

GEORGE STAMATIOU

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Ημερομηνία 7^η Ιουλ-2020

Διευθύντρια Τμήματος Περιβάλλοντος
Λεωφ. 28^{ης} Οκτωβρίου 20 - 22
2414 Έγκωμη, Λευκωσία

Εις Προσοχή κ. Ειρήνη Κωνσταντή

Θέμα - Συμπληρωματική Γεωτεχνική Μελέτη για το έργο Neocleous Tower (A.Neocleous Holdings Ltd) -

Έγκριση από το Τμήμα Περιβάλλοντος (Πολοδομική Άδεια ΠΑ 346/19 - Δήμος Λεμεσού)

Αναφορικά το πιο θέμα επισυνάπτω τα αποτελέσματα πρόσφατης γεωτεχνικής μελέτης (3/7/2020) που διενεργήθηκε από την εταιρεία Geoinvest Ltd κατόπιν εντολής του ιδιοκτήτη.

Ο υδροφόρος ορίζοντας βρίσκεται σε βάθος 17,90 μέτρα από την επιφάνεια του υφιστάμενου εδάφους και είναι χαμηλότερος από την στάθμη θεμελίωσης του κτιρίου (βλέπε σχέδιο που επισυνάπτεται).

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Παρακαλώ όπως έχουμε την άμεση ανταπόκριση σας και τις θετικές απόψεις σας το συντομότερο δυνατό.

Παραμένω στην διάθεση σας για περαιτέρω διευκρινήσεις που τυχόν να χρειαστούν.

Γιώργος Σταματιού
Αρχιτεκτονας

ΕΙΡΗΝΗ

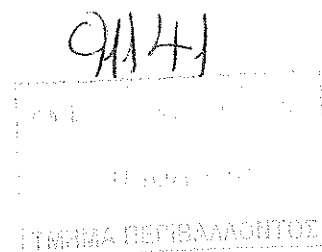
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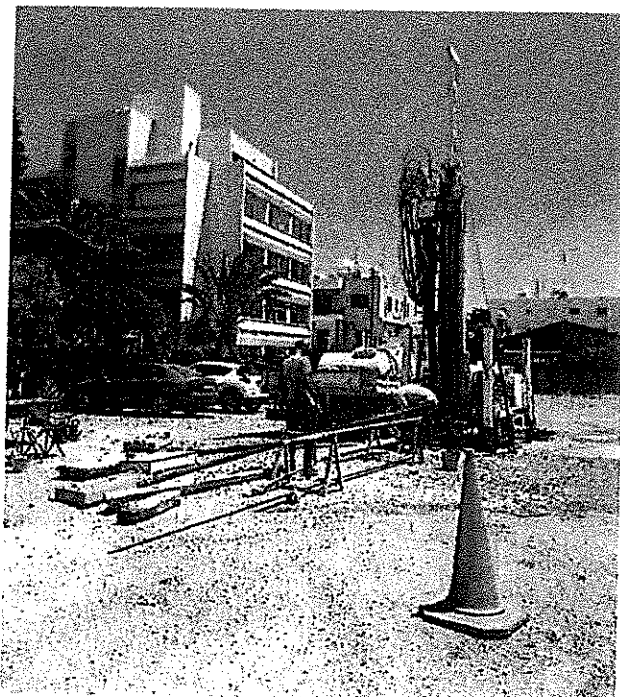
"NEOCLEOUS TOWER"



GEOLOGICAL – GEOTECHNICAL INVESTIGATION

AT THE SITE OF THE PROPOSED DEVELOPMENT

IN LIMASSOL



JUNE – JULY, 2020

GEOINVEST LTD - ΓΕΩΕΠΕΥΝΑ
Applied Geology – Geotechnics – Materials Testing
Environmental Engineering

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03/07/2020

X\Geotech20\Neocleous Tower

A. NEOCLEOUS HOLDINGS LTD
c/o: Andros Achilleos/ ASD HYPERSTATIC ENGINEERING DESIGN
Limassol.

Dear sirs,

**SUBJECT: GEOLOGICAL – GEOTECHNICAL AT THE SITE OF THE
PROPOSED DEVELOPMENT “NEOCLEOUS TOWER” IN LIMASSOL**

We are glad to advise you that the above additional ground investigation is completed and three hard copies are forwarded.

The investigations comprised drilling, in situ and laboratory testing, as well as the evaluation of the data obtained. A detailed account on the results of the ground investigation, are presented in the report that follows. It is believed that this work will facilitate the effort of your engineers in finding the most suitable solution to this case.

Finally, we would like to express our sincere thanks for entrusting our firm the execution of this site investigation and remain at your disposal for any clarifications or further information on this subject.

