EVALUATION OF WATER QUALITY IN SELECTED AREAS OF PESHAWAR CITY AND IT'S MAPPING THROUGH GIS

MINI PROJECT

GIS/RS APPLICATION TO CIVIL ENGINEERING (Lab)

Submitted By: Iftikhar Yaqub

Reg. No. : 7683

Submitted To: Engr. Hamza Mustafa

Module: 8

Section: A

Department: Civil Engineering

1) INTRODUCTION TO OUR PROJECT:

- Rapid Increase in industrialization, urbanization and agriculture badly affects both surface and ground water.
- Lack of relevant policies implementation, poor water supply systems and unawareness of people causes available water unsafe for domestic use.
- It also causes serious health problems.
- In this Project we will assess the Quality of drinking water of Peshawar for various physicochemical and biological parameters.
- Samples will be collected from various points and will be tested in PCRWR Peshawar.

2) PROBLEM STATEMENT:

- Direct disposal of domestic waste water into the natural streams/canals.
- Untreated or partially treated of industrial waste water into the natural streams/canals.
- Agricultural run-off containing insecticides and pesticides are received by the natural streams.
- Above mentioned three sources, may cause to contaminate our surface and ground water aquifers.

3) OBJECTIVE OF OUR WORK:

- Analysis of water quality for various Physicochemical and Biological parameters.
- To compare the water quality status of selected areas of Peshawar with WHO standards.
- GIS Mapping of water quality of selected Areas of Peshawar.

4) LITERATURE REVIEW

The literature similar to this project was studied and the necessary data was collected for further research.

5) METHODOLOGY

5.1 Selections of Parameters:

On the basis of the literature reviews the specific water quality Parameters were selected for testing i.e. pH, Turbidity, Total Dissolved Solids(TDS), Hardness, Colour, Arsenic, Flouride, Nitrate, Sulphate, Magnesium, Chloride, Bacteriological Contamination.

5.2 Site Selection and Field Survey:

Field survey was done along the town 3 and congested areas of the union councils of town 3 were selected.

Coordinates of all the places were taken through GPS from which the samples were taken for testing.
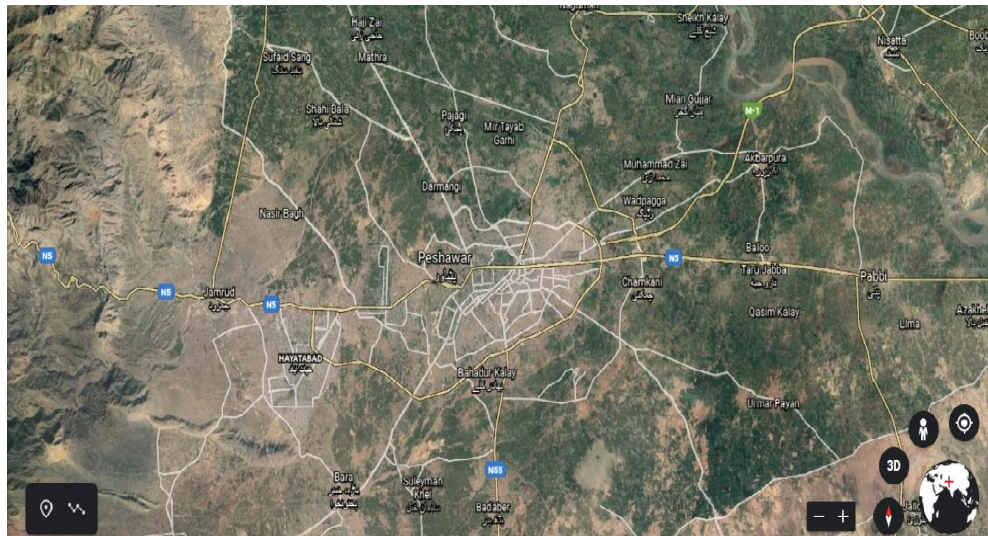
5.3 Collections of Samples:

Drinking Water Samples were collected from the selected areas for lab analysis which were also plotted in GIS and different tools of GIS were performed which are mentioned in analysis section.

5.4 Lab tests:

After the collections of samples, the physiochemical and biological test were performed on each sample in PCRWR.

5.5 Result Analysis:

After the lab tests, the result obtained were compared with WHO standards.

5.6 GIS Mapping:

Then the GIS mapping of the water quality of selected areas was done.

6) DATA ANALYSIS

After comparing the data with WHO standards, the data was analyzed in GIS and different analytical tools were performed which are mentioned below.

WHO STANDARDS FOR DRINKING WATER

- pH = 6.5-8.5
- Turbidity (NTU) = less than 5
- TDS (mg/l) = less than 1000
- Hardness (mg/l) = less than 500
- It should be colourless
- Arsenic (ppb) = 50 (PSQCA)
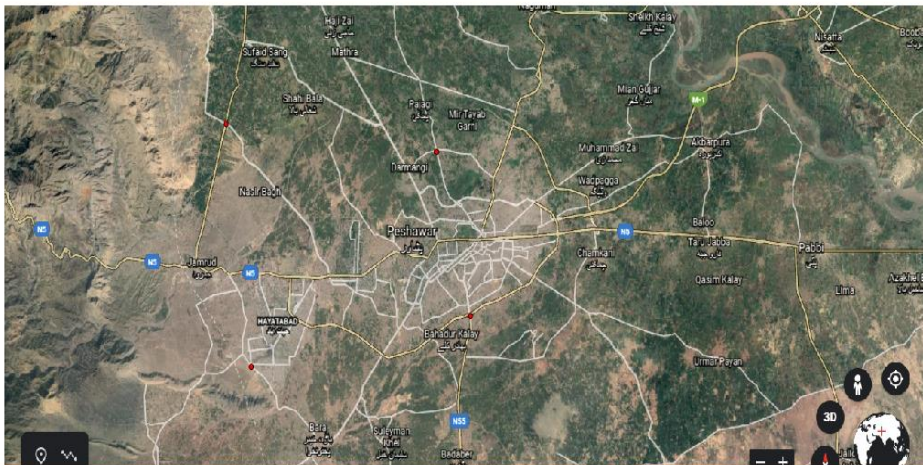- Flouride (mg/l) = less than 1.5

- Nitrate (mg/l) = less than 10
- Sulphate (mg/l) = less than 250
- Magnesium (mg/l) = less than 150
- Chloride (mg/l) = less than 250
- Bacteriological Contamination = Negative

The data was first analyzed collectively then it was analyzed separately for locations with water fit for health and unfit for health.

