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THE INFLUENCE OF WATER CONTENT ON THE SPT-N_{30} VALUES IN THE VADOSE ZONE, A CASE STUDY OF TORBALI SETTLEMENT AREA

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ABSTRACT

The SPT-N_{30} test is widely used for the geotechnical investigation as well as cohesive soil. In this study, the SPT-N_{30} applications were performed on the unconsolidated clayey and silty alluvium soil and then, water content effectiveness on the SPT-N_{30} values at the vertical soil profile were investigated. As a result, it is concluded that the SPT-N_{30} value affects the water content values. The increments of the water content values cause the decrements of the SPT-N_{30} values. On the other hand, the water content values should be considered on the determination of the SPT-N_{30} and qu (unconfined compression strength) values to obtain more realistic results.

The influence of the water content on the SPT-N_{30} and qu (unconfined compression strength) values are compared with the literature. It is concluded that the SPT-N_{30} values are influenced by the water content values of the soil profiles. As a results of this study, about 100-150 kN/m^2 less qu (unconfined compression strength) values are calculated on the SPT-N_{30} test for the similar clays. The water content values of the cohesive soil are increased at the rainy seasons, because of that, the high bearing capacity values are used during the construction, therefore, some of the structures had damaged and also some of them are evacuated. If the equation developed from this investigation is utilized during the construction on the Torbali's settlement area, the damage will be reduced to minimum level.

Key Words: SPT-N_{30}, Water Content, Torbali, Alluvium

SU İÇERİĞİNİN VADOZ ZONUNDAKİ SPT-N_{30}' A ETKİSİ, TORBALI YERLEŞİM ALANINDA YAPILAN BİR ÇALIŞMA

ÖZET

SPT-N_{30} testi geoteknik araştırmalarda çok yaygın olarak kullanılmaktadır. Bu çalışmada, SPT-N_{30} testi konsolide olmamış killi ve siltli alüvyonlu zeminler üzerinde uygulanmış ve su içeriğinin düşey zemin profilinde SPT-N_{30} değerlerinin etkileri araştırılmıştır. Sonuç olarak, SPT-N_{30} değerlerlerinin su içeriği değerlerini etkilediği belirlenmiştir. Artan su içeriği değerleri, SPT-N_{30} değerlerinin azalmalarına sebep olmaktadır. Bu nedenle, gerçeğe uygun SPT-N_{30} ve qu değerlerinin elde edilebilmesi için su içeriği değerleri gözönüne alınmalı gerekmektedir.

Aynı zamanda, su içeriği miktarının SPT-N_{30} ve qu değerleri üzerine etkileri literatüre çalışmalarıyla mukayese edilmiştir. Zemin profilinde SPT-N_{30} değerlerinin su içeriği tarafından önemli ölçüde etkilendiği belirlenmiştir. Bu çalışma sonucunda diğer araştırmacıların elde ettiği değerler mukayese edildiğinde, 100-150 kN/m^2 daha az SPT-N_{30} ve qu değerleri edildiği saptanmıştır. Yağışlı mevsimlerde, kohesiv zeminlerde su içeriği değerleri doğal olarak arttığından inşaatlarda yüksek taşıma gücü değerleri kullanılmaktadır, bu nedenle, bazı yapılarda önemli ölçüde hasarlar oluşmakta ve bazı yapıların boşaltılmak zorunda kalınmakta olduğu söz konusu olmaktadır. Eğer bu çalışma kapsamında geliştirilen eşitlik Torbalı yerleşim alanındaki yürütülen inşaatlarda uygulandığı takdirde oluşabilecek zararın minimum düzeye inebileceği düşünülmektedir.

Anahtar Kelimeler: SPT-N_{30}, Su İçeriği, Torbalı, Alüvyon

1. INTRODUCTION

The investigation area is called as Torbali which is placed on the Izmir-Aydin highway far from 50 km south of Izmir (Figure 1). Torbali which is one of the industrialized towns which has more than a hundred thousand of population and is established on the alluvium depositional area on the north branch of the Kucuk Menderes River with a north-south extension. For the determination of the soil specifications of the local depositional area of Torbali, twenty soil borings having approximately 15-25 m of depth were performed from the selected locations of this area. During the soil investigations, the rotary boring system with B-66 drilling core was applied and the Standard Penetration Tests (SPT-N_{30}) were performed on the each of 1.5 m depth of the soil profile, finally, disturbed and undisturbed samples obtained from these soil profiles for the soil laboratory tests. After that to determine the soil properties, several experimental soil laboratory tests were performed on the disturbed and undisturbed samples as the unconfined

compression strength, atterberg limits, water contents, natural unit weight, consolidations were determined. With the accomplishment of the SPT-N_{30} tests during the soil borings, the water content values of the cohesive soils were evaluated and their relationships investigated [1] and [2].

