
7	MuslimAbad Kohat	0.019105	0	0.019105	0.019105					
8	Sumari Cross (Chok) Kohat	0.048466	0	0.048466	0.048466					
9	Lachi Bazar	0.048466	0	0.048466	0.048466					
10	Speena Curve sharp turn Karak	0.066603	0	0.066603	0.066603					
11	Niazi Stop/Serekhawah bus stop Karak	0.066603	0	0.066603	0.066603					
12	Hassan Filling Station Karak	0.040706	0	0.040706	0.040706					
13	ToorDand Karak	0.040706	0	0.040706	0.040706					
14	Ambiri Kala Chok Karak	0.013342	0	0.013342	0.013342					
15	AhmedAbad Chok Karak	0.013342	0	0.013342	0.013342					
16										
17										
18										
19										
20										
21										
22										
23										

5.4.9 Nearest Neighbour Analysis
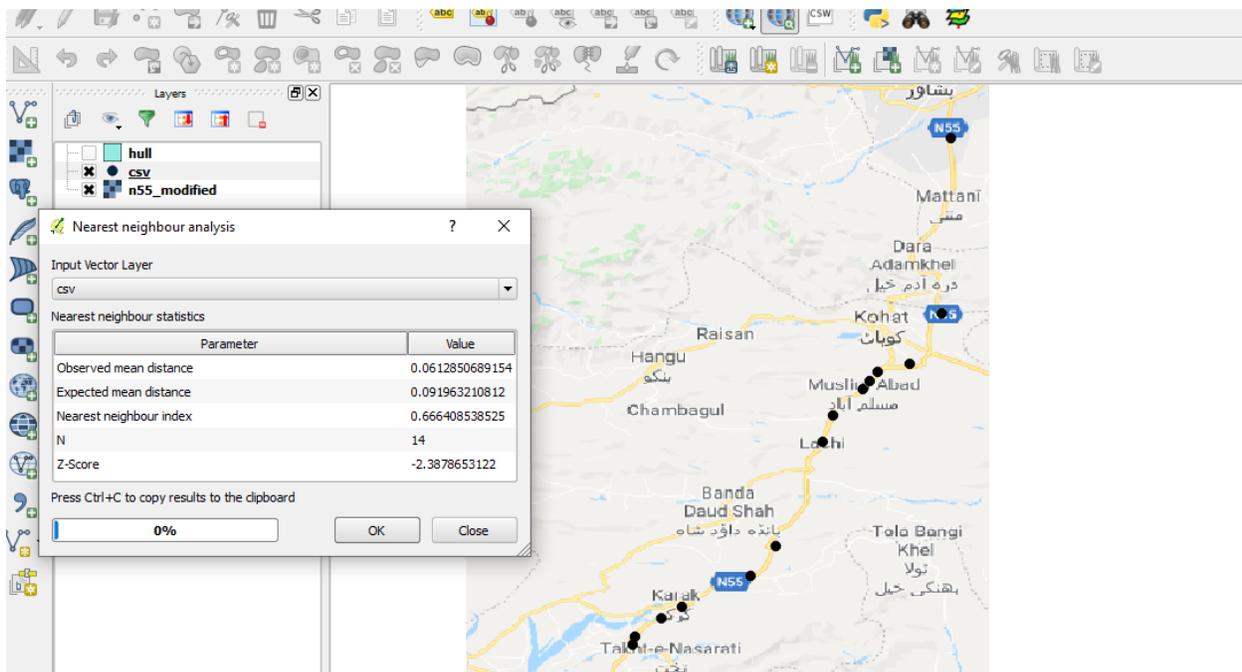
Hence the nearest neighbour index is near to one so points are Random points

