Quintillion Subsea Cable System

The Alaska State Legislature
House Committee on Education
Chair, Representative Drummond
24 March 2017

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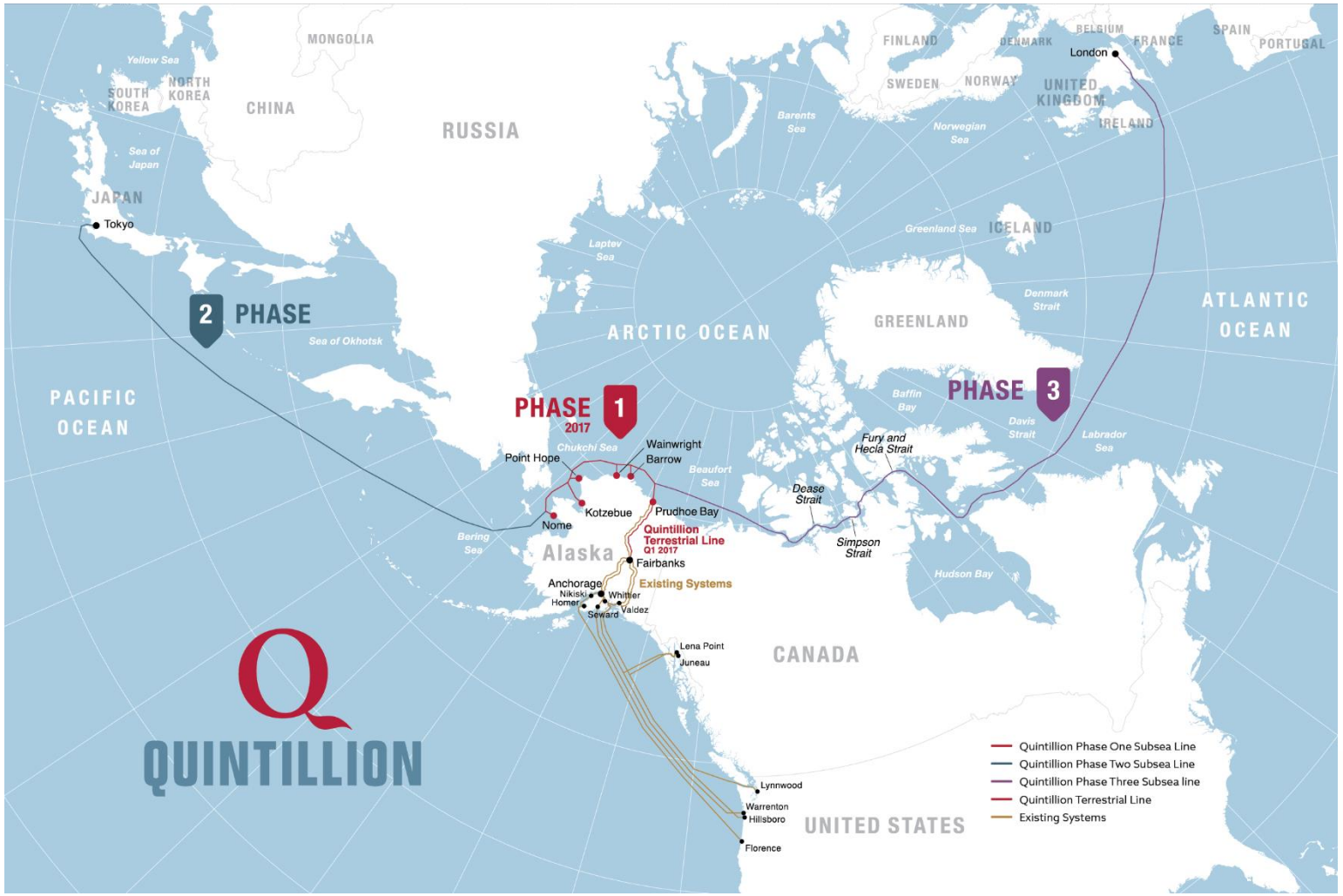
Meet Quintillion

- Headquartered in Anchorage, Alaska
- Building a multi-phase fiber optic cable network in and around Alaska with plans to connect to Asia, Arctic Canada and Europe
- Privately funded – includes select Alaska investors
- Delivering 50 to 90% price reductions for wholesale dedicated capacity compared to current backhaul options
- Private operator selling **wholesale** capacity to telecom service providers – capacity on Quintillion's network is available to all service providers
- Bringing high speed internet and true broadband to the North American Arctic in 2017