1.1 General Geology

The basement of the Torbali and its surroundings were established by brown-grey-green color schists during the Mesozoic age as an underneath layer and overlaid by dolomitic marble with transitive touching [3] and [4]. The Neogen lakes sediment deposition was placed on the top of the metamorphic units at an angle discordance. The Neogen sedimentation is established by brown color clay stone as below layer and overlaid by grey-yellow color clay stone. The series of Neogen can be observed at the north and east of the investigation area (Figure 1). The plain of Torbali and its surroundings were formed by the deep graben system at the northeast-southwest direction [5]. The plain of Torbali is covered by recent alluvium materials with average 50 m of thickness [6].

1.2 Local Geology

Torbali was established on top of the vast alluvium plain areas. The alluvium materials of Torbali regions are transported to the plain areas by the small rivers because of the physical and chemical events of the environmental rocks which are placed on the deep graben system at north-south and northwest-southeast directions. Torbali's plain alluvium materials were shaped by the carried materials as a coarse materials at the north and cohesive materials at the south. First of all, the carried materials were settled at the north areas as coarse materials and then smaller materials deposited through the south. Generally, the basement of Torbali soil has cohesive materials specified as CL-ML characteristic. The soil with ML characteristics provide sandy silt specialty having medium, low plasticity and hard-medium solid deposition. According to the soil borings having 15-26m of thickness which were performed at the different locations of the study area, the soil has ML characteristics on the top of the soil profile at the 0-5 m of the depth and the average SPT-N_{30} values and water content values were found out as 25 and %3-9 respectively. For the silty soil, the water content values increase (average 15-20) while depth of the soil profile increases but meanwhile the SPT-N_{30} values decreases (Figure 2).

At the surface of the southwest area, SK-9, the CL type of soil, overlaid by the silt layer, has the water content values of %7-11 at the 0-7 m of the soil

profile and reaches to the %20- 25 values of the 15-25 m depth of the soil profile. It is understood from the above information that the values of the SPT-N_{30} decrease as it is for silty soil. According to boring research, the silty soil with ML characteristic having 25 m of thickness is found out at the south of the study area but, generally, the CL characteristic of soil having 7-25 m of thickness is obtained from the north. After 5 m depth of the soil profile, it is observed that the water content values of the cohesive soil increase while SPT-N_{30} values decrease with average of 12-14 values. The relationship between SPT-N_{30} - qu (unconfined compression strength) is represented in Table 1.

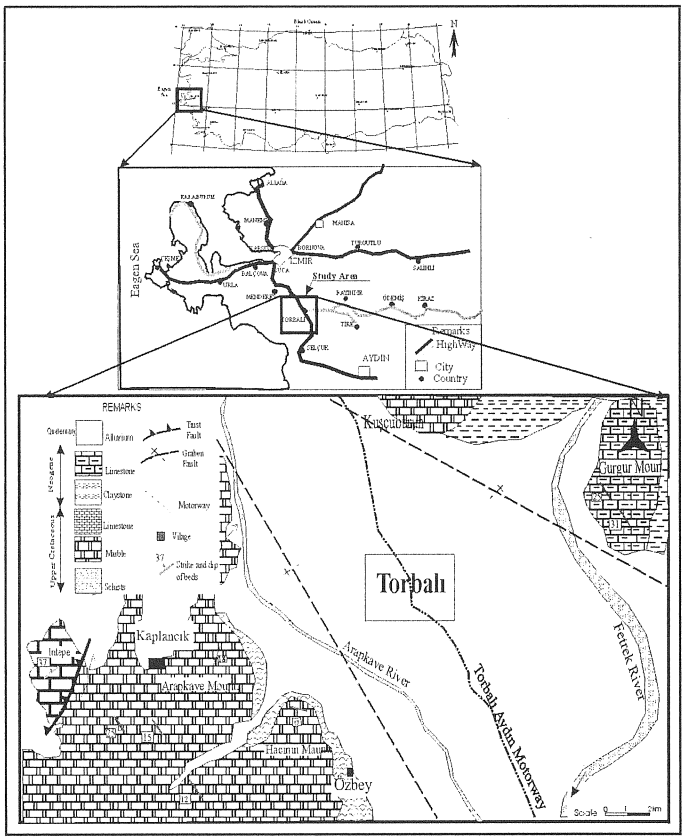

Figure 1 The Location Map of the Investigation area.

