

# STUDY OF EFFECT OF DUMPYARD SITES ON SOIL PROPERTIES OF EMBANKMENT

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**Abstract:** Management and disposal of municipal solid waste (MSW) is one of the major environmental problems in Indian cities. The current practices of the uncontrolled dumping of waste on the outskirts of towns/cities have created a serious environmental and public health problem. The annual rate of growth of urban population in India is 4% and rate of generation of solid waste increases exponentially with growth rate. Typical landfill of MSW (Municipal solid waste) may occupy an area of several acres. Unscientific dumping pollutes the environment to a greater extent and hence it is difficult to find the balance between economic growth and environmental protection. The dumping of municipal solid waste causes changes in the geotechnical properties of the soil of embankment.

The focus of the present study is to carry out a comprehensive laboratory study on soil and water collected from in and around MSW dumping yard in Pucca Pul area in old Lucknow in U.P state of India and to investigate the changes in the index properties, compaction characteristics, and shear strength properties of the soil. The results show that dumping has increased the liquid limit and compressibility of the soil, making it more plastic. Dumping of organic content into the soil causes the increase in its compressibility. The increase in compressibility is also evident from the increase in liquid limit. This can be attributed to reaction of leachate with the soil which increases the permeability of the soil.

This observation of change in geotechnical properties may be useful to carryout land development in order to meet the land requirement in urban areas like Lucknow and improving the quality of suburban environment in the vicinity of the dump yard sites.

**Key Words:** Municipal waste, Dumping sites, Embankment, Leachate, Permeability

## Introduction

The focus of the present study is to carry out a comprehensive laboratory study on soil and water collected from in and around MSW dumping yard in Pucca Pul area in old Lucknow in U.P state of India and to investigate the changes in the index properties,

compaction characteristics, and shear strength properties of the soil. The results show that dumping has increased the liquid limit and compressibility of the soil, making it more plastic. Dumping of organic content into the soil causes the increase in its compressibility. The increase in compressibility is also evident from the increase in liquid limit. This can be attributed to reaction of leachate with the soil which increase the permeability of the soil.

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## Literature Review

<sup>1</sup>Dr.Krishna M. K., <sup>2</sup>Chaitra B.R. studies about "Effect of Municipal Solid Waste Leachate on the Quality of Soil" and find out that Dumping of solid wastes on land is a common waste disposal method and practiced almost by all the cities around the globe.

Evangelin Ramani Sujatha studied about **Impact of Municipal Solid Waste Dumping on the Geotechnical Properties of Soil and Ground Water** in Ariyamangalam, Trichy, India and find out that Management and disposal of municipal solid waste (MSW) is one of the major environmental problems in Indian cities.

Anchal Sharma describe the Impact of open dumping of municipal solid waste on soil properties in mountainous region.

## Results

Following results were obtained during the course of study:

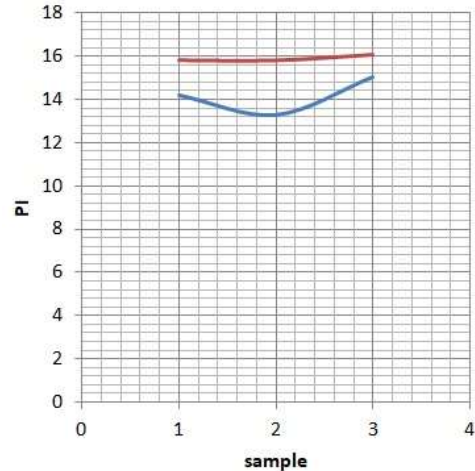
### Results for Uncontaminated Sample

Sr. No.	Properties	Sample 1	Sample 2	Sample 3
1	LL	37.5	37.2	37.9
2	PL	23.31	23.92	22.87

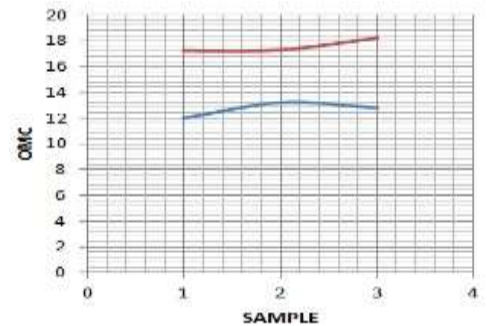
3	PI	14.19	13.28	15.03
4	OMC	12	13.2	12.8
5	Dry Density	19	19	19
6	Permeability(cm/s) x10 <sup>-4</sup>	2.48	3	2.73
7	UCS	8.11	8.5	8.33
8	CBR	2.00	2.10	2.15

**Results for Contaminated Soil**

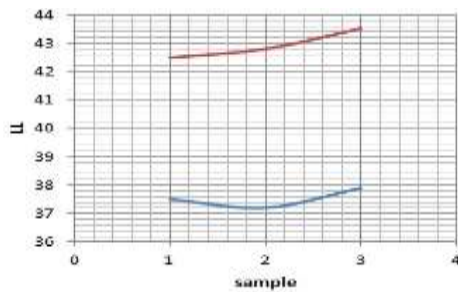
Sr. No.	Properties	Sample 1	Sample 2	Sample 3
1	LL	42.5	42.8	43.5
2	PL	26.67	26.98	27.43
3	PI	15.83	15.82	16.07
4	OMC	17.25	17.3	18.2
5	Dry Density	17	17.6	18.1
6	Permeability(cm/s) x10 <sup>-4</sup>	3.86	3.98	4.3
7	UCS	6.78	6.9	7.1
8	CBR	1.5	1.56	1.62



