

worldwide leader in the foundation engineering field

TREVI FOUNDATIONS
KUWAIT CO. WLL
شركة تريفي الكويت للأساسات ذ.م.ك

TECHNICAL REFERENCE



Sabah Al-Ahmad housing project

Sabah Al-Ahmad, Kuwait

**Dynamic
Compaction**



Owner:	Public Authority for Housing Welfare (PAHW)
Main Contractor:	China Rail No.5 Engineering group & First Group Construction
Duration of works:	2021 - 2023

Main project

Construction, completion and maintenance of Nos. 1,184 houses, general buildings, roads work, infrastructures services networks and car parking for part two of East Sabah Al Ahmad Project for No. PAHW 1440 & 1441

Trevi works

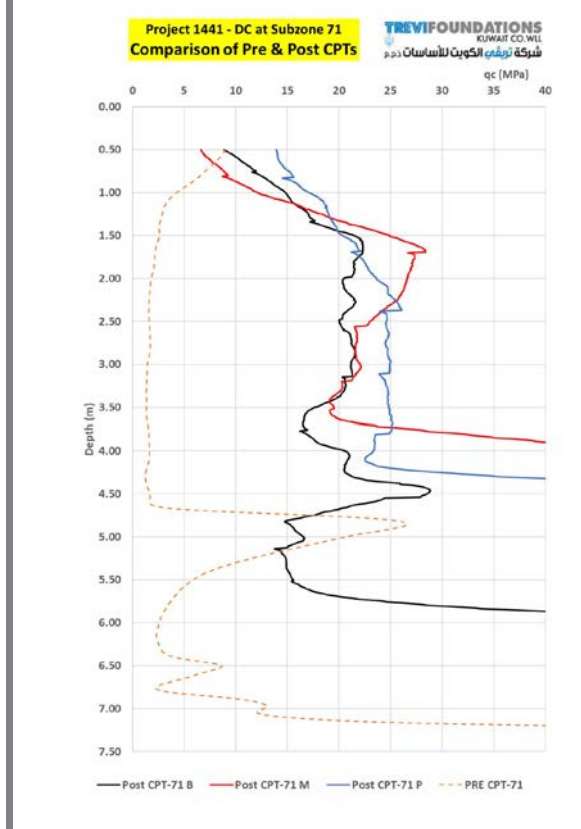
The project plots PAHW-C-1441 of East Sabah Al-Ahmed City are under the development of Kuwait Public Authority for Housing and Welfare and are located south of Kuwait City.

The project area is 1,211,303 m².

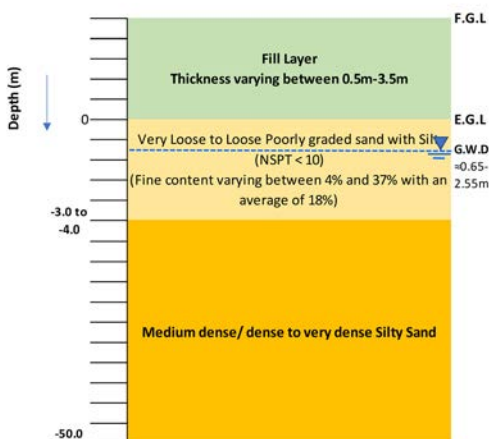
In that framework, Trevi Foundations Kuwait has been requested by main contractor to provide the best ground improvement alternative based on project specifications and the existing soil conditions.

Based on the soil investigation campaign it was noticed that the top 2.5 to 3.5 m of in-situ soil is very loose to loose silty sand, underlain by medium dense to very dense silty sand, down to end of borehole. In addition to the existing loose sandy layer -2.5m and 3m, houses foundations were designed to be between 0.5 m to 6 m above existing ground level.

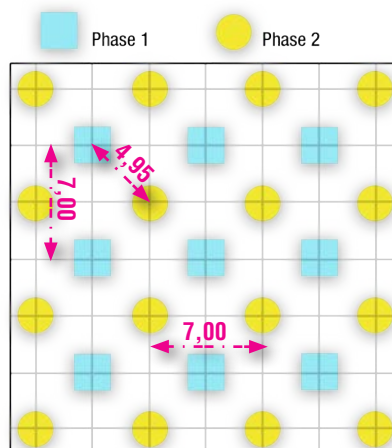
Trevi Foundations Kuwait scope of works was to improve both the existing loose layer + Fill layer, total improvement depth ranging from 3 m to 9 m.



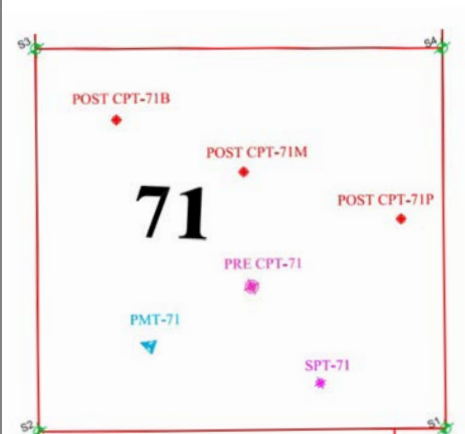
Typical section of the improvement layer



Initial and final grid



Testing layout for a random subzone



The following criteria was requested as minimum specifications to be achieved after soil improvement works:

- **Foundation:** Isolated footing 3x3 m at 1.2 m below finished floor level.
 - a) The maximum allowable bearing capacity required for buildings and houses is 200 kPa.
 - b) Settlement: 20 mm
- **Mitigation of Liquefaction Risks.** The Liquefaction risk shall be mitigated to achieve a minimum liquefaction FOS above 1.1 down to the depth of improvement for the following earthquake parameters.
 - Magnitude 6/0 earthquake.
 - Peak ground acceleration of 0.12g

- The drop height (20 meters)
- The type and weight of the pounder (23.5 tons DC Pounder + 15 tons Ironing Pounder)
- The number of phases and passes. (Two phases, one pass each)

Once DC works has been completed for each 6,000 m², quality control testing as been done follow:

- 1-Three post-CPT test every 6,000 m² down to a maximum depth of 10m from N.G.L or refusal, whichever comes first (Refusal is defined by Qc=50 MPa).



The project was divided into equal subzones, 6,000 m² each. Each subzone should be backfilled to the final level +0.5 m of soil to allow some settlement of soil after DC works. After backfilling works were completed in each subzones, they were then handed over to Trevi.

Prior to start DC works, an extensive pre-improvement testing campaign has been carried out by mean of Cone Penetration Test (1 CPT down to 10 m or refusal, whichever comes first from the WPL each 6,000 m²) to further verify/assess the subsoil & site conditions for the whole project prior to start the soil improvement/compaction works. In particular, the type of weak soil, depth of improvement, surface soil conditions, global soil strata will be assessed.

The following parameters were followed in the project.

- The grid patterns (5 meters X 5 meters)
- The number of blows per print (18 blows)

- 2- One post-SPT up to 10m from N.G.L.
- 3- One Post-PMT up to 10m from N.G.L.





1,211,306 m²
total area of soil improvement



5819, via Dismano - 47522 Cesena (FC) - Italy
Tel. +39.0547.319311
Fax +39.0547.318542
e-mail: intdept@trevispa.com
www.trevispa.com



P.O.Box 1032 - Dasman - 15461 Kuwait
Phone: +965 22468591/93
Fax: +965 22468594
e-mail: tfk@trevikuwait.com
www.trevikuwait.com