

## **"THE PEARL - QATAR" – State of Qatar**

### **ABOUT THE PEARL-QATAR**

The Pearl-Qatar is a US \$2.5 billion offshore, Riviera-style man-made island, covering 400 hectares of reclaimed land. It is Qatar's first international real estate venture, the largest real estate development in the country and the first to offer freehold and residential rights to international investors.

The Pearl-Qatar's name and location, on a former pearl diving site, leverages the country's traditions, and strong historical and cultural ties to the sea. The Pearl-Qatar will eventually house over 30,000 residents in an up-scale, multi-cultural residential community which will be a secure and exclusive Island.



The four-phase development comprises 10 distinct districts to be developed over five years, with the first investors expected to take up residency in 2007. The Riviera Arabia themed districts will house three luxury hotels, three marinas, with combined mooring for over 700 boats, and 60,000 square m of luxury retail and restaurant space.



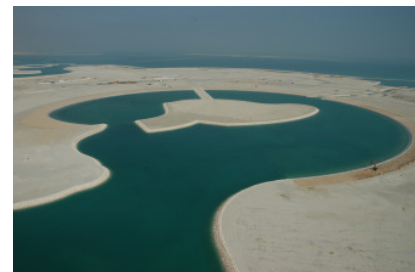
The Pearl-Qatar is being built 350 m offshore the West Bay Lagoon area of the country's capital, Doha and it will create over 30 km of new coastline.

The Pearl-Qatar is being developed and promoted by United Development Company (UDC), Qatar's largest private sector shareholding company while Dar A-Handasah (DAR) has been appointed by UDC to act as Supervising Engineer for the purpose of this project.

Dredging works were awarded to Qatar Dredging Company (QDC, now renamed as MEDCO) which is a joint venture between the Qatari United Development Company, the Qatari Government and Belgian Dredging International. The works started in August 2004 and were complete on the 6<sup>th</sup> of July 2006.

### **THE WORKS**

The concept of construction opted for the 'Pearl-Qatar' project differs substantially from that of other artificial island developments in the Middle East Region. Whereas the latter are constructed in areas with sufficient water depth, allowing the easy access and deployment of large dredging equipment, UDC opted to construct their island on an existing shallow area, a former pearl bank.



By doing so UDC minimized the total project's requirement for fill to be dredged from off shore borrow areas. On the other hand, as every medal has its reverse, it forced the Contractor to abandon his traditional "dredging" solution for a more bold execution methodology.

In order to bring the 400 hectares up to final level a total of 15,5 million m<sup>3</sup> of reclamation material was required. Ten million m<sup>3</sup> would come from the "blue water dredging" operations while the remainder had to come from an offshore borrow area. The "blue water dredging" was not only necessary to create the design water depth in the channels, the beach areas and the marinas but was also indispensable for giving the water its magnificent blue colour.



The major problem with this was that the largest part of the seabed around the Pearl consists of limestone and cap-rock which are too hard to be dredged by a small, shallow drafted Cutter Suction Dredger (CSD). Furthermore these "blue water areas" were located in areas which were too shallow to be dredged by a heavy duty CSD not only for the latter's minimum draft requirement but also due to the fact that the design depth of these areas is less than the minimum dredging depth of such dredging vessel.



In order to overcome this problem the Contractor decided to perform part of the blue water dredging "in the dry". Complete working areas were closed off from the open sea via the construction of temporary bunds (in total 20 km). Fully confined areas were drained via the deployment 60 large dewatering pumps (of which 30 pieces with a minimum capacity of 3,000 m<sup>3</sup>/hr). The total set of pumps was able to dewater at a rate of approximately 100.000 m<sup>3</sup> per hour.

Drained areas were subsequently attacked via a huge fleet of dry earth moving equipment able to remove the rocky material as well as the local soft materials. At high days no less than 500 machines (including 120 excavators, 35 bulldozers and rippers, 150 articulated dump trucks and tipper trucks, 25 wheel loaders, compaction equipment, graders, cranes ....) were deployed on site. In this way some 10,5 million m<sup>3</sup> (of which 7 million m<sup>3</sup> of rock) was moved in 2 years time.



The total rock volume consisted of 2,5 million m<sup>3</sup> limestone and 4,5 million m<sup>3</sup> cap-rock. The limestone was mainly used as under layer for the shore protection whereas the cap-rock, after having been reduced to an acceptable size by means of crushers, was used as suitable fill in the reclamation.

The following rock excavation techniques were deployed: rock-breakers, ripping bulldozers and excavators, trenchers and surface miners. Even blasting had to be done as some 1 million m<sup>3</sup> limestone showed itself to be too hard to be removed by any other technique listed here above. The excavated limestone was subsequently processed via two enormous rotary grizzly's, each having a capacity of 500 ton/h, in material streams of different grading destined for the shore protection as well as other civil works.



Apart from this 6,5 Mio m<sup>3</sup> was dredged by means of a CSD and delivered to the reclamation area via a floating pipeline, sinker line and shoreline. In the borrow areas layers of hard rock occurred next to pockets of soft silt, the latter being unacceptable as such for use as reclamation material. As selective dredging was not acceptable due to its major impact on the dredger's efficiency the Contractor opted to treat these fines within the reclamation area. Via the technique of "finger

bunds" the settling of silt in the subsequent reclamation layers could be minimized. The flushed out fines, approximately 2,5 million m<sup>3</sup>, were mixed with no less than 1,5 million m<sup>3</sup> dune sand to create some 4 million m<sup>3</sup> acceptable fill. Settlement was accelerated by applying surcharges, vertical drains, classical vibrating rollers, hexagonal vibrating rollers and HEIC rollers.



In addition hereto the Scope of Work for the Pearl-Qatar project included the construction of shore protection requiring no less than 2 million tons of rock material. Other civil works were: the construction of 3,2 km of concrete quay walls (type: vertical gravity block wall – single block weight 30T); the construction 3,6 km of concrete steps both; the installation of some 23 km of border stone and the creation of some 4,5 km of 'Venice Canals'. Finally some 20 km of beaches had to be created. For this reason some 1 million m<sup>3</sup> of dune sand was imported from Messaieed and installed as beach sand.