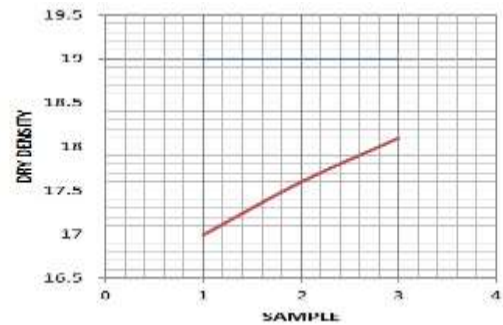
**Chart 3: Comparative result of Plasticity Index**



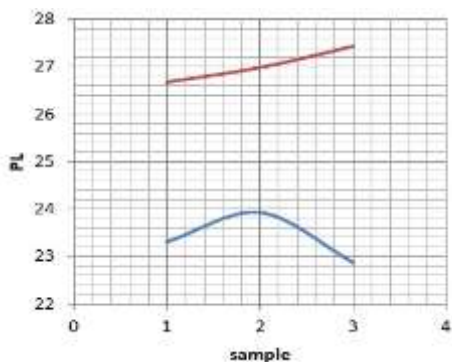
**Chart 4: Comparative result of OMC**



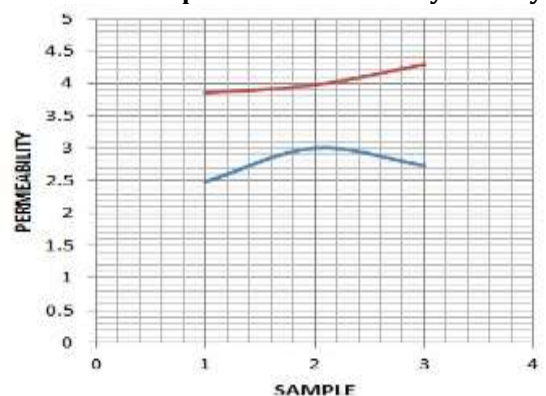
**Chart 1: Comparative result of Liquid Limit**



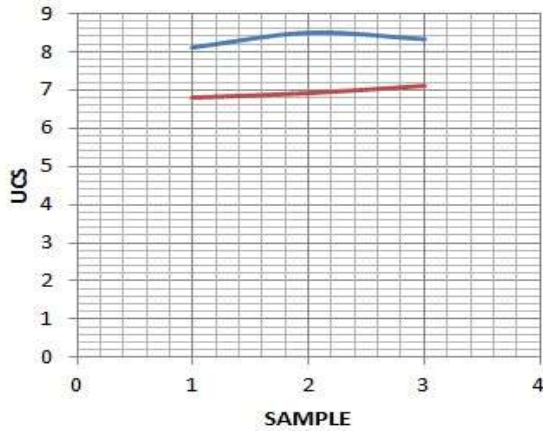
**Chart 5: Comparative result of Dry Density**



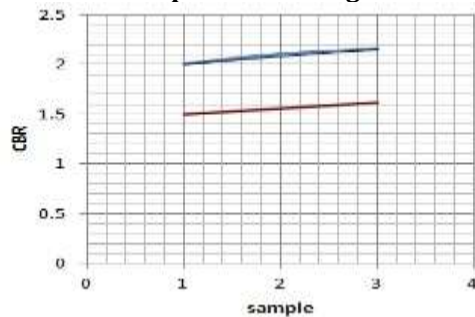
**Chart 2: Comparative result of Plastic Limit**



**Chart 6: Comparative result of Permeability**



**Chart 7: Comparative result of Unconfined Compressive Strength**



**Chart 8: Comparative result of CBR**

- ❖ The red line in the graph shows the contaminated soil and the blue line indicate the uncontaminated soil result.

### Discussion:

From above it is clear that on contamination there are:

- Permeability increases this partially accounts for increase in organic content in soil.
- OMC increases why dry density is decreasing.
- All the strength parameters decrease i.e. UCC and CBR values go on decreasing.
- While observing the three sample of contaminated soil it appears that sample 3 is more contaminated this is conformed from the fact that sample no 3 was collected from the most contaminated location.

### Conclusions

Experiments were conducted to characterize and correlate engineering properties of soil with the extent of contamination in the bund and depending upon the observations following conclusion were drawn:

- Permeability of the soil increases causing more seepage through the bund which may cause instability.
- Strength parameters of the soil decrease again increasing the possibility of failure.
- Liquid limit and plastic limit increases which give the direct indication of the extent of contamination of the soil.

Any dumping of MSW near the bunds contaminates soil, which will affect the life period of the bund. This observation of change in geotechnical properties may be useful to carryout land development and water quality assessment activities in order to meet the land requirement in urban areas like Lucknow and improving the quality of suburban environment in the vicinity of the dump yard sites.

### Acknowledgement:

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