SUMMARY OF LABORATORY TEST ON BORING

PROJECT : DRAINAGE PUMP STATION

BORING No : UB(1) - 02

#16	#30	#50	#100	#200	0.005	Natural water content w (%)	Natural γ (g/cm³)	Dry γd (g/cm³)	Specific gravity Gs	Porosity n (%)	Void ratio e₀	Degree saturation S (%)	Liquid limit LL (%)	Plastic limit PL (%)	Plastic index PI (%)	Liquidity index B	Unconfined compression qu (Kg/cm²)	Compression index Cc	Coefficient of consolidation Cv (cm²/s)	Preconsolidation pressure Pc (Kg/cm²)	Coefficient of volume compressibility mv (cm²/g)	Coefficient of permeability k₂₀ (cm/s)	REMARK
1.18	0.6	0.3	0.15	0.075	0.005																		
(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(29)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)
			100	97.2	65.2	101.23	1.412	0.702	2.579	0.73	2.675	97.6											
			100	98.1	62.2	104.32	1.404	0.687	2.584	0.73	2.760	97.7	92.7	48.6	44.11	1.26	0.112	1.3853	2.24E-04	0.755	1.47E-04	4.07E-08	
			100	96.8	63.2	99.23	1.421	0.713	2.561	0.72	2.591	98.1											
			100	98.9	62.8	95.29	1.442	0.738	2.588	0.71	2.505	98.5	87.8	46.3	41.55	1.18	0.097	1.4077	3.26E-04	1.639	1.34E-04	4.27E-08	
			100	94.8	65.3	94.89	1.438	0.733	2.597	0.72	2.520	97.8											
			100	98.9	64.3	87.74	1.468	0.782	2.592	0.70	2.315	98.2	85.8	45.1	40.77	1.05	0.096	1.2686	2.09E-04	1.531	1.30E-04	2.73E-08	
			100	95.9	66.2	83.92	1.471	0.800	2.603	0.69	2.255	96.9											
			100	98.2	55.9	52.19	1.438	0.945	2.598	0.64	1.750	77.5	59.6	32.3	27.33	0.73							
			100	97.2	60.2	53.20	1.467	0.958	2.607	0.63	1.723	80.5											
98.4	97.2	94.8	86.2	65.2	31.4	48.00	1.661	1.122	2.630	0.57	1.343	94.0	57.4	31.9	25.55	0.63	0.097	0.5054	5.29E-04	1.032	7.91E-05	3.84E-08	
97.3	96.1	92.8	84.8	66.2	32.7	50.12	1.621	1.080	2.641	0.59	1.446	91.6											
99.1	98.8	98	90.4	67.3	28.3	38.58	1.598	1.153	2.628	0.56	1.279	79.3	50.4	30.8	19.61	0.40							
97.8	96.1	94.2	89.2	55.2	29.4	34.57	1.436	1.067	2.647	0.60	1.481	61.8											
99.5	99.0	98.1	90.3	54.3	28.2	33.75	1.388	1.038	2.635	0.61	1.539	57.8	41.7	24.6	17.1	0.54							
98.7	97.6	96.2	88.6	56.1	29.8	36.84	1.426	1.042	2.647	0.61	1.540	63.3											

4.2 BEARING CAPACITY OF FOUNDATION

For example , a concrete pile with the dimensions 0.4 x 0.4 x 45.0 m is taken, the calculation is as follows :

$$P \quad = \quad 1.6 \text{ m}$$
$$As \quad = \quad 0.16 \text{ m}^2$$

Applying formula

$$Qult \quad = \quad C \text{ Ncs } As + C_A \; 2 \, \pi \, R \, L$$
$$P \quad = \quad 1.6 \text{ m}$$
$$As \quad = \quad 0.16 \text{ m}^2$$

At the borehole UB(1)-01, with following parameters :
- Layer 1 + layer 2 :

$$L \quad = \quad 17.5 \text{ m.}$$
$$C \quad = \quad 0.051 \text{ kg/cm}^2 \; = \; 0.510 \text{ T/m}^2$$
$$C_A \quad = \quad 0.510 \text{ T/m}^2$$

- Layer 3 :

$$L \quad = \quad 12.5 \text{ m .}$$
$$C \quad = \quad 0.0485 \text{ kg/cm}^2 \; = \; 0.485 \text{ T/m}^2$$
$$Ncs \quad = \quad 9$$

Because the pile gets through 3 layers so the total bearing capacity is the sum of skin friction through all layers (layer 1 + layer 2 and layer 3) and bearing capacity of tip in layer 3 :

Calculation :

Layer 1 + 2 : $\quad Q \quad = \quad C_A \; 2 \, \pi \, R \, L$

$Q_{1+2} \quad = \quad 0.510 \text{ T/m}^2 \quad x \quad 1.6\text{m} \quad x \quad 17.5 \text{ m} \quad = \quad 14.280 \text{ T .}$

Layer 3 :

$$Q_3 \quad = \quad C \text{ Ncs } As + C_A \; 2 \, \pi \, R \, L$$
$$Q_{3-1} \quad = \quad C_A \; 2 \, \pi \, R \, L$$
$Q_{3-1} \quad = \quad 0.485 \text{ T/m}^2 \quad x \quad 1.6\text{m} \quad x \quad 12.5 \text{ m} \quad = \quad 9.700 \text{ T .}$
$$Q_{3-2} \quad = \quad C \text{ Ncs } \pi \, As$$
$Q_{3-2} \quad = \quad 0.485 \; x \; 9 \; x \; 0.4^2 = \quad 0.698 \text{ T.}$

$Q_{total} \quad = \quad Q_{1+2} \; + \; Q_{3-1} \; + \; Q_{3-2} \quad =$
$Q_{total} \quad = \quad 14.280\text{T} + 9.700 \text{ T} + 0.698 \text{ T} \quad = \quad 24.678 \text{ T}$

Choosing safety factor $\quad Fs \quad = \quad 3 \quad , \quad Qult \quad = \quad 8.226 \text{ T .}$

Conclusion

With the above mentions, some following remarks can be made :

- Up to 30.0 m deep, the foundation is constructed by Holocene deposit layers, with thickness more 30m (very soft - soft, Organic Clay), have low bearing capacity.

- According to load of construction, foundation can be put on the layer 2 after improving, may be to use cajeput pile foundation, sand pile foundation or draining plastic stripes (for small load construction) or use concrete pile foundation to transmit the construction load to Pleistocene deposit soil layers and in this case have to drill some more deeper boreholes into the Pleistocene deposit.

Calculation for a concrete pile at borehole UB(1)-01 with section (0.4 x 0.4m) and length of 30.0m has following results :

$$Qult \quad = \quad 8.226 \text{ T .}$$