

METU Northern Cyprus Campus

Department of Civil Engineering

Geotechnical Design Project

ANCHORED PILE RETAINING WALL DESIGN OF A HOTEL PROJECT

Ahmed MABROUK¹, S. Uhde YILDIRIM¹, Hamit Can YAPICI¹, Efe BURŞUK¹

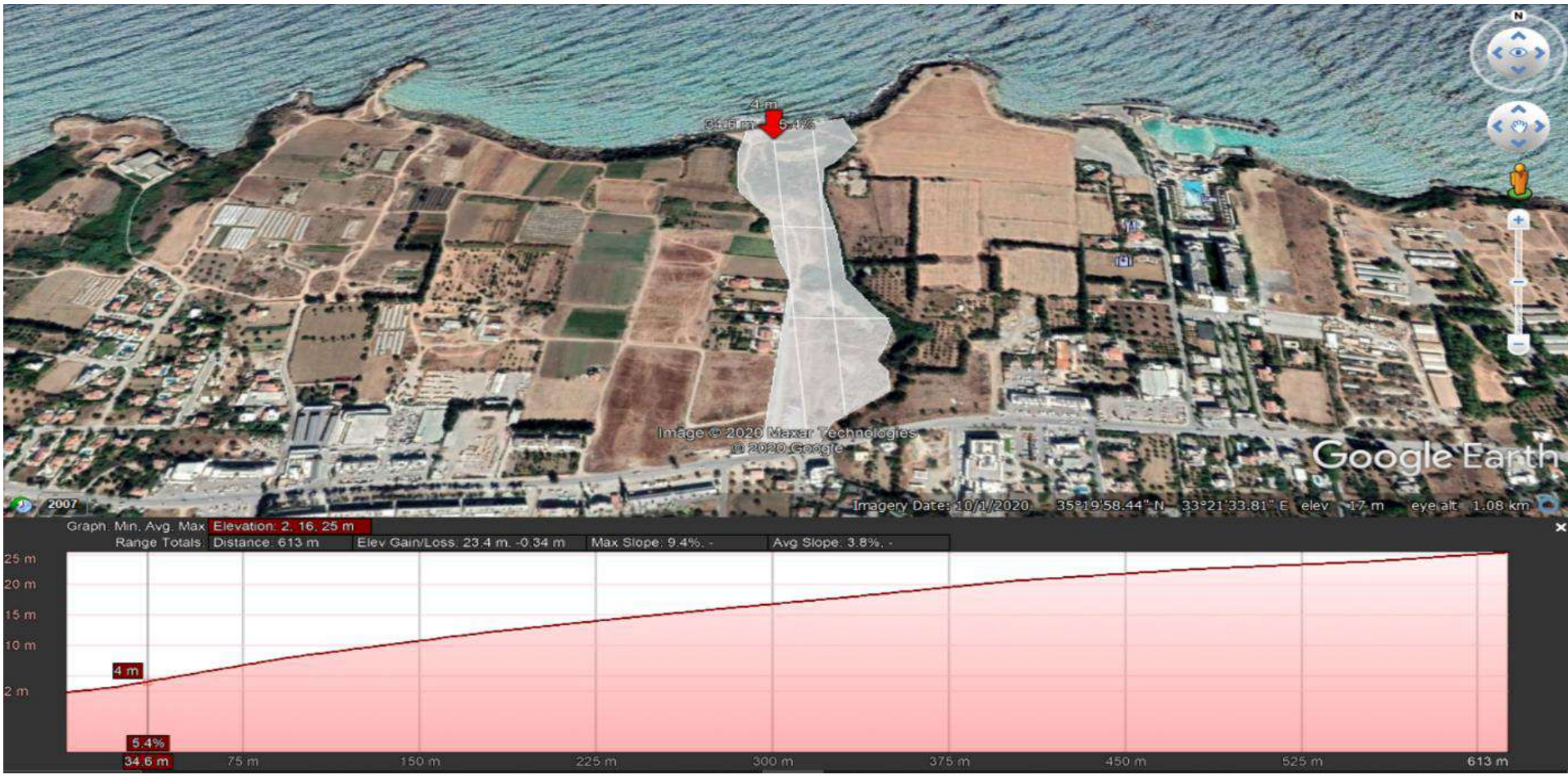
Supervised by Asst. Prof. Dr. Abdullah EKİNCİ

¹ Senior Student at Department of Civil Engineering, Middle East Technical University Northern Cyprus Campus

Introduction and Statement of the Project

The project is of a 5-star hotel in Kyrenia – Cyprus, the aim is to find the shoring for a 25m deep excavation. Throughout the process of finding the possible design solutions a number of studies have been made in order to find the necessary parameters. One of these studies is the desk study which is completed by evaluating site location, topography, site geology, hydrology, flood risk, site history and ecology. With the accordance of desk study, the literature research is done to find possible design solution according to technicality and availability. To find design solution, the site investigation tests and soil profile is also considered. In this project, after all of these studies, the design solution is found both hand calculation and software analysis (GEO5).