1.3 The Groundwater Level

In the Torbali plain, the average static level of the ground water is determined as 35 m. However, the level of the ground water table was measured as 12 m in 1980's, 26 m in 1998 and 35 m recently [6]. The level

of the plain decreases continuously due to the less feeding and high gravity. The ground water is feed from the surface at the north and also from the underground karstic empty places and then migrates through the south.

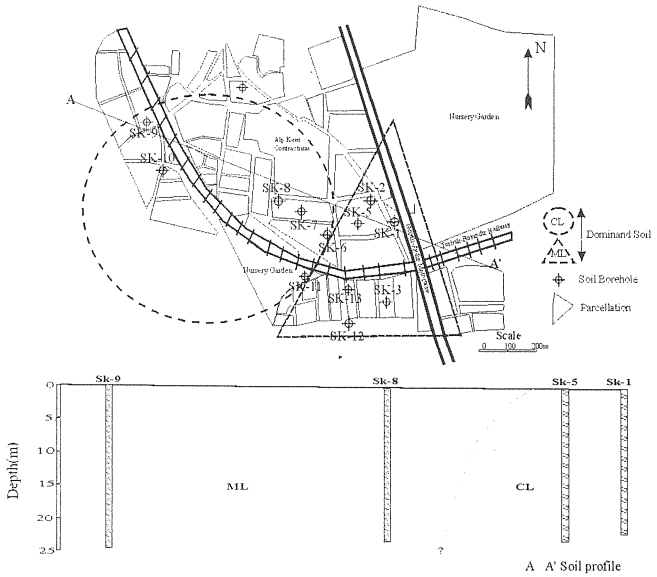

Figure 2 The cross-section of the soil profile.

Table 1. The Relationship Between the values of SPT-N_{30} and uncon-fined compression strength of the Soil Profiles [6].

Cohessive Soils		
SPT-N_{30}	**qu(kN/m^2)**	**Solidity**
<2	<25	Very soft
2-4	25-50	Soft
4-8	50-100	Medium
8-15	100-200	Solid
15-30	200-400	Very Solid
>30	>400	Hard

1.4 The Application of the Standard Penetration Test (SPT-N_{30})

During the soil borings, the standard penetration test, SPT-N_{30}, can be performed to determine of the unconfined compression strength of the soil profile. This test is also called as an in situ shear test and it has a special steel penetrometer to obtain undisturbed soil samples by using the split-spoon sample tube. The numbers of blows are required for a free-falling weight to

advance a standardized cylindrical split tubes to a definite distance. The test is made on clays, noncohesive soils, and intermediate soils, but its particular value is with noncohesive soils. The split-spoon sample is obtained by driving the sampler of a total of 45.0 cm with a 63.5 kg hammer falling for a distance of 76.2 cm [7].

The values of the SPT-N_{30} give approximate information about the consistency and the unconfined compression strength of the soil profile. It is concluded from the SPT-N_{30} values which were obtained during the drillings in which the silt layers have loose-medium solid and solid consistency and their unconfined compression strength values change between 50 and 200 kN/m^2. Also, this calculation gives the same trends with the free falling test performed on the cohesive soils in the laboratory. According to [8], there is a relationship between cohesive soils and the unconfined compression strength qu = 2.31 N+22.07 and 3.5 N on the unconfined compression strength of the cohesive soils. On the other hand, after performing more than a hundred of SPT-N_{30} applications, [9] found out that there is a similar field and laboratory values between SPT-N_{30} and undrained shear strength. During the soil drillings on the Torbali's cohesive soils, the soil samples were obtained from the several depths of the soil profile where SPT-N_{30} tests were performed and the SPT-N_{30} tests were also performed at different depths of soil profile and laboratory tests were performed on each these samples as atterberg limits, water content, unconfined compression strength, natural unit weight values were calculated and then they compared with the SPT-N_{30} values as represented in Table 2 and 3.