Planned Network - Phased Approach



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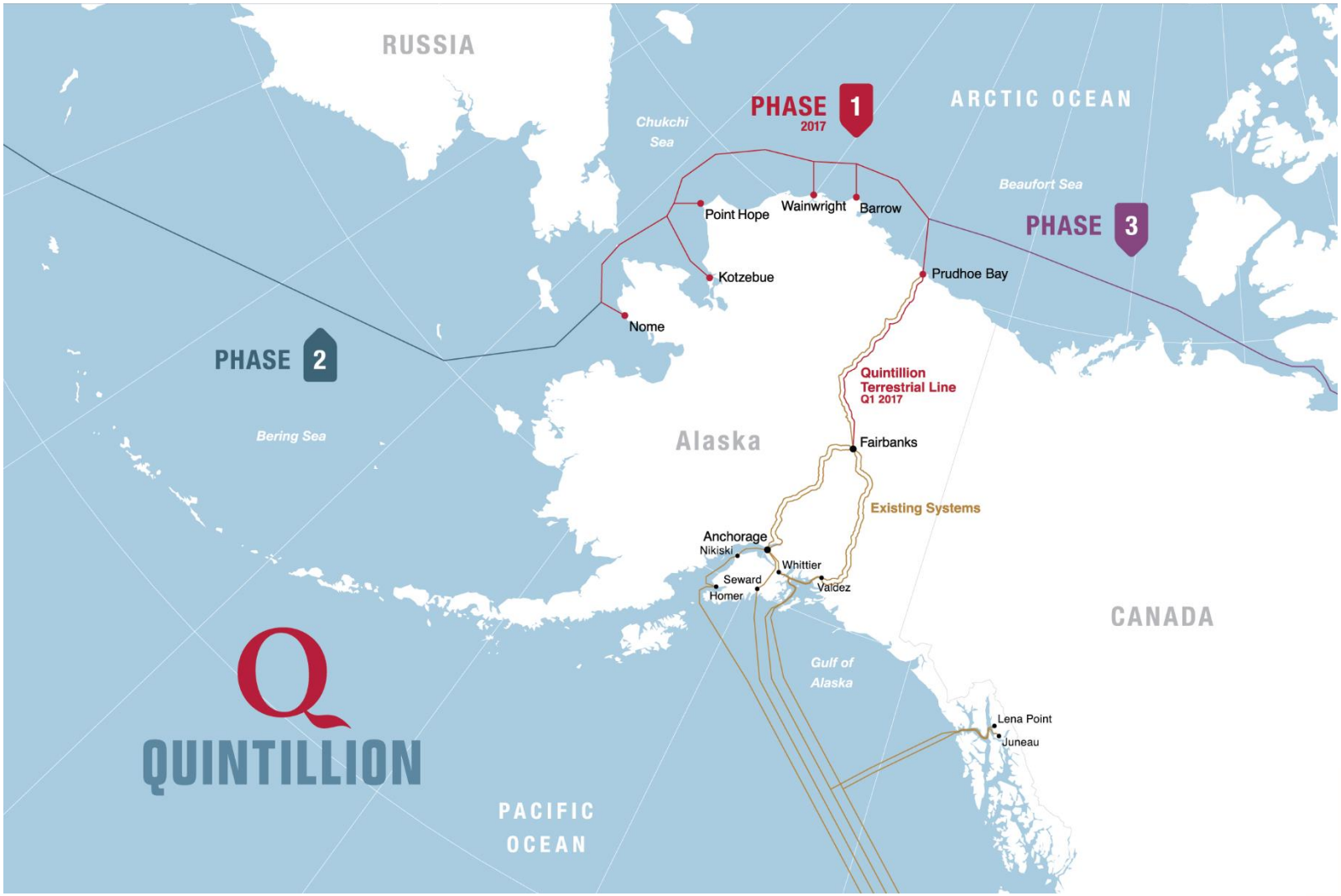
Alaska Scheduled In-service 2017



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COST OF SERVICE

ARCTIC TELECOMMUNICATIONS

Backhaul technology drives cost of service

Backhaul Technology *– the connection from a community to the internet*

- **Satellite – high cost; limited capacity**
  - Substantial operation and maintenance costs on ground stations
  - Large capital outlay
  - Susceptible to environmental outages: weather, solar flares, etc.
  - On a per Mbps cost basis, cost is very high and capacity limited **< 2,000 Mbps**
- **Microwave – high cost; limited capacity**
  - Substantial operation and maintenance costs on towers, power plants and radios
  - Expensive to construct in remote environments
  - Susceptible to environmental outages: weather, solar flares, etc.
  - Capacity is limited and ability to upgrade is limited - **2,000 to 10,000 Mbps** - on most systems
- **Fiber Optic Cable – low cost; virtually unlimited capacity**
  - Cost of construction is coming down as tools advance
  - Lower cost of operation and maintenance – no routine subsea maintenance, no remote facilities – all community based
  - Virtually unlimited capacity – **10,000,000** Mbps per fiber pair with ability to **triple** capacity by changing equipment in community-based landing site

