

PROJECT REFERENCE

Project **NLNG Expansion project Bonny Island, Nigeria**

Subject: Monitoring
 Location: Bonny Island, Nigeria
 Principal: Nigerian Liquefied Natural Gas (NLNG)
 Type of principal: Oil Industry
 Date: 1999 - 2002

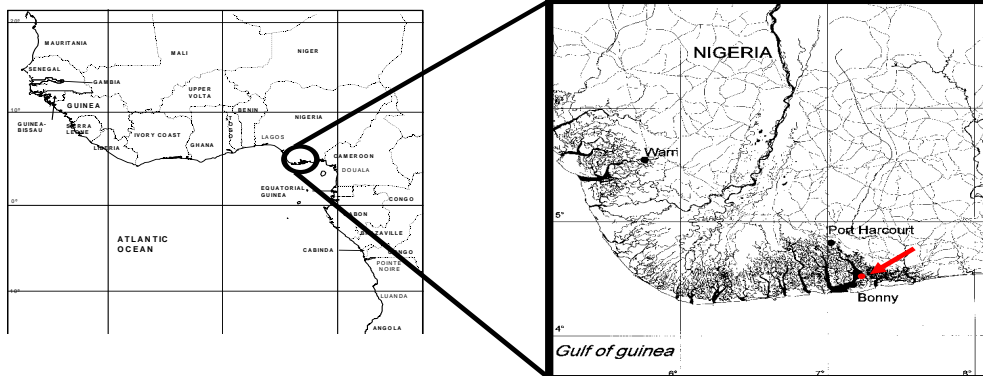
Description:

The projects on Bonny Island concern the construction and expansion of a Liquefied Natural Gas (LNG) export factory, consisting of several trains (for processing and cooling of the natural gas) and LNG tanks for temporary storage of the liquefied gas. From the tanks the gas will be transported to LNG cooling vessels in the river via a so-called pumping jetty.



The sub soil of the Niger delta consists predominantly of normal consolidated layers alternating with sand layers. It is a typical deltaic soil profile, similar to the one we know in Holland. The settlement behaviour of the soil is critical for the above mentioned constructions and has to be minimised.

Well before the construction of the trains and tanks the soil is pre-consolidated by pre-loading with sand (to 20m height during a period of approx. 1-year). This way the settlements and especially the differences in settlements during the operational phase are minimised.



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The instrumentation for this project was installed by shell and auger drilling or Cone Penetration trucks. The equipment is installed before commencing with the pre-loading. The instruments are monitored in real-time from installation until the removal of the load. The real-time monitoring of settlements and pore pressures at the surface and in the sub-soil (to 60m depth) gives the required understanding of the consolidation behaviour of the soil. This information is of vital importance to the designer for the design of the plate foundation and to predict the settlement behaviour during the operational phase in the long term.

For this project the following instruments were installed:

- 35 extensometers to approximately 60m depth;
- 100 piezometers (type: vibrating wire) installed with CPT truck;
- 70 piezometers (type: vibrating wire) installed in a sand filter to 50m depth;
- 18 piezometers in monitoring wells;
- 2 settlement tubes.

Approximately 19kms cabling was used.

The instruments were logged centrally by data-acquisition system, controlled autonomously by means of solar panels and GSM.