6.1 Georefrencing

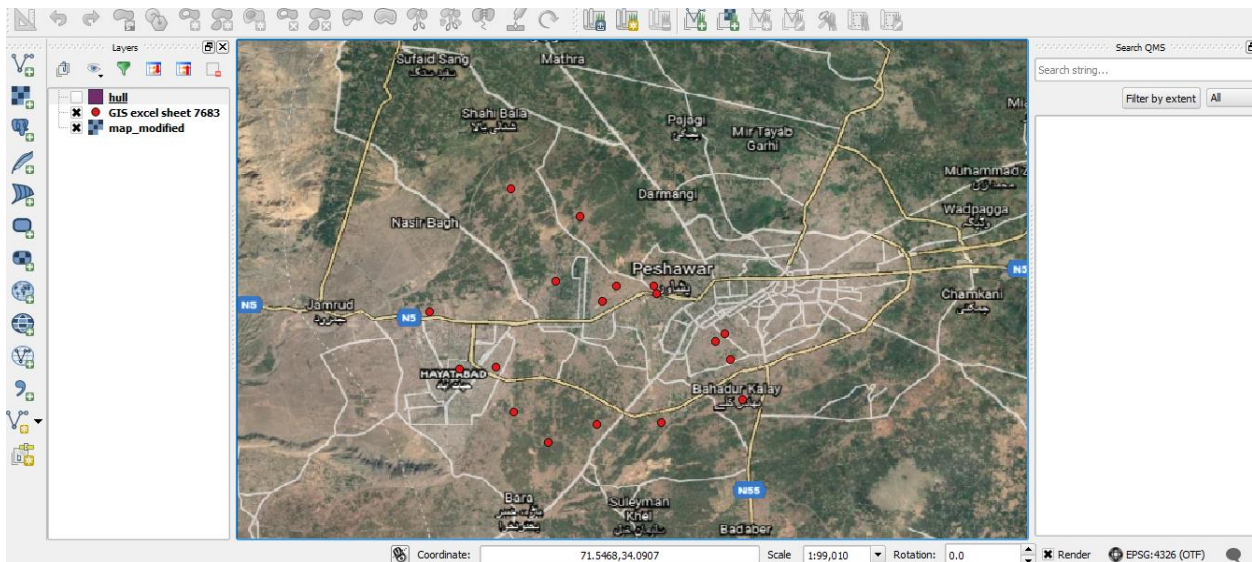| on/off	id	srcX	srcY	dstX	dstY	dX[pixels]	dY[pixels]	residual[pixels]
✖	0	350.30	-431.60	71.42	33.96	0.24	-0.89	0.92
✖	1	661.65	-370.50	71.56	33.98	-0.38	0.92	0.99
✖	2	613.71	-174.04	71.54	34.05	0.41	1.46	1.51
✖	3	314.39	-140.89	71.40	34.07	-0.27	-1.48	1.51

6.2 CSV File

CSV file was created from excel sheet and was loaded in QGIS.
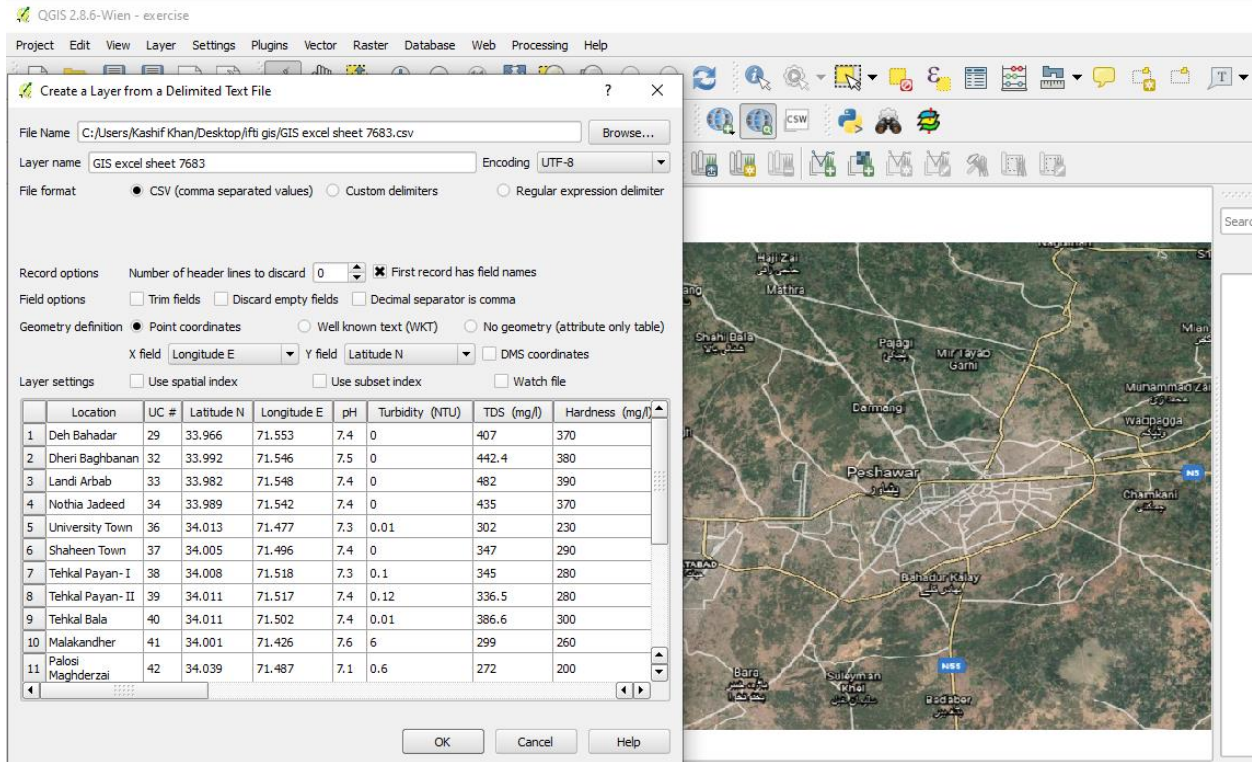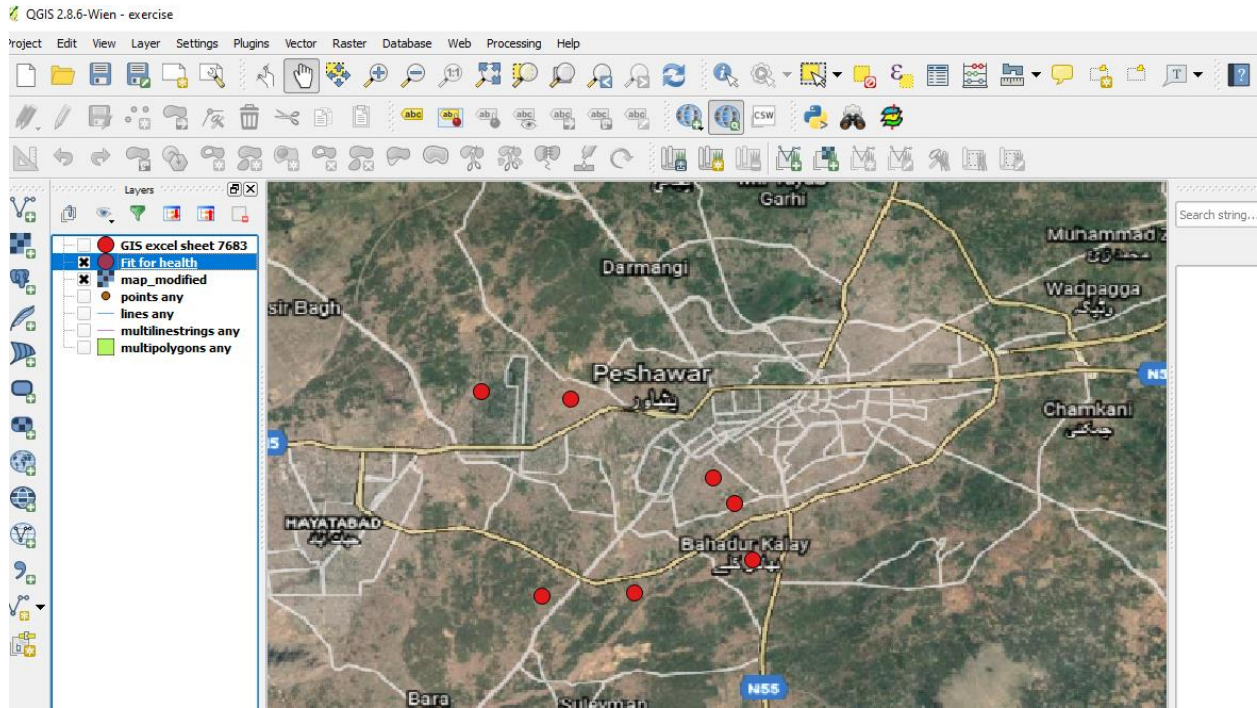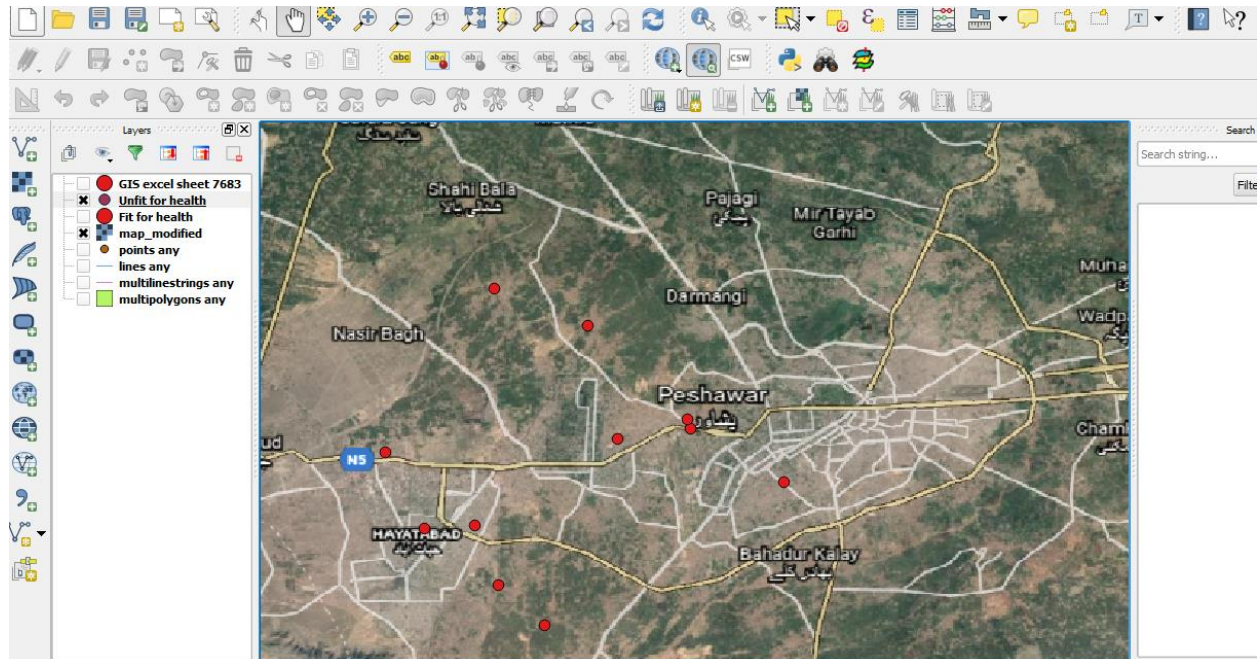