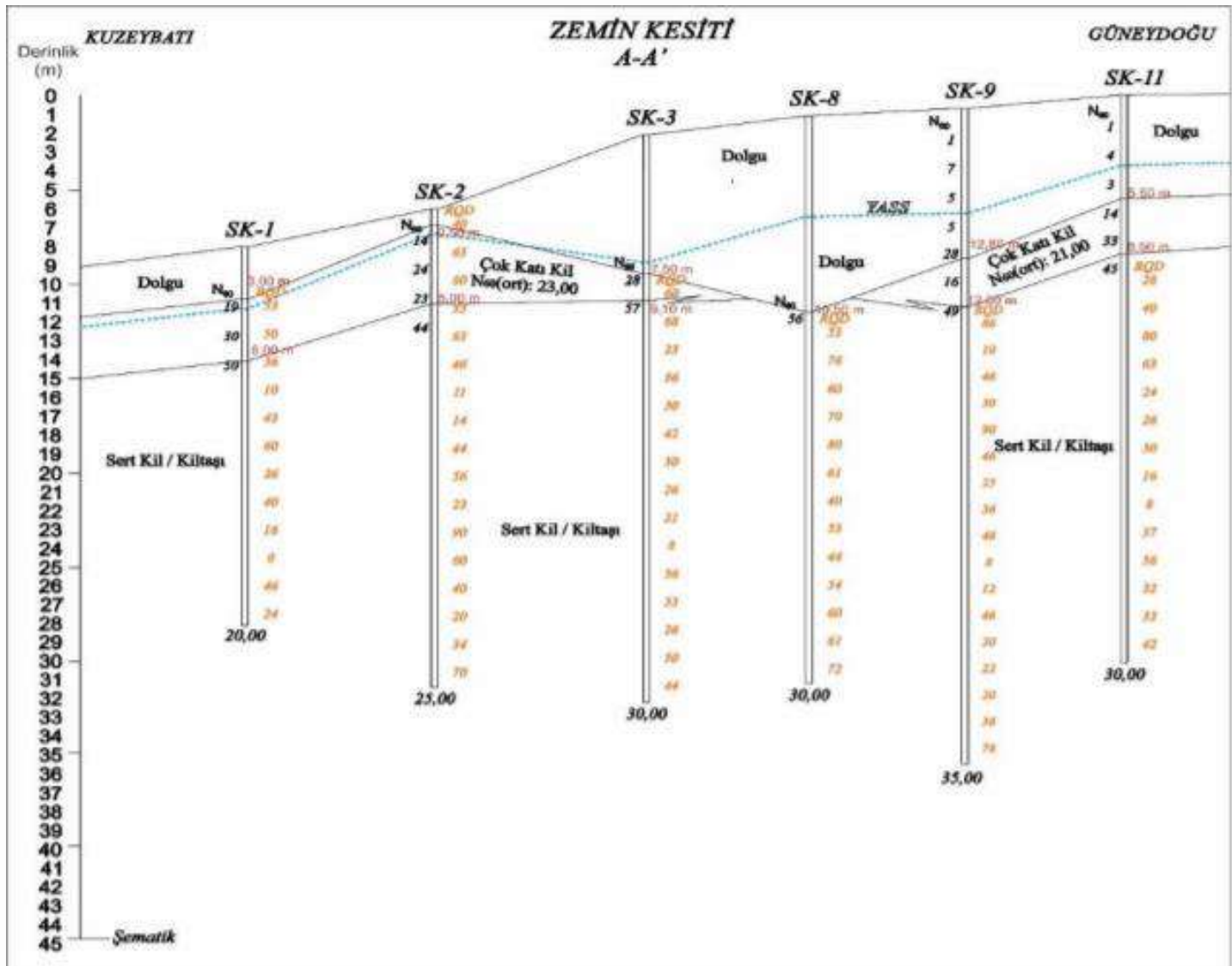
SITE INVESTIGATION & DESK STUDY



