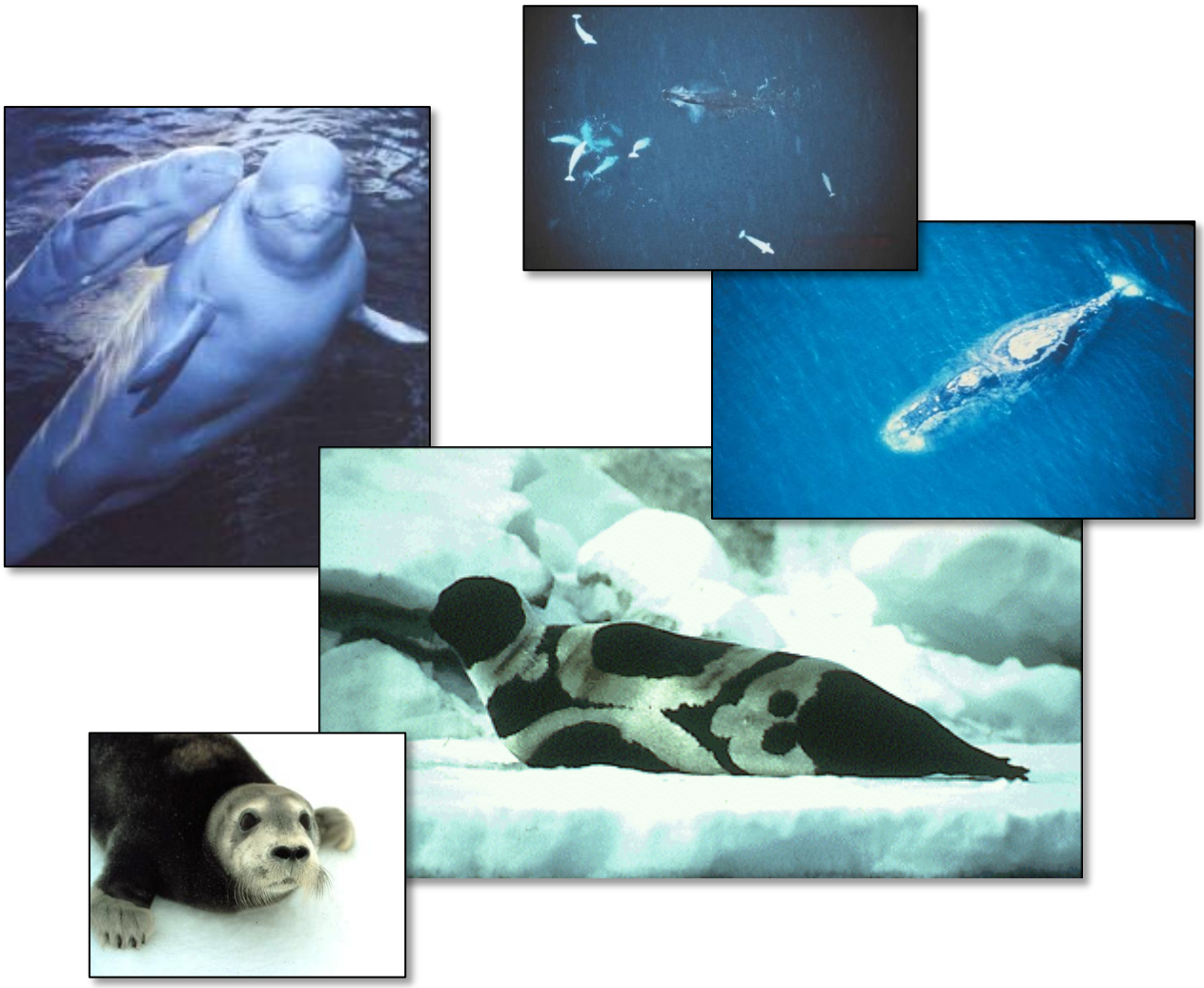
Effects of Oil and Gas Activities in the Arctic Ocean

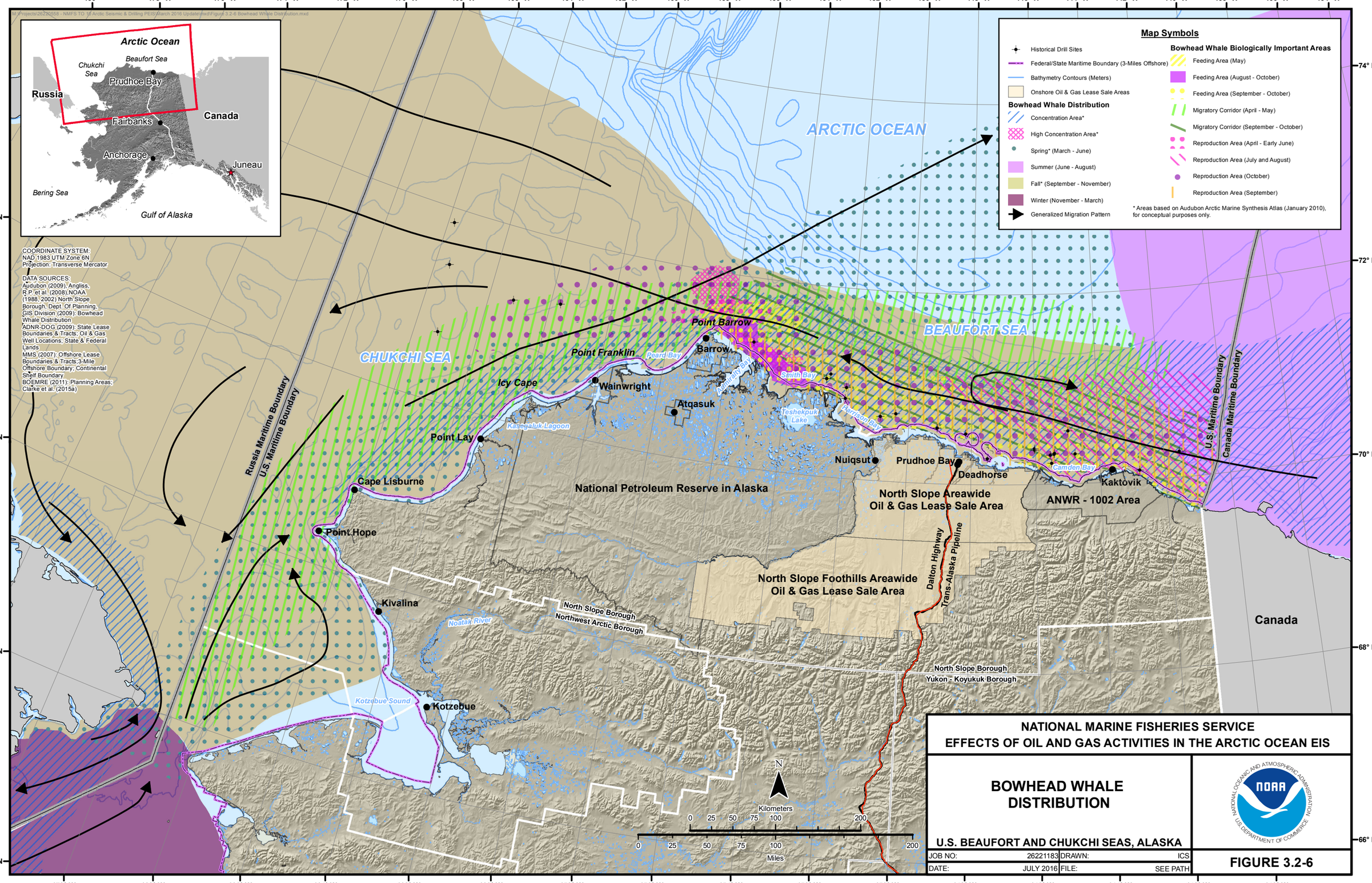
Final Environmental Impact Statement

Volume 3: Figures and Appendices



October 2016

United States Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Office of Protected Resources



NATIONAL MARINE FISHERIES SERVICE
EFFECTS OF OIL AND GAS ACTIVITIES IN THE ARCTIC OCEAN EIS

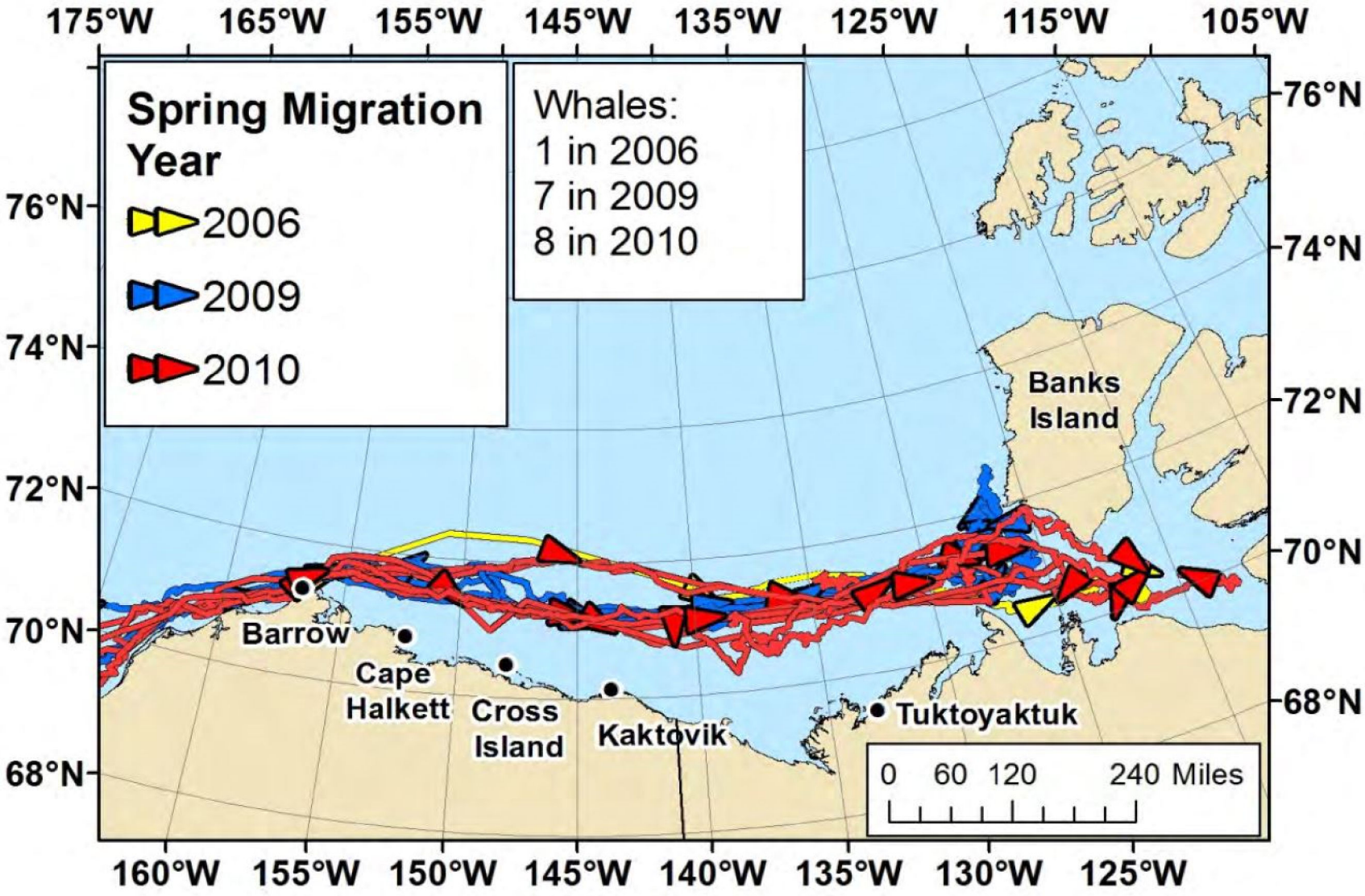
BOWHEAD WHALE DISTRIBUTION

U.S. BEAUFORT AND CHUKCHI SEAS, ALASKA

JOB NO:	26221183	DRAWN:	ICS
DATE:	JULY 2016	FILE:	SEE PATH

FIGURE 3.2-6

M:\Projects\26220558 - NMFS TO 10 Arctic Seismic & Drilling PEIS\March 2016 Update\mxd\Figure 3.2-7 Tracks of Satellite Tagged Bowhead Whales.mxd



DATA SOURCE:
Quakenbush et al. 2013

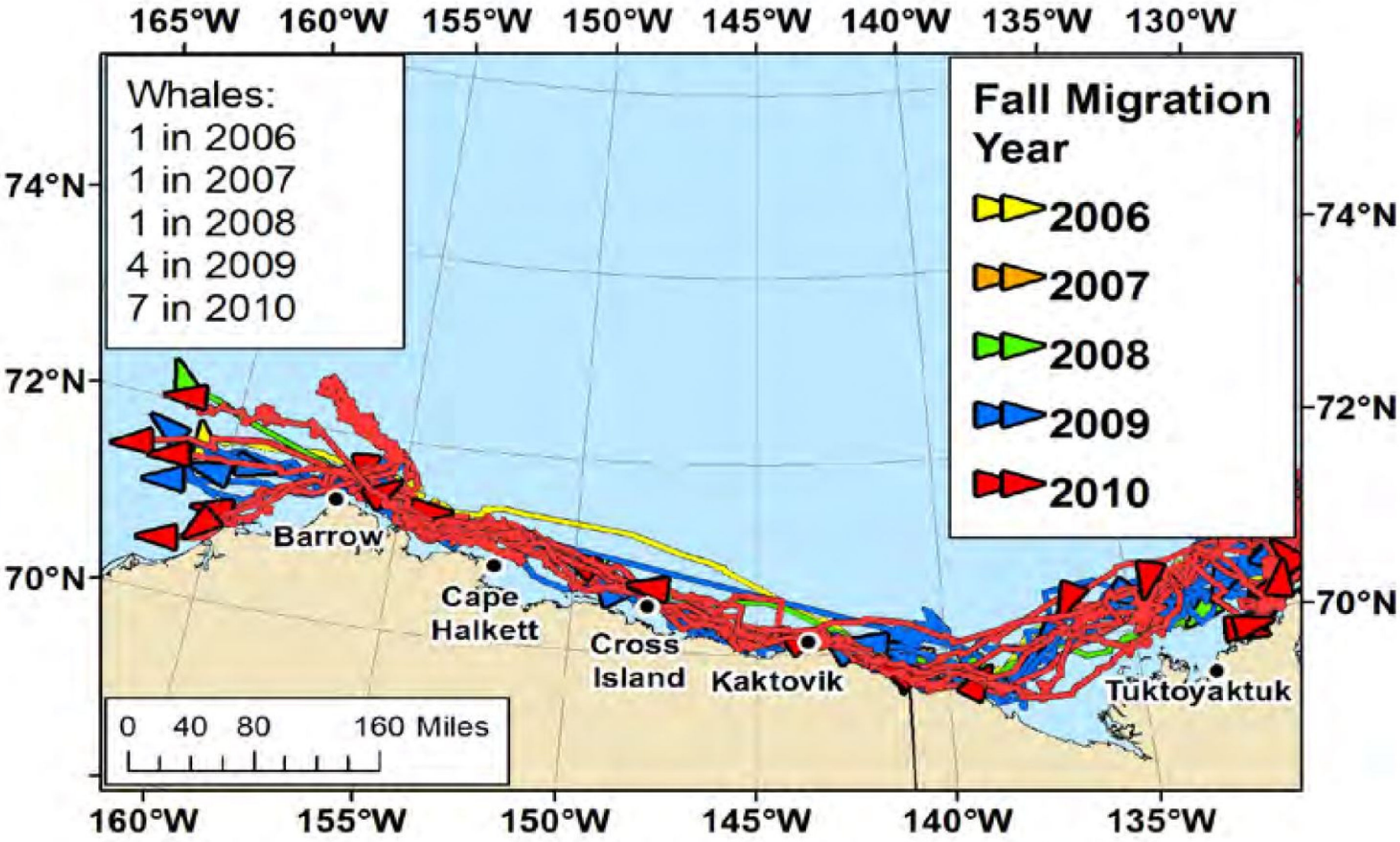
NATIONAL MARINE FISHERIES SERVICE
EFFECTS OF OIL AND GAS ACTIVITIES IN THE ARCTIC OCEAN EIS

