

Kurdistan Region - Iraq

Ministry Of Higher Education & Scientific Research

Erbil Polytechnic University

Site investigation study for Shaqlawa **district** Soils

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Abstract:

The approach adopted for a particular site investigation, its extent and the techniques used will all depend upon the site-specific circumstances, and the experience and judgment of those involved. There is no single way to carry out an investigation. However, it is usual for the site investigation to be a phased exercise. For any project soil investigation is usually performed in several stages, i.e., during feasibility and planning stage, before construction and during construction.

This research was conducted to identify the engineering characteristics of soil types from four different areas in Shaqlawa **district**, Figure 1. The locations are (1) Baananok (in the east), (2) Sorik (north), (3) Kaawanyaan (west), and (4) Sarmaydaan (west), Figure 2. Laboratory data was collected after conducting a set of tests on the four mentioned **locations** above, which are the **water content, Organic Content, specific gravity, Atterberg Limits determinations and grainsize analysis. Knowing the characteristics of various locations of Shaqlawa soil are necessary for any designing and implementation of civil engineering project in future.**

Keywords : site investigation, engineering characteristics of soil and soil laboratory tests.

1- Introduction:

Site investigation is a complex process. It is vital to the success of any construction project, since in adequate investigation can lead to very large construction cost overruns. If site investigation is to be effective then it must be carried out in a systematic way.

Site investigation is the process by which geological, geotechnical, and other relevant information which **prior for** construction or performance of any civil engineering **project**.

At the turn of the twentieth century, a series of major failures occurred which led to the almost simultaneous formation of geotechnical research groups in various countries. In America, slope failures on the Panama Canal led to the formation of the American Foundations Committee of the American Society of Civil Engineers in 1913 and, in Sweden, landslides during a railway construction resulted in the formation of the State Geotechnical Commission in the same year. Following a number of embankment and dyke failures, a government committee under Buisman was set up in Holland in 1920. Casagrande (1960), however, dates the advent of modern soil mechanics to the period between 1921 and 1925, when Terzaghi published several important papers relating to the pore pressures set up in clay during loading, and their dissipation during consolidation, and also published his book *Erdbaumechanik auf Bodenphysikalischer Grundlage*.

These works largely stemmed from Terzaghi's appreciation of the need to supplement geological information with numerical data, following two years spent collecting geological information on the construction sites of US dams (Terzaghi 1936).

Therefore, Site investigation study, became necessary prior any engineering projects in order to avoid any future problems.

2- Why is Site Investigation Necessary?

It is obvious that site investigation is of importance for the successful completion of any project.

The design of a structure which is economical and safe to construct, is durable and has low maintenance costs, depends upon an adequate understanding of the nature of the ground. This understanding comes from an appreciation of the distribution of the materials in the ground, and their properties and behavior under various influences and constraints during the construction and lifetime of the structure. An adequate and properly structured site investigation is therefore an essential part of any civil engineering project.

Site investigation is required to determine the engineering properties of soil and rock and how they will interact with a planned development. The purpose of site investigation is to establish

parameters for foundation and substructure design; and to assess the potential contamination risks to humans, property and the environment.

The primary objective of a site investigation is to determine as accurately as may be required-

- The nature and sequence of strata.
- The ground water conditions at the site.
- The physical properties of soil and rock underlying the site.
- The mechanical properties, such as strength and compressibility of different soil or rock strata.

Site investigation should be organized to obtain all possible information toward a thorough understanding of the subsurface condition and probably foundation behavior.

3- Stages of Site Investigation:

For most projects, the stages of a site investigation can be broken down into phases. The stages of site investigation usually coincide with the overall project planning. Site investigations will take place during the feasibility and planning stage, pre-construction, and construction phases when needed. So, what are the stages of site investigation? The three stages of site investigation are:

- Preliminary investigation.
- Detailed investigation.
- Supplementary investigation and construction recommendations.

The information obtained from each phase is assessed to ensure the initial objectives of the site investigation are satisfied. Changes to the scope of the investigation or even the design proposals and construction works, might be needed in the light of any unexpected findings.