Loading the CSV File
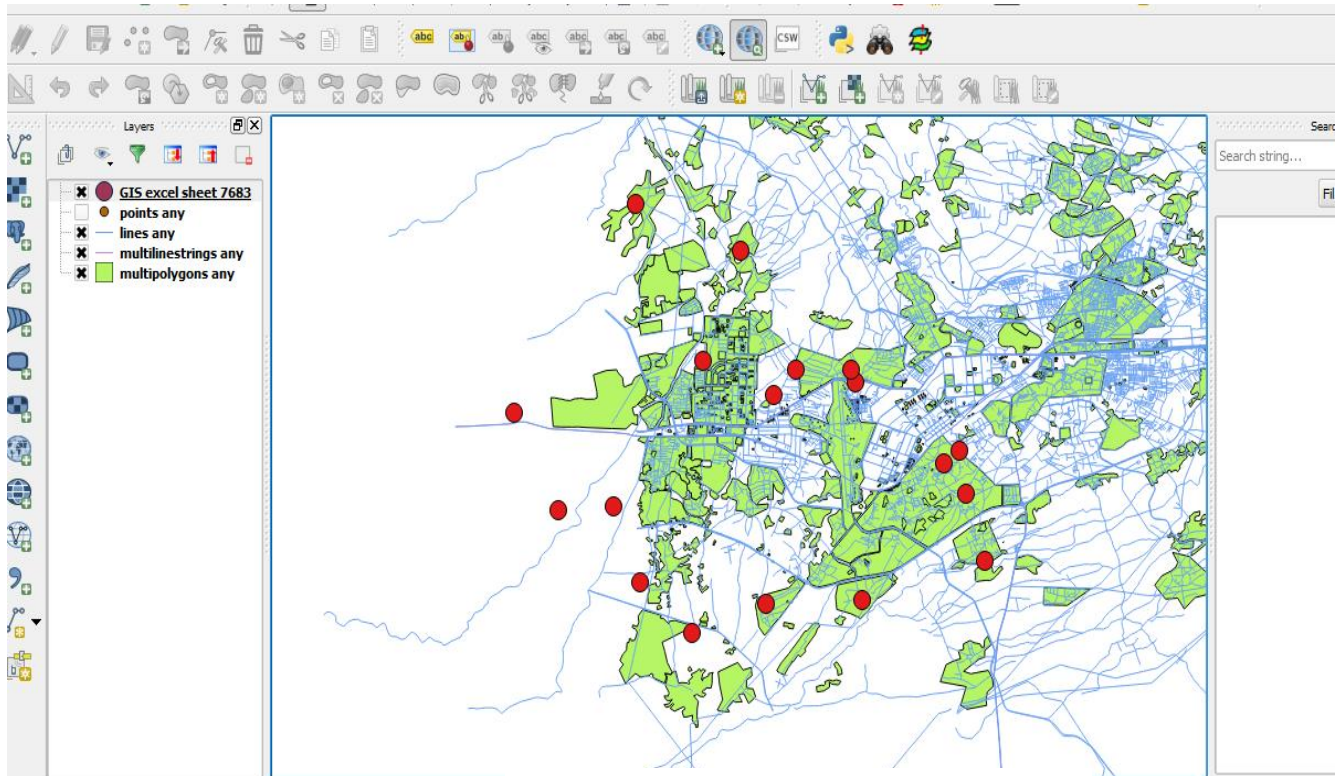
6.3 Locations of Sample Collection