Depth (m)	**W_{LL}**	**γn gr/cm^3**	**W %**	**qu kN/m^2**	**Cu=qu/2 kN/m^2**	**SPT-N_{30} Distance**	**Mean SPT-N_{30}**
0.50-0.95	20	1.85	3-5	93	46	22-38	30
1.50-1.95	24	1.86	5-8	80	40	18-28	23
3.00-3.45	24-26	1.80	7-12	71	36	16-28	22
4.50-4.95	25	1.92	10-12	78	37	9-22	16
6.00-6.45	25	1.76	12-15	65	33	10-32	22
7.50-7.95	28	1.80	13-15	61	31	8-18	13
9.00-9.45	28	1.85	12-15	56	28	8-18	13
10.50-10.95	30	1.81	13-15	51	26	9-15	13
12.00-12.45	32	1.85	13-17	50	25	10-16	13

13.50-13.95	32-33	1.84	15-18	45	23	10-18	14
15.00-15.45	33	1.85	15-20	42	21	10-18	14
16.50-16.95	34	1.90	17-20	41	20	12-22	17
18.00-18.45	35	1.90	18-22	42	21	10-22	16
19.50-19.95	36	1.90	19-23	40	20	8-18	13
21.00-21.45	36-37	1.92	20-22	42	21	8-18	13
22.50-22.95	37	1.89	20-23	41	21	10-18	14
24.00-24.45	37	1.90	21.25	40	20	8-18	13

Table 2 The Mean Characteristics of the ML Soil Profile (Sk-1, Sk-2, Sk-5, Sk-6, Sk-11, Sk-12, Sk-13)

Depth (m)	**W_{LL}**	**γn gr/cm3**	**w%**	**qu kN/m²**	**Cu=qu /2 kN/m²**	**SPT-N_{30} Distance**	**Mean SPT-N_{30}**
0.50-0.95	25	1.85	5-8	84	42	18-30	24
1.50-1.95	26	1.86	8-11	71	36	15-28	17
3.00-3.45	26	1.80	10-13	63	32	14-26	20
4.50-4.95	27	1.92	10-13	60	30	8-20	14
6.00-6.45	27	1.76	12-15	60	30	8-22	15
7.50-7.95	30	1.80	12-16	56	27	6-15	15
9.00-9.45	32	1.85	13-16	56	28	6-12	9
10.50-10.95	31	1.81	15-17	54	27	8-15	11
12.00-12.45	33	1.85	15-18	51	25	8-16	12
13.50-13.95	33	1.84	17-19	48	44	8-18	13
15.00-15.45	35	1.85	17-20	48	44	10-22	18
16.50-16.95	37	1.90	17-20	46	43	8-23	15
18.00-18.45	39	1.90	20-24	45	23	8-18	13
19.50-19.95	40	1.90	22-26	44	42	12-22	16
21.00-21.45	40-42	1.92	22-27	43	22	10-18	14
22.50-22.95	42	1.89	25-27	42	21	8-20	14
24.00-24.45	44	1.90	26-27	42	21	8-21	14

Table 3 The Mean Characteristics of the CL Soil Profile (Sk-7, Sk-8, Sk-9, Sk-10)

2 EVALUATION

According to the results of the field and laboratory tests, the consistency of the cohesive soil is controlled by the water content (Figure 3). There is a linear relationship between SPT-N_{30} values and laboratory unconfined compression strength test values. Also, there is a similar

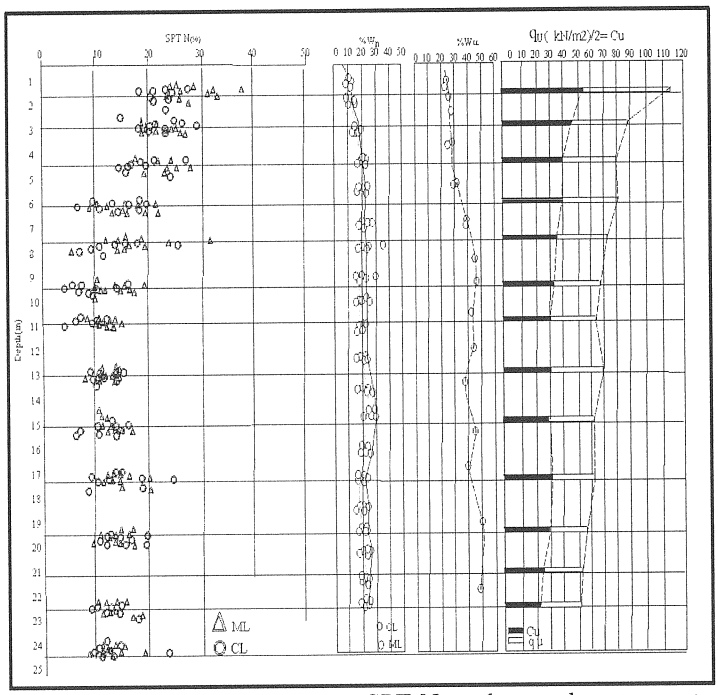

Figure 3 The relationship between SPT-N_{30} values and water content values of the soil profile.