TRACKS OF SATELLITE-TAGGED BOWHEAD WHALES DURING SPRING MIGRATION IN THE BEAUFORT SEA IN 2006, 2009, AND 2010

U.S. BEAUFORT SEA, ALASKA

JOB NO:	26221183	DRAWN:	ICS
DATE:	JULY 2016	FILE:	SEE PATH

FIGURE 3.2-7



DATA SOURCE:
Quakenbush et al. 2013

NATIONAL MARINE FISHERIES SERVICE
EFFECTS OF OIL AND GAS ACTIVITIES IN THE ARCTIC OCEAN EIS

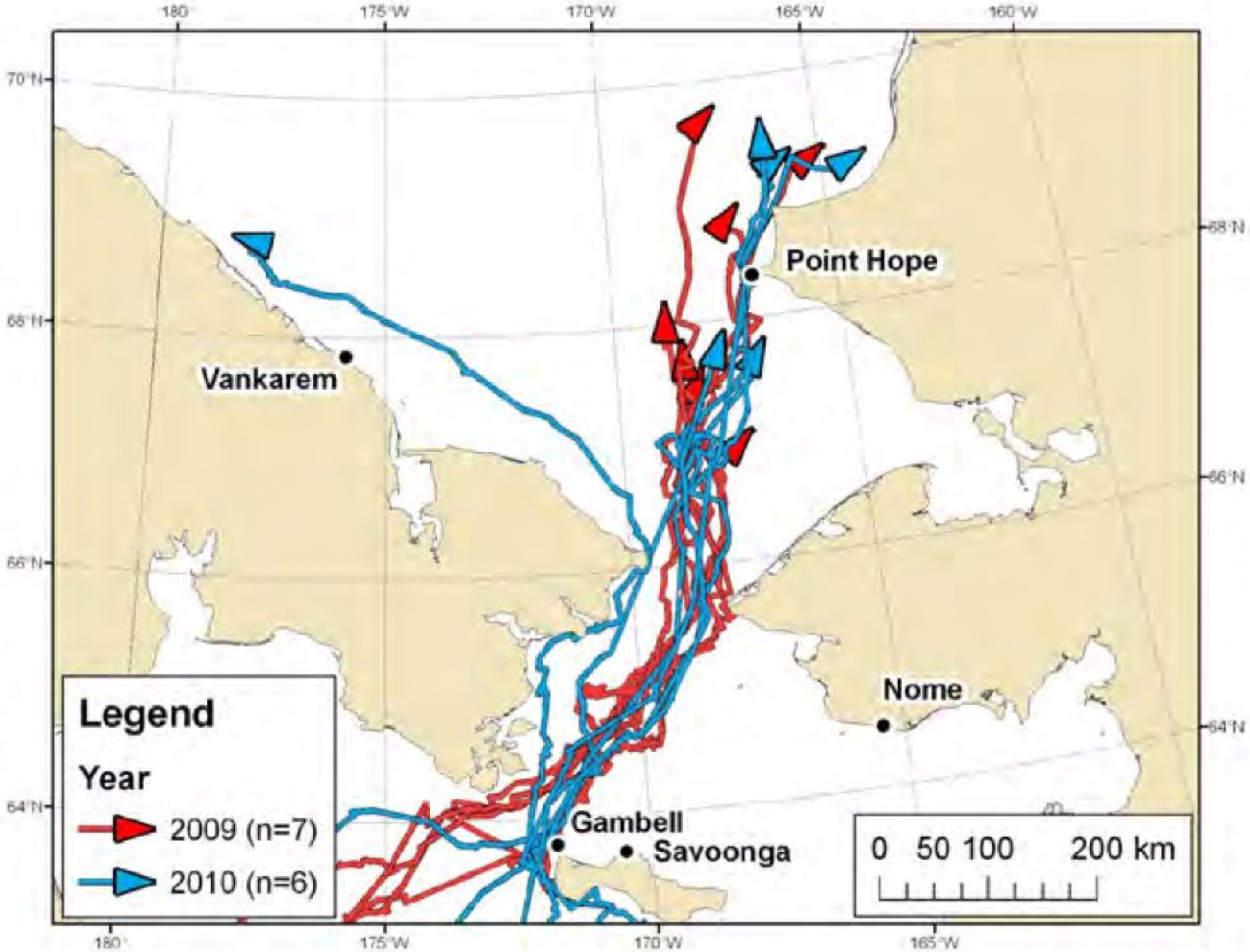
TRACKS OF TAGGED BOWHEAD WHALES TRAVELING WESTWARD IN THE BEAUFORT SEA - FALL MIGRATION 2006-2010

U.S. BEAUFORT SEA, ALASKA

JOB NO:	26221183	DRAWN:	ICS
DATE:	JULY 2016	FILE:	SEE PATH

FIGURE 3.2-8

M:\Projects\26220558 - NMFS TO 10 Arctic Seismic & Drilling PEIS\March 2016 Update\mxd\Figure 3.2-9 Tracks of Satellite Tagged Bowhead Whales.mxd



DATA SOURCE:
Quakenbush et al. 2013

NATIONAL MARINE FISHERIES SERVICE
EFFECTS OF OIL AND GAS ACTIVITIES IN THE ARCTIC OCEAN EIS

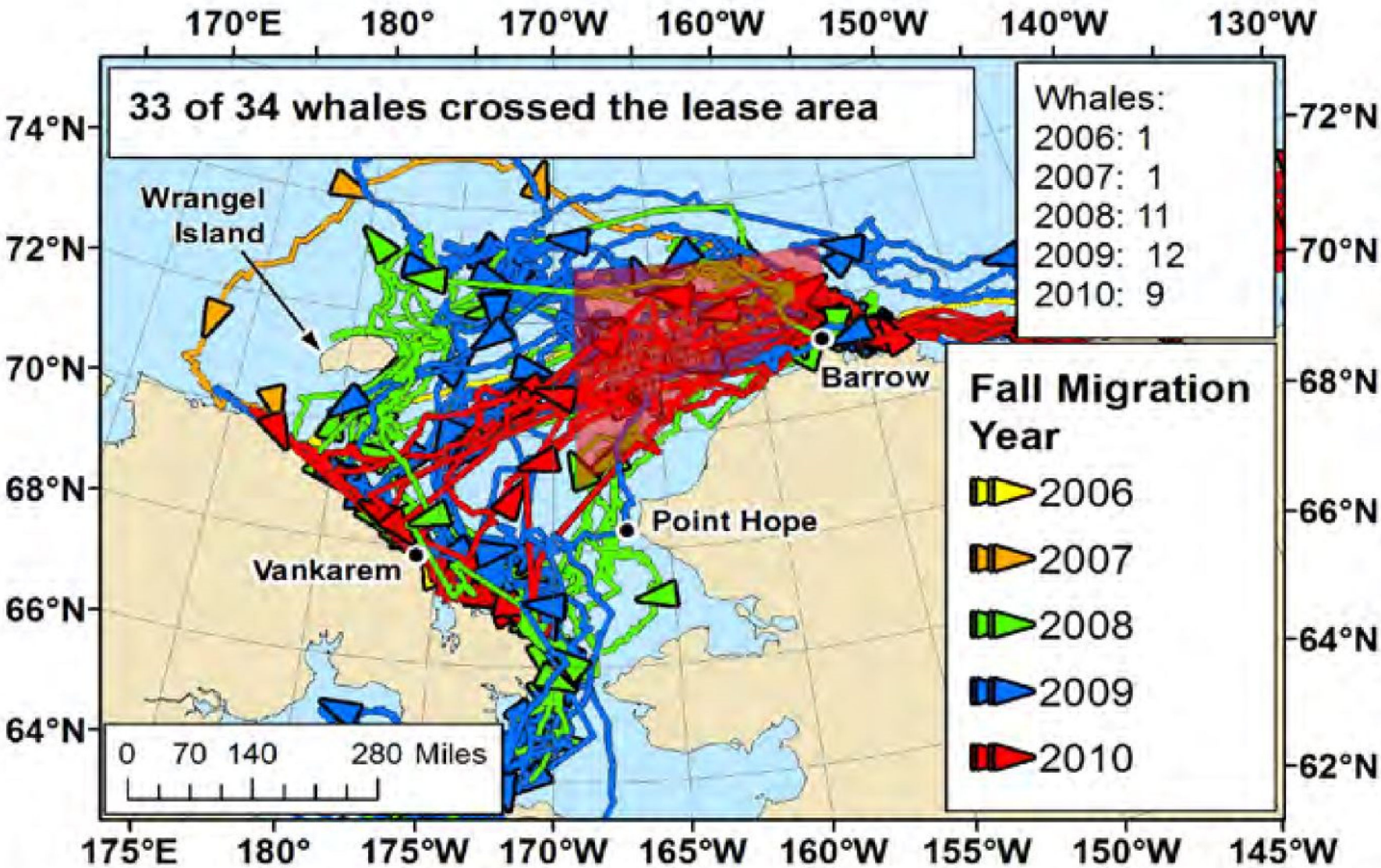
TRACKS OF BOWHEAD WHALES LEAVING THE BERING SEA ON SPRING MIGRATION ALONG THE WESTERN CHUKCHI SEA COAST - 2009 AND 2010

U.S. BEAUFORT AND CHUKCHI SEAS, ALASKA

JOB NO:	26221183	DRAWN:	ICS
DATE:	JULY 2016	FILE:	SEE PATH

FIGURE 3.2-9

M:\Projects\26220558 - NMFS TO 10 Arctic Seismic & Drilling PEIS\March 2016 Update\mxd\Figure 3.2-10 Tracks of Thirty Two Satellite Tagged Bowheads.mxd



DATA SOURCE:
Quakenbush et al. 2013

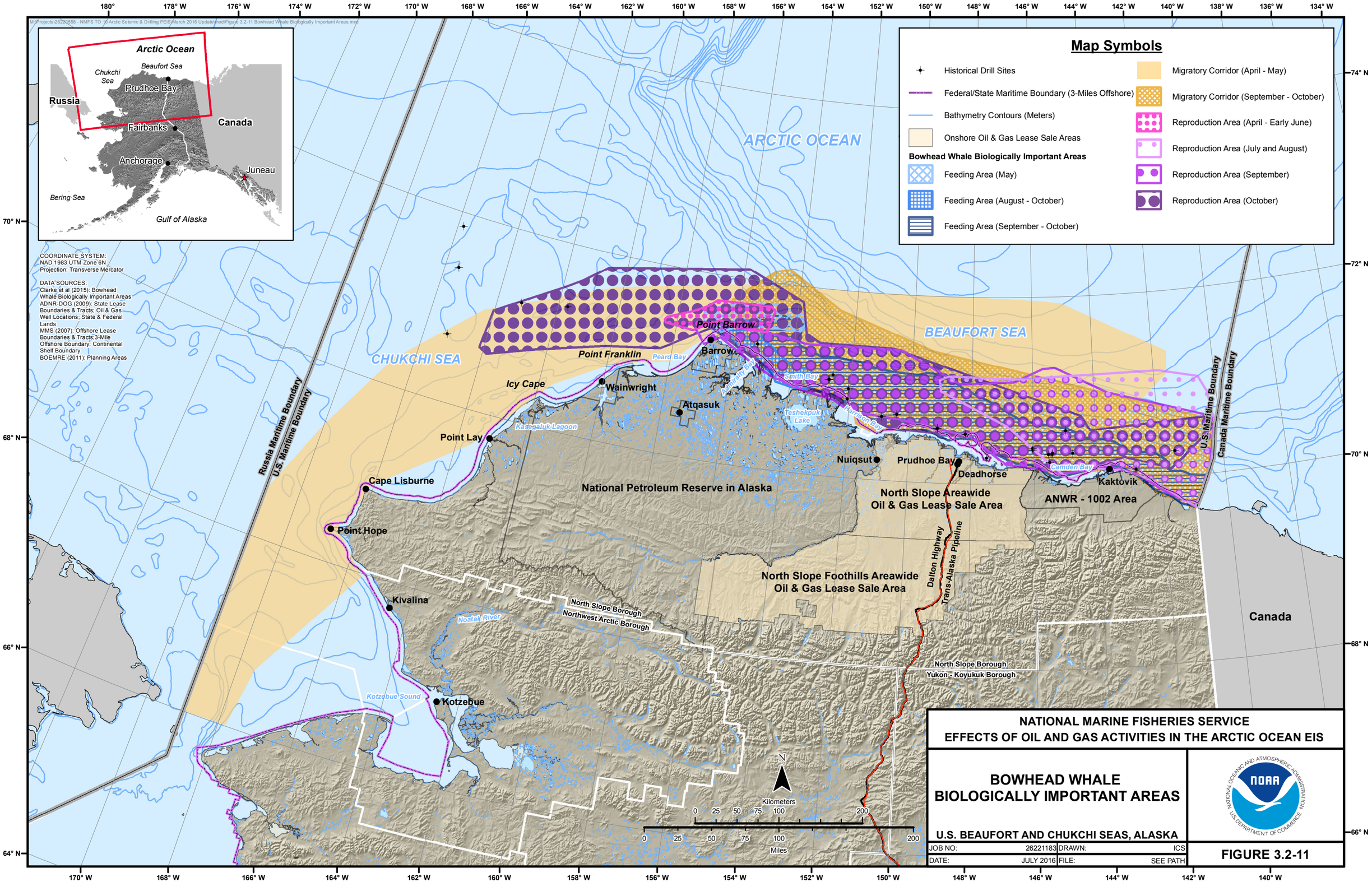
NATIONAL MARINE FISHERIES SERVICE
EFFECTS OF OIL AND GAS ACTIVITIES IN THE ARCTIC OCEAN EIS

