









VISUAL OBSERVATION





Fig.IV-XIII Showing sampling and in situ testing

The work has been performed in the laboratories of Chemistry department of Dyal Singh College, University of Delhi as well as in the laboratories of Central soil and materials research station (CSMRS), Ministry of water resources, New Delhi .The sample collected were analyzed for their physico-chemical properties using different volumetric, gravimetric and instrumental analytical procedures as per BIS, ASTM standards. (Table III and IV)

Table-III

<b>CHEMICAL PARAMETERS</b>	<b>IS: CODE</b>
pH	IS:2720-1987
Total soluble salts	IS:2720, part-27
Water soluble Sulphate	IS:2720-1977
Water soluble Chloride	BS codes
Organic Matter	IS:2720, part-22, -1972
Calcium Carbonate	IS:2720-1976
Cation Exchange capacity ( CEC)	IS:2720-1976

Table-IV

<b>ENGINEERING PARAMETERS</b>	<b>IS :CODE</b>
Methods of test for soils Preparation of dry soil samples for various tests	IS 2720 : Part I : 1972
Soil Classification	IS:1498-1970
Mechanical Analysis (Particle size distribution)	IS:2720, part-4,1975
Atterbergs Limit	IS:2720, part-5-1979
Compaction test	IS: 2720 ,Part 8) – 1983
Relative density test	IS: 2720 ,Part 14) - 1983
Soil Permeability	IS:2720, part-17-1985
Shear Strength	IS: 2720,Part 11-1971
Specific Gravity	IS:2720

Sampl e No.	Sampling Location	pH	Conduc tivity µmhos/ cm	Salinity %	Calciu m Carbo nate Conten t %	Organi c Matter % by wt.	Water soluble Chloride % by wt.	Water soluble sulpha te % by wt	Cati on exch ange capa city meq/ 100 gram
S-1	Up Stream of Wazirabad Barrage , Jagatpur Village ( R/B)	7. 35	105	0.1	1.5	0.15	0.02	0.015	7.0
S-2.	Down Stream Wazirabad Barrage, Left Bank ( L/B)	7. 38	185	0.1	2.5	0.39	0.038	0.030	6.0
S-3	Blank soil sample from 300 meter away from down stream Wazirabad Barrage	7. 40	89	0.1	2.0	0.20	0.035	0.028	12. 5
S-4	ITO barrage, Down Stream , ( R/B)	7. 82	402	0.4	5.0	4.06	0.099	0.110	9.8
S-5.	Blank soil sample from 300 meter away from down stream up stream ITO Barrage	7. 50	135	0.1	4.0	0.48	0.042	0.057	10. 6

S-6	Blank soil sample from 300 meter away from down stream Nizamuddin Barrage	7.61	150	0.2	3.5	0.73	0.003	0.047	16.4
S-7	Okhala Barrage, Down Stream, (R/B), Kalindi Kunj	8.69	555	0.6	7.2	6.0	0.152	0.162	8.9

Table-V Chemical analysis of soil samples from Yamuna river bed

The results of chemical analysis of contaminated soils are presented in Table V

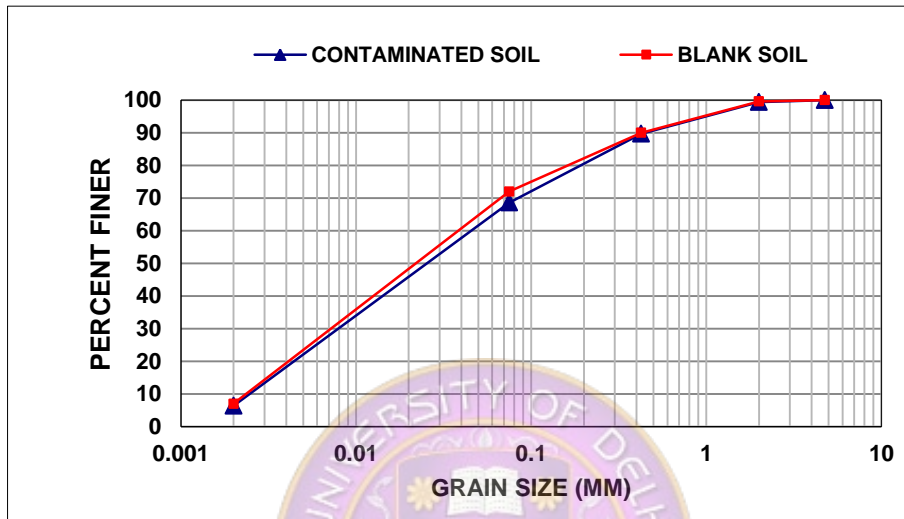


Figure- XIV: Mechanical analysis results of Down Stream Wazirabad Barrage, Left Bank ( L/B) S-4 and blank soil sample ( S-5)