linear relationship between [10]'s one dimensional consolidation test values and SPT-N_{30} values (Figure 5). The values of %5-8, 97-113 kN/m^2 , 24 were obtained for the water content, qu (unconfined compression strength), and SPT-N_{30}, respectively from the ML type of surface soil.However, there is a sharp decrease at the SPT-N_{30} values around 8-15 m of depth of the soil profile where the water content values starts to increase. Around these depths, the water content values change from %8 to 21 and SPT-N_{30} values changes from 14 to 22 values. The average values of the unconfined compression strength test change between 67 and 80 kN/m^2 at these same depth. It is found out from the investigation of the CL type of the surface soil that the unconfined compression strength is controlled by the water content due to having %10-17, 15-20, 67-90 kN/m^2 values, the water content, SPT-

N_{30}, unconfined compression strength values, respectively. After performing some laboratory experiments on the dry and wet cohesive soils, [11] compared their SPT-N_{30} values, he concluded that the wet soils had low SPT-N_{30} values and also mudstone had less SPT-N_{30} values than siltstone with depth increment. [12] investigated the affection of the hydrostatic gradient values on the SPT-N_{30} values of the sandy soils that the SPT-N_{30} values obtained from the underwater soil is less than the SPT-N_{30} values obtained from the dry soil. As a results of the consolidation and permeability laboratory tests which were performed on the alluvium cohesive soils of Torbali the soil has non-consolidated characteristics and less permeability values (Table 4).

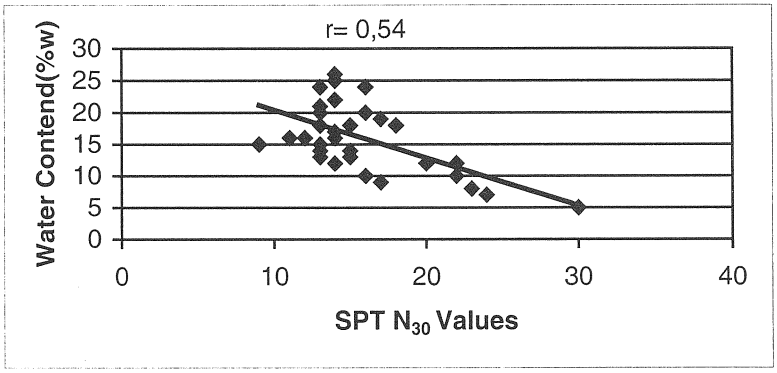

Figure 4. The Correlation of the SPT-N_{30} versus Water Content Values

Soil specifications	CLAY	SILT
Water content (%)	17-30	5-21
Liquid limit	30-55	21-37
Plastic limit	14-21	7-17
Plasticity index	11.20	9-14
Natural unit weight	1.86-1.95	1.75-1.98
qu (kN/m^2)	63-87	77-113
Cu (kN/m^2)	30-50	40-70
Porosity (%)	18-20	20-25
Void ratio (%)	31-40	35-42
N_{30} (Average)	12	14
Permeability	$1\text{-}4x10^{-6}$ (cm/s)	$7\text{-}9x10^{-5}$ (cm/s)

Table 4 The calculated values of the index properties of the study area's soil profile.

After the evaluation of the SPT-N_{30} values, the unconfined compression strength, and the settlement of the cohesive soil, the relationship between SPT-N_{30} and qu (unconfined compression strength) parameters were used continuously and new correlations were created. SPT-N_{30} and Cu (undrained shear strength) values were installed on the equation of the qu = Cu.Nc + Df. γ and Cu = 6N kN/m^2 determination was used [13]. These correlations give the accurate results if they are performed immediately on the cohesive soil at the normal field situations without loosing any water content. Especially in the winter time, the surface water stays for a very long time on top of the cohesive soils of Torbali due to the low permeability values of the soil profile. This surface water increases the values of LI as 30-55, therefore, clay gains the high plasticity characteristics of the soil. The value of qu (unconfined compression strength) decreases as the value of water content increases, for that reason, the settlement of the buildings, and some structural damages occur during the rainy seasons. Some of the buildings which were structured on top of the Torbali's cohesive soil turn out to be in an unusable condition after a few years from their instruction due to the excessive and different settlements.