6.3.1 Locations of Samples Fit for health
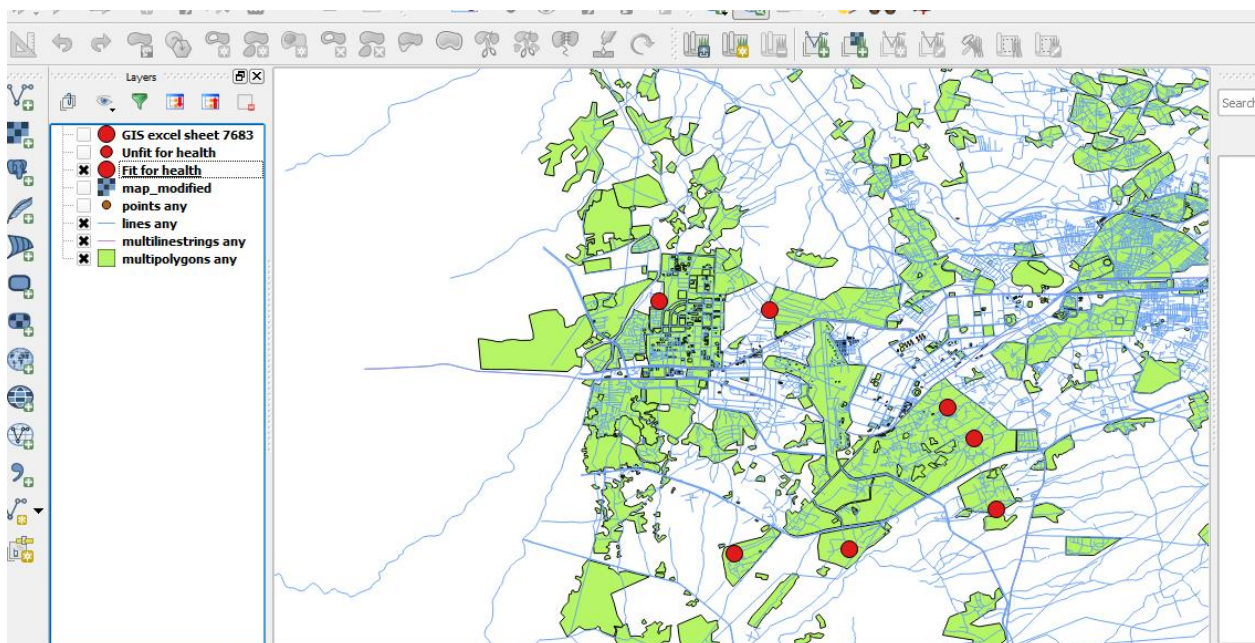

6.3.2 Locations of Samples Unfit for health
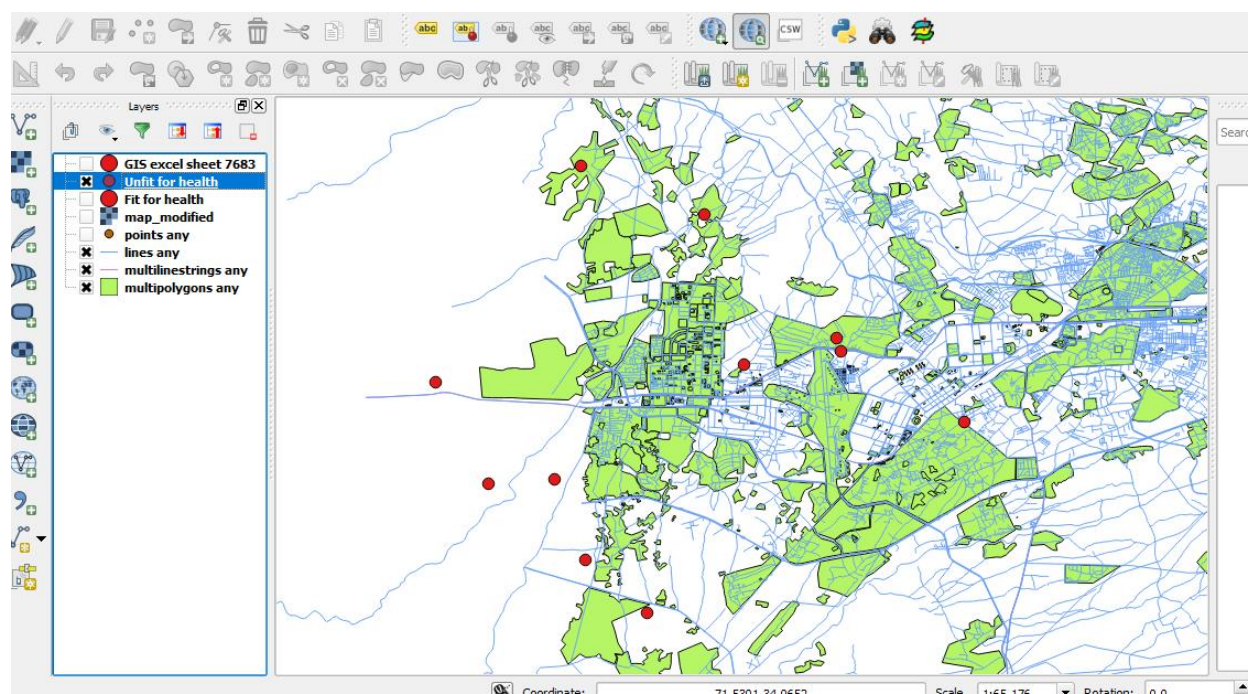
6.4 Open Street Map

Locations of Sample Collection on OSM

6.4.1 OSM Fit for Health Locations

6.4.2 OSM Unfit for Health Locations

6.5 Attribute Table

	Location	UC #	Latitude N	Longitude E	pH	Turbidity (NTU)	TDS (mg/l)	Hardness (mg/l)	Colour	Arsenic (ppb)	Flouride (mg/l)	Nitrate (mg/l)	Sulphate(mg/l)	Magnesium (mg/l)	Chloride (mg/l)	eriological Contamin	Remarks
0	Deh Bahadar	29	33.966	71.553	7.4	0	407	370	colorless	Nil	0.2	7.9	74	51	32	-ve	Fit
1	Dheri Baghbanan	32	33.992	71.546	7.5	0	442.4	380	colorless	Nil	0.41	8	56	19.4	28	+ve	unfit
2	Landi Arbab	33	33.982	71.548	7.4	0	482	390	colorless	Nil	0.26	9.2	77	22	28	-ve	Fit
3	Nothia Jadeed	34	33.989	71.542	7.4	0	435	370	colorless	Nil	0.16	8.6	66	29.16	25	-ve	Fit
4	University Town	36	34.013	71.477	7.3	0.01	302	230	colorless	Nil	0.19	6	46	12	18	-ve	Fit
5	Shaheen Town	37	34.005	71.496	7.4	0	347	290	colorless	Nil	0.24	11	57.5	24	32	-ve	Unfit
6	Tehkal Payan- I	38	34.008	71.518	7.3	0.1	345	280	colorless	Nil	0.2	12.2	54	19.4	35	+ve	unfit
7	Tehkal Payan- II	39	34.011	71.517	7.4	0.12	336.5	280	colorless	Nil	0.17	12	43.5	17	35	-ve	unfit
8	Tehkal Bala	40	34.011	71.502	7.4	0.01	386.6	300	colorless	Nil	0	7.3	68	24.3	35	-ve	Fit
9	Malakandher	41	34.001	71.426	7.6	6	299	260	Turbid	Nil	0.19	6.5	45	22	21	-ve	unfit
10	Palosi Maghderzai	42	34.039	71.487	7.1	0.6	272	200	colorless	Nil	0	7.8	62	15	28	+ve	unfit
11	Hayatabad I	43	33.979	71.453	7.5	0.01	334	270	colorless	Nil	0.12	8.6	50.5	17	35	+ve	Unfit
12	Hayatabad II	44	33.978	71.438	8.1	0	301.5	250	colorless	Nil	0.19	11.3	54	12	28	-ve	Unfit
13	Bazid Khail	49	33.961	71.46	7.4	0.01	513.47	440	colorless	Nil	0.06	5	67	58	28	+ve	unfit
14	Sarband	59	33.956	71.494	7.7	0	339	280	colorless	Nil	0.3	7.4	54	15	28	-ve	Fit
15	Pushtakhara Payan	60	33.957	71.52	7.6	0	416.3	320	colorless	Nil	0.04	8.8	53	24.3	25	-ve	Fit
16	Regi	80	34.05	71.459	7.5	1.2	323.4	240	colorless	Nil	0.27	5.2	51.5	22	25	+ve	Unfit
17	Achini Payan	91	33.949	71.474	7.9	0.01	310.8	230	colorless	Nil	0.15	11.2	42	12	39	+ve	unfit

