Diving in the Arctic Extremes
BP's Northstar Island, Alaska

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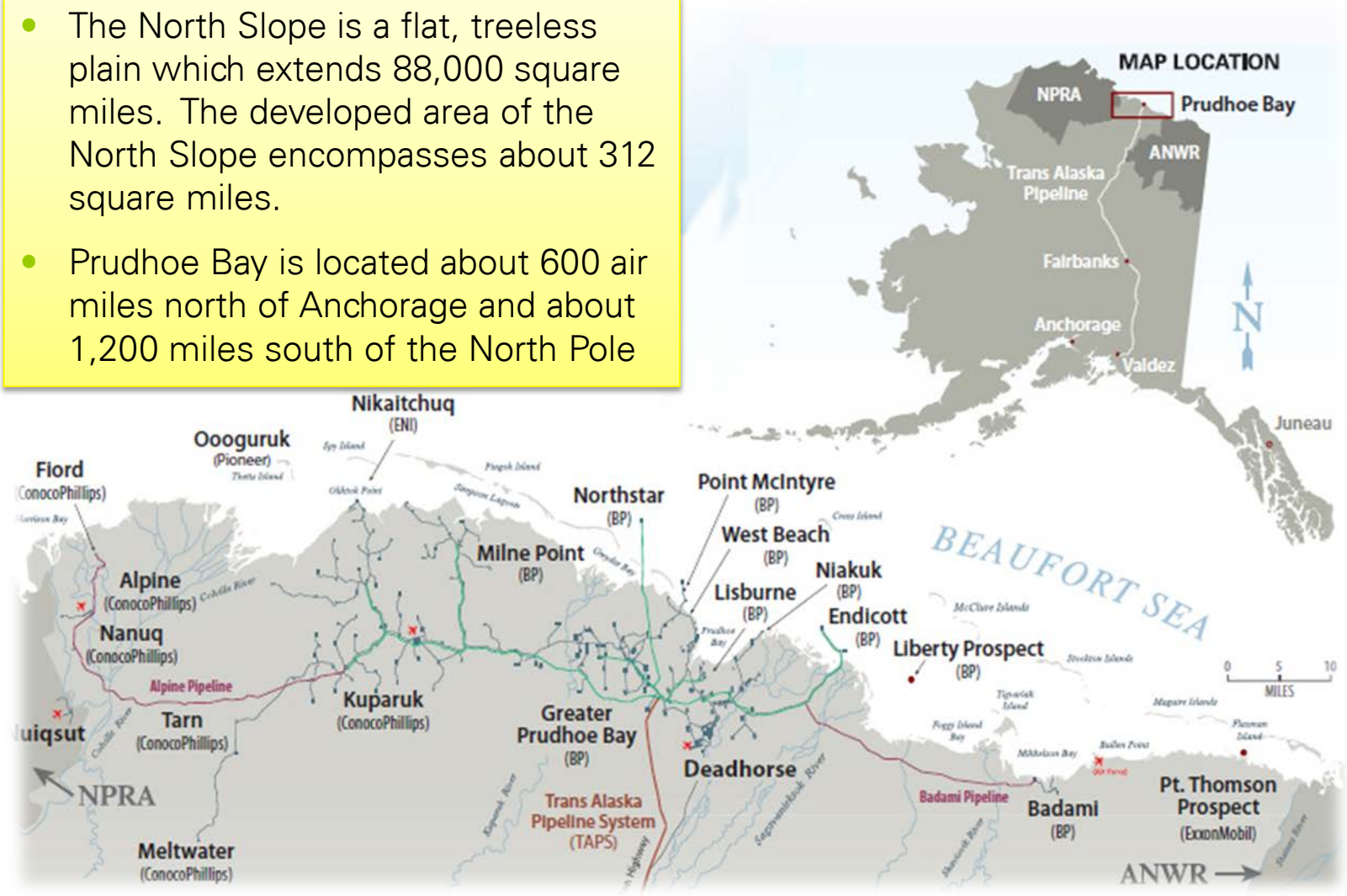
Diving in the Arctic Extremes
BP in Alaska

- The North Slope is a flat, treeless plain which extends 88,000 square miles. The developed area of the North Slope encompasses about 312 square miles.
- Prudhoe Bay is located about 600 air miles north of Anchorage and about 1,200 miles south of the North Pole