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Benefits of Fiber to Rural Communities

- **EDUCATION:** Supports Digital Learning agenda; improves education and job training while lowering cost of delivery
- **HEALTH CARE:** Supports Tele-medicine solutions; electronic health records; remote diagnostic and specialist consultations
- **GOVERNMENT:** Improves efficient delivery of government services
- **ECONOMIC DEVELOPMENT:** Enables business opportunities dependent on high-speed communications and true online/remote work
- **EMERGENCY RESPONSE:** Allows real-time monitoring and management of resource development industries (oil & gas and mining) and improves Search and Rescue capabilities
- **PUBLIC SAFETY:** Improves capabilities for effective community public safety and security services
- **NATIONAL STRATEGY:** Reliable communications is essential to all three areas identified in the President's National Strategy for the Arctic Region, published 2013
  - Advance United States Security Interests
  - Pursue Responsible Arctic Region Stewardship
  - Strengthen International Cooperation

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How *Does* One Build Arctic Subsea Cables?

DESIGN & BUILD

Logical & Feasible Design

- Prior efforts by other companies failed to overcome the unique complexities of building in the Arctic
- Quintillion's plan will deliver the system in logical phases anchored in Alaska
- Have worked for the past four+ years to design a system that is both logical and feasible
- **PHASE 1 - ALASKA**
  - Nome to Prudhoe Bay (Oliktok Point) with branches to Kotzebue, Point Hope, Wainwright and Barrow
  - New terrestrial fiber from Prudhoe Bay to Fairbanks interconnecting with existing cables to the US Pacific Northwest
  - *Construction underway*
- ***Phase 1 scheduled in-service 2017***
- **PHASE 2 – ASIA**
  - Plans to extend the system at the Nome branching west to Asia
  - Options for additional branches into Alaska
  - Provides diverse and redundant communication routes
- **PHASE 3 – CANADA-WESTERN EUROPE**
  - Designed to extend subsea fiber east from Prudhoe Bay, Alaska through the Lower Northwest Passage to Europe
  - Planned spurs into Arctic communities in Northern Canada
  - Shorter route between Europe and Asia
  - Provides diversity for Europe to Asia routes

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Building an Arctic-Resilient System: Phase 1-AK

- Alcatel-Lucent Submarine: Turn-key contractor for design, build and construction of subsea system
- New Horizons Telecom, Inc.: Design and build the Dalton Highway terrestrial system and cable landing sites for subsea system
- Cable constructed of high quality glass, wrapped in protective coating and armoring, sometimes double armored, and water-resistant membrane
- Resilient network design: double armor and bury below ice gouge risk
- 25+ year design-life – many older systems are realizing longer system life
- **30 terabit per second system** – can increase capacity with change of equipment in cable landing station
- HDD boring at each cable landing protects cable and minimizes shoreline disruption
- Four marine spreads operating in parallel to install during Arctic open water season
- Custom maintenance program to effect repair, if necessary