6.5.1 Attribute table Fit for Health

Attribute table - Fit for health :: Features total: 7, filtered: 7, selected: 0

	Location	UC #	Latitude N	Longitude E	pH	Turbidity (NTU)	TDS (mg/l)	Hardness (mg/l)	Colour	Arsenic (ppb)	Flouride (mg/l)	Nitrate (mg/l)	Sulphate(mg/l)	Magnesium (mg/l)	Chloride (mg/l)	Bacteriological Contamination	Remarks
0	Deh Bahadar	29	33.966	71.553	7.4	0	407	370	colorless	Nil	0.2	7.9	74	51	32	-ve	Fit
1	Landi Arbab	33	33.982	71.548	7.4	0	482	390	colorless	Nil	0.26	9.2	77	22	28	-ve	Fit
2	Nothia Jadeed	34	33.989	71.542	7.4	0	435	370	colorless	Nil	0.16	8.6	66	29.16	25	-ve	Fit
3	University Town	36	34.013	71.477	7.3	0.01	302	230	colorless	Nil	0.19	6	46	12	18	-ve	Fit
4	Tehkal Bala	40	34.011	71.502	7.4	0.01	386.6	300	colorless	Nil	0	7.3	68	24.3	35	-ve	Fit
5	Sarband	59	33.956	71.494	7.7	0	339	280	colorless	Nil	0.3	7.4	54	15	28	-ve	Fit
6	Pushtakhara Payan	60	33.957	71.52	7.6	0	416.3	320	colorless	Nil	0.04	8.8	53	24.3	25	-ve	Fit

## 6.5.2 Attribute table Unfit for Health

Attribute table - Unfit for health :: Features total: 11, filtered: 11, selected: 0

|	Location	UC #	Latitude N	Longitude E	pH	Turbidity (NTU)	TDS (mg/l)	Hardness (mg/l)	Colour	Arsenic (ppb)	Flouride (mg/l)	Nitrate (mg/l)	Sulphate(mg/l)	Magn...
0	Dheri Baghbanan	32	33.992	71.546	7.5	0	442.4	380	colorless	Nil	0.41	8	56	
1	Shaheen Town	37	34.005	71.496	7.4	0	347	290	colorless	Nil	0.24	11	57.5	
2	Tehkal Payan- I	38	34.008	71.518	7.3	0.1	345	280	colorless	Nil	0.2	12.2	54	
3	Tehkal Payan- II	39	34.011	71.517	7.4	0.12	336.5	280	colorless	Nil	0.17	12	43.5	
4	Malakandher	41	34.001	71.426	7.6	6	299	260	Turbid	Nil	0.19	6.5	45	
5	Palosi Maghderzai	42	34.039	71.487	7.1	0.6	272	200	colorless	Nil	0	7.8	62	
6	Hayatabad I	43	33.979	71.453	7.5	0.01	334	270	colorless	Nil	0.12	8.6	50.5	
7	Hayatabad II	44	33.978	71.438	8.1	0	301.5	250	colorless	Nil	0.19	11.3	54	
8	Bazid Khail	49	33.961	71.46	7.4	0.01	513.47	440	colorless	Nil	0.06	5	67	
9	Regi	80	34.05	71.459	7.5	1.2	323.4	240	colorless	Nil	0.27	5.2	51.5	
10	Achini Payan	91	33.949	71.474	7.9	0.01	310.8	230	colorless	Nil	0.15	11.2	42	