Diving in the Arctic Extremes
BP in Alaska

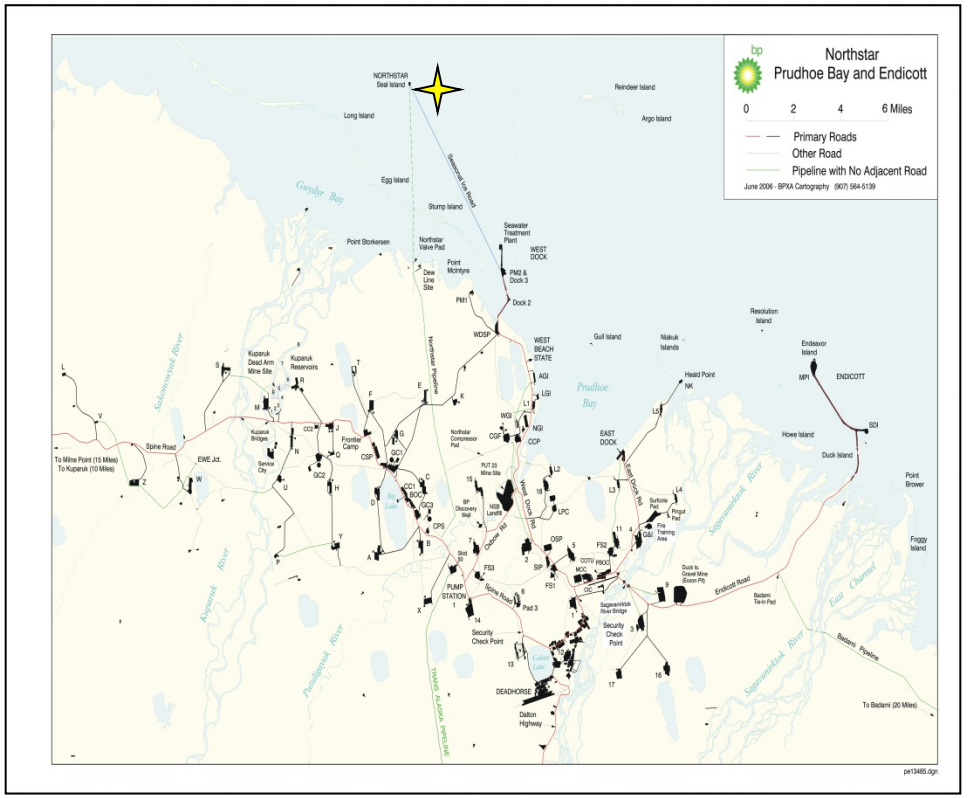
- BP Operates fifteen North Slope oil fields, four North Slope pipelines and owns significant interests in six other producing fields.
- BP has been in business in Alaska for 33 years.
- After more than 33 years of production, Prudhoe Bay remains the largest oil field in North America and ranks amongst the 20 largest oil fields ever discovered worldwide.
- Alaska's North Slope Natural Gas is one of the largest undeveloped resources in BP's Global portfolio. Recoverable natural gas is estimated at 35 trillion cubic feet.

Diving in the Arctic Extremes
Today's Presentation

- Where BP operate in the Arctic
- BP Northstar Island Asset
- The harshness of the environment
- Repair and maintenance requirements
- Working closely with the contractor managing the environmental risks
- 2012 Arktos Ramp Project
- How BP cares for the environment

Diving in the Arctic Extremes
Northstar Island – Where BP operate in the Arctic

The State of Alaska



Diving in the Arctic Extremes
BP Northstar Island Asset

- Five-acre, man-made island in the Beaufort Sea, 12 miles NW of Prudhoe Bay and 6 miles offshore
- First production modules installed in 2000
- Peak production of 85,000 Bbps per day
- Connected to onshore processing facilities by a pipeline buried 7-11ft below the seafloor to avoid ice impacts
- Water depth approx 40 feet
- Summer water average temp 2 °C
- Winter water average temp –1.8 °C

Diving in the Arctic Extremes
Northstar Island (Summer)

Diving in the Arctic Extremes
Northstar Island (Winter)

The harshness of the environment

Diving in the Arctic Extremes
Northstar Island Ice Ride Up

The harshness of the environment

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Diving in the Arctic Extremes
The Winter Ice Build-up

Spring / Fall Beaufort Sea Storms

Diving in the Arctic Extremes
Repair and Maintenance Requirements

Diving in the Arctic Extremes
Repair and Maintenance Requirements

- Annually Assess and Repair the Island Armor

Island Armor

Diving in the Arctic Extremes
Repair and Maintenance Requirements

Excavate ice in work corridor

Conduct dive assessment to determine damage to blocks, filter fabric or geophysical barrier (gravel bags)

Remove shoreline and underwater shackles to allow lifting of the concrete blocks

Diving in the Arctic Extremes
Repair and Maintenance Requirements

Connect slings to the concrete block section for lifting and removal

Crane recovers concrete block

Straighten the existing filter fabric, sew tears and replace the blocks

Diving in the Arctic Extremes
Repair and Maintenance Requirements – Moat Diving

Placement of various sizes of gravel bags into permanent locations

Placement of new filter fabric and geo grid over repaired areas

Detachment of slings after existing concrete blocks are returned to original position and reattachment of shackles and links to reassemble the block matt slope protection system

Diving in the Arctic Extremes
Repair and Maintenance Requirements – Moat Diving

Anchorage Diving Contractors

- Working closely with the contractor – managing the environmental risks
- American Marine Corporation - BP and IMCA Compliant. IMCA Members, very pro-active and supportive of the drive to Safe and Compliant diving Operations.
- Global Diving and Salvage. Not BP Compliant, not IMCA Members.