Sincerely yours,

Andreas Shathas
(Geologist - Managing Director)

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1 INTRODUCTION

A.Neocleous Holdings Ltd, is at the final design stage to develop the property at the site between Ayios Nicolaos Round About and Ariel Traffic Lights, along Makarios III avenue, Limassol. The development, under the name, "Neocleous Tower", is related with the rural and tourist industry involving the construction of high rise buildings with 3 levels basement.

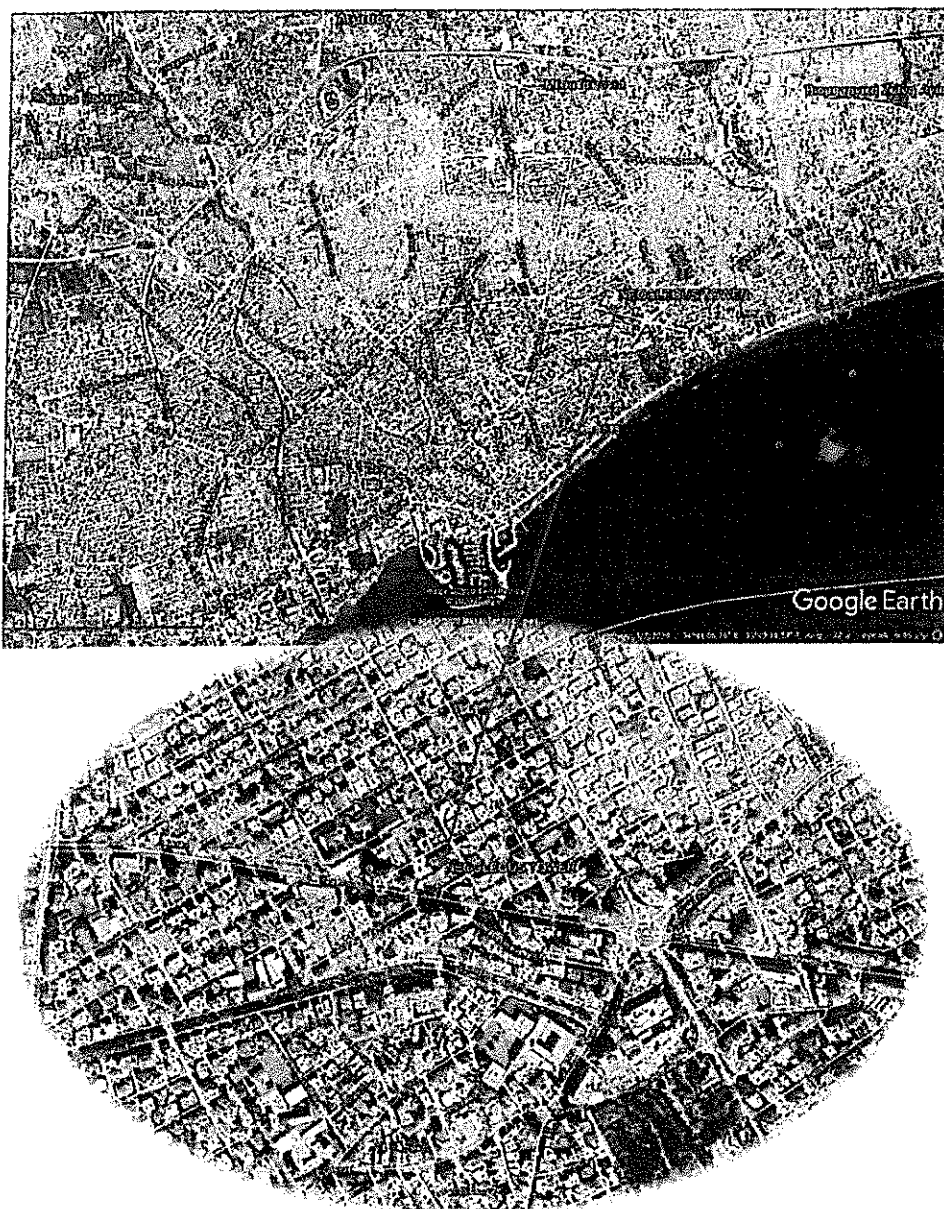


Figure 1: Site Location

Geoinvest Ltd has been retained by the owner through his engineers "Hyperstatic Engineering Design", to conduct additional geotechnical field investigations and the related reporting to support the foundation design, the excavation conditions and the stability of the excavations.

1.1 Brief description of the proposed construction

The project consists of a high rise building, some 120 m high with 23 floors and 4 levels basement. It covers an area of almost 1556 m². The exact location and the morphology are shown on figure 1 and the lay out of the building on figure 2.