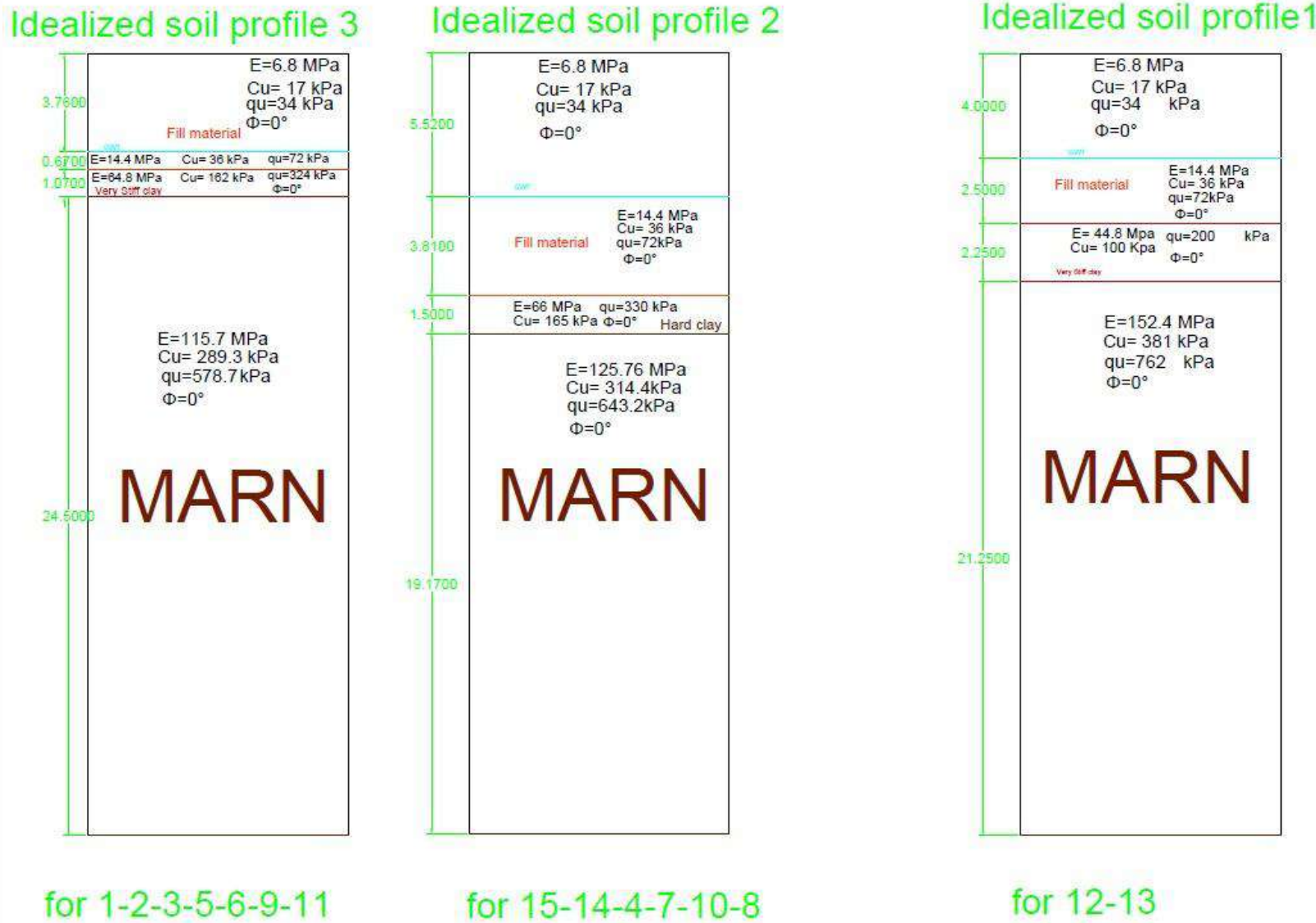
1st Elevation "North to South" at site location