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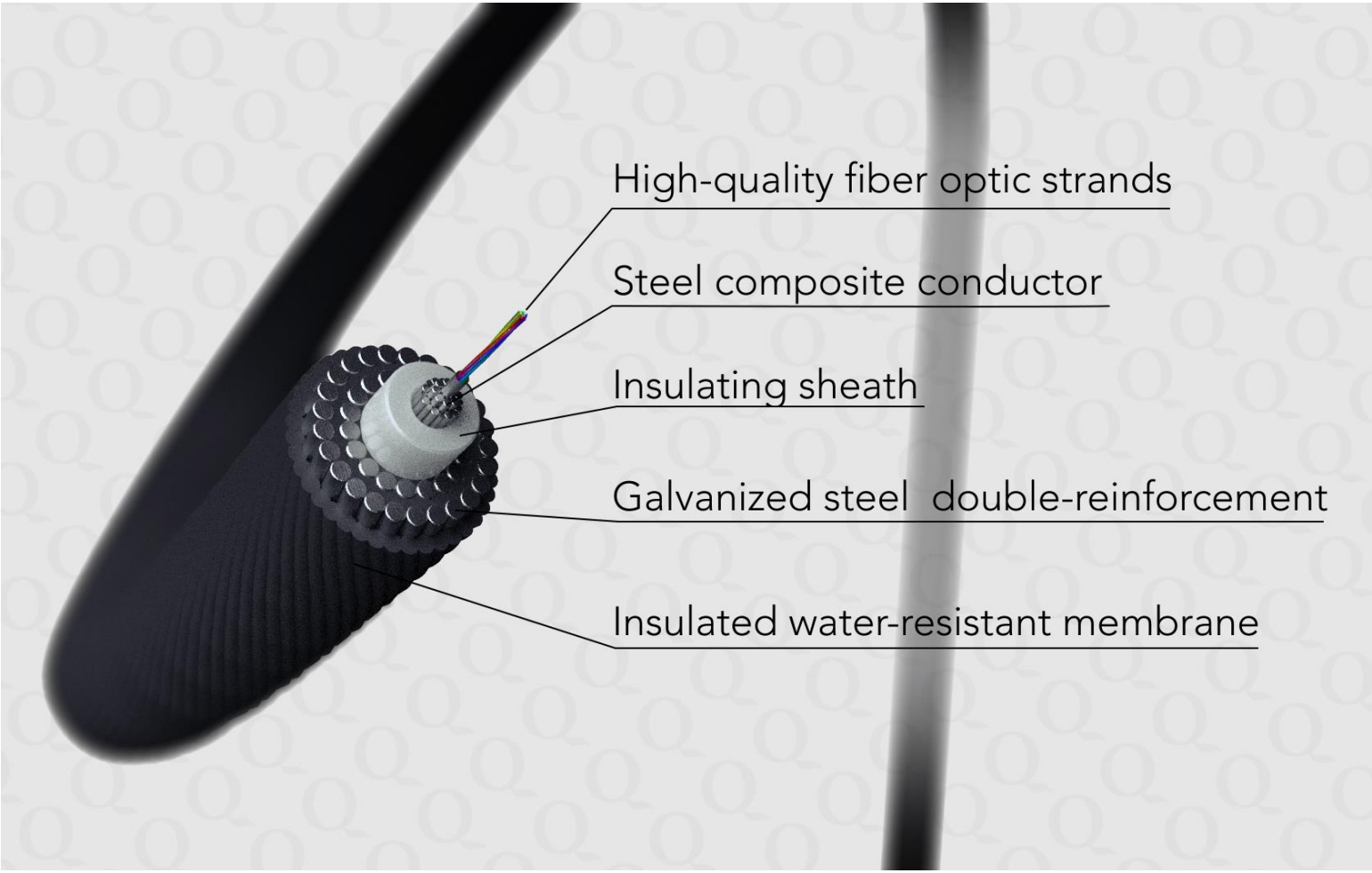
Resilient Fiber Design & Installation



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Trailblazers bringing fiber to the Arctic

- Four+ years to develop Phase 1-Alaska
- 3 years Permitting and approvals – over 275 permits, approval, easements, etc
- 3 years analyzing and planning for risk mitigation – external aggression; logistics, etc
- 2 seasons of Marine Surveys – geotechnical and geophysical studies
- 2 years to complete horizontal drilling for the six shore landings
- 2 years to complete the terrestrial cable to Fairbanks
- 2 year to build the cable, repeaters, branching units and terminal equipment
- 2 Arctic summers to install Phase 1 subsea cable system
  - Bury the cable deep to avoid external risks
  - Work around marine mammal migrations
  - Work around traditional activities including subsistence hunting

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System Resilience – design & build considerations

- Human activities present greatest risk to subsea cables, which are relatively low in the Arctic
- Ice gouging presents greatest risk in Arctic - Quintillion's cable burial design will install the cable below the ice gouge risk assessed by ice study experts
- Installed shore landings using deep bores and steel conduits to protect from shallow water risks
- Dual redundant network equipment insures network operation from equipment failure

Typical Risks

Risk of Service-Impacting Cable Breaks	Percentage of Total Failures	Quintillion's Mitigation Plan
Fishing	42%	Construct outside fish trawling region
Anchors	23%	Cable burial
Geological	10%	Construct outside seismic region
Other	12%	Cable burial
Abrasion	6%	ASN has lowest amplifier & repeater failure rates
TOTAL	100%	