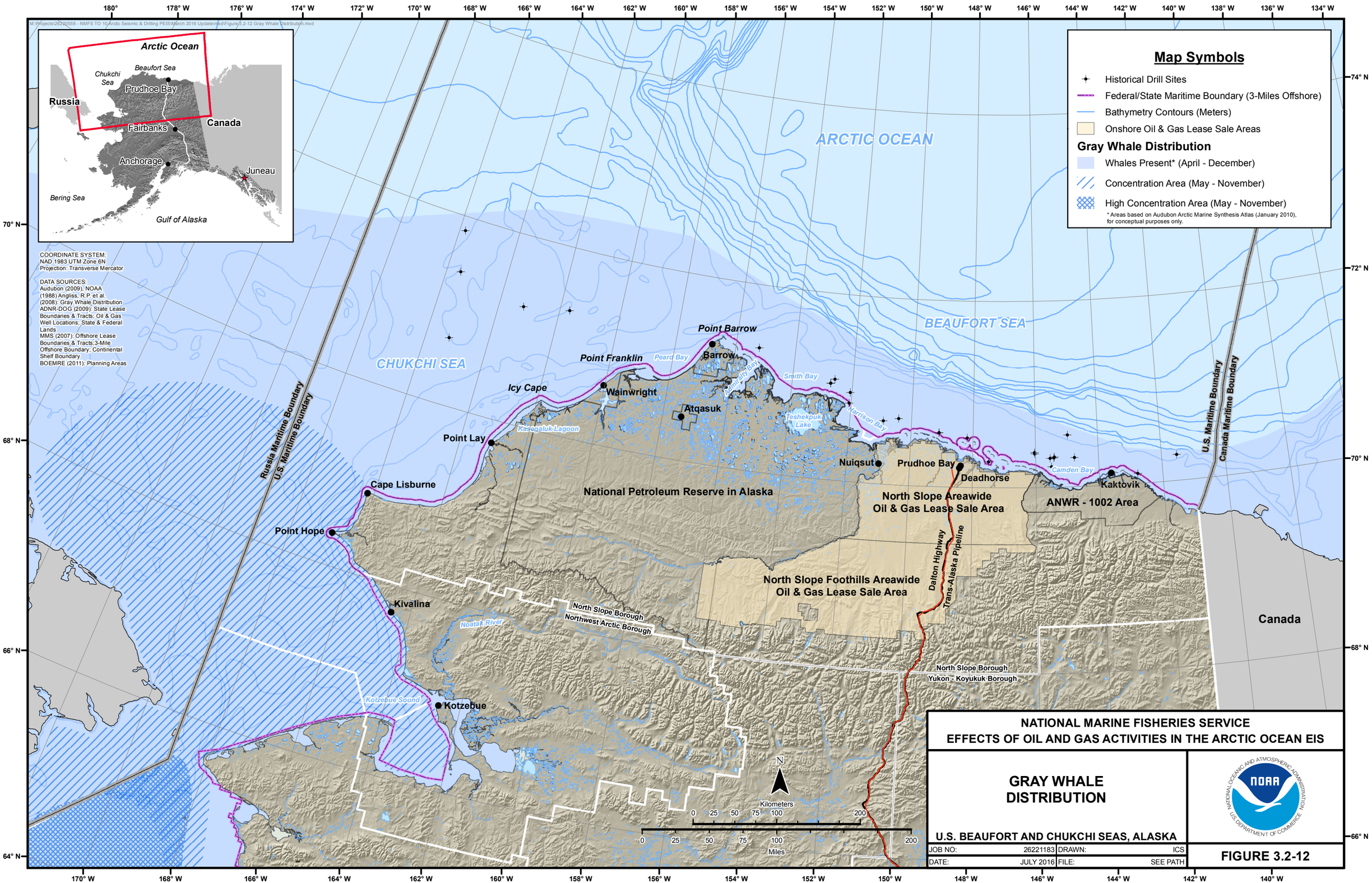
TRACKS OF THIRTY-TWO SATELLITE-TAGGED BOWHEAD WHALES IN THE CHUKCHI SEA FROM AUGUST THROUGH DECEMBER, 2006–2010 RELATIVE TO CHUKCHI LEASE SALE 193

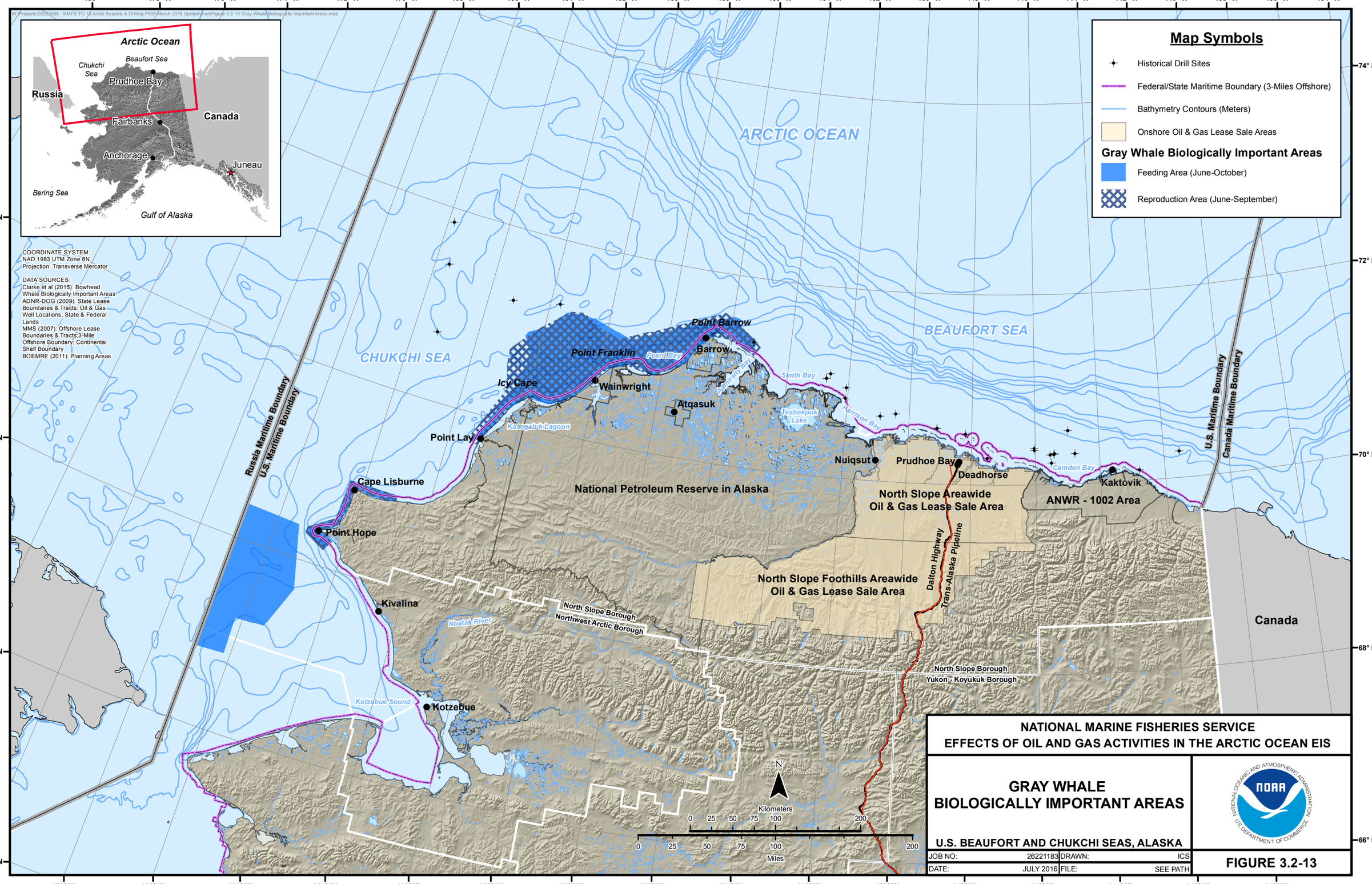
U.S. CHUKCHI SEA, ALASKA

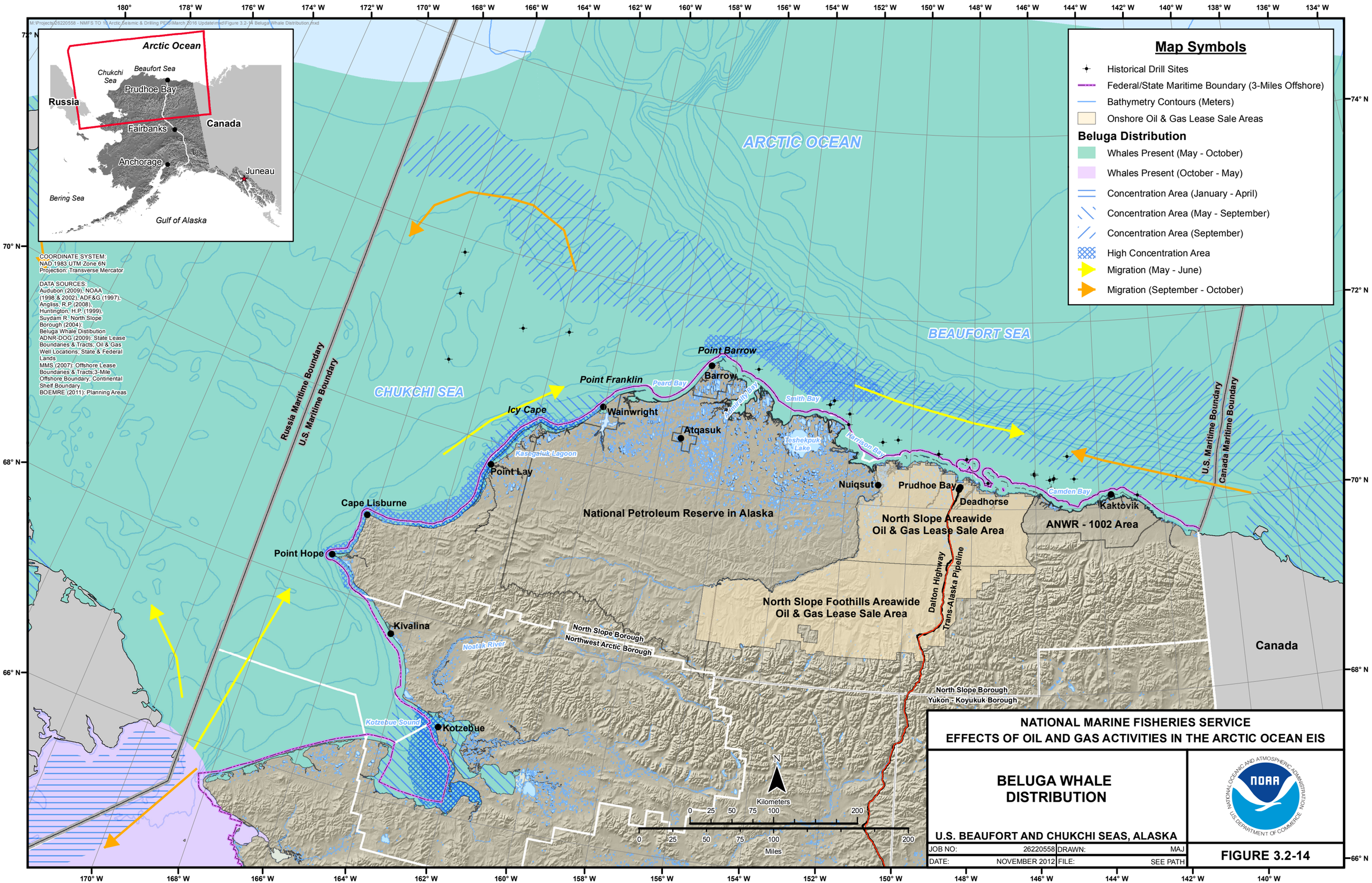
JOB NO:	26221183	DRAWN:	ICS
DATE:	JULY 2016	FILE:	SEE PATH