6.6 Convex Hull
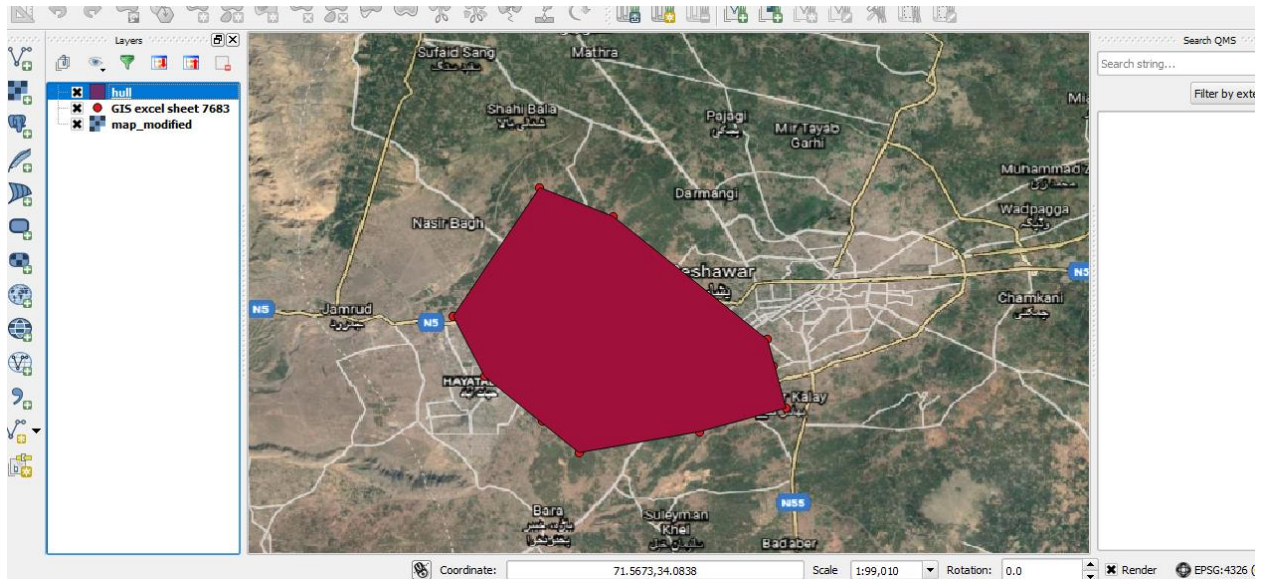
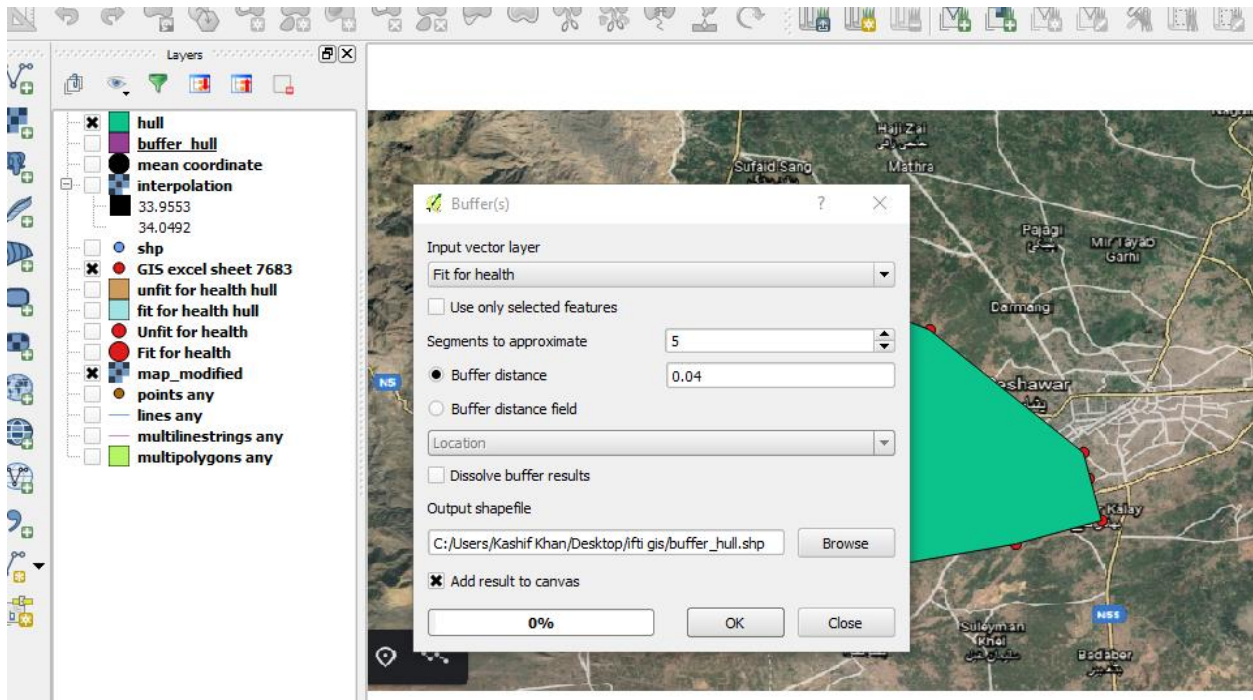## 6.6.1 Convex Hull for Fit Drinking water Locations
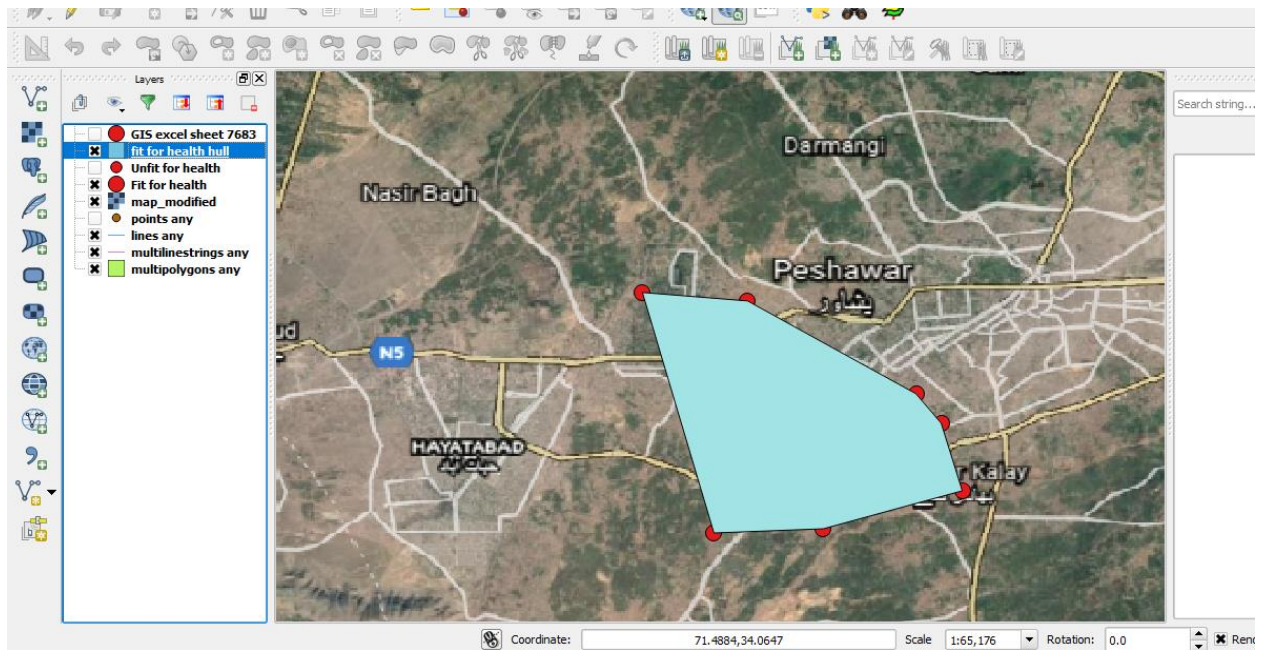
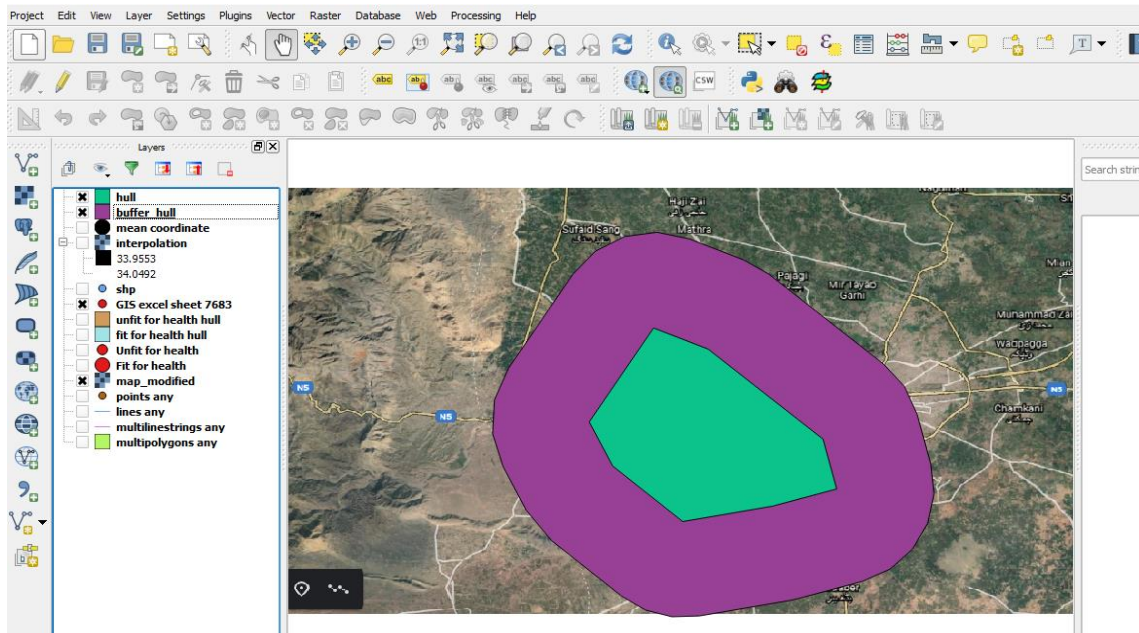## 6.6.2 Convex Hull for Unfit Drinking water Locations
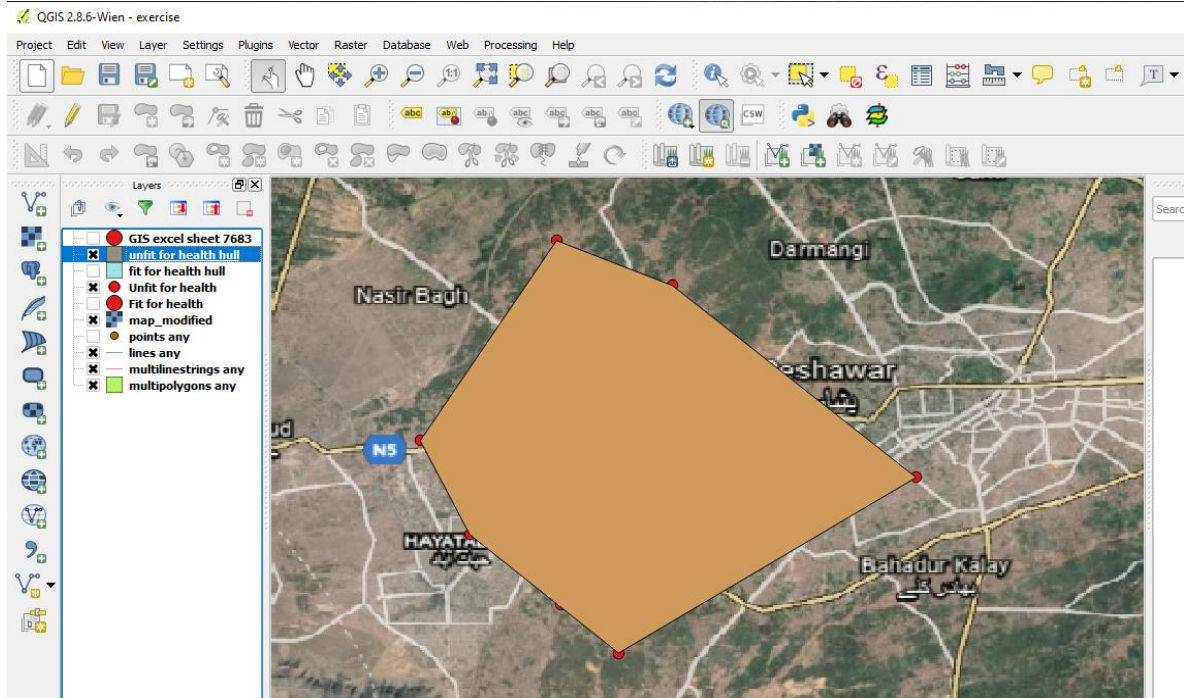
6.7 Buffer