Borehole location in soocle earth pro



Section A-A of boreholes and the corresponding value of N60

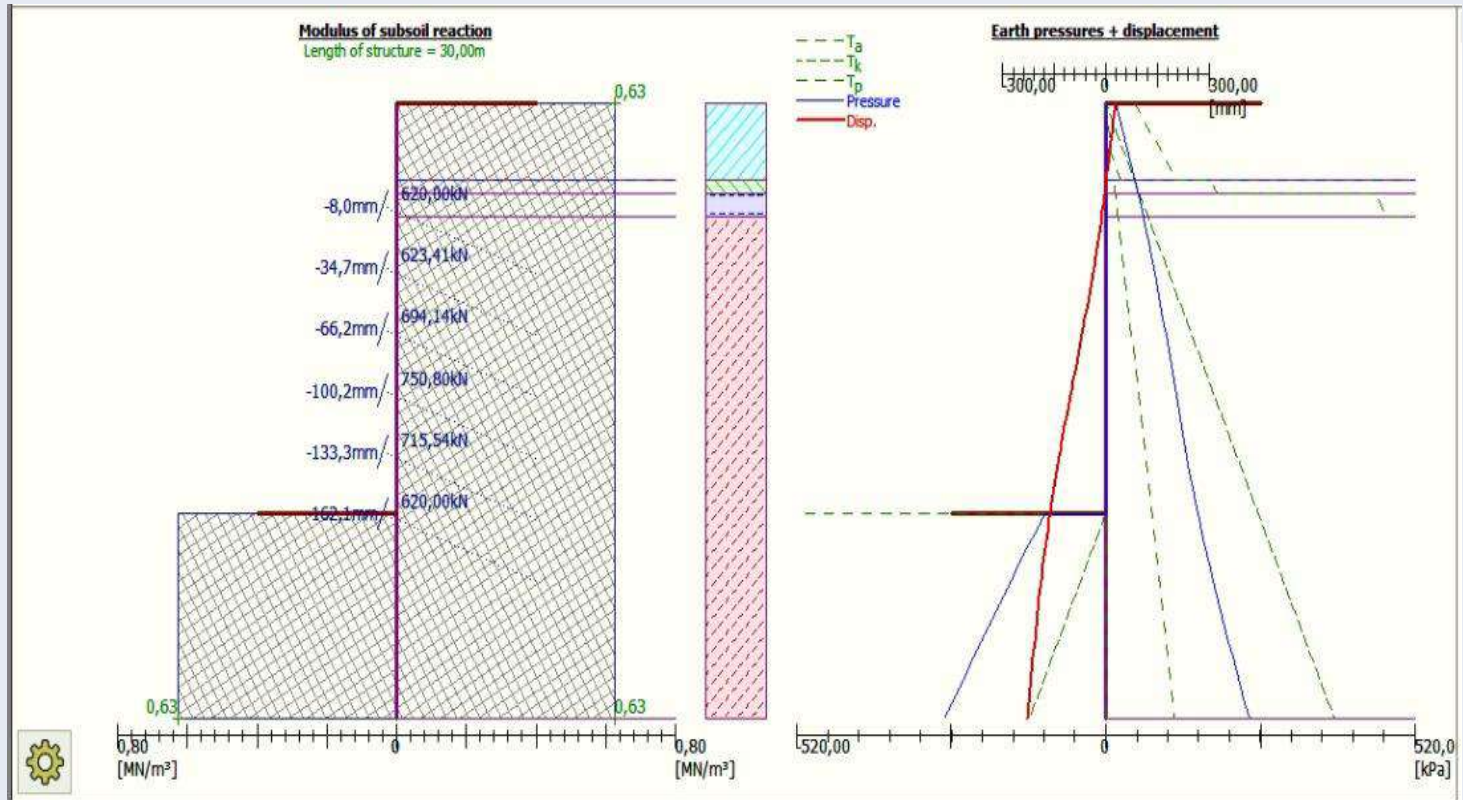


Idealized soil profiles

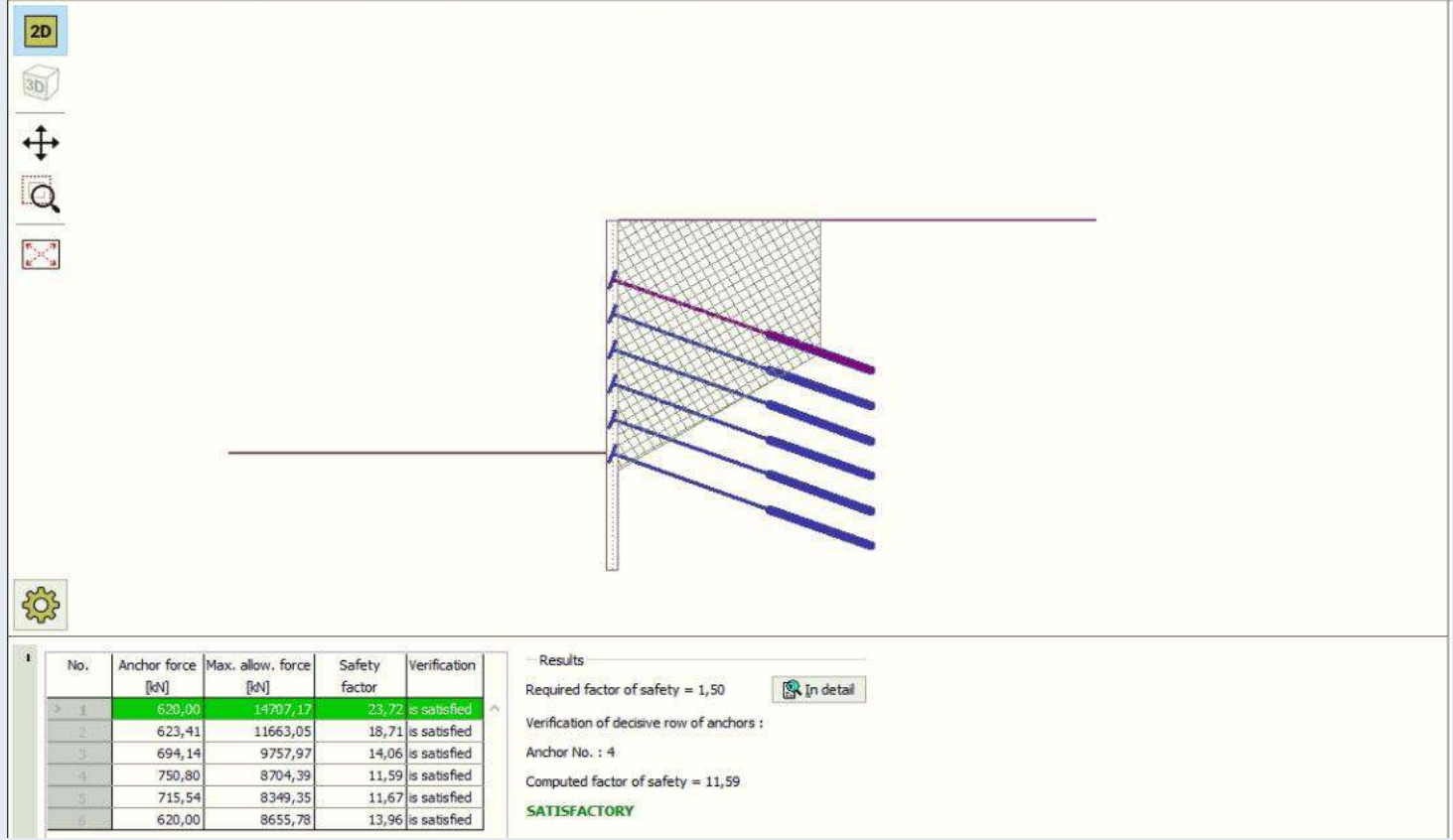
ANALYSIS

when looking at the calculations, pre anchored ixa (support system design)^[1] is taken as sample. According, to project soil type, Type D anchor is selected, and six anchors is required for 29 m depth and for every anchor the free length, root length and diameter are defined. Also, the P values were calculated. Then, these lengths and diameter were inputted to the software. Once the pile geometry has been entered into the program the analysis can be computed. In figure above the analysis the software ran can be found and following parts are completed.