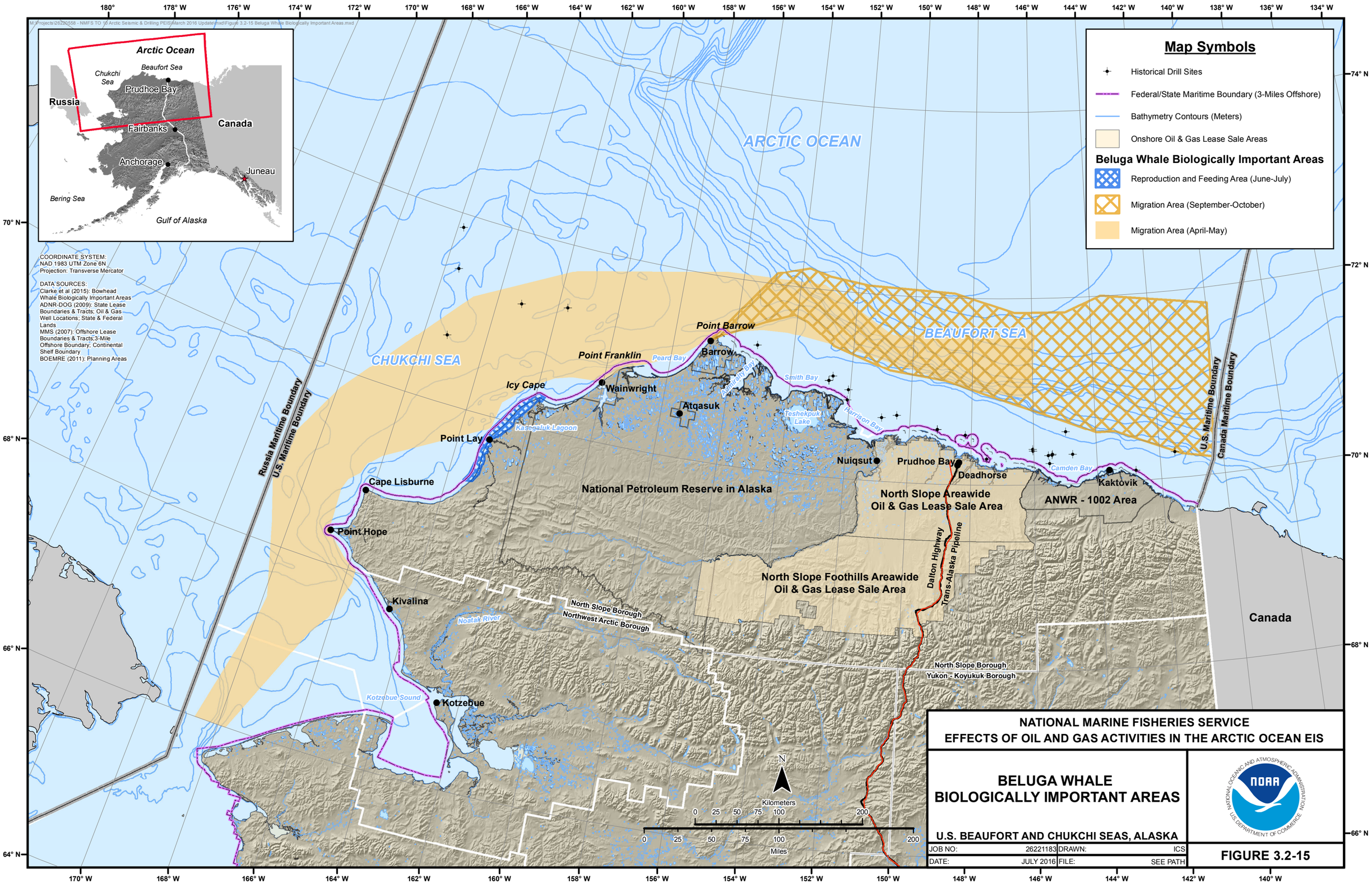
FIGURE 3.2-10

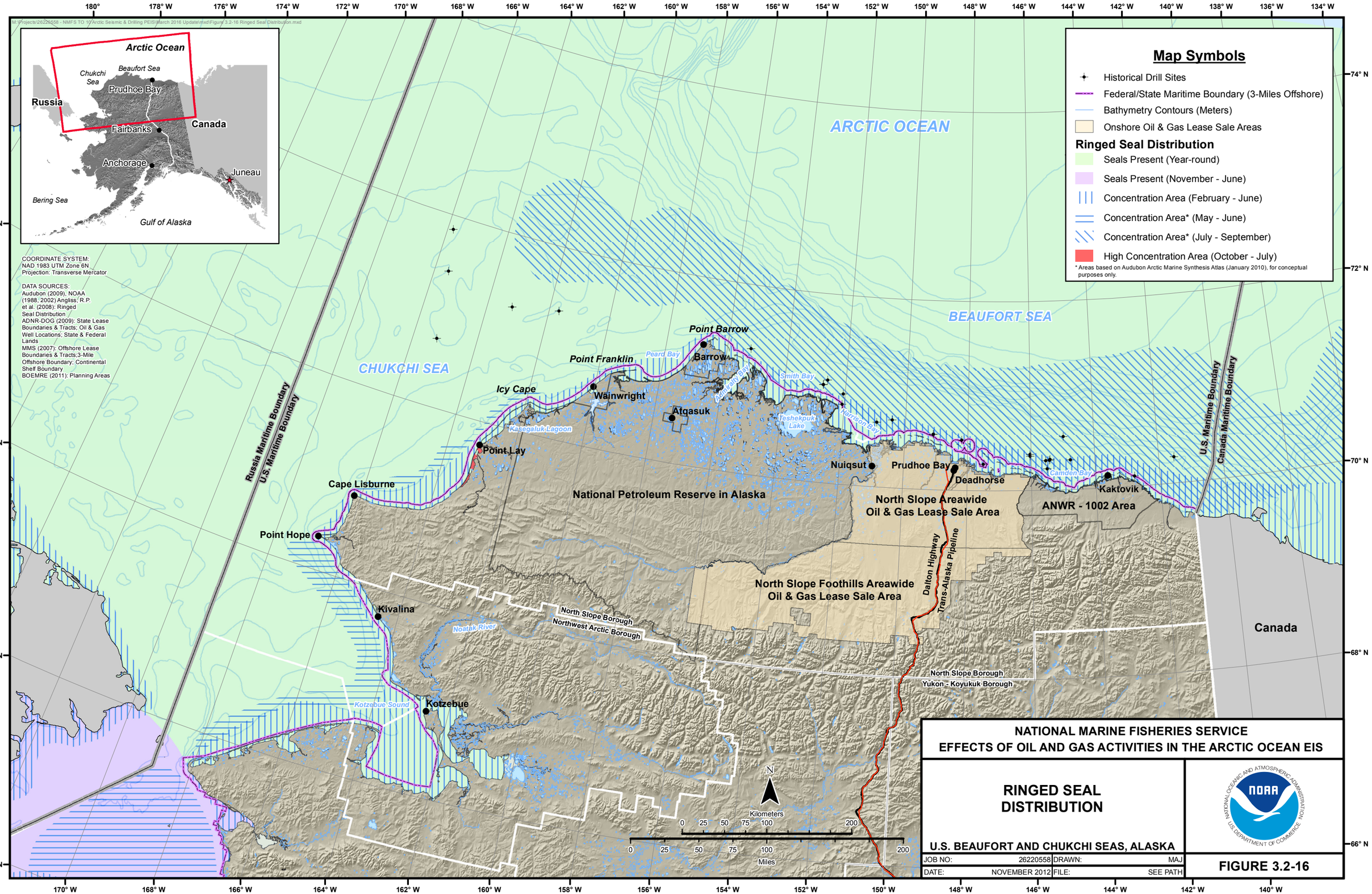

M:\Projects\26221558 - NMFS TO 10 Arctic Seismic & Drilling PEIS\March 2016 Update\mxd\Figure 3.2-11 Bowhead Whale Biologically Important Areas.mxd
Arctic Ocean
Beaufort Sea
Chukchi Sea
Prudhoe Bay
Russia
Canada
Fairbanks
Anchorage
Juneau
Bering Sea
Gulf of Alaska
COORDINATE SYSTEM:
NAD 1983 UTM Zone 6N
Projection: Transverse Mercator
DATA SOURCES:
Clarke et al (2015): Bowhead Whale Biologically Important Areas
ADNR-DOG (2009): State Lease Boundaries & Tracts; Oil & Gas Well Locations; State & Federal Lands
MMS (2007): Offshore Lease Boundaries & Tracts;3-Mile Offshore Boundary; Continental Shelf Boundary
BOEMRE (2011): Planning Areas
Map Symbols
Historical Drill Sites
Federal/State Maritime Boundary (3-Miles Offshore)
Bathymetry Contours (Meters)
Onshore Oil & Gas Lease Sale Areas
Bowhead Whale Biologically Important Areas
Feeding Area (May)
Feeding Area (August - October)
Feeding Area (September - October)
Migratory Corridor (April - May)
Migratory Corridor (September - October)
Reproduction Area (April - Early June)
Reproduction Area (July and August)
Reproduction Area (September)
Reproduction Area (October)
ARCTIC OCEAN
BEAUFORT SEA
CHUKCHI SEA
Point Barrow
Barrow
Point Franklin
Peard Bay
Icy Cape
Wainwright
Atqasuk
Smith Bay
Teshekpuk Lake
Kasegaluk Lagoon
Point Lay
Nuiqsut
Prudhoe Bay
Deadhorse
Camden Bay
Kaktovik
Cape Lisburne
Point Hope
Kivalina
Noatak River
Kotzebue Sound
Kotzebue
Russia Maritime Boundary
U.S. Maritime Boundary
U.S. Maritime Boundary
Canada Maritime Boundary
National Petroleum Reserve in Alaska
North Slope Areawide Oil & Gas Lease Sale Area
ANWR - 1002 Area
North Slope Foothills Areawide Oil & Gas Lease Sale Area
Dalton Highway
Trans-Alaska Pipeline
North Slope Borough
Northwest Arctic Borough
North Slope Borough
Yukon - Koyukuk Borough
Canada
N
Kilometers
0 25 50 75 100 200
Miles
0 25 50 75 100 200
NATIONAL MARINE FISHERIES SERVICE
EFFECTS OF OIL AND GAS ACTIVITIES IN THE ARCTIC OCEAN EIS
BOWHEAD WHALE BIOLOGICALLY IMPORTANT AREAS
U.S. BEAUFORT AND CHUKCHI SEAS, ALASKA
JOB NO: 26221183 DRAWN: ICS
DATE: JULY 2016 FILE: SEE PATH
FIGURE 3.2-11

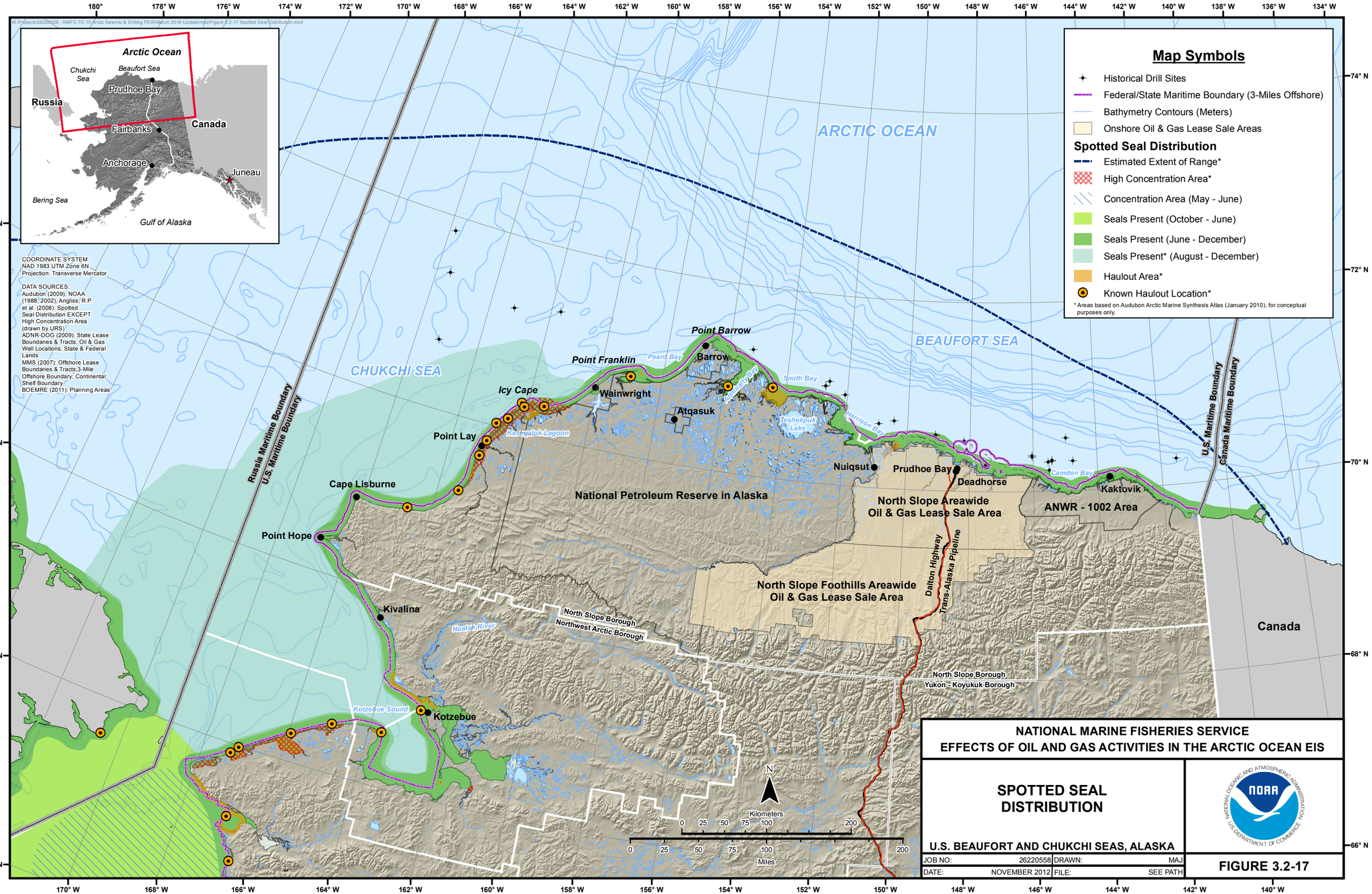

M:\Projects\26220558 - NMFS TO 10 Arctic Seismic & Drilling PEIS\March 2016 Updates\mxd\Figure 3.2-12 Gray Whale Distribution.mxd
Arctic Ocean
Beaufort Sea
Chukchi Sea
Prudhoe Bay
Russia
Canada
Fairbanks
Anchorage
Juneau
Bering Sea
Gulf of Alaska
COORDINATE SYSTEM:
NAD 1983 UTM Zone 6N
Projection: Transverse Mercator
DATA SOURCES:
Audubon (2009); NOAA
(1988) Angliss, R.P. et al.
(2008): Gray Whale Distribution
ADNR-DOG (2009): State Lease Boundaries & Tracts; Oil & Gas Well Locations; State & Federal Lands
MMS (2007): Offshore Lease Boundaries & Tracts;3-Mile Offshore Boundary; Continental Shelf Boundary
BOEMRE (2011): Planning Areas
Map Symbols
Historical Drill Sites
Federal/State Maritime Boundary (3-Miles Offshore)
Bathymetry Contours (Meters)
Onshore Oil & Gas Lease Sale Areas
Gray Whale Distribution
Whales Present* (April - December)
Concentration Area (May - November)
High Concentration Area (May - November)
* Areas based on Audubon Arctic Marine Synthesis Atlas (January 2010), for conceptual purposes only.
ARCTIC OCEAN
BEAUFORT SEA
CHUKCHI SEA
Point Barrow
Barrow
Point Franklin
Peard Bay
Smith Bay
Icy Cape
Wainwright
Atqasuk
Teshekpuk Lake
Harrison Bay
Kasegaluk Lagoon
Point Lay
Nuiqsut
Prudhoe Bay
Deadhorse
Camden Bay
Kaktovik
Cape Lisburne
Point Hope
National Petroleum Reserve in Alaska
North Slope Areawide Oil & Gas Lease Sale Area
ANWR - 1002 Area
North Slope Foothills Areawide Oil & Gas Lease Sale Area
Dalton Highway
Trans-Alaska Pipeline
Russia Maritime Boundary
U.S. Maritime Boundary
U.S. Maritime Boundary
Canada Maritime Boundary
Canada
Kivalina
Noatak River
North Slope Borough
Northwest Arctic Borough
North Slope Borough
Yukon - Koyukuk Borough
Kotzebue Sound
Kotzebue
N
Kilometers
0 25 50 75 100 200
0 25 50 75 100 200
Miles
NATIONAL MARINE FISHERIES SERVICE
EFFECTS OF OIL AND GAS ACTIVITIES IN THE ARCTIC OCEAN EIS
GRAY WHALE DISTRIBUTION
U.S. BEAUFORT AND CHUKCHI SEAS, ALASKA
JOB NO: 26221183 DRAWN: ICS
DATE: JULY 2016 FILE: SEE PATH
FIGURE 3.2-12