6.7.1Loading Buffer Layer

6.7.2 Buffer Around Convex Hull

6.8 Distance Matrix

	A	B	C	D	E	F	G	H
1	InputID	MEAN	STDDEV	MIN	MAX			
2	Deh Bahadar	0.016763055	0	0.016763	0.016763			
3	Dheri Baghbanan	0.005	0	0.005	0.005			
4	Landi Arbab	0.009219544	0	0.00922	0.00922			
5	Nothia Jadeed	0.005	0	0.005	0.005			
6	University Town	0.020615528	0	0.020616	0.020616			
7	Shaheen Town	0.008485281	0	0.008485	0.008485			
8	Tehkal Payan- I	0.003162278	0	0.003162	0.003162			
9	Tehkal Payan- II	0.003162278	0	0.003162	0.003162			
10	Tehkal Bala	0.008485281	0	0.008485	0.008485			
11	Malakandher	0.025942244	0	0.025942	0.025942			
12	Palosi Maghderzai	0.027856777	0	0.027857	0.027857			
13	Hayatabad I	0.015033296	0	0.015033	0.015033			
14	Hayatabad II	0.015033296	0	0.015033	0.015033			
15	Bazid Khail	0.018439089	0	0.018439	0.018439			
16	Sarband	0.02118962	0	0.02119	0.02119			
17	Pushtakhara Payan	0.026019224	0	0.026019	0.026019			
18	Regi	0.030083218	0	0.030083	0.030083			
19	Achini Payan	0.018439089	0	0.018439	0.018439			
20								
21								
22								

6.8.1 Distance Matrix Fit for Health

	A	B	C	D	E	F	G
1	InputID	MEAN	STDDEV	MIN	MAX		
2	Dheri Baghbanan	0.005	0	0.005	0.005		
3	Shaheen Town	0.008485281	0	0.008485281	0.008485281		
4	Tehkal Payan- I	0.016278821	0	0.016278821	0.016278821		
5	Tehkal Payan- II	0.015	0	0.015	0.015		
6	Malakandher	0.052392748	0	0.052392748	0.052392748		
7	Palosi Maghderzai	0.027856777	0	0.027856777	0.027856777		
8	Hayatabad I	0.041617304	0	0.041617304	0.041617304		
9	Hayatabad II	0.05240229	0	0.05240229	0.05240229		
10	Bazid Khail	0.034365681	0	0.034365681	0.034365681		
11	Regi	0.041146081	0	0.041146081	0.041146081		
12	Achini Payan	0.02118962	0	0.02118962	0.02118962		
13							
14							
15							
16							

6.8.2 Distance Matrix Unfit for Health

	A	B	C	D	E	F
1	InputID	MEAN	STDDEV	MIN	MAX	
2	Dheri Baghbanan	0.005	0	0.005	0.005	
3	Shaheen Town	0.00848528	0	0.008485281	0.008485281	
4	Tehkal Payan- I	0.01627882	0	0.016278821	0.016278821	
5	Tehkal Payan- II	0.015	0	0.015	0.015	
6	Malakandher	0.05239275	0	0.052392748	0.052392748	
7	Palosi Maghderzai	0.02785678	0	0.027856777	0.027856777	
8	Hayatabad I	0.0416173	0	0.041617304	0.041617304	
9	Hayatabad II	0.05240229	0	0.05240229	0.05240229	
10	Bazid Khail	0.03436568	0	0.034365681	0.034365681	
11	Regi	0.04114608	0	0.041146081	0.041146081	
12	Achini Payan	0.02118962	0	0.02118962	0.02118962	
13						
14						
15						
16						

