

Archaeological Evidence for Late-Holocene Fault Rupture Characteristics of the North Anatolian Fault in Hersek Peninsula, Izmit Bay, Turkey

Kozacı Ö.,(1), Altunel E., (2), Clahan K., (3) and Şimşek O., (4)

(1) Fugro Consultans Inc.

(2) Eskişehir Osmangazi University

(3) Lettis Consultants International

(4) Fugro-SIAL Yerbilimleri Danışmanlığı

Corresponding Author: Kozacı, Ö., (ozgurkozaci@gmail.com)

Anatolia (Asia Minor) has been inhabited by numerous civilizations over the last several millennia. Roman, Byzantine and Ottoman Empires have lived and these significant civilizations all have built magnificent structures which are still relatively well-preserved throughout Turkey. These structures as well as written records provide us plenty of evidence for documenting and characterizing the disasters of both natural and anthropogenic origin.

The study site on the Hersek Peninsula (Helenopolis) has been a strategic site for at least the last two millennia as a result of its strategic location between Izmit Bay and the Sea of Marmara. Historically it provided a nautical shortcut for the Bagdad Road, an important section of the spice route, between Istanbul (Constantinople) and Iznik (Nicaea). It also controls the entrance of Izmit Bay to Izmit (Nicomedia). The Hersek peninsula is also located near the western termination of 1999 Izmit earthquake surface rupture and it is the last place that the North Anatolian fault (NAF) can be studied on land before it enters the Marmara Sea.

We performed extensive paleoseismic investigations to assess the seismic hazard risk for Marmara region; however, an offset 6th century Byzantine aqueduct across the North Anatolian fault provided key evidence for fault activity. Our investigations included detailed surveying of the aqueduct, which proves to be a competent strain gauge as it reveals an abrupt right-bend coincident with the mapped trace of the right-lateral NAF. Detailed geomorphic descriptions of Helenopolis and construction accounts at this location were found within historical records of the Justinian era providing precise age control. The offset aqueduct provides valuable fault rupture information on the location, amount and rate of offset of the NAF over the last 1500 years. In addition, it provides reliable evidence for the western termination of the 1999 Izmit earthquake.