Source: SubOptic2016

Repeater Laid off C/V Ile de Brehat

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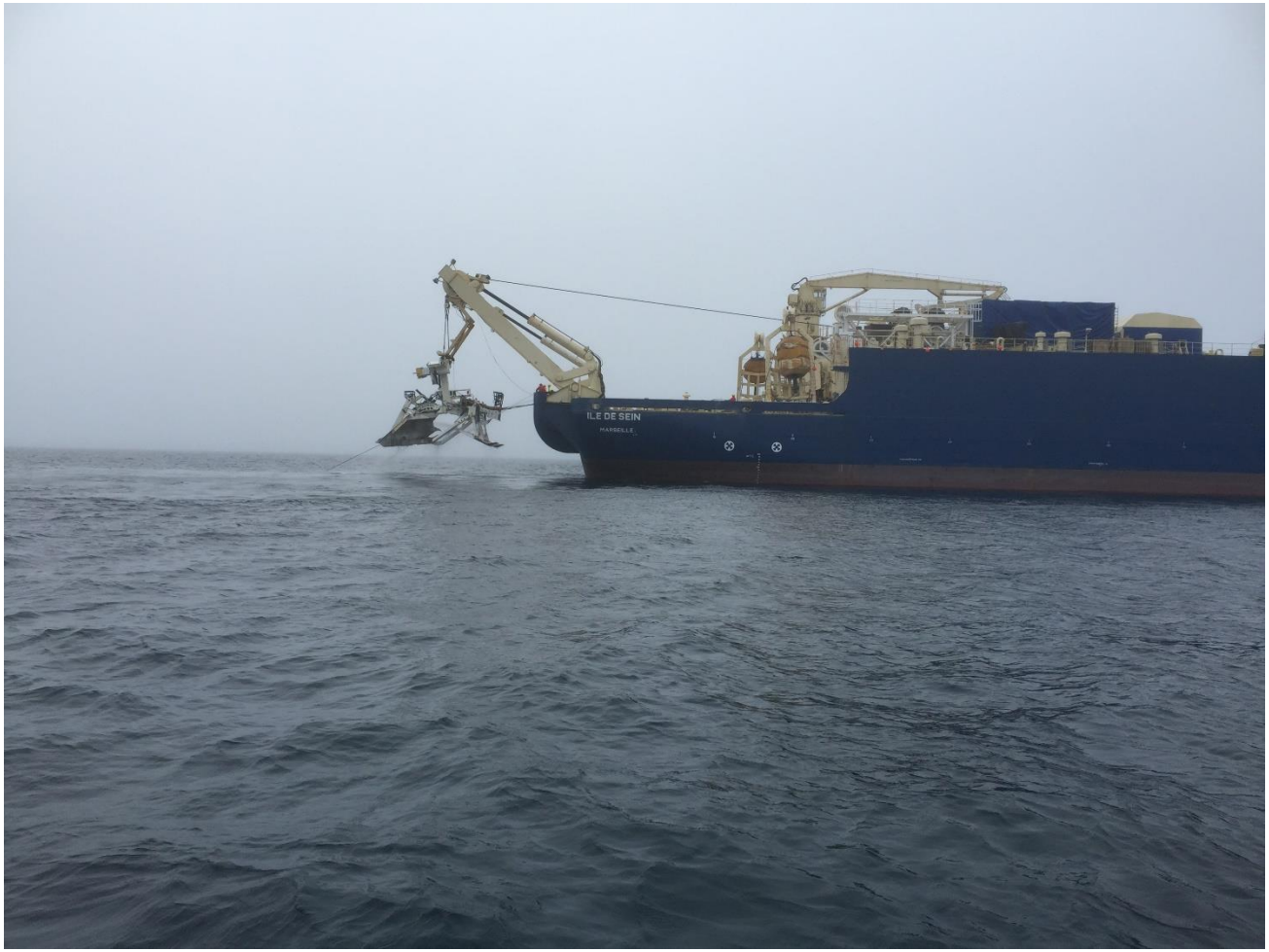
Ile de Sein Deploying Plough off Wainwright



