

Combined geological and geophysical investigations of a heavily liquefied site: A case at Makuhari-Kaihira Park.

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Combined geological and geophysical investigations were conducted at Makuhari-Kaihira Park where significant sand boiling from fissures was observed accompanied with liquefaction caused by the 2011 East Japan Earthquake. The park was reclaimed just after the 1987 East off Chiba Prefecture Earthquake using dredged fine sand and covered by surface soils up to 5 m in thickness. Because the boiling sand is characterized by fine sand including large amount of shell fragments, it was presumed to be originated from the dredged sand. However near-surface geology was still unknown and there were few available drill data around the park. To clarify the near-surface structure, we conducted the following surveys.

SPT boring (1 hole to 35 m) and Suspension PS logging,

All-core Boring (4 holes to 20 m),

CPT and SCPT (7 points to 15 m),

Surface sampling using Handy Geoslicer (9 points to max. 2.4 m),

Surface sampling using Daiki core sampler (4 holes to max. 4.3 m),

Dynamic cone penetrometer test (6 point up to 6.3 m),

and Surface wave survey and high-resolution SH seismic reflection survey
(120 m, 2 lines).

As a result, a low S-wave velocity layer was identified at the dredged sand horizon about 3 to 5 m in depths. The combined survey showed that it is capable to delineate liquefied layers as anomaly zones in geophysical profiles.

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Keywords: East Japan Earthquake, liquefaction, all core boring, geophysical survey