Diving in the Arctic Extremes
Working Closely with the Contractor – Managing the Environmental Risks

Surface Support - Cold Weather

- Heated dive control van on site:
  - Hot Water Facility (both Diesel and Electric Water Heaters)
  - Dive Locker and Dressing Facility
  - Dive Tending and Dive Support Structure
  - Dive Control Van (with work bench, dive rack and emergency high pressure (HP) air-banks)
  - Forced air heaters to maintain interior temperatures and work conditions
  - Designed to serve as a refuge from polar bears

Diving in the Arctic Extremes
Working Closely with the Contractor – Managing the Environmental Risks

Diver Exposure Control

- Diver hot-water system
  - Secondary backup in-case of failure of primary system
  - Water source – sea water from ice hole
  - Hoses are kept from freezing by insulating hoses and keeping inside the dive van
  - Primary power source is a generator used solely for dive operations. Backup power source is also provided by Northstar.
- Personnel protective clothing includes arctic cold weather clothing

Diving in the Arctic Extremes
Working Closely with the Contractor – Managing the Environmental Risks

Gear problems associated with freezing

- Filter/drier systems are used in the L.P. delivery air system
- Volume tanks are used with the air-system to retain residual volume and precipitate moisture out of the air before delivered
- Hose runs are kept in the controlled temperature conditions of the shelter
- Diver regulator shrouds are used to pre-heat diver air at the helmet before breathing
- Valves and regulators in the bottle rack have heat trace to keep frost off and for preventing internal freeze up

Diving in the Arctic Extremes
Working Closely with the Contractor – Managing the Environmental Risks

Remote Location Challenges

- EMT-Dive medical technicians on standby when diver in the water
- Divers, diver-tenders, and dive medical technicians are cross-trained
- Decompression chambers located on-site prior to start of dive operations
- Communications continuously maintained with continuous back-up systems
- Standby diver is immediately available at all times wearing a helmet
- Additional in-water tender used for penetration ice diving

Diving in the Arctic Extremes
How the Risks are Mitigated

SimOps of Crane Operations with Dive Operations

- Training
- Competency
- Communication
- Work Relationship
- Trust

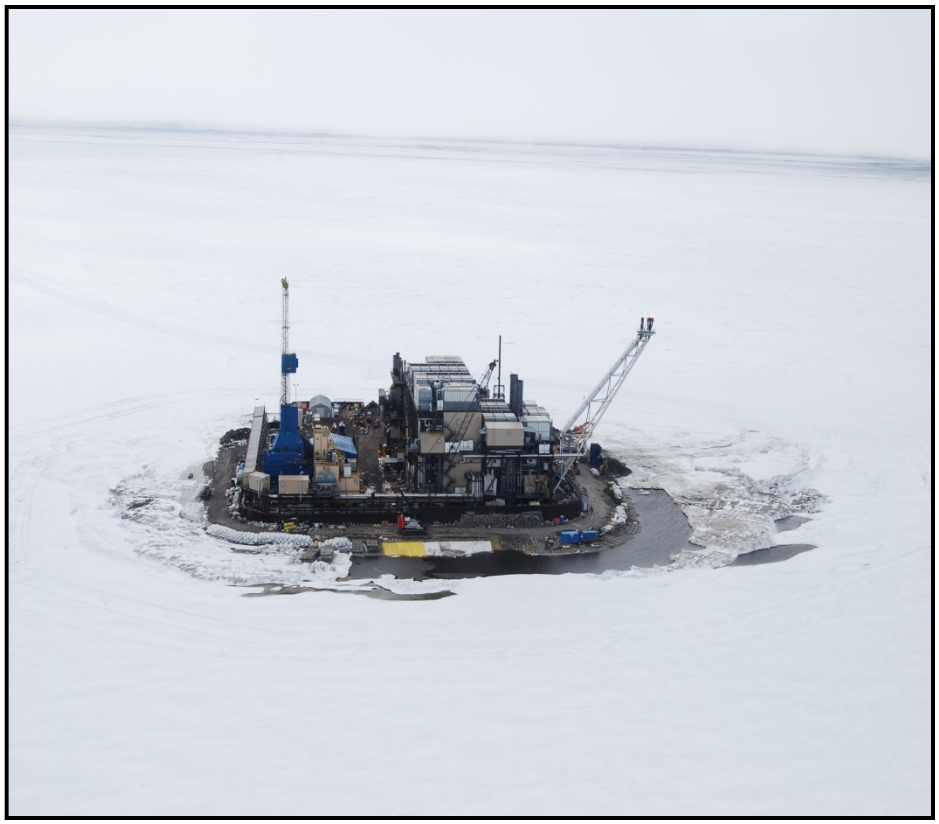
Other Hazards – walking/working surfaces