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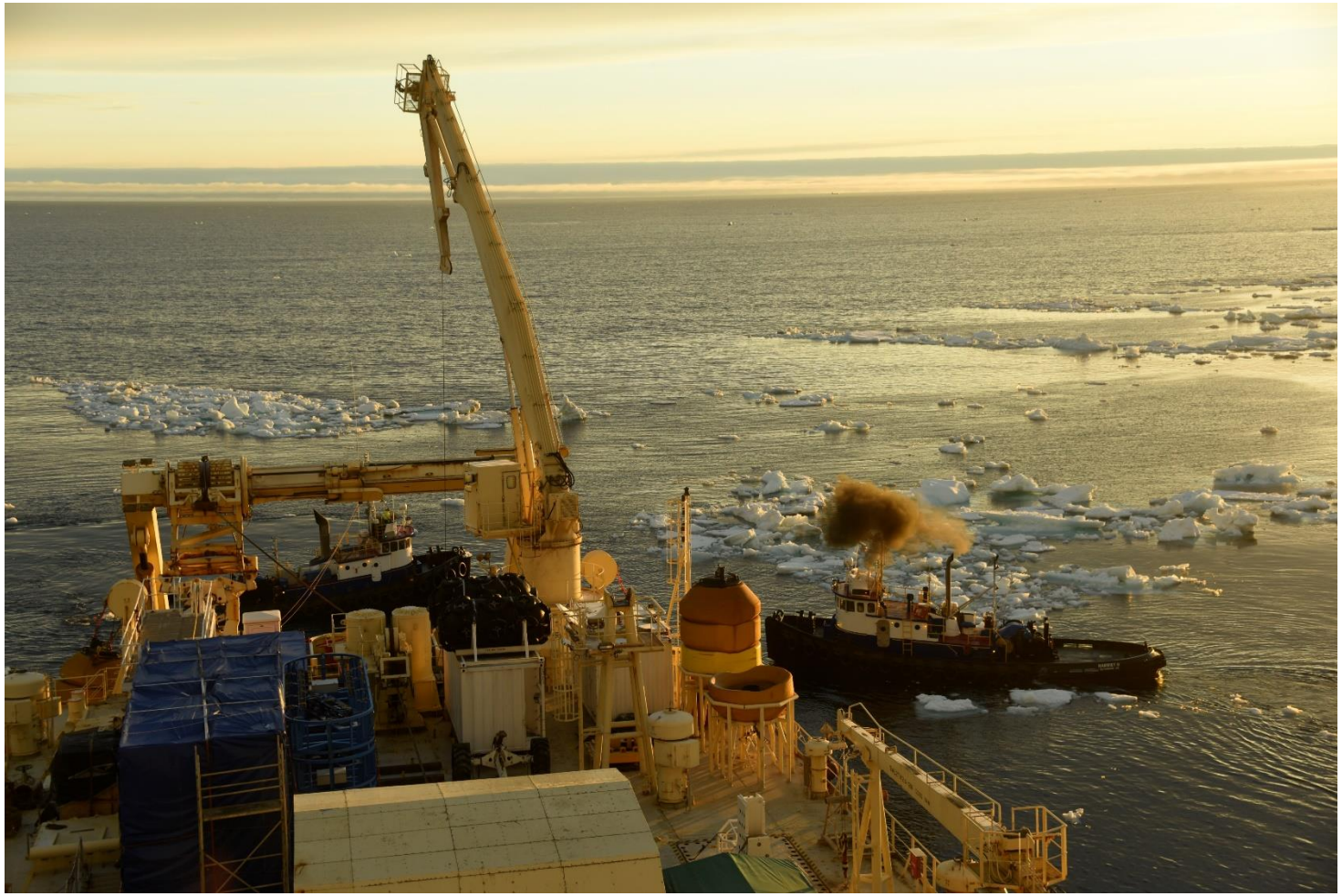
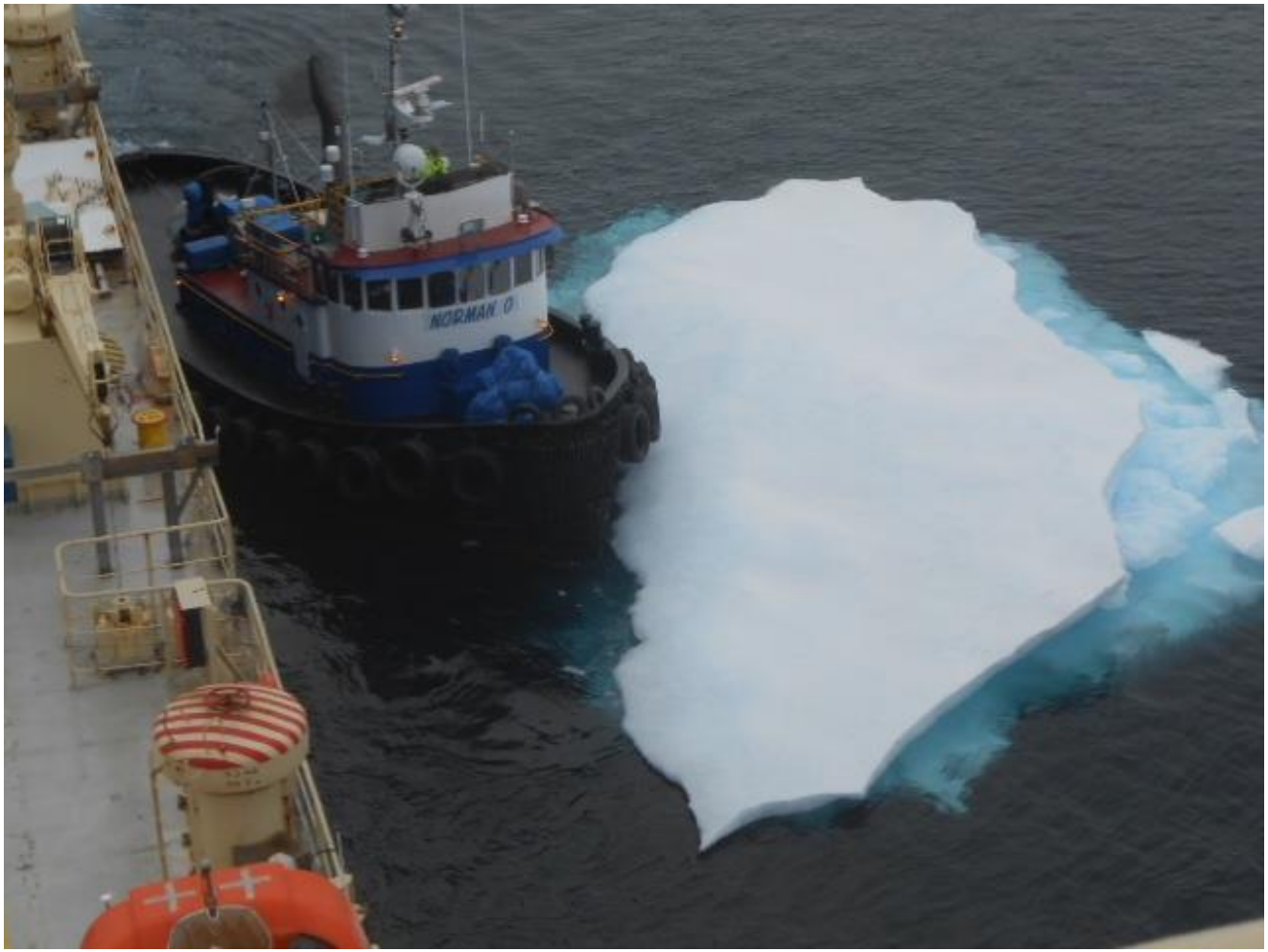
Managing Ice off Wainwright, Alaska