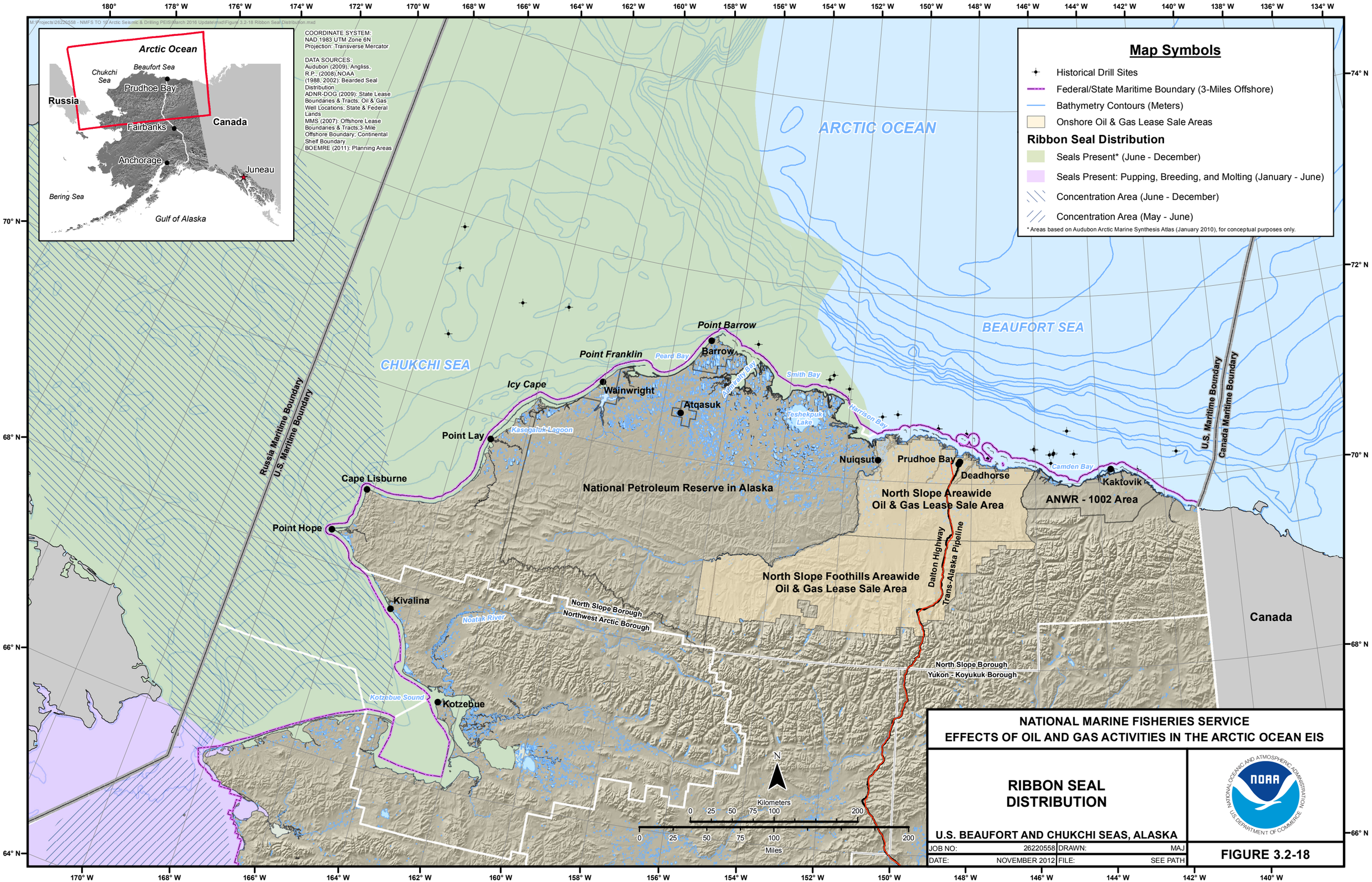

M:\Projects\26220558 - NMFS TO 10 Arctic Seismic & Drilling PEIS\March 2016 Update\mxd\Figure 3.2-13 Gray Whale Biologically Important Areas.mxd
Arctic Ocean
Beaufort Sea
Chukchi Sea
Prudhoe Bay
Russia
Canada
Fairbanks
Anchorage
Juneau
Bering Sea
Gulf of Alaska
COORDINATE SYSTEM:
NAD 1983 UTM Zone 6N
Projection: Transverse Mercator
DATA SOURCES:
Clarke et al (2015): Bowhead Whale Biologically Important Areas
ADNR-DOG (2009): State Lease Boundaries & Tracts; Oil & Gas Well Locations; State & Federal Lands
MMS (2007): Offshore Lease Boundaries & Tracts;3-Mile Offshore Boundary; Continental Shelf Boundary
BOEMRE (2011): Planning Areas
Map Symbols
Historical Drill Sites
Federal/State Maritime Boundary (3-Miles Offshore)
Bathymetry Contours (Meters)
Onshore Oil & Gas Lease Sale Areas
Gray Whale Biologically Important Areas
Feeding Area (June-October)
Reproduction Area (June-September)
ARCTIC OCEAN
BEAUFORT SEA
CHUKCHI SEA
Point Barrow
Barrow
Point Franklin
Peard Bay
Icy Cape
Wainwright
Atqasuk
Smith Bay
Dease Inlet
Teshekpuk Lake
Harrison Bay
Kasegaluk Lagoon
Point Lay
Nuiqsut
Prudhoe Bay
Deadhorse
Camden Bay
Kaktovik
Cape Lisburne
Point Hope
National Petroleum Reserve in Alaska
North Slope Areawide Oil & Gas Lease Sale Area
ANWR - 1002 Area
North Slope Foothills Areawide Oil & Gas Lease Sale Area
Dalton Highway
Trans-Alaska Pipeline
Russia Maritime Boundary
U.S. Maritime Boundary
Canada Maritime Boundary
Kivalina
Noatak River
North Slope Borough
Northwest Arctic Borough
Yukon - Koyukuk Borough
Kotzebue Sound
Kotzebue
Canada
Kilometers
Miles
NATIONAL MARINE FISHERIES SERVICE
EFFECTS OF OIL AND GAS ACTIVITIES IN THE ARCTIC OCEAN EIS
GRAY WHALE BIOLOGICALLY IMPORTANT AREAS
U.S. BEAUFORT AND CHUKCHI SEAS, ALASKA
JOB NO: 26221183 DRAWN: ICS
DATE: JULY 2016 FILE: SEE PATH
FIGURE 3.2-13

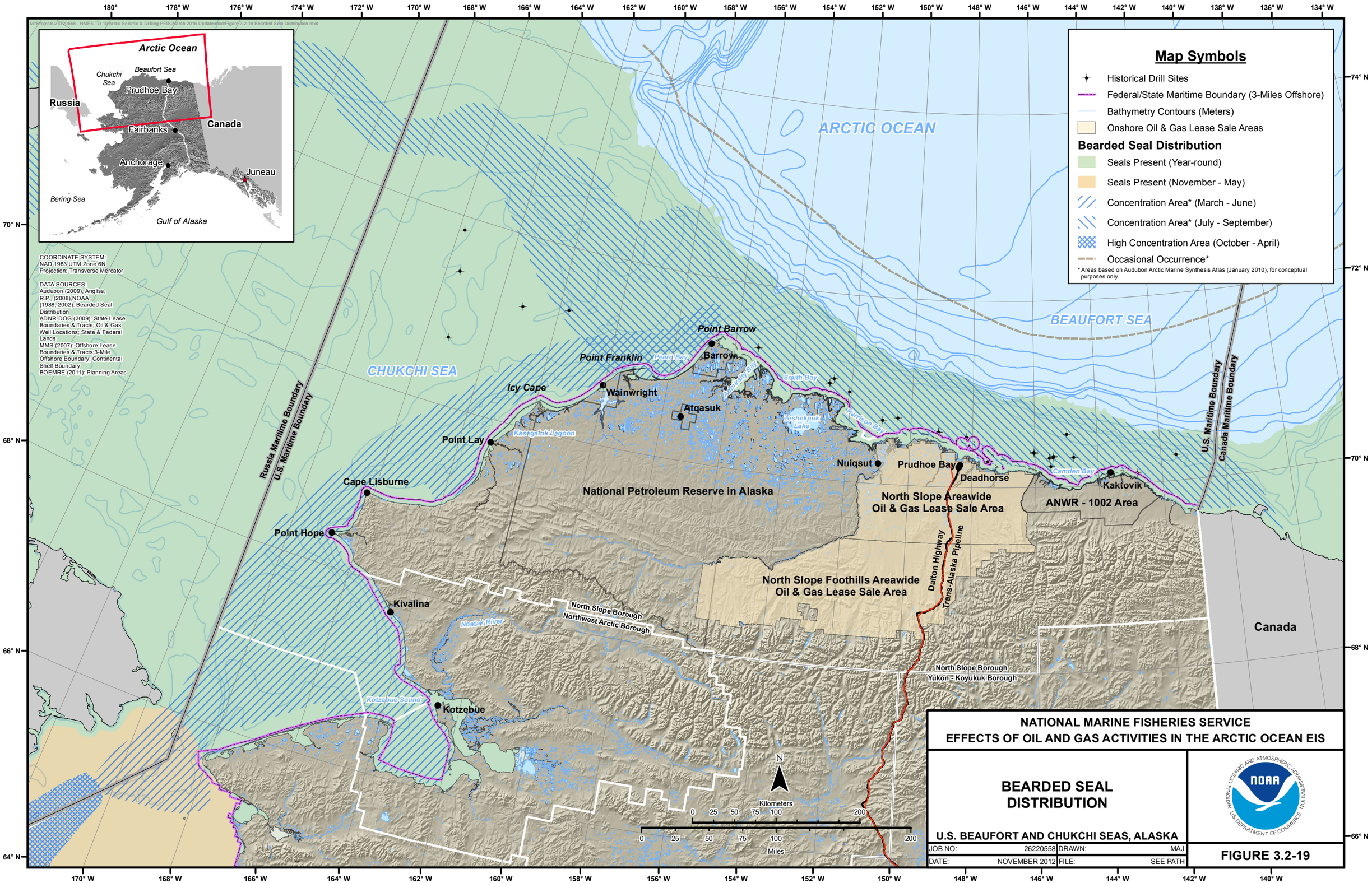

M:\Projects\26220558 - NMFS TO 10 Arctic Seismic & Drilling PEIS\March 2016 Updates\mxd\Figure 3.2-14 Beluga Whale Distribution.mxd
Arctic Ocean
Beaufort Sea
Chukchi Sea
Prudhoe Bay
Russia
Canada
Fairbanks
Anchorage
Juneau
Bering Sea
Gulf of Alaska
COORDINATE SYSTEM:
NAD 1983 UTM Zone 6N
Projection: Transverse Mercator
DATA SOURCES:
Audubon (2009); NOAA (1998 & 2002); ADF&G (1997); Angliss, R.P. (2008); Huntington, H.P. (1999); Suydam R. North Slope Borough (2004): Beluga Whale Distibution
ADNR-DOG (2009): State Lease Boundaries & Tracts; Oil & Gas Well Locations; State & Federal Lands
MMS (2007): Offshore Lease Boundaries & Tracts;3-Mile Offshore Boundary; Continental Shelf Boundary
BOEMRE (2011): Planning Areas
Map Symbols
Historical Drill Sites
Federal/State Maritime Boundary (3-Miles Offshore)
Bathymetry Contours (Meters)
Onshore Oil & Gas Lease Sale Areas
Beluga Distribution
Whales Present (May - October)
Whales Present (October - May)
Concentration Area (January - April)
Concentration Area (May - September)
Concentration Area (September)
High Concentration Area
Migration (May - June)
Migration (September - October)
ARCTIC OCEAN
BEAUFORT SEA
CHUKCHI SEA
Russia Maritime Boundary
U.S. Maritime Boundary
Canada Maritime Boundary
Point Barrow
Barrow
Point Franklin
Peard Bay
Smith Bay
Icy Cape
Wainwright
Atqasuk
Teshekpuk Lake
Harrison Bay
Kasegaluk Lagoon
Point Lay
Nuiqsut
Prudhoe Bay
Deadhorse
Camden Bay
Kaktovik
Cape Lisburne
Point Hope
National Petroleum Reserve in Alaska
North Slope Areawide Oil & Gas Lease Sale Area
ANWR - 1002 Area
Dalton Highway
Trans-Alaska Pipeline
North Slope Foothills Areawide Oil & Gas Lease Sale Area
Kivalina
Noatak River
North Slope Borough
Northwest Arctic Borough
North Slope Borough
Yukon - Koyukuk Borough
Canada
Kotzebue Sound
Kotzebue
N
Kilometers
0 25 50 75 100 200
0 25 50 75 100 200
Miles
NATIONAL MARINE FISHERIES SERVICE
EFFECTS OF OIL AND GAS ACTIVITIES IN THE ARCTIC OCEAN EIS
BELUGA WHALE DISTRIBUTION
U.S. BEAUFORT AND CHUKCHI SEAS, ALASKA
JOB NO: 26220558
DRAWN: MAJ
DATE: NOVEMBER 2012
FILE: SEE PATH
FIGURE 3.2-14