- Fall prevention/protection devices when working near the water's edge
- Personal Floatation Devices required for personnel working at water's edge
- Nut-Plug traction media is placed on walking surfaces before operations begin
- Personal footwear traction devices required on the frozen blocks

Diving in the Arctic Extremes
How the Risks are Mitigated

Moat Diving

- ✓ – If open water is maintained, surface water is calm for dive
- ✓ – High-risk "Penetration Dives" under the ice are minimized reducing risk and cost
- ✕ – Very difficult to keep ice out of Moat in extremely cold weather
- ✕ – Heavy equipment is required to maintain the Moat (Skimmers)
- ✕ – Increased risk of personnel next to waters edge



Diving in the Arctic Extremes
2012 Arktos Ramp Project

- 2012 Campaign
  - Detailed Engineering Workscopes
  - Hot and Cold Cutting scopes
  - Setting up on the ice
  - Keeping the plant operating
- Inspection sundry diving = 36hrs 18mins
- Drilling and pinning of the 4 piles = 19hrs 8mins
- Burning = 38hrs 15mins
- Welding = 59hrs 20mins

Diving in the Arctic Extremes
2012 Arktos Ramp Project

Cutting the sheet pile walls with both hot and cold techniques.

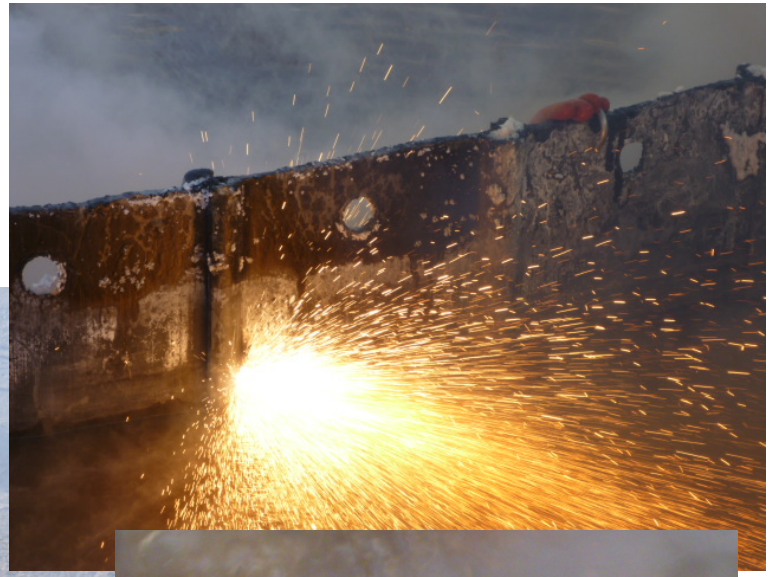
- Diver competency
- Diver selection
- Diver training
- Diver qualifications

Equipment Selection

- Oxy Arc cutting
- Hot work management
- Cold Cutting techniques
- BP Cutting checklist
- IMCA Guidance

Diving in the Arctic Extremes
2012 Arktos Ramp Project

Heavy plant operating on frozen Beaufort Sea



Diving in the Arctic Extremes
2012 Arktos Ramp Project

Success through:-

- Commitment
- Diligence
- Competences

No incidents through:-

- Effective Risk Assessment at all stages of the scopes

Diving in the Arctic Extremes
Successful Operations

- Keys to successful operation
  - Pre-planning
  - Incorporating lessons learned
  - Performing a comprehensive risk and hazard assessment prior to the operation to include:
    - Diving, Lifting, Equipment, Manpower
  - Utilise the COW process
  - Communication, Communication, Communication, Communication

Diving in the Arctic Extremes
How BP cares for the Environment

- Four double-hulled, state of the art Alaska-class tankers now transport BP North Slope oil to refineries on the West Coast.
- The Alaska-Class tankers are amongst the most environmentally friendly oil tankers ever launched
- They exceed regulatory standards for new tankers
  - Alaska Legend - 1,3000,000 bbls capacity
  - Alaskan Explorer - 1,3000,000 bbls capacity
  - Alaskan Frontier - 1,3000,000 bbls capacity
  - Alaskan Navigator - 1,3000,000 bbls capacity

Diving in the Arctic Extremes
How BP Cares for the Environment

Wildlife

- Polar Bear Watch
- Seals

Other Visitors

Thank You