Geoscience Ireland Award

Seveso Capacity Building, Turkey

Engineering company AWN Consulting formed part of a consortium for the delivery of a capacity building contract to the Turkish environment ministry. The contract would support bringing EU Seveso II directives into Turkish law. Turkey has 1,700 Seveso categorised sites, ie sites that pose potential major accident risks to local populations and the environment.

AWN provided classroom and on-site training on hazard, environmental and human risk modelling, over a 24-month period across Turkey. Training took place at 15 venues, from Bodrum to Erzerum on the Iraqi/Syrian border, resulting in significant environmental knowledge and skills transfer to 150 inspectors.

AWN also prepared the first EU standard environmental and safety report for a Turkish Seveso site.

In addition, AWN organised a visit to Ireland for 25 ministry officials where they visited a number of Irish Seveso sites and met relevant government and agency officials.

The training has enabled immediate commencement of Seveso site assessment, which has led to greater protection for both population and environment in Turkey today.

Ballaghaderreen Bypass, Roscommon

The 13.5km Ballaghaderreen bypass is a single carriageway national primary road that was constructed to remove through traffic including heavy commercial vehicles from the town; reduce journey times and improve road safety along the N5; and reduce congestion, thereby improving the environment of Ballaghaderreen town.

The client, Roscommon County Council, and the consultants, JB Barry & Partners, set a high bar for how infrastructure projects should be delivered in terms of minimising environmental impact. The client obtained planning permission for areas of land adjacent to the road corridor to be utilised as material recovery areas. This enabled the consultant, and later the contractor, to balance the geotechnical elements of the project by utilising their engineering knowledge and expertise.

Among the key environmental benefits of the scheme were the reuse of excavated material in the project; utilising geotechnical information to produce an environmentally self-contained project; eliminating the requirement for sending material to landfill through the use of the material recovery areas; and minimising the carbon footprint of the project.

Blantyre Water Supply, Malawi

Nicholas O'Dwyer Consulting Engineers partnered with Apex Geoservices for this $164 million World Bank funded project to expand water abstraction, treatment and delivery systems to meet the increasing water demand in the city of Blantyre, Malawi, for a 25-year period.

Most of Blantyre's water is extracted from the Shire river about 40km from and 800m below the city. Recurring problems led to the selection of a new intake site 4.3 km upstream of the existing intake.

A new water treatment works producing an additional 71 million litres per day was designed to cater for anticipated demand up to 2030. A further expansion to 130 million litres per day will meet the 2040 water needs.

The project includes the design of high capacity pumped transfer pipelines for both raw and treated water. A geophysical survey by Apex Geoservices enabled 45 km of pipeline route to be efficiently zoned in terms of expected ground conditions, informing the subsequent pipeline design.

Tidal Turbine Framework, Canada, France

OpenHydro Ltd designs and manufactures marine turbines to generate renewable energy from tidal streams. Gavin & Doherty Geosolutions (GDG) is a geotechnical engineering company specialising design for offshore and renewable energy projects.

OpenHydro is currently developing two tidal arrays in the Bay of Fundy, Canada, and in Paimpol-Brehat, France. The foundation solutions for these sites are gravity based structures supported by penetrometer footings, founded on the underlying bedrock strata.

In the absence of design guidelines to size these footings, current practice is to assume relatively conservative values. Therefore therefore large amounts of ballast are required to resist the significant loads that the turbine structure experiences during service.

To optimise the design of these structures, OpenHydro and GDG created an experimental programme aimed at developing a novel plasticity-based design approach. The investigation revealed that achieving even small penetrations of the footing would allow ratios of horizontal load to vertical reaction (or dead-weight of the structure) far in excess of the values identified in the available literature.

The geotechnical analysis and testing programme has allowed significant design efficiency to be achieved with considerable impact on both capital outlay and the cost of the energy produced.