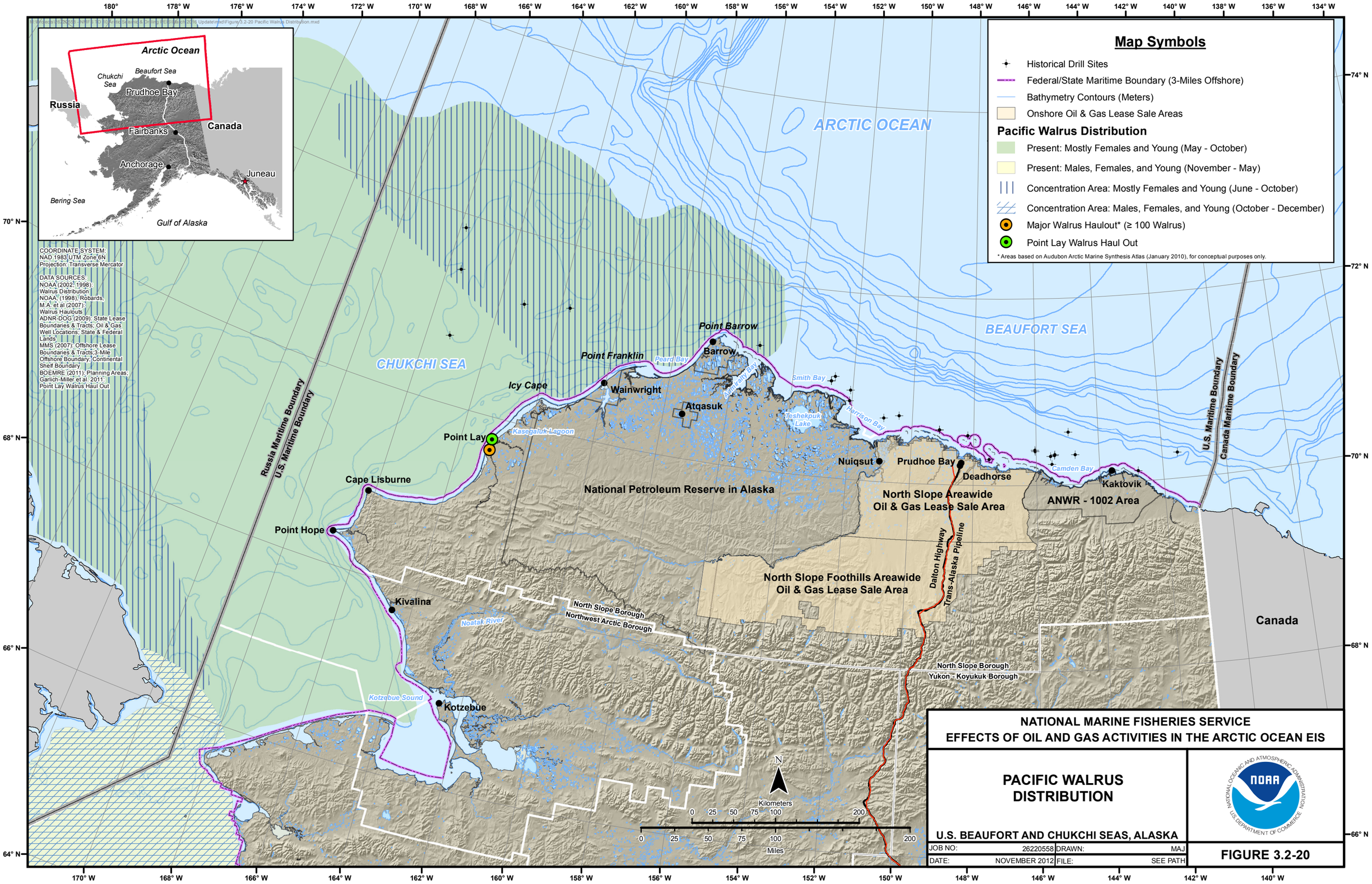

M:\Projects\26221558 - NMFS TO 10 Arctic Seismic & Drilling PEIS\March 2016 Update\mxd\Figure 3.2-15 Beluga Whale Biologically Important Areas.mxd
Arctic Ocean
Beaufort Sea
Chukchi Sea
Prudhoe Bay
Russia
Canada
Fairbanks
Anchorage
Juneau
Bering Sea
Gulf of Alaska
Map Symbols
Historical Drill Sites
Federal/State Maritime Boundary (3-Miles Offshore)
Bathymetry Contours (Meters)
Onshore Oil & Gas Lease Sale Areas
Beluga Whale Biologically Important Areas
Reproduction and Feeding Area (June-July)
Migration Area (September-October)
Migration Area (April-May)
COORDINATE SYSTEM:
NAD 1983 UTM Zone 6N
Projection: Transverse Mercator
DATA SOURCES:
Clarke et al (2015): Bowhead Whale Biologically Important Areas
ADNR-DOG (2009): State Lease Boundaries & Tracts; Oil & Gas Well Locations; State & Federal Lands
MMS (2007): Offshore Lease Boundaries & Tracts;3-Mile Offshore Boundary; Continental Shelf Boundary
BOEMRE (2011): Planning Areas
ARCTIC OCEAN
BEAUFORT SEA
CHUKCHI SEA
Point Barrow
Barrow
Point Franklin
Peard Bay
Smith Bay
Dease Inlet
Icy Cape
Wainwright
Atqasuk
Teshekpuk Lake
Harrison Bay
Kasegaluk Lagoon
Point Lay
Nuiqsut
Prudhoe Bay
Deadhorse
Camden Bay
Kaktovik
Cape Lisburne
Point Hope
National Petroleum Reserve in Alaska
North Slope Areawide Oil & Gas Lease Sale Area
ANWR - 1002 Area
North Slope Foothills Areawide Oil & Gas Lease Sale Area
Dalton Highway
Trans-Alaska Pipeline
Kivalina
Noatak River
North Slope Borough
Northwest Arctic Borough
Yukon - Koyukuk Borough
Kotzebue Sound
Kotzebue
Russia Maritime Boundary
U.S. Maritime Boundary
Canada Maritime Boundary
Canada
N
Kilometers
0 25 50 75 100 200
Miles
0 25 50 75 100 200
NATIONAL MARINE FISHERIES SERVICE
EFFECTS OF OIL AND GAS ACTIVITIES IN THE ARCTIC OCEAN EIS
BELUGA WHALE BIOLOGICALLY IMPORTANT AREAS
U.S. BEAUFORT AND CHUKCHI SEAS, ALASKA
JOB NO: 26221183 DRAWN: ICS
DATE: JULY 2016 FILE: SEE PATH
FIGURE 3.2-15

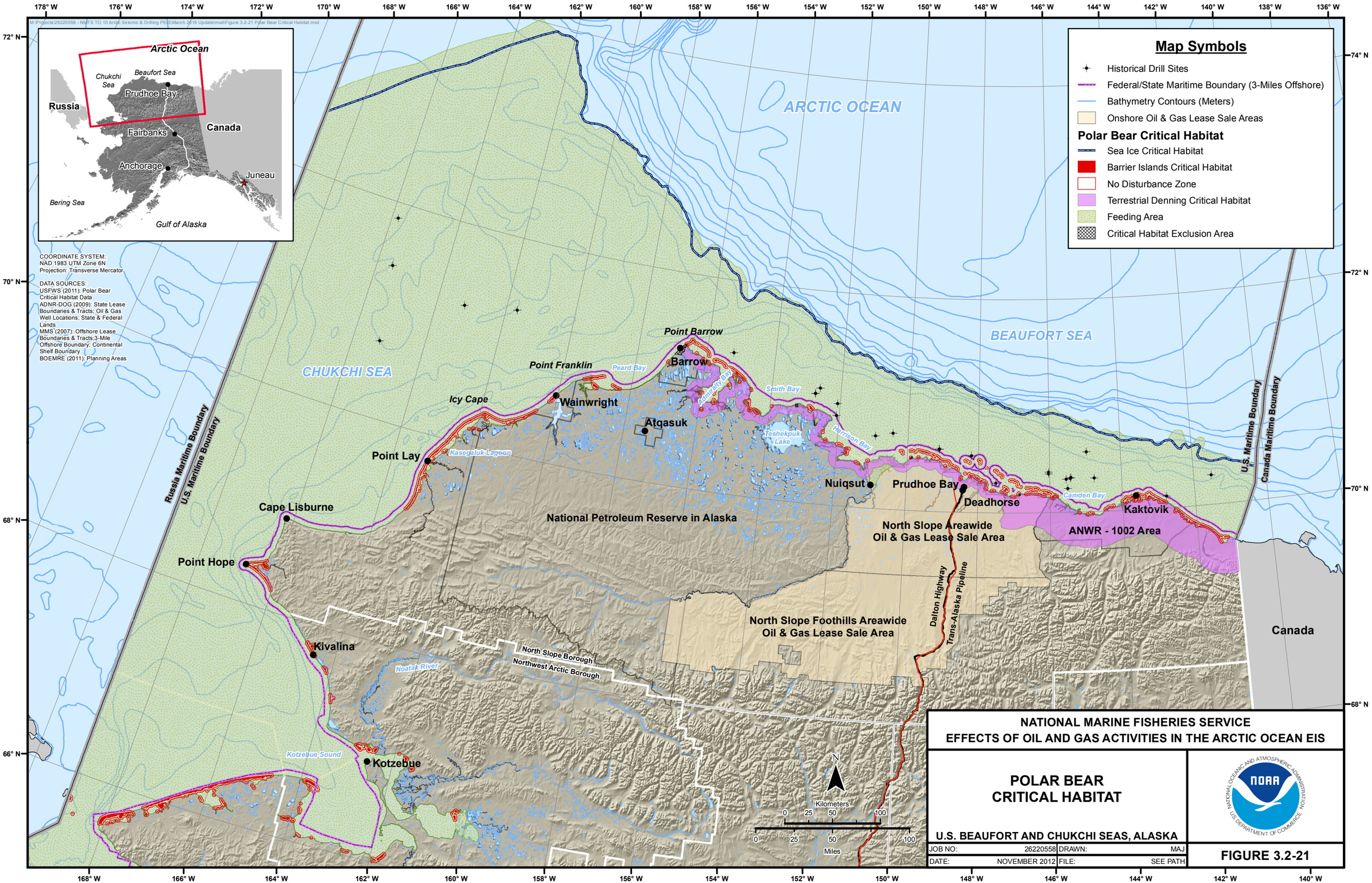

M:\Projects\26220558 - NMFS TO 10\Arctic Seismic & Drilling PEIS\March 2016 Update\mxd\Figure 3.2-16 Ringed Seal Distribution.mxd
Arctic Ocean
Beaufort Sea
Chukchi Sea
Prudhoe Bay
Russia
Canada
Fairbanks
Anchorage
Juneau
Bering Sea
Gulf of Alaska
COORDINATE SYSTEM:
NAD 1983 UTM Zone 6N
Projection: Transverse Mercator
DATA SOURCES:
Audubon (2009), NOAA (1988, 2002) Angliss, R.P. et al. (2008): Ringed Seal Distribution
ADNR-DOG (2009): State Lease Boundaries & Tracts; Oil & Gas Well Locations; State & Federal Lands
MMS (2007): Offshore Lease Boundaries & Tracts;3-Mile Offshore Boundary; Continental Shelf Boundary
BOEMRE (2011): Planning Areas
Map Symbols
Historical Drill Sites
Federal/State Maritime Boundary (3-Miles Offshore)
Bathymetry Contours (Meters)
Onshore Oil & Gas Lease Sale Areas
Ringed Seal Distribution
Seals Present (Year-round)
Seals Present (November - June)
Concentration Area (February - June)
Concentration Area* (May - June)
Concentration Area* (July - September)
High Concentration Area (October - July)
* Areas based on Audubon Arctic Marine Synthesis Atlas (January 2010), for conceptual purposes only.
ARCTIC OCEAN
BEAUFORT SEA
CHUKCHI SEA
Point Barrow
Barrow
Point Franklin
Peard Bay
Icy Cape
Wainwright
Atqasuk
Smith Bay
Admiralty Bay
Teshekpuk Lake
Harrison Bay
Kasegaluk Lagoon
Point Lay
Nuiqsut
Prudhoe Bay
Deadhorse
Camden Bay
Kaktovik
Cape Lisburne
Point Hope
Russia Maritime Boundary
U.S. Maritime Boundary
Canada Maritime Boundary
National Petroleum Reserve in Alaska
North Slope Areawide Oil & Gas Lease Sale Area
ANWR - 1002 Area
North Slope Foothills Areawide Oil & Gas Lease Sale Area
Dalton Highway
Trans-Alaska Pipeline
Kivalina
Noatak River
North Slope Borough
Northwest Arctic Borough
Yukon - Koyukuk Borough
Kotzebue Sound
Kotzebue
Canada
N
Kilometers
0 25 50 75 100 200
Miles
0 25 50 75 100 200
180° 178° W 176° W 174° W 172° W 170° W 168° W 166° W 164° W 162° W 160° W 158° W 156° W 154° W 152° W 150° W 148° W 146° W 144° W 142° W 140° W 138° W 136° W 134° W
74° N 72° N 70° N 68° N 66° N 64° N
170° W 168° W 166° W 164° W 162° W 160° W 158° W 156° W 154° W 152° W 150° W 148° W 146° W 144° W 142° W 140° W
NATIONAL MARINE FISHERIES SERVICE
EFFECTS OF OIL AND GAS ACTIVITIES IN THE ARCTIC OCEAN EIS
RINGED SEAL DISTRIBUTION
U.S. BEAUFORT AND CHUKCHI SEAS, ALASKA
JOB NO: 26220558
DRAWN: MAJ
DATE: NOVEMBER 2012
FILE: SEE PATH
FIGURE 3.2-16