For the protection from this phenomenon, the water content affection on the unconfined compression strength of the cohesive soil should be considered. Therefore, the wet soil properties should be used for dry and wet top soils. By using the correlation factors of the SPT-N_{30} values of the loose-medium beach clays which were placed below the underground water level, it is determined that the SPT-N_{30} values decrease about %40-50 [14]. By using linear line on the SPT-N_{30} versus qu (unconfined compression strength) graphic given on Figure 5 which was prepared by [10], some useful information can be obtained about the unconfined compression strength of the soil (Figure 5). The new graphic was formed by adding the water content on these values. At this graphic, the SPT-N_{30} and the water content values of the basement soil are crossed. After that, the qu values of the X axis were utilized by using the lowest values of the water content. There is about 100-150 kN/m^2 qu values of reduction between this value and normal SPT-N_{30}. This result can reach more reliable the unconfined compression strength of the cohesive soils in the Torbali's plain.

According to the graphical interpretation on the water content and SPT-N_{30} values, there is a reverse ratio and the straight line correlation given in Figure 4. Also, a linear straight line equation was obtained between the

unconfined compression strength (qu) and SPT-N_{30} values. While Y and X axis represent qu and SPT-N_{30} values on the equation of Y = 3.4 X (Figure 5), they represent Cu (undrained shear strength) and SPT-N_{30} values on the equation of Y = 1.7 X (Figure 6).

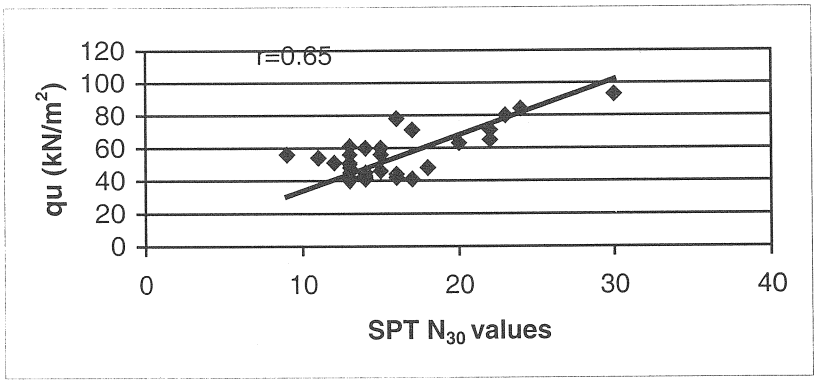

Figure 5. The Correlation of the SPT-N_{30} versus qu Values

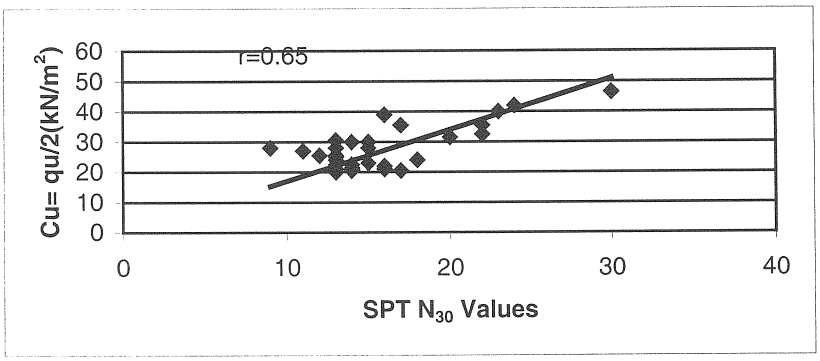

Figure 6. The Correlation of the SPT-N_{30} versus Cu (undrained shear strength) alues

If these two equations are added together, the following equation can be obtained:

$qu = 3.4\ N_{30}\ kN/m^2$
$Cu = 1.7\ N_{30}\ kN/m^2$

The values of $qu=3.4N_{30}\ kN/m^2$ and $Cu<1.7\ N_{30}\ kN/m^2$ are recommended for the cohesive soil which has 1.85-1.92 g/cm^3 of γ_n and 1-20 of plastic index values. According to the qu-SPT graphic which was obtained by [10], there

is less relationship between qu and SPT values on the Torbali alluvial clay and silt soil.

Owing to this equation, the water content values were added directly to the correlation between SPT-N_{30} and the unconfined compression strength values and the water content affection on the unconfined compression strength will be understood in Torbali cohesive soil (Figure 7). In the past, this soil was called as Nohut Alan Lake wetland sediments.

First, the SPT-N_{30} and water content values should be crossed with each other, and then a straight line should be drawn from the lowest border of the water content and finally from this point the unconfined compression strength should be reached. This obtained value represents a more reliable unconfined compression strength value in Torbali alluvium clays.