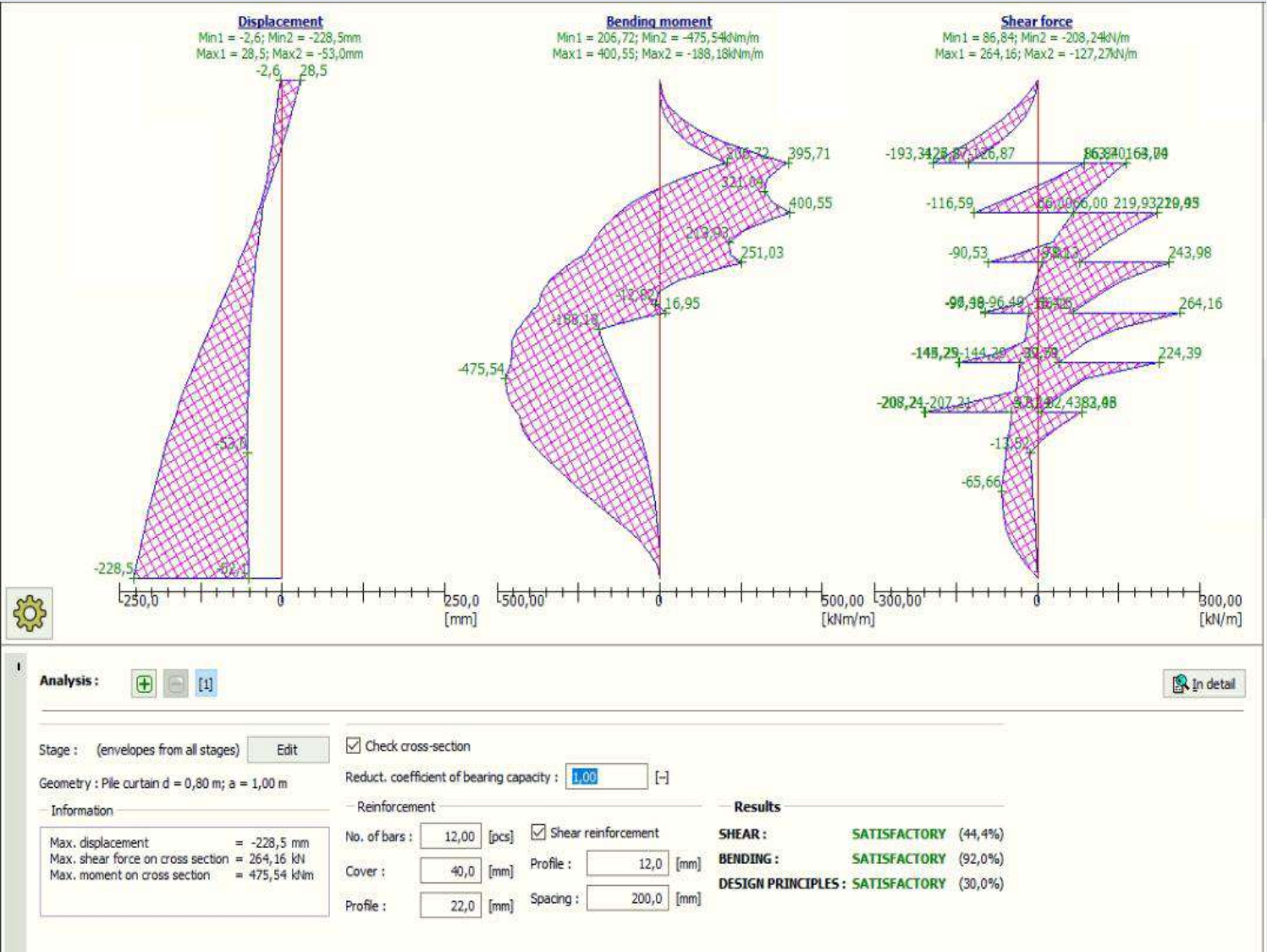
Software analysis



Internal Stability Check



Moment and shear diagrams along with the detailing of the pile

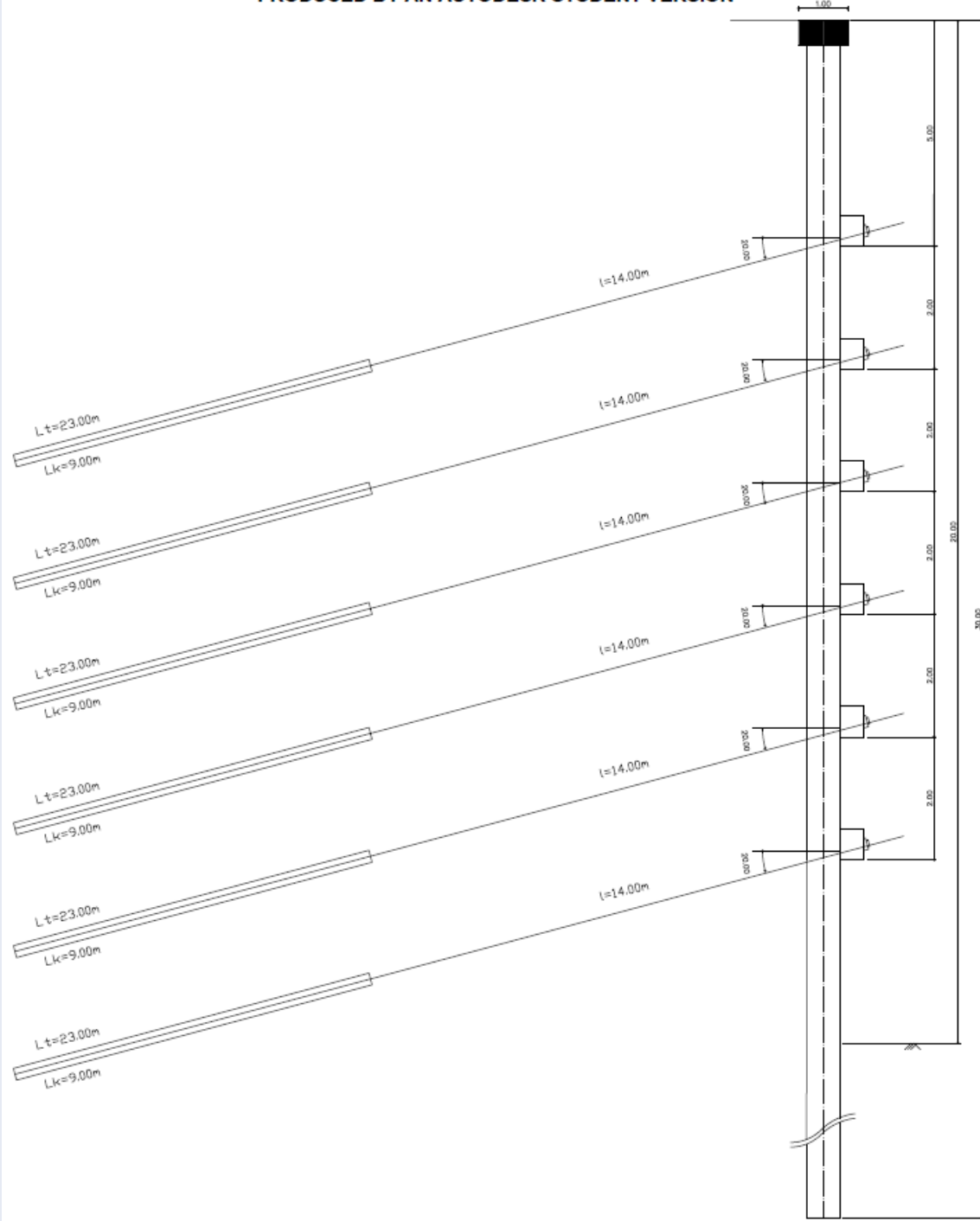


DESIGN

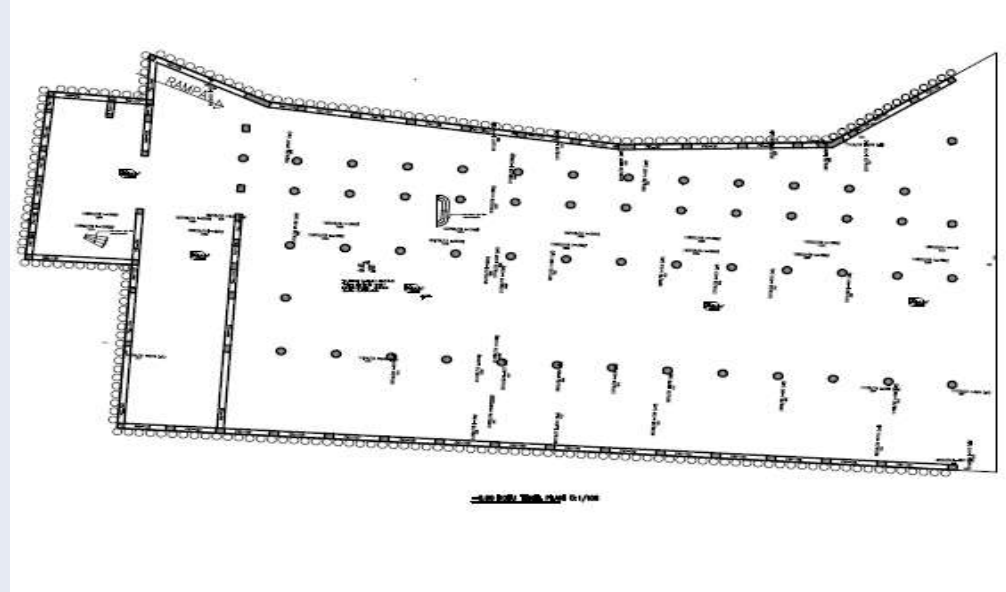
Crossbeam Reinforcement Calculations

CROSSBEAM REINFORCEMENT CALCULATION			
Concrete Classification	C25		
Steel Classification	S420		
f _{ctd}	1.15 N/mm ²		
f _{yd}	365 N/mm ²		
Longitudinal Reinforcement Calculation			
b	700 mm		
d ₁	40 mm		
h	400 mm		
d	360 mm		
$q_{min} = F_{min} \cos \alpha / S_x$	470 kN/m		
$M_d = 1,35 q_{min} L^2 / 12$	135.36 kNm		
$k_s = \frac{M_d}{b d^2}$	1.492063492	ks	0.956
$A_s = \frac{M_d}{k_s f_{yd} d}$	1077.549149	mm ²	
Longitudinal Reinforcement front and back			
Body dist. reinforcement above and below	4	16	804.2477 mm ²
	2	16	402.1239 mm ²
Stirrup Calculation			
$V_d = 1,35 q_{min} S_x$	299.64	kN	
$V_{cr} = 0,65 f_{ctd} b_w d$	188.37	kN	
$V_d = 0,8 V_{cr}$	150.696	kN	
$\frac{A_{sv}}{s} = \frac{V_d - V_{cr}}{f_{yd} d}$	1.133515962	mm ²	
$A_{sv} =$	230	12	
s	202.9084757	mm	
s	17	cm	

