

NORTHSTAR OFFSHORE DRILLING ISLAND

Client: BP Exploration (Alaska), Inc.

Location: Beaufort Sea, Alaska



Key Features:

- Design and testing OPEN CELL® perimeter wall and rock armor berm shore protection
- Operations Center enhancement designed to withstand extreme ice and metocean conditions
- Wave and ice tank physical modeling
- Advanced numerical modeling

Northstar is an artificial gravel island north of Prudhoe Bay, Alaska, constructed to support petroleum production. It is presently the most northerly Arctic island for petroleum production. PND has been responsible for several key elements of the project since its beginning.

Initial Construction (Year: 2000)—PND engineered a 360-foot by 140-foot OPEN CELL SHEET PILE® dock at Northstar Island, complete with fenders, foundations, and other structural elements. One unique feature of the dock was construction in halves to allow installation of a J-tube pipeline onto the island for petroleum transport to the mainland. The gap for pipeline access was later closed by a sheet pile element. Other aspects of the job included heliport design; spread footing foundation design for the very heavy processor, compressor, turbine modules and fuel tanks. PND has also designed various modifications to the facility since original construction.

Perimeter Shore Protection (Years: 2007-2009) - In 2007 and 2008 PND was again selected to assist with the Northstar project in a number of areas including logistics analysis, shore protection design and modifications to the southeast corner. Since construction of the island the existing perimeter shore protection has required extensive maintenance. PND designed and tested new shore protection alternatives for the island, including an OPEN CELL® perimeter wall and rock berm alternatives to provide a very low maintenance shore protection system. The work was done on a fast track and included modeling alternatives in wave tanks at Oregon State University and at Texas A&M University and modeling physical ice tank testing in Newfoundland and Finland. Computer modeling includes ice simulations, CGWAVE and COBRAS wave modeling, and structural finite element modeling.

Southeast Corner Enhancement (Years: 2008-2009) - PND designed civil and structural engineering elements including ramps for emergency egress, a new enlarged southeast corner uplands configuration for new Operations Center, and dock installation to allow direct offload of the 3,500 ton module.