M:\Projects\26220558 - NMFS TO 10\Arctic Seismic & Drilling PEIS\March 2016 Update\mxd\Figure 3.2-17 Spotted Seal Distribution.mxd
Arctic Ocean
Chukchi Sea
Beaufort Sea
Prudhoe Bay
Russia
Canada
Fairbanks
Anchorage
Juneau
Bering Sea
Gulf of Alaska
COORDINATE SYSTEM:
NAD 1983 UTM Zone 6N
Projection: Transverse Mercator
DATA SOURCES:
Audubon (2009), NOAA (1988, 2002), Angliss, R.P. et al. (2008): Spotted Seal Distribution EXCEPT High Concentration Area (drawn by URS)
ADNR-DOG (2009): State Lease Boundaries & Tracts; Oil & Gas Well Locations; State & Federal Lands
MMS (2007): Offshore Lease Boundaries & Tracts;3-Mile Offshore Boundary; Continental Shelf Boundary
BOEMRE (2011): Planning Areas
Map Symbols
Historical Drill Sites
Federal/State Maritime Boundary (3-Miles Offshore)
Bathymetry Contours (Meters)
Onshore Oil & Gas Lease Sale Areas
Spotted Seal Distribution
Estimated Extent of Range*
High Concentration Area*
Concentration Area (May - June)
Seals Present (October - June)
Seals Present (June - December)
Seals Present* (August - December)
Haulout Area*
Known Haulout Location*
* Areas based on Audubon Arctic Marine Synthesis Atlas (January 2010), for conceptual purposes only.
ARCTIC OCEAN
BEAUFORT SEA
CHUKCHI SEA
Point Barrow
Barrow
Point Franklin
Peard Bay
Smith Bay
Wainwright
Icy Cape
Atqasuk
Teshekpuk Lake
Harrison Bay
Point Lay
Kasegaluk Lagoon
Nuiqsut
Prudhoe Bay
Deadhorse
Camden Bay
Kaktovik
Cape Lisburne
Point Hope
National Petroleum Reserve in Alaska
North Slope Areawide Oil & Gas Lease Sale Area
ANWR - 1002 Area
North Slope Foothills Areawide Oil & Gas Lease Sale Area
Dalton Highway
Trans-Alaska Pipeline
Russia Maritime Boundary
U.S. Maritime Boundary
Canada Maritime Boundary
Canada
Kivalina
Noatak River
North Slope Borough
Northwest Arctic Borough
North Slope Borough
Yukon - Koyukuk Borough
Kotzebue Sound
Kotzebue
N
Kilometers
0 25 50 75 100 200
0 25 50 75 100 200
Miles
NATIONAL MARINE FISHERIES SERVICE
EFFECTS OF OIL AND GAS ACTIVITIES IN THE ARCTIC OCEAN EIS
SPOTTED SEAL DISTRIBUTION
U.S. BEAUFORT AND CHUKCHI SEAS, ALASKA
JOB NO: 26220558
DRAWN: MAJ
DATE: NOVEMBER 2012
FILE: SEE PATH
FIGURE 3.2-17


M:\Projects\26220558 - NMFS TO 10 Arctic Seismic & Drilling PEIS\March 2016 Update\mxd\Figure 3.2-18 Ribbon Seal Distribution.mxd
COORDINATE SYSTEM:
NAD 1983 UTM Zone 6N
Projection: Transverse Mercator
DATA SOURCES:
Audubon (2009); Angliss, R.P., (2008);NOAA (1988, 2002): Bearded Seal Distribution
ADNR-DOG (2009): State Lease Boundaries & Tracts; Oil & Gas Well Locations; State & Federal Lands
MMS (2007): Offshore Lease Boundaries & Tracts;3-Mile Offshore Boundary; Continental Shelf Boundary
BOEMRE (2011): Planning Areas
Arctic Ocean
Beaufort Sea
Chukchi Sea
Prudhoe Bay
Russia
Canada
Fairbanks
Anchorage
Juneau
Bering Sea
Gulf of Alaska
Map Symbols
Historical Drill Sites
Federal/State Maritime Boundary (3-Miles Offshore)
Bathymetry Contours (Meters)
Onshore Oil & Gas Lease Sale Areas
Ribbon Seal Distribution
Seals Present* (June - December)
Seals Present: Pupping, Breeding, and Molting (January - June)
Concentration Area (June - December)
Concentration Area (May - June)
* Areas based on Audubon Arctic Marine Synthesis Atlas (January 2010), for conceptual purposes only.
ARCTIC OCEAN
BEAUFORT SEA
CHUKCHI SEA
Point Barrow
Barrow
Point Franklin
Peard Bay
Smith Bay
Icy Cape
Wainwright
Atqasuk
Teshekpuk Lake
Harrison Bay
Point Lay
Kasegaluk Lagoon
Nuiqsut
Prudhoe Bay
Deadhorse
Camden Bay
Kaktovik
Cape Lisburne
Point Hope
National Petroleum Reserve in Alaska
North Slope Areawide Oil & Gas Lease Sale Area
ANWR - 1002 Area
North Slope Foothills Areawide Oil & Gas Lease Sale Area
Dalton Highway
Trans-Alaska Pipeline
Kivalina
Noatak River
North Slope Borough
Northwest Arctic Borough
North Slope Borough
Yukon - Koyukuk Borough
Kotzebue Sound
Kotzebue
Russia Maritime Boundary
U.S. Maritime Boundary
U.S. Maritime Boundary
Canada Maritime Boundary
Canada
N
Kilometers
0 25 50 75 100 200
Miles
0 25 50 75 100 200
NATIONAL MARINE FISHERIES SERVICE
EFFECTS OF OIL AND GAS ACTIVITIES IN THE ARCTIC OCEAN EIS
RIBBON SEAL DISTRIBUTION
U.S. BEAUFORT AND CHUKCHI SEAS, ALASKA
JOB NO: 26220558
DRAWN: MAJ
DATE: NOVEMBER 2012
FILE: SEE PATH
NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE
FIGURE 3.2-18


M:\Projects\26220558 - NMFS TO 10\Arctic Seismic & Drilling PEIS\March 2016 Updates\mxd\Figure 3.2-19 Bearded Seal Distribution.mxd
Arctic Ocean
Beaufort Sea
Chukchi Sea
Prudhoe Bay
Russia
Canada
Fairbanks
Anchorage
Juneau
Bering Sea
Gulf of Alaska
Map Symbols
Historical Drill Sites
Federal/State Maritime Boundary (3-Miles Offshore)
Bathymetry Contours (Meters)
Onshore Oil & Gas Lease Sale Areas
Bearded Seal Distribution
Seals Present (Year-round)
Seals Present (November - May)
Concentration Area* (March - June)
Concentration Area* (July - September)
High Concentration Area (October - April)
Occasional Occurrence*
* Areas based on Audubon Arctic Marine Synthesis Atlas (January 2010), for conceptual purposes only.
COORDINATE SYSTEM:
NAD 1983 UTM Zone 6N
Projection: Transverse Mercator
DATA SOURCES:
Audubon (2009); Angliss, R.P. (2008),NOAA (1998, 2002): Bearded Seal Distribution
ADNR-DOG (2009): State Lease Boundaries & Tracts; Oil & Gas Well Locations; State & Federal Lands
MMS (2007): Offshore Lease Boundaries & Tracts;3-Mile Offshore Boundary; Continental Shelf Boundary
BOEMRE (2011): Planning Areas
ARCTIC OCEAN
BEAUFORT SEA
CHUKCHI SEA
Point Barrow
Barrow
Point Franklin
Peard Bay
Icy Cape
Wainwright
Atqasuk
Smith Bay
Admiralty Bay
Teshekpuk Lake
Harrison Bay
Kasegaluk Lagoon
Point Lay
Nuiqsut
Prudhoe Bay
Deadhorse
Camden Bay
Kaktovik
Cape Lisburne
Point Hope
Kivalina
Noatak River
Kotzebue Sound
Kotzebue
Russia Maritime Boundary
U.S. Maritime Boundary
U.S. Maritime Boundary
Canada Maritime Boundary
National Petroleum Reserve in Alaska
North Slope Areawide Oil & Gas Lease Sale Area
ANWR - 1002 Area
North Slope Foothills Areawide Oil & Gas Lease Sale Area
Dalton Highway
Trans-Alaska Pipeline
North Slope Borough
Northwest Arctic Borough
North Slope Borough
Yukon - Koyukuk Borough
Canada
Kilometers
0 25 50 75 100 200
Miles
0 25 50 75 100 200
NATIONAL MARINE FISHERIES SERVICE
EFFECTS OF OIL AND GAS ACTIVITIES IN THE ARCTIC OCEAN EIS
BEARDED SEAL DISTRIBUTION
U.S. BEAUFORT AND CHUKCHI SEAS, ALASKA
JOB NO: 26220558
DRAWN: MAJ
DATE: NOVEMBER 2012
FILE: SEE PATH
FIGURE 3.2-19


Map Symbols
Historical Drill Sites
Federal/State Maritime Boundary (3-Miles Offshore)
Bathymetry Contours (Meters)
Onshore Oil & Gas Lease Sale Areas
Pacific Walrus Distribution
Present: Mostly Females and Young (May - October)
Present: Males, Females, and Young (November - May)
Concentration Area: Mostly Females and Young (June - October)
Concentration Area: Males, Females, and Young (October - December)
Major Walrus Haulout* (≥ 100 Walrus)
Point Lay Walrus Haul Out
* Areas based on Audubon Arctic Marine Synthesis Atlas (January 2010), for conceptual purposes only.
Arctic Ocean
Beaufort Sea
Chukchi Sea
Prudhoe Bay
Russia
Canada
Fairbanks
Anchorage
Juneau
Bering Sea
Gulf of Alaska
COORDINATE SYSTEM: NAD 1983 UTM Zone 6N Projection: Transverse Mercator
DATA SOURCES: NOAA (2002, 1998): Walrus Distribution NOAA (1998): Robards, M.A. et al (2007): Walrus Haulouts ADNR-DOG (2009): State Lease Boundaries & Tracts; Oil & Gas Well Locations; State & Federal Lands MMS (2007): Offshore Lease Boundaries & Tracts; 3-Mile Offshore Boundary; Continental Shelf Boundary BOEMRE (2011): Planning Areas; Garlich-Miller et al. 2011: Point Lay Walrus Haul Out
ARCTIC OCEAN
BEAUFORT SEA
CHUKCHI SEA
Point Barrow
Barrow
Point Franklin
Peard Bay
Icy Cape
Wainwright
Atqasuk
Smith Bay
Admiralty Bay
Teshekpuk Lake
Harrison Bay
Point Lay
Kasegaluk Lagoon
Nuiqsut
Prudhoe Bay
Deadhorse
Camden Bay
Kaktovik
Cape Lisburne
Point Hope
Kivalina
Noatak River
Kotzebue Sound
Kotzebue
Russia Maritime Boundary
U.S. Maritime Boundary
Canada Maritime Boundary
National Petroleum Reserve in Alaska
North Slope Areawide Oil & Gas Lease Sale Area
ANWR - 1002 Area
North Slope Foothills Areawide Oil & Gas Lease Sale Area
Dalton Highway
Trans-Alaska Pipeline
North Slope Borough
Northwest Arctic Borough
North Slope Borough
Yukon - Koyukuk Borough
Canada
Kilometers
Miles
NATIONAL MARINE FISHERIES SERVICE
EFFECTS OF OIL AND GAS ACTIVITIES IN THE ARCTIC OCEAN EIS
PACIFIC WALRUS DISTRIBUTION
U.S. BEAUFORT AND CHUKCHI SEAS, ALASKA
JOB NO: 26220558
DRAWN: MAJ
DATE: NOVEMBER 2012
FILE: SEE PATH
FIGURE 3.2-20


M:\Projects\26220558 - NMFS TO 10 Arctic Seismic & Drilling PEIS\March 2016 Update\mxd\Figure 3.2-21 Polar Bear Critical Habitat.mxd
Arctic Ocean
Chukchi Sea
Beaufort Sea
Prudhoe Bay
Russia
Canada
Fairbanks
Anchorage
Juneau
Bering Sea
Gulf of Alaska
COORDINATE SYSTEM:
NAD 1983 UTM Zone 6N
Projection: Transverse Mercator
DATA SOURCES:
USFWS (2011): Polar Bear Critical Habitat Data
ADNR-DOG (2009): State Lease Boundaries & Tracts; Oil & Gas Well Locations; State & Federal Lands
MMS (2007): Offshore Lease Boundaries & Tracts;3-Mile Offshore Boundary; Continental Shelf Boundary
BOEMRE (2011): Planning Areas
Map Symbols
Historical Drill Sites
Federal/State Maritime Boundary (3-Miles Offshore)
Bathymetry Contours (Meters)
Onshore Oil & Gas Lease Sale Areas
Polar Bear Critical Habitat
Sea Ice Critical Habitat
Barrier Islands Critical Habitat
No Disturbance Zone
Terrestrial Denning Critical Habitat
Feeding Area
Critical Habitat Exclusion Area
ARCTIC OCEAN
BEAUFORT SEA
CHUKCHI SEA
Point Barrow
Barrow
Point Franklin
Peard Bay
Admiralty Bay
Smith Bay
Icy Cape
Wainwright
Atqasuk
Teshekpuk Lake
Harrison Bay
Point Lay
Kasegaluk Lagoon
Nuiqsut
Prudhoe Bay
Deadhorse
Camden Bay
Kaktovik
Cape Lisburne
Point Hope
National Petroleum Reserve in Alaska
North Slope Areawide Oil & Gas Lease Sale Area
ANWR - 1002 Area
Dalton Highway
Trans-Alaska Pipeline
North Slope Foothills Areawide Oil & Gas Lease Sale Area
Canada
Kivalina
Noatak River
North Slope Borough
Northwest Arctic Borough
Kotzebue Sound
Kotzebue
Russia Maritime Boundary
U.S. Maritime Boundary
Canada Maritime Boundary
N
Kilometers
0 25 50 100
Miles
0 25 50 100
NATIONAL MARINE FISHERIES SERVICE
EFFECTS OF OIL AND GAS ACTIVITIES IN THE ARCTIC OCEAN EIS
POLAR BEAR CRITICAL HABITAT
U.S. BEAUFORT AND CHUKCHI SEAS, ALASKA
JOB NO: 26220558
DRAWN: MAJ
DATE: NOVEMBER 2012
FILE: SEE PATH
NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE
FIGURE 3.2-21