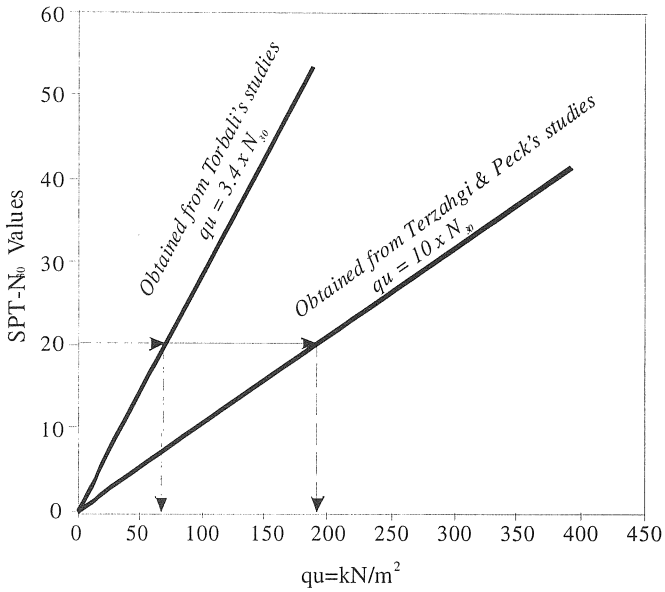

Figure 7 The graphical relationship between SPT-N_{30} , qu (unconfined ompression strength) and water content values.

3 CONCLUSIONS

It is found out from the soil drillings which were performed on the alluvium area in Torbali that there is unconsolidated silty and clayey cohesive soil of about 10-30 m of thickness. The cohesive soils are extended through the west and south parts of the study area and gets deeper and deeper

horizontally and vertically. According to the field SPT-N_{30} applications, the dry silty soil with %3-9 water content values has an average 25 SPT-N_{30} value while clayey soil with %5-12 water content values has 21 SPT-N_{30} of value. It is also found out that the water content values start to increase from the 5 m of the depth but it remains at the same values after 15 m of the depth. Average SPT-N_{30} values were determined as 12 around these depths. According to the relationship between SPT-N_{30} and the unconfined compression strength on the cohesive soil, the water content has diminished characteristics.

As results of the graphical interpretation of the SPT-N_{30} and water content values, there is a reverse ratio and the straight line correlation given as

$$qu = 3.4\ N_{30}\ kN/m^2$$
$$Cu = 1.7\ N_{30}\ kN/m^2$$

The value of the other components can be calculated easily.

The relationship between SPT-N_{30} and the unconfined compression strength was investigated by [10] and then the water content values were added. It is observed that the water content existence reduces the SPT-N_{30} values and unconfined compression strength average value of 100-150 kN/m^2.

More careful attention is needed to calculation of the SPT-N_{30}, unconfined compression strength, and settlement values of the cohesive soil due to the fact that water content existence reduces the N values.

Detailed studies are needed around the investigated settlement area which has many abandoned structures, schools, buildings etc caused by different settlement. If not, it is unavoidable for the structures to go through a severe damage as a result of a possible earthquake.

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YAZIM KURALLARI

1. Dergi "Hakemli Dergi" statüsüne uygun olarak yayınlanmaktadır.

2. Dergide yayınlanacak yazılar, Fen ve Mühendislik Bilimleri alanındaki konuları kapsar.

3. Gönderilen çalışmalar, alanında bir boşluğu dolduracak araştırmaya dayalı özgün çalışma veya daha önce yayınlanmış bir yazıyı değerlendiren, bu konuda yeni ve dikkate değer görüşleri ortaya koyan araştırma veya inceleme olmalıdır.

4. Yayınlanmak üzere gönderilen yazılar, özet dahil 15 sayfayı geçmemeli ve daha önce yayınlanmamış olmalıdır.

5. Dergi Yayın Kurulu, biçim açısından uygun bulduğu yazıları seçilmiş hakemlere (üç hakeme) gönderir, makaleler üç hakemin en az ikisinin oluruyla yayın alır. Yayınlanması için düzeltilmesine karar verilen yazıların yazarları tarafından en geç (posta süresi dahil) 10 gün içerisinde teslim edilmesi gereklidir. Bu süreyi aşan yazılar daha sonraki sayılarda değerlendirilecektir.

6. Dergide yayınlanan yazıların, telif hakkı dergiye aittir. Fen Bilimleri Dergisi telif hakkı karşılığında yazarlarına bir adet dergi ve 1. yazara 1 adet dergi ve 20 adet ayrı baskı gönderilecektir.

7. Yazım dili Türkçe ve İngilizce'dir. Makalenin başında Türkçe ve İngilizce olmak üzere en az 100, en fazla 200 kelimeden oluşan özet ile Türkçe ve İngilizce anahtar sözcükler (en az 3 en fazla 5 kelime) verilmelidir.