Support Vessel Managing Ice



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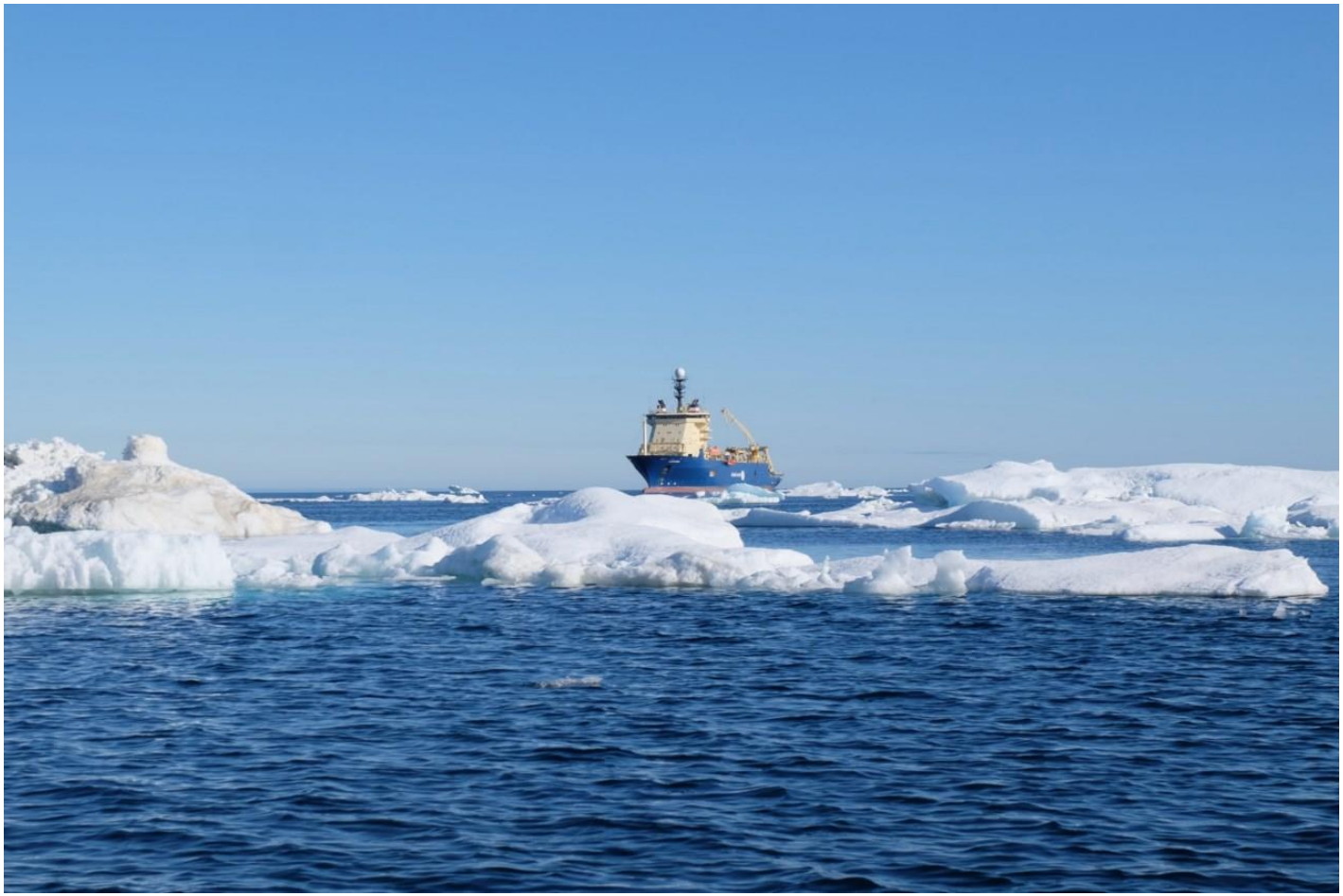
C/V Ile de Sein in Arctic Ice Flow