Cross-section



Pile Placement Plan



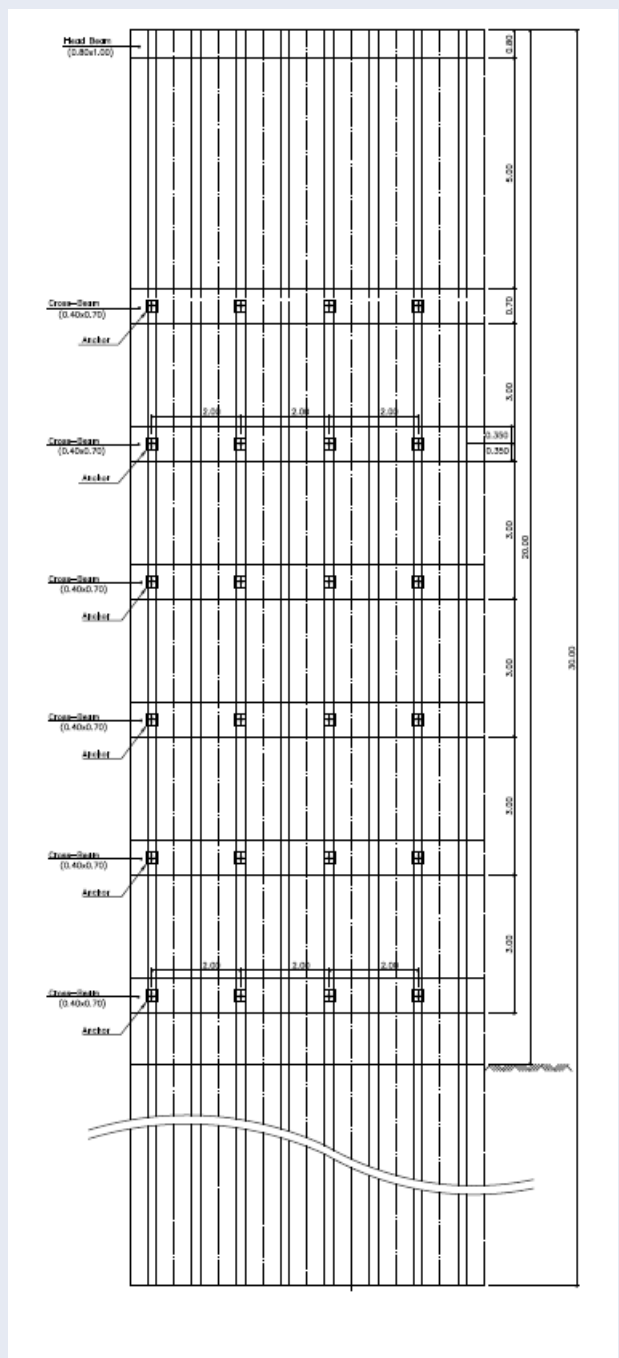
Reference

[1] INM 424122 İstinat Yapıları Tasarımı

Head Beam Calculations

HEAD BEAM CALCULATION			
Concrete Classification	C25		
Steel Classification	S420		
f _{ctd}	1.15 N/mm ²		
f _{yd}	365 N/mm ²		
Longitudinal Reinforcement Calculation			
b _w	850 mm		
d ₁	40 mm		
h	1000 mm		
d	760 mm		
$A_{smin} = 0.8 \frac{f_{ctd}}{f_{yd}} b_w d$	1628.274	mm ²	
Longitudinal Reinforcement front and back			
Body distribution reinforcement above and below	6	18	1526.814 mm ²
	2	18	508.938 mm ²
Fret Calculation			
$A_{smin} = 0.3 \frac{f_{ctd}}{f_{yd}} b_w s$	160.68493	mm ²	
S ₀	10	/	15

Elevation



After the piles are designed using the pile diameter and the spacing between the pile centers, a plan of the piles around the site is made.