5.4.10 Styling of Layer
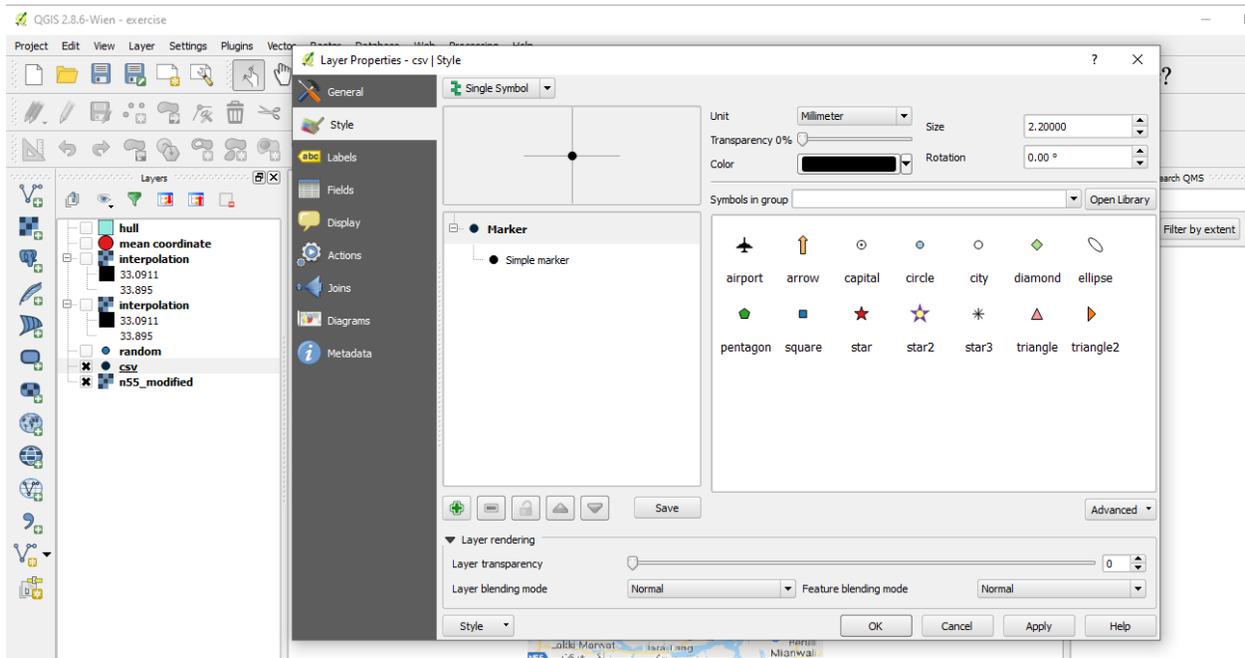
5.4.11 Mean Coordinate
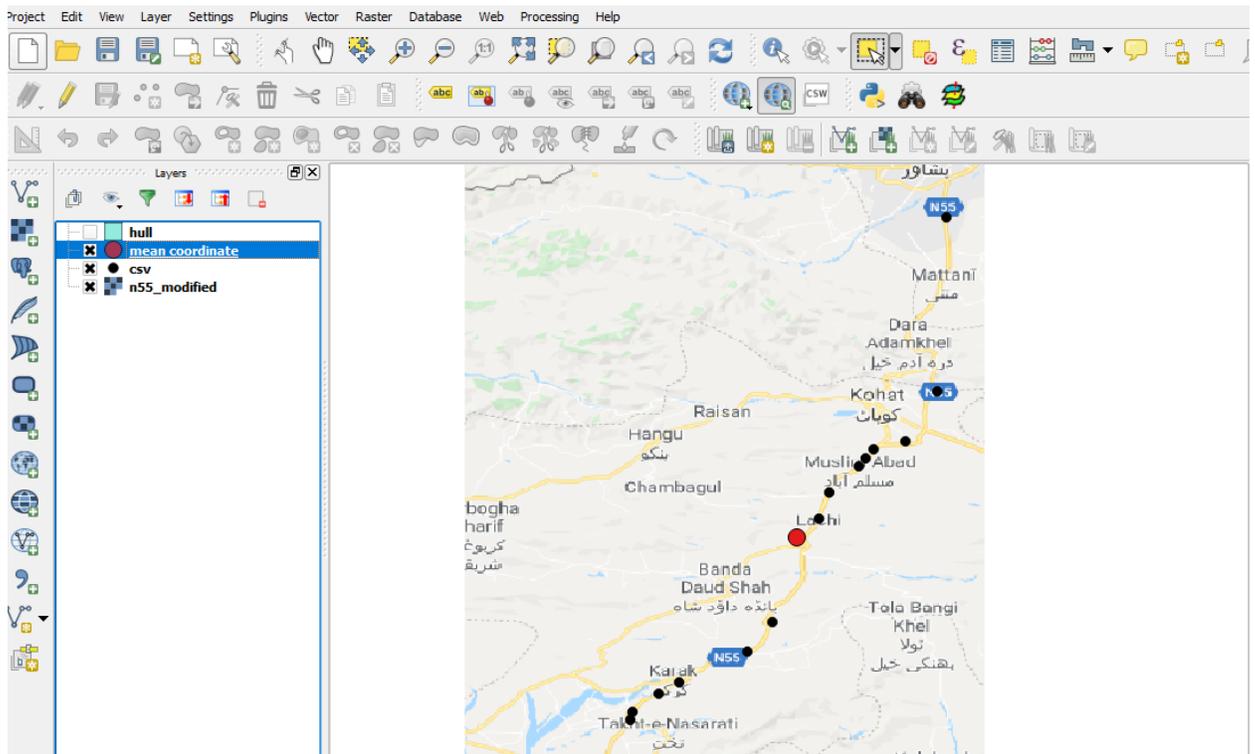
The red point is Mean Coordinate

4.4.12 Grid Interpolation
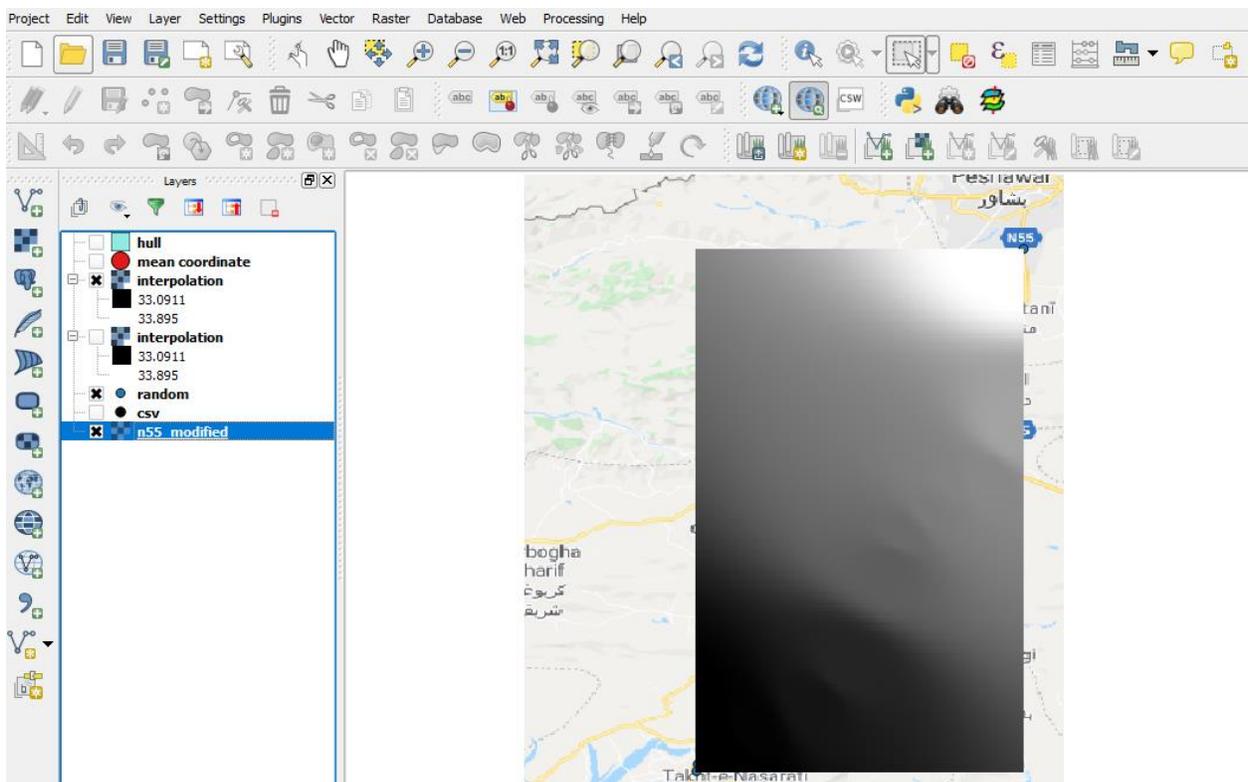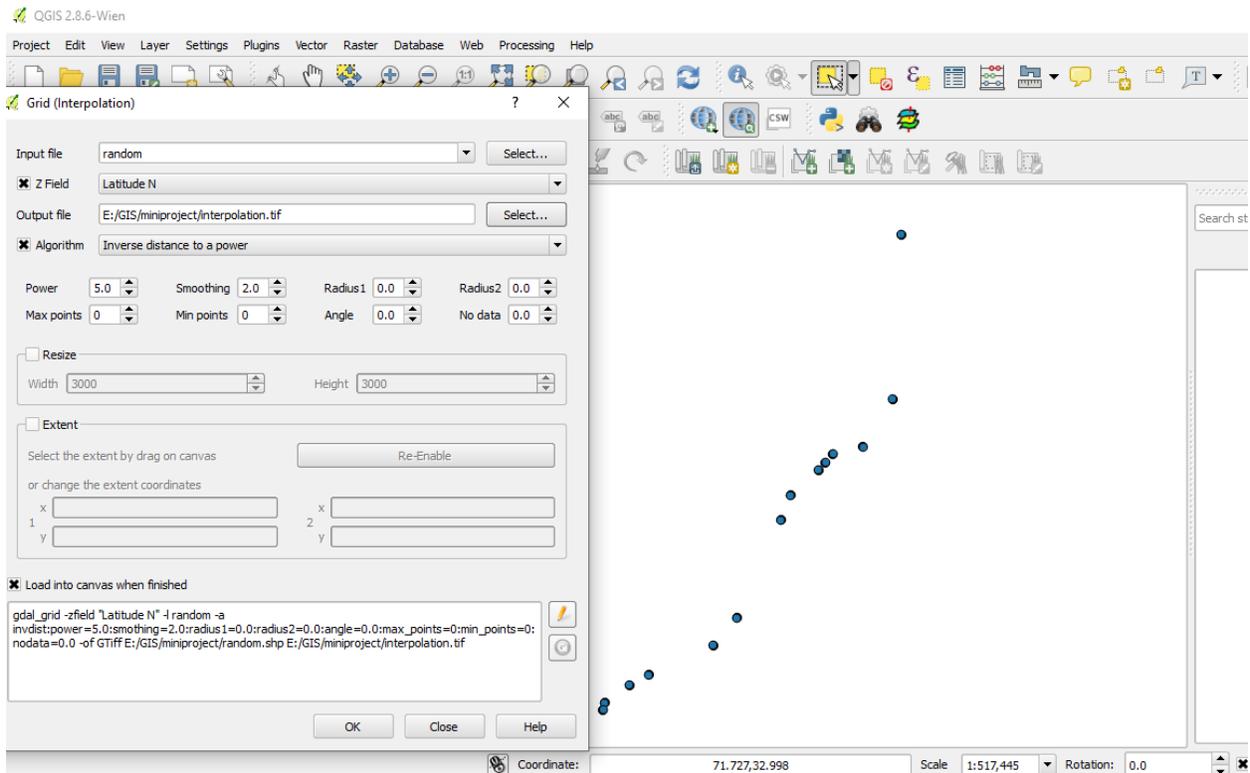
5. Applications

- Remedial measures to reduce accidents on blackspots in future.
- To improve maintenance and operation of highway.
- To reduce great economic loss due to accidents.

6. Conclusion

The excel spread sheet of identified blackspots was converted to CSV file, and was imported in QGIS and the identified blackspots were mapped on N-55 (Indus) Highway map (image from Google earth loaded in QGIS as raster layer).Different concepts like spatial statistics, geoprocessing, georefrencing etc. were applied during the project.