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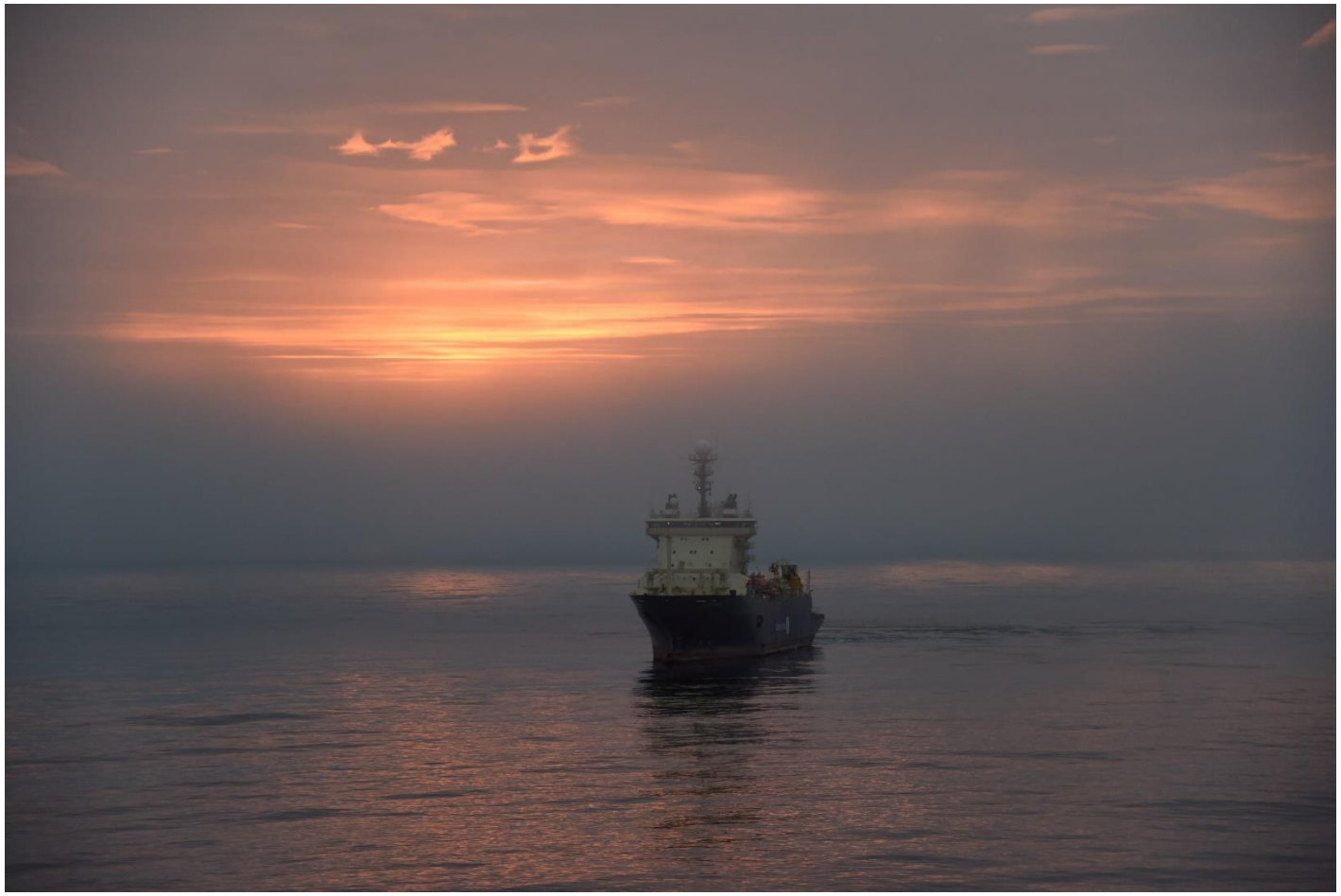
C/V Ile de Brehat off Barrow shore



THANK YOU

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