

Geological, Engineering Geological, and Hydrogeological Characteristics of the Knowledge Economic City, Al Madinah Al Munawarah, KSA

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Abstract : The Knowledge Economic City (KEC) of Al Madinah Al Munawarah is one of the major projects and represents a cornerstone for the new development activities for Al Madinah. The study area contains different geological units dominated by basalt and overlain by surface deposits. The surface soils vary in thickness and can be classified into well-graded SAND with silt and gravel (SW-SM), silty SAND with gravel (SM), silty GRAVEL with sand (GM), and sandy SILTY clay (CL-ML). The subsurface soil obtained from the drilled boreholes can be classified into poorly graded GRAVEL (GP), well-graded GRAVEL with sand (GW), poorly graded GRAVEL with silt (GP-GM), silty CLAYEY gravel with sand (GC-GM), silty SAND with gravel (SM), silt with SAND (ML), and silty CLAY with sand (CL-ML), sandy lean CLAY (CL), and lean CLAY (CL). The relative density of the deposit and the different gravel sizes intercalated with the soil influenced the Standard Penetration Tests (SPT) values. The SPT N values are high and approach refusal even at shallow depths. The shallow refusal depth (0.10 to 0.90m) of the Dynamic Cone Penetration Test (DCPT) was observed. Generally, the soil can be described as inactive with low plasticity and dense to very dense consistency. The basalt of the KEC site is characterized by slightly (W2) to moderately (W3) weathering, their strength ranges from moderate (S4) to very strong (S2), and the Rock Quality Designation (RQD) ranges from very poor (R5) to excellent (R1). The engineering geological map of the KEC characterized the geoengineering properties of the soil and rock materials and classified them into many zones. The high sulphate (SO_4^{2-}) and chloride (Cl^-) contents in groundwater call for protective measures for foundation concrete. The current study revealed that geohazard(s) mitigation measures concerning floods, volcanic eruptions, and earthquakes should be taken into consideration.

Keywords : engineering geology, KEC, petrographic description, rock and soil investigations

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