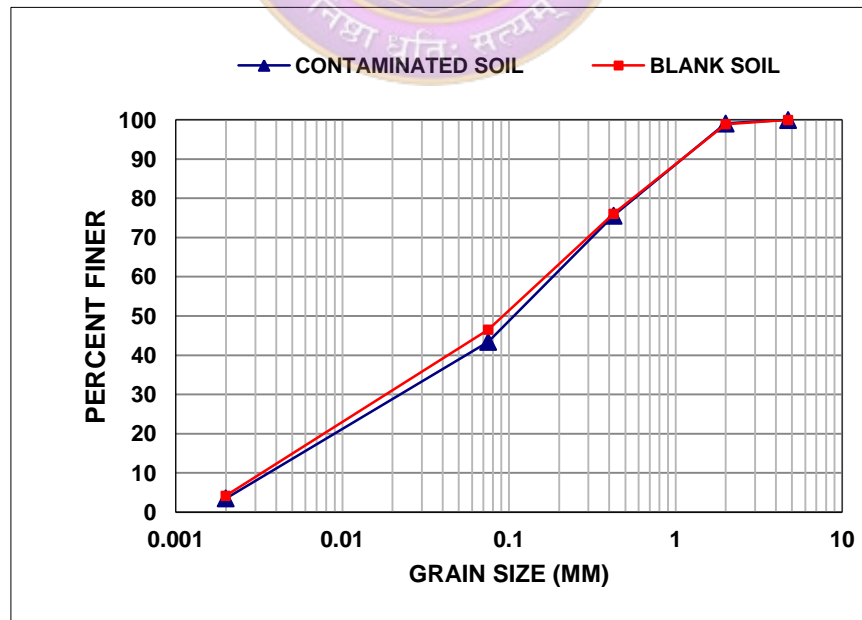


Figure-XV: Mechanical analysis results of ITO barrage down stream ( R/B) S-13 and blank soil sample ( S-14)



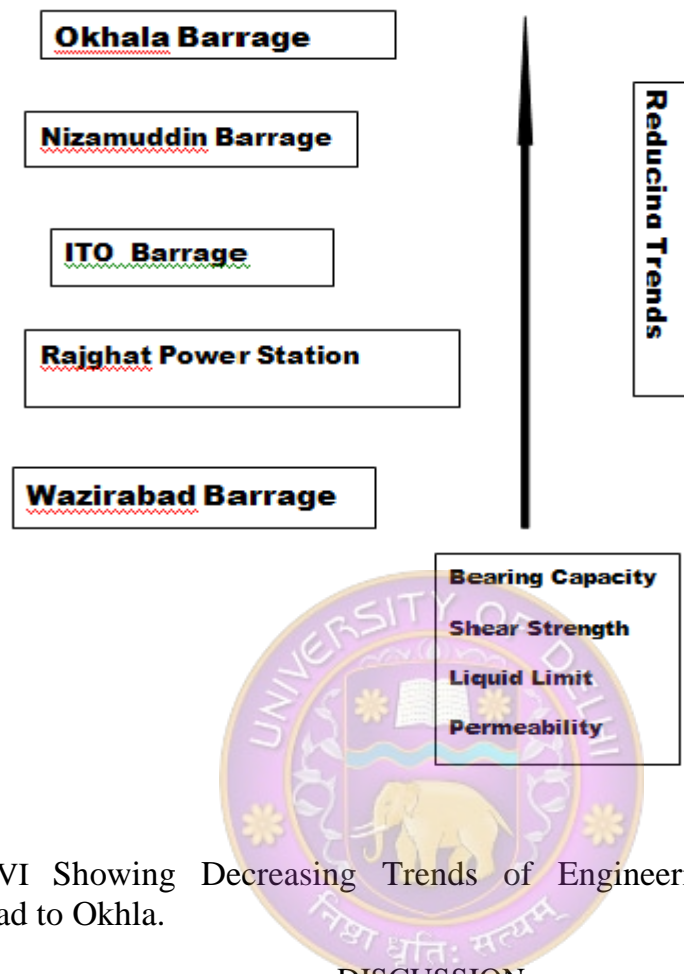


Figure-XVI Showing Decreasing Trends of Engineering Properties from Wazirabad to Okhla.

#### DISCUSSION

The results presented in Table-V shows that there an increasing pattern of concentration of various chemical parameters starting from Wazirabad to Okhla barrage. The value of pH is shows mostly alkaline nature. The increase in total soluble salts contents was also observed. The similar trends were also observed for other parameters. Which might be due to increasing pollutant concentration down stream of Wazirabad.

The results of Mechanical properties of contaminated soils are presented in figure. XIV and XV. It was observed that particle size of contaminated soils will shifts towards more finer fractions compare to blank soil samples. The soil pollutant interactions leads to weathering actions which finally changes the mineralogical compositions of contaminated soils.

The effect of change in chemical environment due to pollutants also results in to decreasing strength properties of soils. The reducing trend was observed for various engineering properties from Wazirabad to Okhla as presented in figure-XVI.

The strength characteristics of soil are affected extensively due to change in soil's internal structure and mineralogy.

## CONCLUSION

The results shows that the effect of different contaminants are quite significant in form of change in pH, total soluble salt content, organic matter, water soluble sulphate and water soluble chloride contents. Due to the leaching of cations and deflocculation the consistency characteristics of the soil is also reduced.

The strength characteristics of soil are affected extensively due to change in soil's internal structure and mineralogy.

The data obtained during the experiments is an indication that alteration in soil properties due to pollutants must be assessed for drawing safe design criteria for upcoming civil engineering structures along Yamuna riverbed and also helps in assessing possible deterioration of existing structures.

## ACKNOWLEDGMENTS

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