8. Hazırlanan yazı şu bölümlerden oluşmalıdır :Başlık, Yazarlar, Adres, Özet, Anahtar Kelimeler, Yabancı Dilde Başlık, Abstract, Key words, Giriş, Materyal ve Yöntem, Bulgular, Tartışma ve Sonuç, Kaynaklar. Türkçe hazırlanan yazıda Abstract'tan önce Y.dilde başlık; Y.dildeki yazıda ise özetten önce Türkçe başlık bulunmalıdır. Yazarların ünvanı yazılmamalıdır.

9. Dergiye gönderilen yazılar dört nüsha (yazar isimleri bulunan bir ve yazar isimleri bulunmayan üç nüsha) olmalıdır. Ayrıca WINDOWS ortamında ve MS WORD 7.0 ve daha sonraki sürümlerinde yazılmalıdır. Yazı içinde kullanılan grafikler WINDOWS ortamında açılabilecek bir grafik formatında, fotoğraflar scannerda 300 dpi çözünürlüğünde taranmış olarak JPG veya GIF formatında gönderilmelidir. Dergiye gönderilen yazı, şekil ve fotoğrafların dijital kayıtları bir disketle gönderilmelidir. Şekil ve tablolar

numaralandırılmalıdır. Şekil adı, şekil altında; tablo adı tablonun üzerinde yer almalıdır.

10. Yazı karakteri Times New Roman, 11 punto, satırlar tek aralıklı yazılacaktır.

11. Paragraflar satır başından başlamalı, iki paragraf arasında bir satır boşluk bırakılmalıdır.

12. Sayfa düzeni normal, sayfa yapısı üstten 5 cm, alttan 5.5 cm, soldan 4.5 cm, sağdan 4.5 cm, cilt payı 0 olmalı, herhangi bir özel format bulunmamalıdır.

13. Başlıklar ardışık olarak numaralanmalı ve satır başından başlamalıdır. Ana başlıklar büyük harflerle ve koyu, alt başlıklarda her kelimenin ilk harfi büyük ve başlık koyu olmalıdır.

14. Makalelerde dipnot kullanılmayacaktır.

15. Kaynaklar metin içinde ilk verilenden başlanarak numaralandırılmalı ve köşeli parantez içinde verilmelidir. Metin sonunda "kaynaklar" başlığı altında numara sırasına göre listelenmelidir. Listede kaynaklar aşağıdaki şekilde belirtilmelidir: Periyodikler: Yazar soyadı, Adının ilk harfi, (varsa diğer yazarlar aynı şekilde), Makale adı, Dergi adı, Cilt no (sayı), Sayfa aralığı, (yayın yılı). Kitaplar: Yazar soyadı, Adının ilk harfi (varsa diğer yazarlar aynı şekilde), Kitap adı, varsa editörün adı, Basım sayısı, Cilt no, Yayınevi adı, Basıldığı yer, Sayfa sayısı, (Yayın yılı) Tezler: Yazar soyadı, Adının ilk harfi, Tez adı, Tez türü, Çalışmanın yapıldığı enstitü adı ve adresi, Sayfa sayısı, Çalışmanın yapıldığı yıl. Kaynaklar kısmı için örnekler aşağıda verilmiştir. -Konuk M., Brown E., Biosynthesis of Nebularine Involves Enzymic Release of Hdroxylamine From Adenosine, Phytochemistry, 38:(1), 61-71, (1995). -Konuk M., Babaoğlu M., Bitki Biyoteknolojisi II, Editörler; Özcan S., Gürel E., Babaoğlu M., 1. Basım, Vol:2, Selçuk Üniversitesi Basım Evi, Konya, 1-45sf (1991). -Konuk M., Studies of The Biosynthesis and Properties of Nebularine, Doktora Tezi, Department of Biochemistry, University College of Swansea, 200, (1993)

16. Sayfa numarası çıktı üzerinde sağ üst köşeye verilmelidir.

17. Dergideki yazıların bilimsel ve idari sorumluluğu yazarına aittir.

18. Yazılar "Afyon Kocatepe Üniversitesi, Fen Bilimleri Dergisi, Fen-Edebiyat Fakültesi, ANS Kampüsü, AFYONKARAHİSAR" adresine gönderilecektir. Yazılara yazışma yapılacak yazarla ilgili ayrı bir sayfada ad, soyad, unvan, posta, telefon, faks ve e-posta bilgileri eklenmelidir.