بسم الله الرحمن الرحيم

An-Najah National University
Earth Sciences & Seismic Engineering Center

جامعة النجاح الوطنية
مركز علوم الأرض وهندسة الزلازل

Assessment of Seismic Site Effect for Rawabi First Palestinian Planned City

Final Report

Prepared by:

Earth Sciences and Seismic Engineering Center (ESSEC)
An-Najah National University, P.O. Box 7, Nablus, Palestine
E-mail address: seiscen@najah.edu

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EXECUTIVE SUMMARY

This executive summary concisely details the assessment of seismic site effect (ASSE), study that was carried out by Earth Sciences and Seismic Engineering Center (ESSEC) at An-Najah National University for the construction of Rawabi City (First Palestinian Planned City). The aim of the study is to avoid or mitigate the seismic site effect, such as: landslides, amplification and faulting systems.

Seismic refraction technique was used to investigate the city of Rawabi Site. More than 30 seismic profiles have been shot to figure out the subsurface geology and to delineate if there are cavities beneath the selected landfill site. The underground seismic models beneath the profiles show different velocities to two or three layers; the first layer represents the soil cover (weathered surface material) with maximum thickness of about 5 m overlaying a layer of sediment material (marly and clay- marly materials) or directly on consolidated carbonate materials of limestone, chalky limestone, and dolomite limestone. The underground seismic models and the time-distance results don't show clear cavities at shallow depths except slight morphological variations at bottom of marly layer which may indicate small voids. The shear wave velocity values (V_s) varies between 500 m/sec and 1500 m/sec for marly materials and hard limestone respectively. Based on thicknesses of layers and the values of V_s for each layer, the type of soil profile at the foundation levels varies between S_B and S^1_C.

The effects of local geology on ground-motion amplification and building damage were studied in Rawabi City (first stage – phase 1). Nakamura's method of microtremor analysis

[1] See the soil profile table in Uniform Building Code 1997, International Building Code (IBC) , Arab Building Code 2006 or Jordanian Building Code 2005.

was applied in this investigation. The measurements showed large differences in amplification between few selected sites. Calculating the natural period of the proposed common buildings (T_b) in the studied area (buildings with 8 stories in Hai 1 – 6 and buildings with 15 stories in the city center), by using the equivalent static analysis method.

The values of T_b obtained were closed to the site dominant natural period (Ts) in few locations. In the other hand Reducing the marly stratum level in city center area by 10 – 20

meters as proposed in the master plan, will affect positively in reducing the seismic amplification factor measured at city center area. In other words, the city center site resonance will be avoided. For the other areas (Hai 1 – 6), the amplification factor is relatively small.

Chapter Four presents slope stability analysis to the proposed site of Rawabi City to assist safety condition regarding slope instability and landsiding. The study models all expected cases such as excavation, building loads, backfill materials behind retaining walls and embankments and expected seismic loads. Analysis was carried for given sections through Hai 1 and for virtual sections according to topography and local geology through the rest of the site. Results show that the stability of slopes within the site is safe. However, it is recommended to construct the buildings on the hard limestone bedrock layer and using backfill materials as according to standards. Furthermore, it is recommended to carry out slope stability analysis for real slopes within the site as they provided from the owner.