4- Results:



Figure 1 Shaqlawa district location

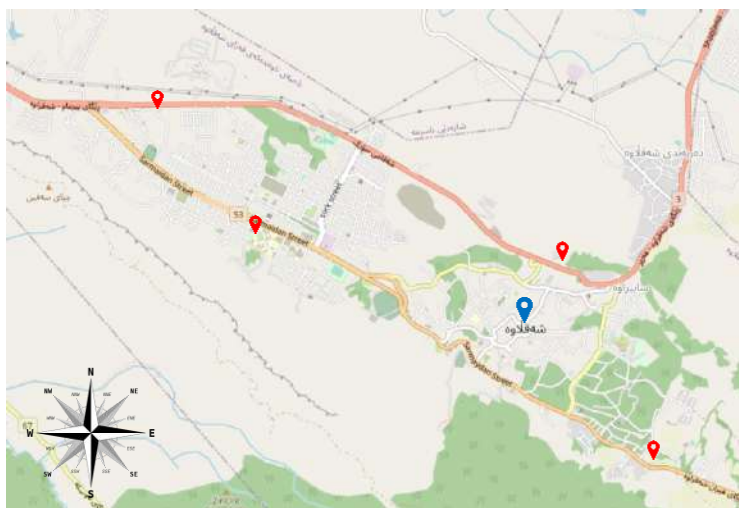


Figure 2 soil sample locations

4. Result and discussion.

4.1 water content determination.

location of sample	(1) Baananok			(2) Sorik			(3) Kaawanvaan			(4)Sarmaydaan		
Weight of the metal container w_c (g)	18	18	18	28	28	28	18	18	18	28	10	18
Weight of the container and wet	44	63	50	72	89	77	51	60	49	81	52	70
Weight of the container and dry	41	57	46	68	83	72	47	55	45	78	49	67
Water Content %	13	15.4	14.2	10	10.9	11	13.7	13.5	14.8	6	7.69	6.1
Average Water Content %	14.2			7.63			14			6.59		

Table 1: Water content test

Form the table it can be seen that the water Content In location (1) and (3), is higher than other two location because, it was an agriculture area before

4-2 Organic Materials content determination:

location of sample	(1) Baananok			(2) Sorik			(3) Kaawanyaan			(4) Sarmaydaan		
weight of the empty porcelain can (gm)	15	18	16	15	18	16	15	18	16	15	18	16
Weight of the original soil and porcelain can (gm)	29	33	35	31	36	34	30	33	30	35	35	34
Weight of the remaining soil and porcelain can (gm)	27	31	32	29	33	32	28	31	28	34	34	33
Organic material %	14.2	13.3	15.7	12.5	16.6	11.1	13.3	13.3	14.2	5	5.8	5.5
Average Organic material %	14.4			13.4			18			5.43		

Table 2: Organic Materials content results

From the results we can observe that, in Location (3), (1) the amount of organic material is higher than other locations because this area, were used to be agriculture Land. In location (4) sore Value is low because now is a big re send area. In Sorik, which is a mountain, above of it is forest, and the down area of it is hotels, motels.

4-3 Specific Gravity determination:

location of sample	(1) Baananok	(2) Sorik	(3) Kaawanyaan	(4) Sarmaydaan
Wt. of empty Pycnometer W1	252	321	271	252
Wt. of Pycnometer + dry soil W2	362	449	361	367
Wt. of Pycnometer + soil + water W3	594	673	597	601
Wt. of Pycnometer + water W4	533	601	454	534
Specific gravity of soil GS				

Specific Gravity results

4-4 Atterberg Limits result:

4-4-1 Liquid limit results:

location of sample	(1) Baananok			(2) Sorik			(3) Kaawanyaan			(4) Sarmaydaan		
	1	2	3	1	2	3	1	2	3	1	2	3
Trial No												
Number of blows	29	20	18	30	23	10	30	22	16	31	24	18
Water content % = $(w_2 - w_3) / (w_3 - w_1) * 100$	43	58	63.6	33.3	38	53.3	31.25	37.5	42.8	27.27	31.57	43.75
Water content % in 25 blows =	49.7 %			37 %			35.2 %			31 %		

Table 4: Liquid limit results

4-4-2 Plastic limit results:

location of sample	(1) Baananok	(2) Sorik	(3) Kaawanyaan	(4) Sarmaydaan
Water content % = $(w_2 - w_3) / (w_3 - w_1) * 100$	33.3	36.6	29.4	23.4

Table 5: Plastic limit results

location of sample	(1) Baananok	(2) Sorik	(3) Kaawanyaan	(4) Sarmaydaan
Liquid limit %	49.7	37	35.2	31
Plastic limit %	33.3	36.6	29.4	23.4
Plastic index = LL - PL	16.4	0.4	5.8	7.6

Table 6: Plasticity index results

4-4-3 Plasticity index results:

The result of PI shows that, in location (1) is higher than the others, because it is in the east of Shaqlause, which is an agriculture land, and it is propound that the Water table is high. But in location (2), PI is low because is a mountain and it contains the soil their is a coarse grained type.