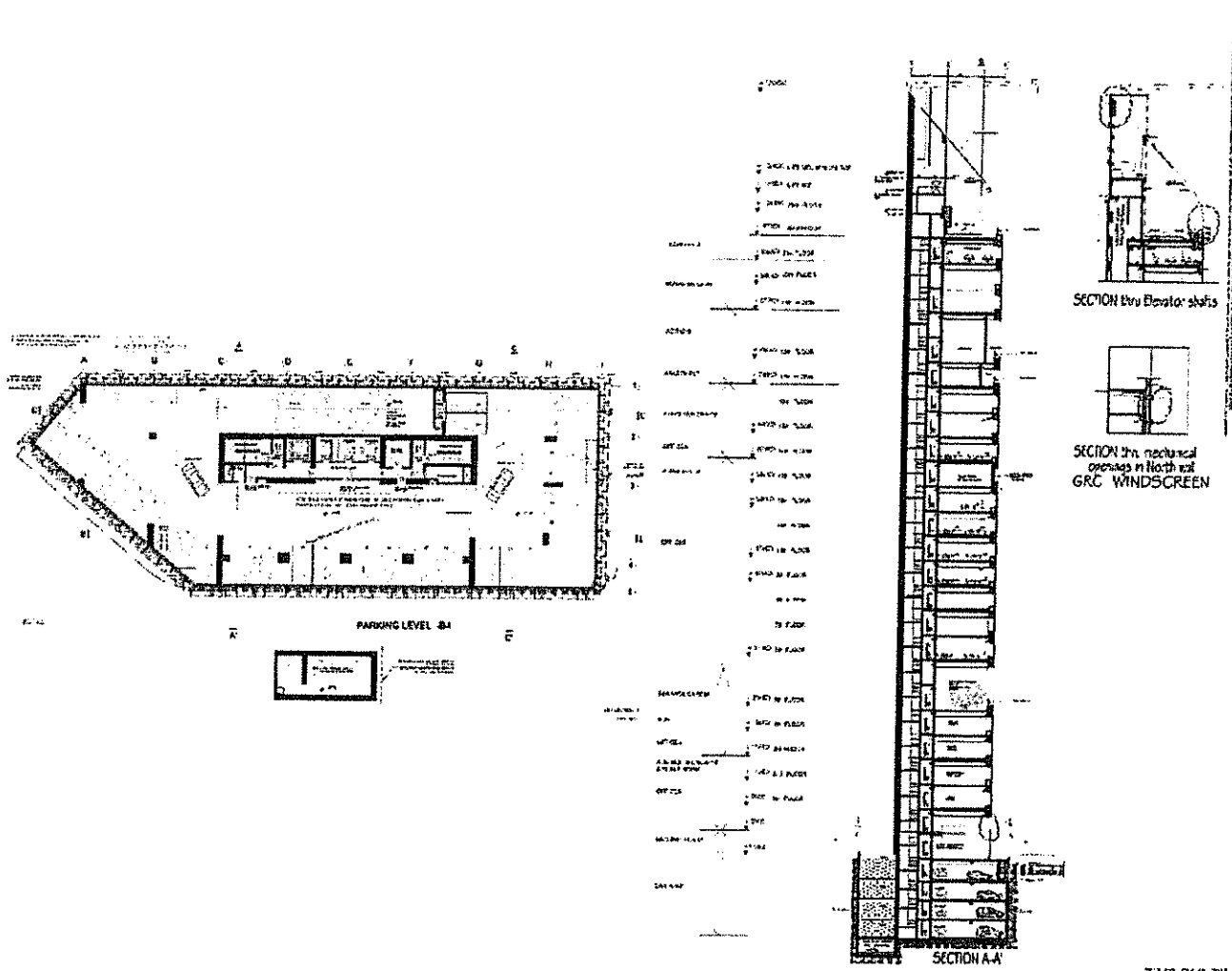


Figure 2: Project Lay out and profile

1.2 Purpose and scope of works

The ground investigation specified by the engineer of the project, Andros Achilleos/A.S.D. Hyperstatic Engineering Design, intends to provide details of ground conditions in the Project area, with special reference to the final design of earthworks and foundations.

The investigations were carried out in two stages: The first was carried out in November/December, 2010 and the second during June 2020, in accordance with accepted standards, i.e. The Eurocode 7, CYS EN ISO 22476, CEN ISO/TS 17892, BS EN 5930 και BS EN 1377.