6.9 Basic Statistics
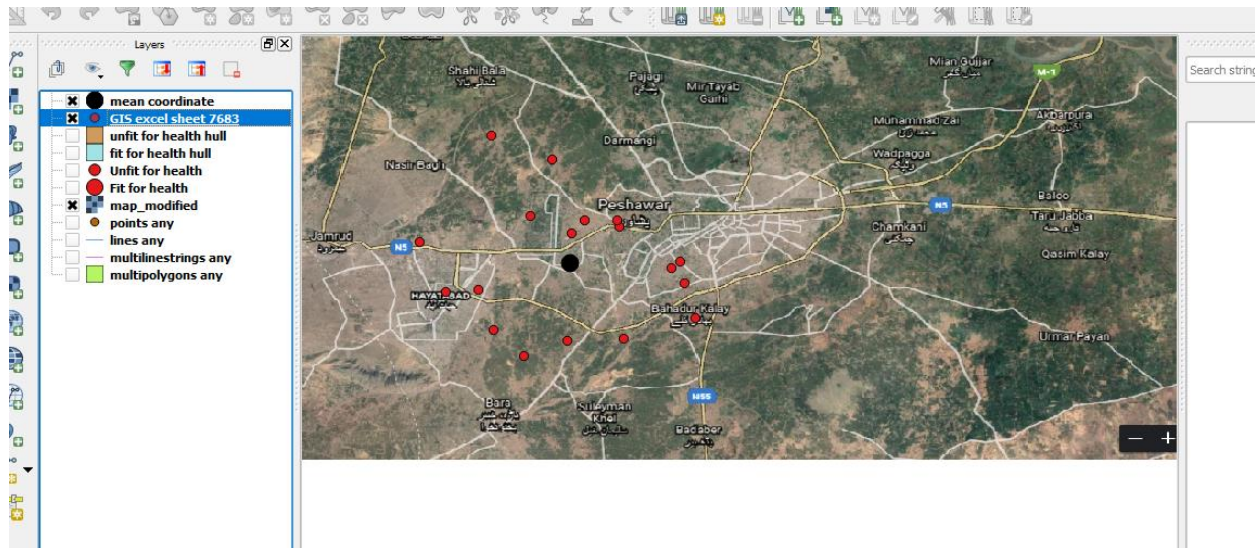

6.10 Nearest Neighbour Analysis

Nearest Neighbour Index =1.15 so the points are Random Points

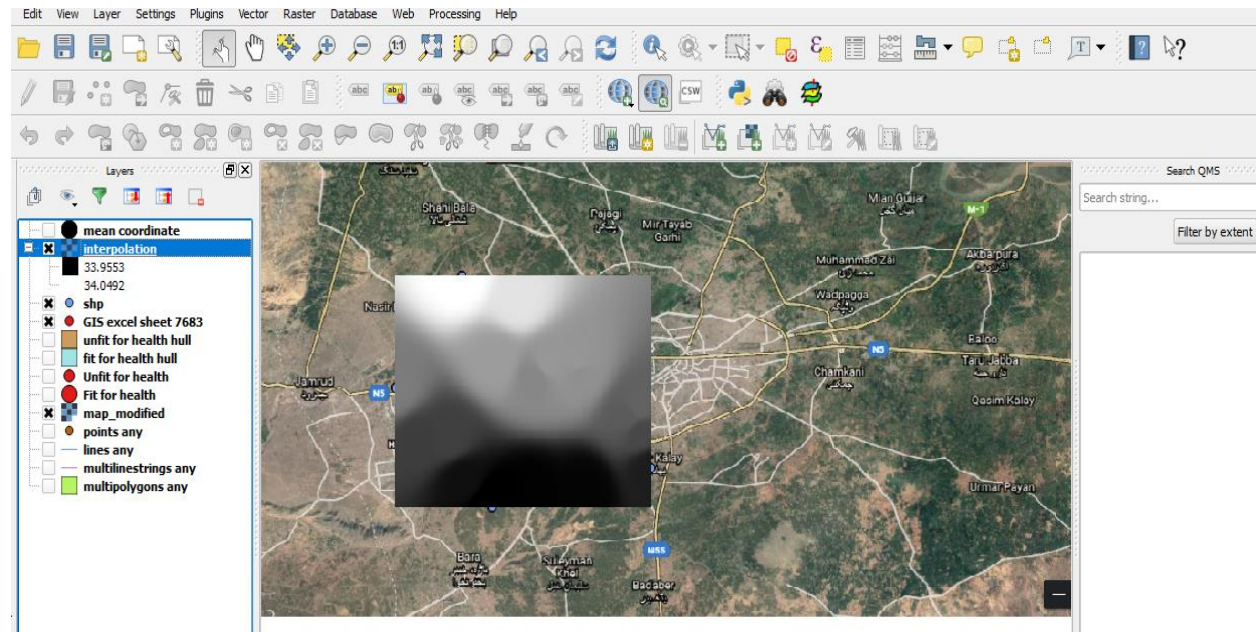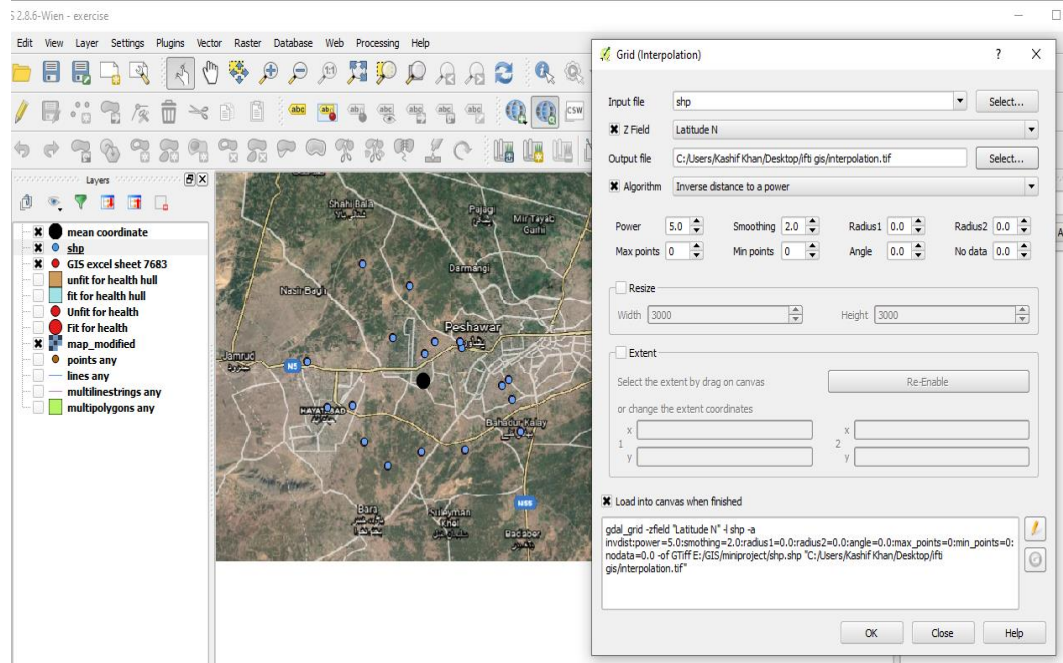## 6.11 Mean Coordinate

Loading the layer
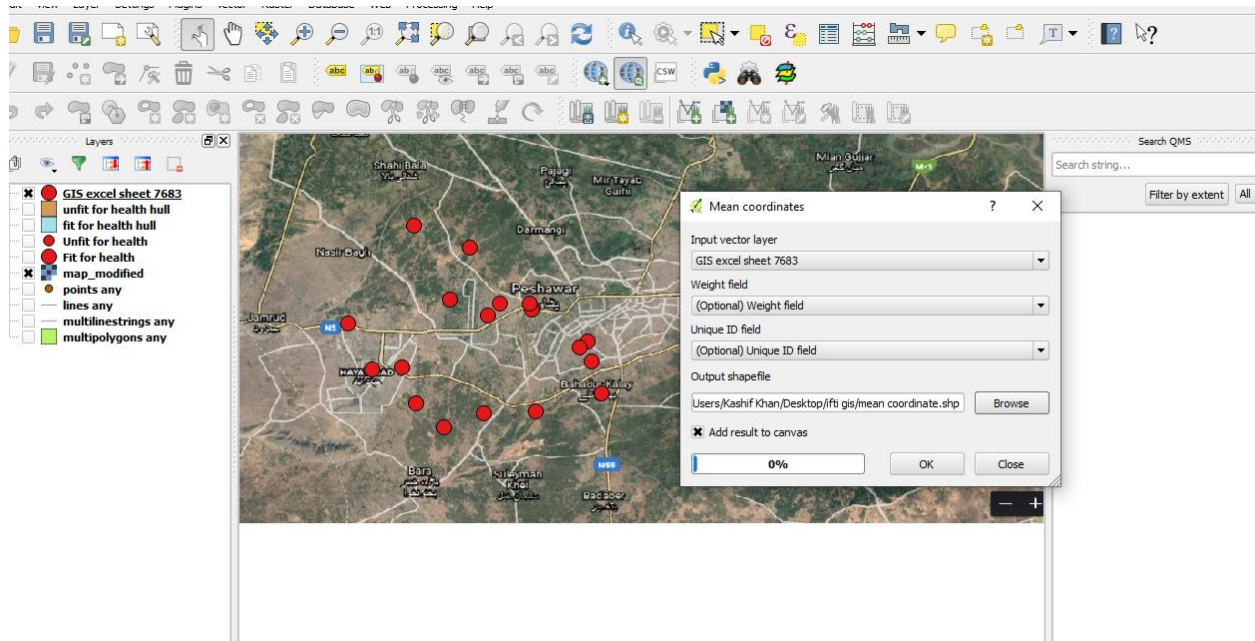
Black point is Mean coordinate

6.12 Grid Interpolation

8) Applications:

- From this project we came to know about the type of contamination present in drinking water.
- We also get the GIS mapping of locations whose water is fit for health and also get the mapping of those areas whose water is unfit for health.
- The GIS mapping of water quality helps in determining those areas whose water quality is poor, where in future the water treatment plants may be installed.

9) Conclusion:

Out of 18 water samples, seven samples were found to have bacteriological contamination; three samples were found chemically contaminated while one sample was physically contaminated. While seven samples were found completely safe for health. The test results of samples were loaded in QGIS as CSV file. The data was also treated separately for the locations fit for health and unfit for health. Different concepts of QGIS i.e. Georefrencing, Geoprocessing, Quick map services and spatial statistics were applied on the data.