4-5 Particle size distribution curves

4-5-1 Baananok site:

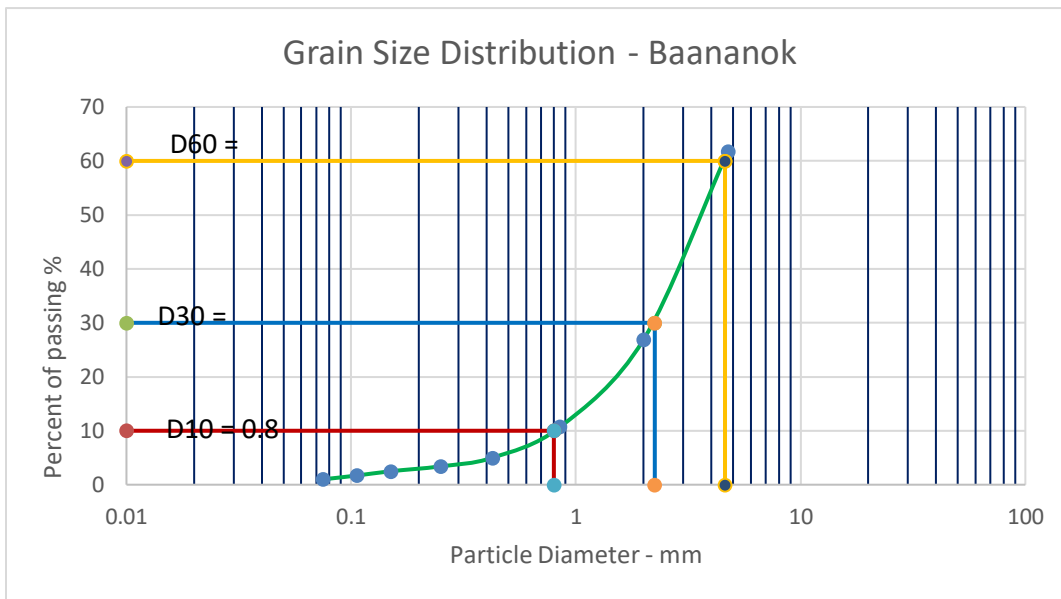


Figure - 7 / Grain Size Distribution - Baananok

Cu = 5.8 -- Cc = 1.4 **poorly graded Sand**

4-5-2 Sorik site:

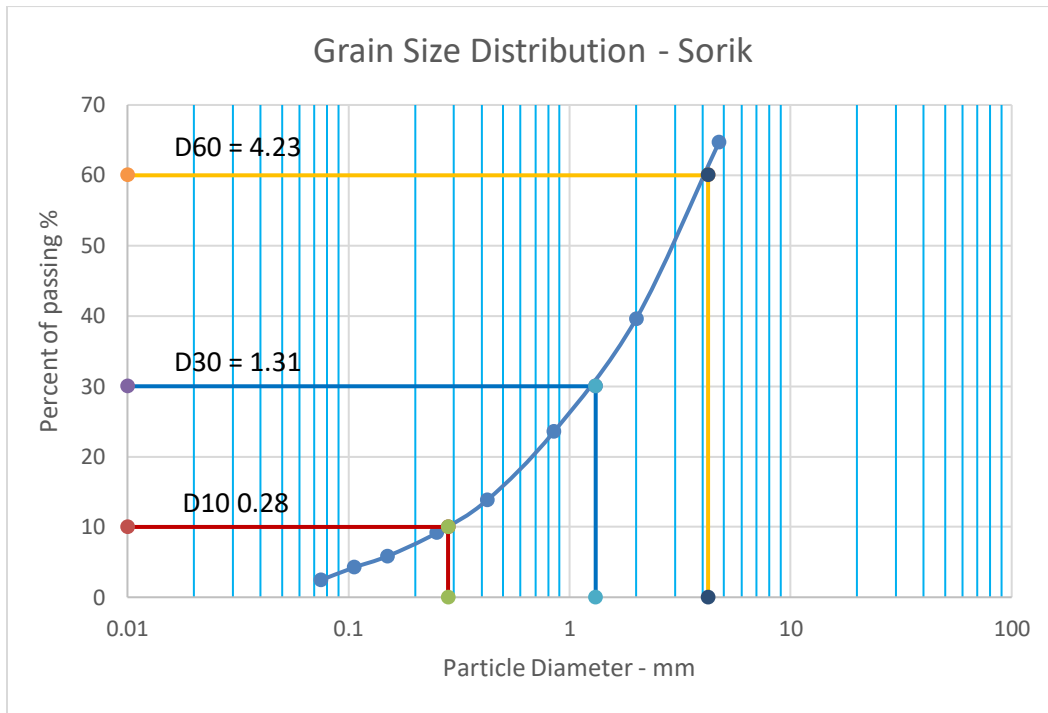


Figure – 8 / Grain Size Distribution –Sorik

4-5-3 Kaawanyaan site: $C_u = 15$ -- $C_c = 1.45$ **poorly graded Sand**

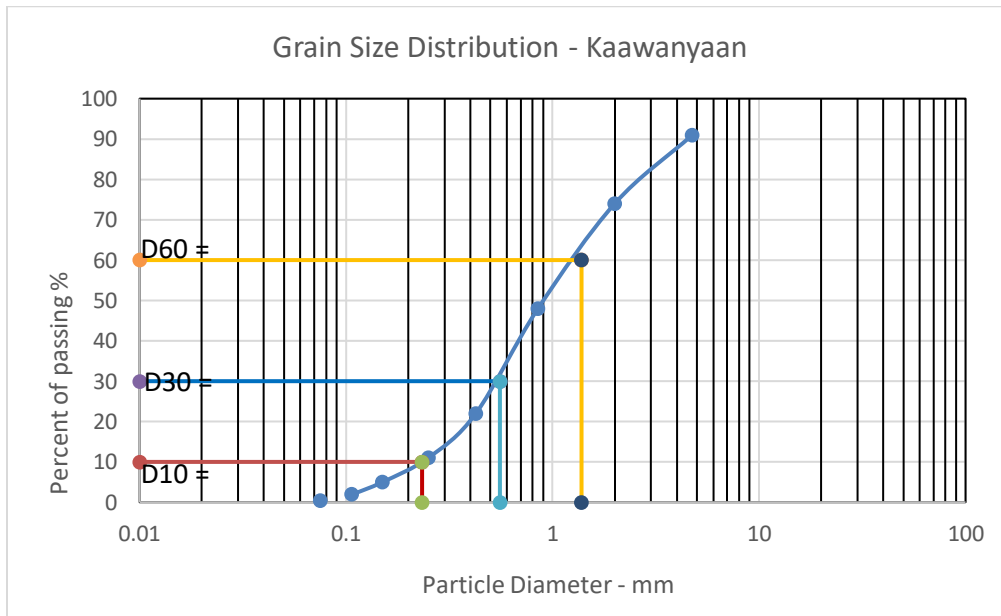


Figure – 9 / Grain Size Distribution –Kaawanyaan

$C_u = 6$ -- $C_c = 1$ **Well graded Sand**

4-5-4 Sarmaydaan site:

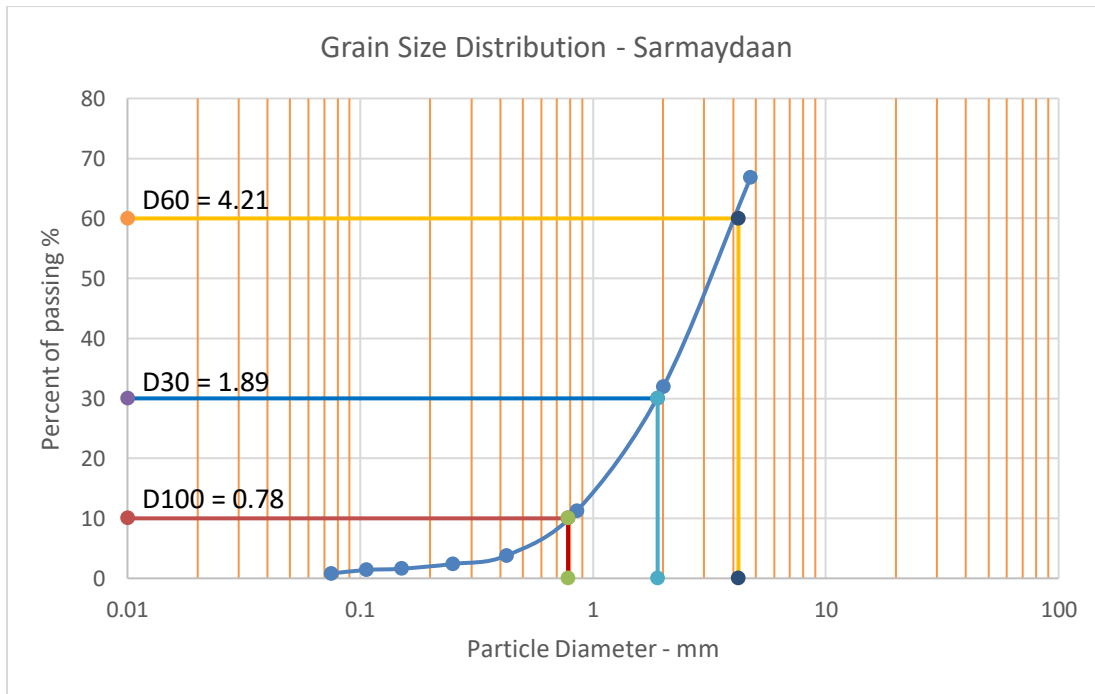


Figure – 10 / Grain Size Distribution –Sarmaydaan

Cu = 5.4 -- Cc = 1.1 **Well graded Sand**

4-5-5 sit investigation result for all four sites :

Site locations	Lab. Results						
	water content	Organic Materials content	Specific Gravity results	Liquid limit results	Plastic limit results	Plastic index results	Sieve analysis results
Baananok	14.2	14.4	2.24	49.7	33.3	16.4	Well graded sand
Sorik	7.63	13.4	2.28	37	36.6	0.4	poorly graded sand
Kaawanyaan	14	18	2.36	35.2	29.4	5.8	Well graded sand
Sarmaydaan	6.59	4.43	2.39	31	23.4	7.6	Well graded sand

Table 11: The final experiments result

5- Some of existing constructed structures (HOTELS) in Shaqlawa:

5-1 Shaqlawa international Hotel:



Figure 11 - Shaqlawa international Hotel

5-2 Blue Marine Hotel:



Figure 12 – Blue Marine Hotel

5-3 Modern city Hotel:



Figure 13 - Modern city Hotel

5-4 Albalad Alameen Hotel



Figure 14- Albalad Alameen

6- Discussion

In our quest to better understand the soil composition in Shaqlawa district, we conducted a site investigation study. This study involved by taking soil samples from four different locations which covered all sites at shaqlawa and subjecting them to laboratory tests. The results of these tests revealed that three of the location is well-graded sand, while one station is bad-graded sand.

The presence of well-graded sand in three of the stations is positive for construction a engineering projects in shaqlawa district. It signifies that building foundations, roads, and other infrastructure can potentially be constructed with fewer challenges and lower risks, of failure .

The presence of bad-graded sand at location (1) indicates potential challenges for construction and engineering activities in that specific area. Additional testing and analysis may be necessary to understand the extent of these challenges.

It's important to use this information to inform the design and construction processes, as each type of soil may require different engineering solutions or modifications to account for its specific properties. Overall, the results of this site investigation study will play a crucial role in guiding future construction and development projects.

From the figures of Varous hotch shown it and which they have been Constructed in the last 20 years, no Settlements or Crucks have been observed, this can Support our results of this Site investigation.

7- Conclusions and recommendation:

This study is considered a practical field research Indicates the engineering properties of soil for four different locations.

- Shaqlawa district has been chosen for this investigation.
- For different places have been selected for sample testing in a surrounded area of Shaqlawa.
- Various site investigation set of tests have been conducted in the laboratory.
- Overall results have been tabulated in table (11), and the results shows that Shaqlawa soils are convenient for implementing various civil engineering projects especially malty story structures.
- Most of the existing constructed structures (HOTELS) are in a good condition and no even small failures have been observed, figures (11, 12, 13 and 14), this supports our results.
- It is recommended that this investigation will be extended in future for further studying in other sites of the city.

8- References:

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