In particular, these investigation works are intending to provide further information related with the following:

- **Ground profile:** With reference to the specific requirements of the works, investigations and tests were carried out to define the variability of the natural ground profile at the site down to 40-50 m depth.
- **Geotechnical and mechanical parameters for design.** The ground investigation included boring of two deep boreholes, in situ testing and laboratory tests to provide detailed information on the geotechnical parameters, including physical characteristics, and mechanical properties of soils.
- **Hydrogeological regime.**
- **Soils characterization,** for a possible and profitable material reuse evaluation.

In summary, the purpose of the investigation according to the Client's requirements, is:

- To establish the stratigraphy and investigate the geotechnical properties of the strata underlying the site in relation to foundation design for the structures.
- To provide information about the excavation conditions and in correlation with the hydrogeological regime to assess the necessity of supporting retaining walls and facilitate their design.

The Scope of the investigation is:

- a. Provision of boreholes
- b. In-situ testing
- c. Sampling
- d. Laboratory testing for geotechnical properties
- e. Factual and on engineering geological criteria, Interpretative reporting, where the general and specific geological picture, the geotechnical parameters, the foundation and excavation conditions are evaluated.

The results are presented in this report, which consists of 1 volume, comprising the presentation of the works executed and the geological evaluation of the results as follows:

- Report,

Table 21: Specific Gravity, Bulk Density, Unit Weight

Soil Group	Specific Density g/cm ³	Bulk Density g/cm ³	Unit Weight kN/m ³
B1	2.635	1.925	18.9
B2	2.698	2.043	20.0

Table 22: Proposed Strength Parameters

They are based on both in situ and laboratory results

Soil Group	Shear Strength	UCS
B1	70 kPa	140 kPa

6 EXCAVATION CONDITIONS

All soil types at the investigated site are of the soft type and can be excavated without any serious problems, except that of the stability.

As understood, a four levels basement is envisaged and, therefore, deep excavations should be undertaken. As far as the stability of deep excavations is concerned, it should be pointed out that the soils are not stable for long time at vertical angle and all necessary measures should be taken so that the excavations are carried out with safety. On the positive site is the fact that the static groundwater level is found below the excavation level. If there is enough space around the basement footprint, the excavations could be carried out in steps giving a safe angle slope. Otherwise, the necessary measures to avoid collapsing of the excavation walls should be taken.

7 HYDROGEOLOGICAL CONDITIONS

No real aquifer was encountered down to the investigated depth. Small amounts of groundwater were encountered within the sand rich horizons between 17 and 27 m. Groundwater was encountered within the gravelly horizon encountered at 40 meters. The groundwater in this case, seem to be under pressure, so probably that's why static water level was developed at the depth of ~18m. On the other hand the water at this depth might be concentrated during the last very wet years.

The static water level was recorded during the field work and no worth noting fluctuations were recorded. It was found to fluctuate between 17.90-18.20 m, most probably due local variations of the altitude. Standpipes were installed into the boreholes for further water level recording.

Table 23. Static water level of ground water

BH No	1	2	
Depth in m. below ground level	18.20	17.90	Upon completion of drilling of each BH

7.1 Permeability

Laboratory permeability tests with the falling head method in accordance with BS 5930 were performed with the aid of which the following permeability was established:

Table 24: Coefficient of permeability ok

Group	Coefficient of Permeability, Ks cm/sec	Coefficient of Permeability, Ks m/day
Silts	2.5×10^{-6}	2.16×10^{-3}
Silty Sand	$5.3 \times 10^{-4} - 1.5 \times 10^{-3}$	0.46 – 1.3
Gravel	$2.55 \times 10^{-3} - 9.85 \times 10^{-3}$	2.2 – 8.5

The permeability of the coarse material (gravel, sand) is estimated to be more than 2 and probably up to 8.5 meters per day depending on the content of the fine material. The rest are low to moderate as shown below.

Table 25: Permeability and drainage characteristics of soil (Terzaghi et al., 1996)

cm/s	10 ⁰	10 ⁻¹	10 ⁻²	10 ⁻³	10 ⁻⁴	10 ⁻⁵	10 ⁻⁶	10 ⁻⁷	10 ⁻⁸	10 ⁻⁹	10 ⁻¹⁰
				Gravel	Sand	Silts					
Drainage	Good							Poor		Practically impervious	
Soil types	Clean Gravel	Clean sands, clean sand and gravel mixtures				Mixtures of clay, silt and sand		Very fine sands, organic and inorganic silts, mixtures of sand silt and clay, glacial till, stratified clay deposits etc		"Impervious" soils, e.g. homogenous clays below zone of weathering.	
						"Impervious" soils modified by effects of vegetation and weathering.					

7.2 Excavation Dewatering

All evidences show that no such a problem is envisaged, unless enormous leakages from the infrastructure could take place at the site.

Figure No. 8
CROSS SECTION 1 - 1'
 SCALE: Approximate