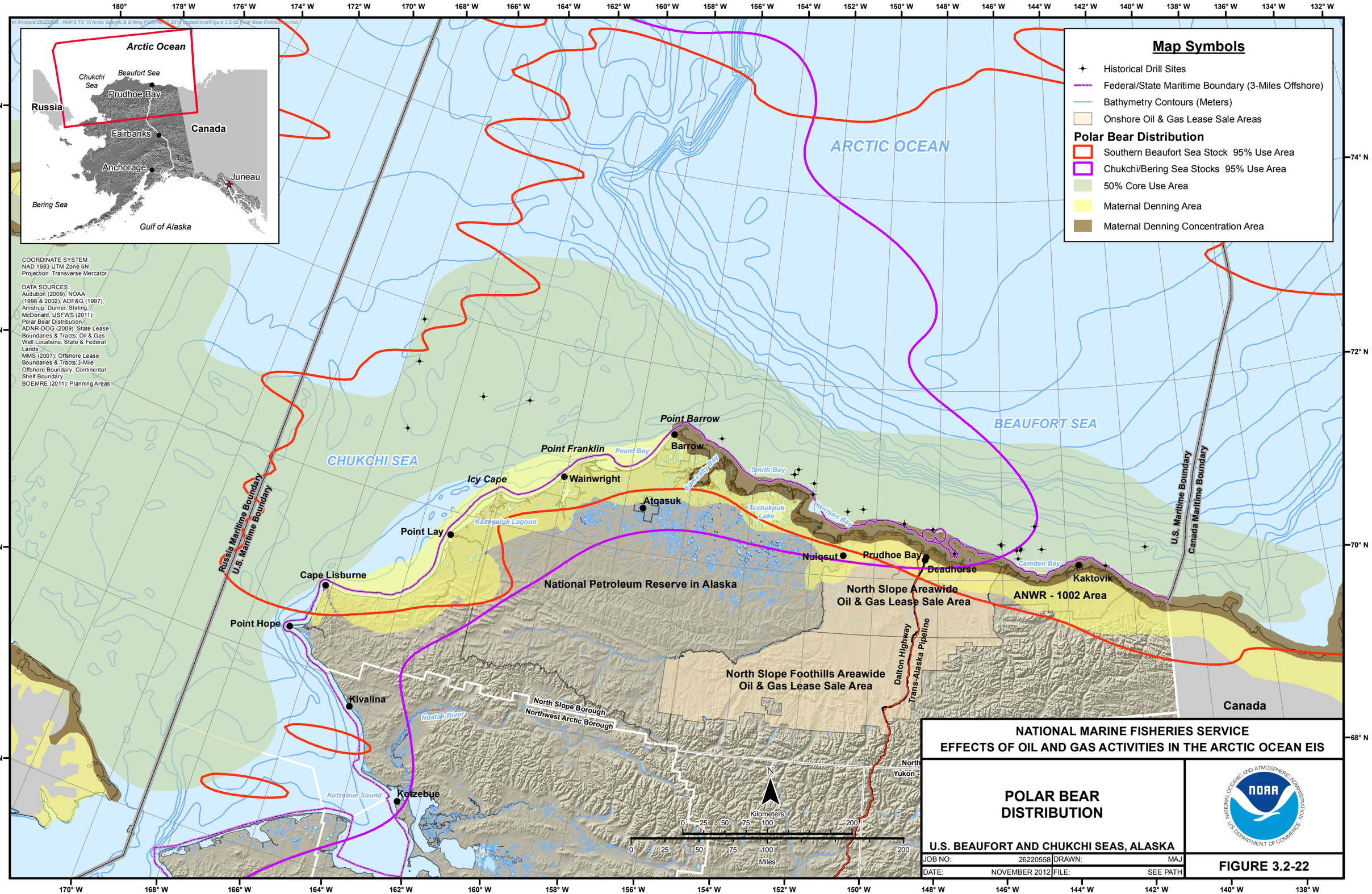

Map Symbols
Historical Drill Sites
Federal/State Maritime Boundary (3-Miles Offshore)
Bathymetry Contours (Meters)
Onshore Oil & Gas Lease Sale Areas
Polar Bear Distribution
Southern Beaufort Sea Stock 95% Use Area
Chukchi/Bering Sea Stocks 95% Use Area
50% Core Use Area
Maternal Denning Area
Maternal Denning Concentration Area
Arctic Ocean
Chukchi Sea
Beaufort Sea
Prudhoe Bay
Russia
Fairbanks
Canada
Anchorage
Juneau
Bering Sea
Gulf of Alaska
COORDINATE SYSTEM:
NAD 1983 UTM Zone 6N
Projection: Transverse Mercator
DATA SOURCES:
Audubon (2009), NOAA (1998 & 2002), ADF&G (1997), Amstrup, Durner, Stirling, McDonald, USFWS (2011): Polar Bear Distribution
ADNR-DOG (2009): State Lease Boundaries & Tracts; Oil & Gas Well Locations; State & Federal Lands
MMS (2007): Offshore Lease Boundaries & Tracts;3-Mile Offshore Boundary; Continental Shelf Boundary
BOEMRE (2011): Planning Areas
ARCTIC OCEAN
BEAUFORT SEA
CHUKCHI SEA
Point Barrow
Barrow
Point Franklin
Peard Bay
Smith Bay
Icy Cape
Wainwright
Atqasuk
Admiralty Bay
Teshekpuk Lake
Harrison Bay
Kasegaluk Lagoon
Point Lay
Nuiqsut
Prudhoe Bay
Deadhorse
Camden Bay
Kaktovik
Cape Lisburne
Point Hope
National Petroleum Reserve in Alaska
North Slope Areawide Oil & Gas Lease Sale Area
ANWR - 1002 Area
North Slope Foothills Areawide Oil & Gas Lease Sale Area
Dalton Highway
Trans-Alaska Pipeline
Russia Maritime Boundary
U.S. Maritime Boundary
Canada Maritime Boundary
Canada
Kivalina
Noatak River
North Slope Borough
Northwest Arctic Borough
North Yukon
Kotzebue Sound
Kotzebue
Kilometers
Miles
NATIONAL MARINE FISHERIES SERVICE
EFFECTS OF OIL AND GAS ACTIVITIES IN THE ARCTIC OCEAN EIS
POLAR BEAR DISTRIBUTION
U.S. BEAUFORT AND CHUKCHI SEAS, ALASKA
JOB NO: 26220558
DRAWN: MAJ
DATE: NOVEMBER 2012
FILE: SEE PATH
FIGURE 3.2-22

Figure 3.2-23 Seasonal ranges of the Western Arctic caribou herd with locations of satellite-collared caribou collected during the 2006-2007 regulatory year.

Source: ADF&G 2003

Data excludes first year caribou was collared; all collars standardized to one location every six days.

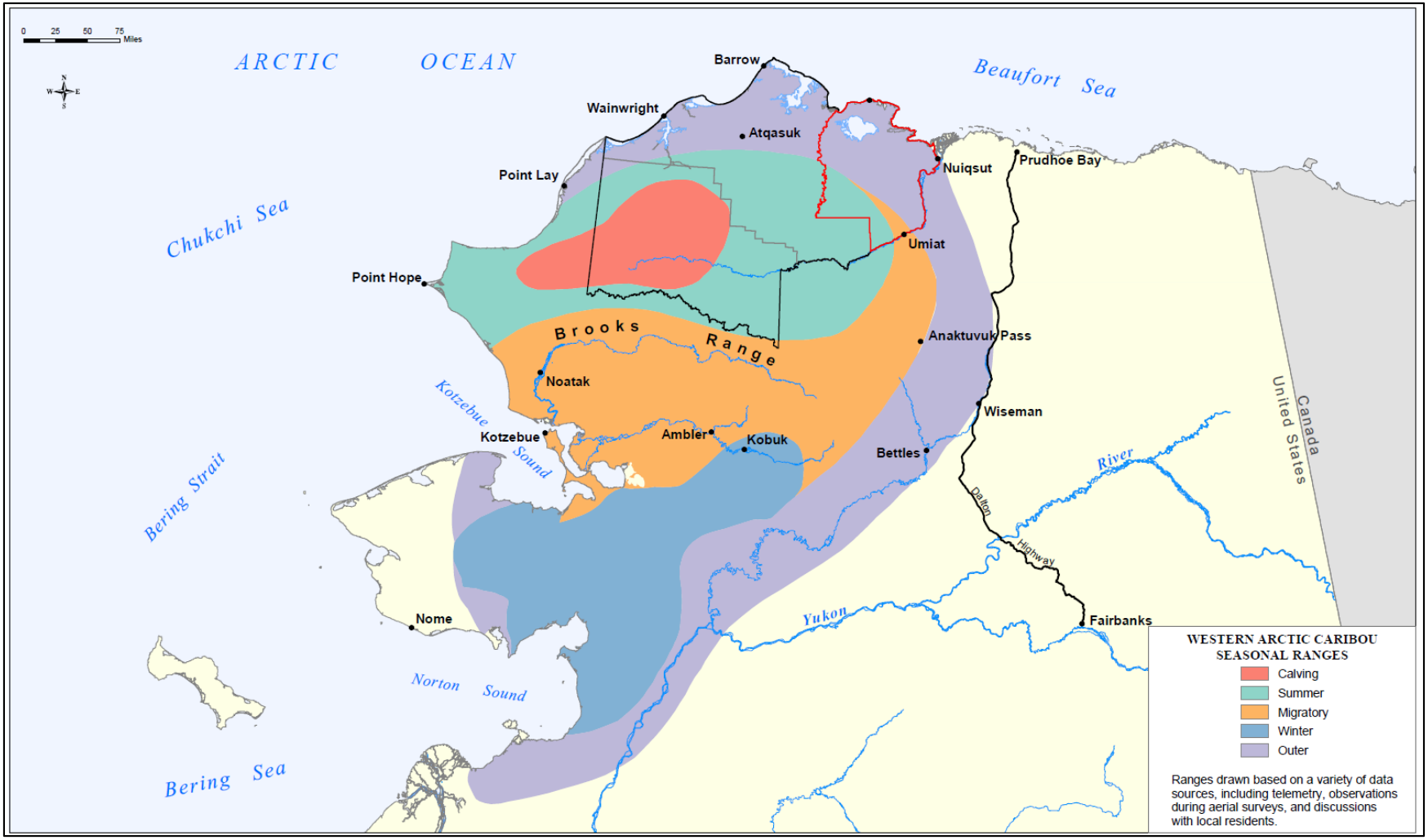
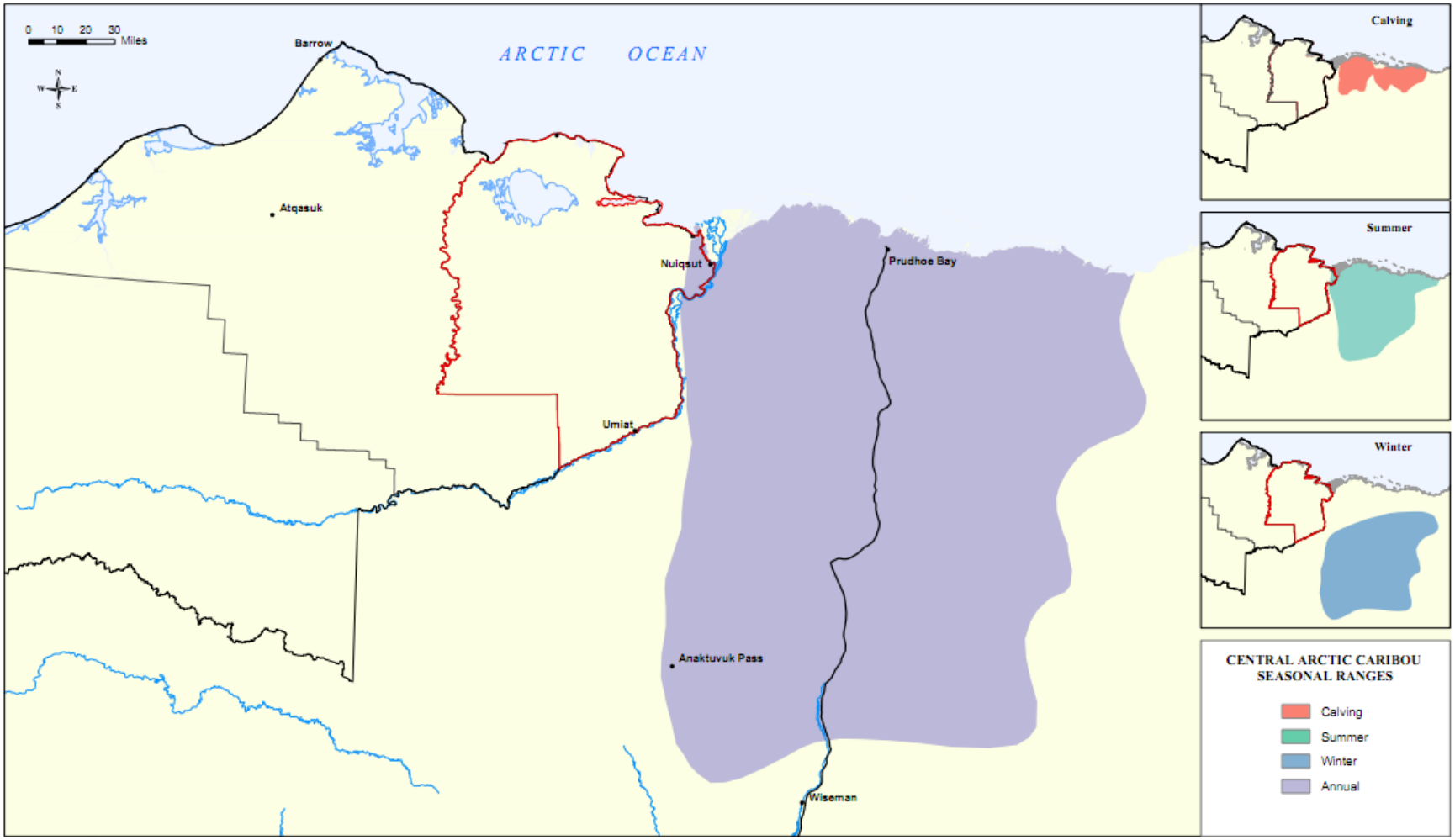


Figure 3.2-24 Central Arctic Caribou Herd Seasonal Ranges in Northern Alaska.
Source: BLM 2005



Source: Alaska Department of Fish & Game

Figure 3.2-25 Ranges of Central Arctic and Porcupine Caribou Herds

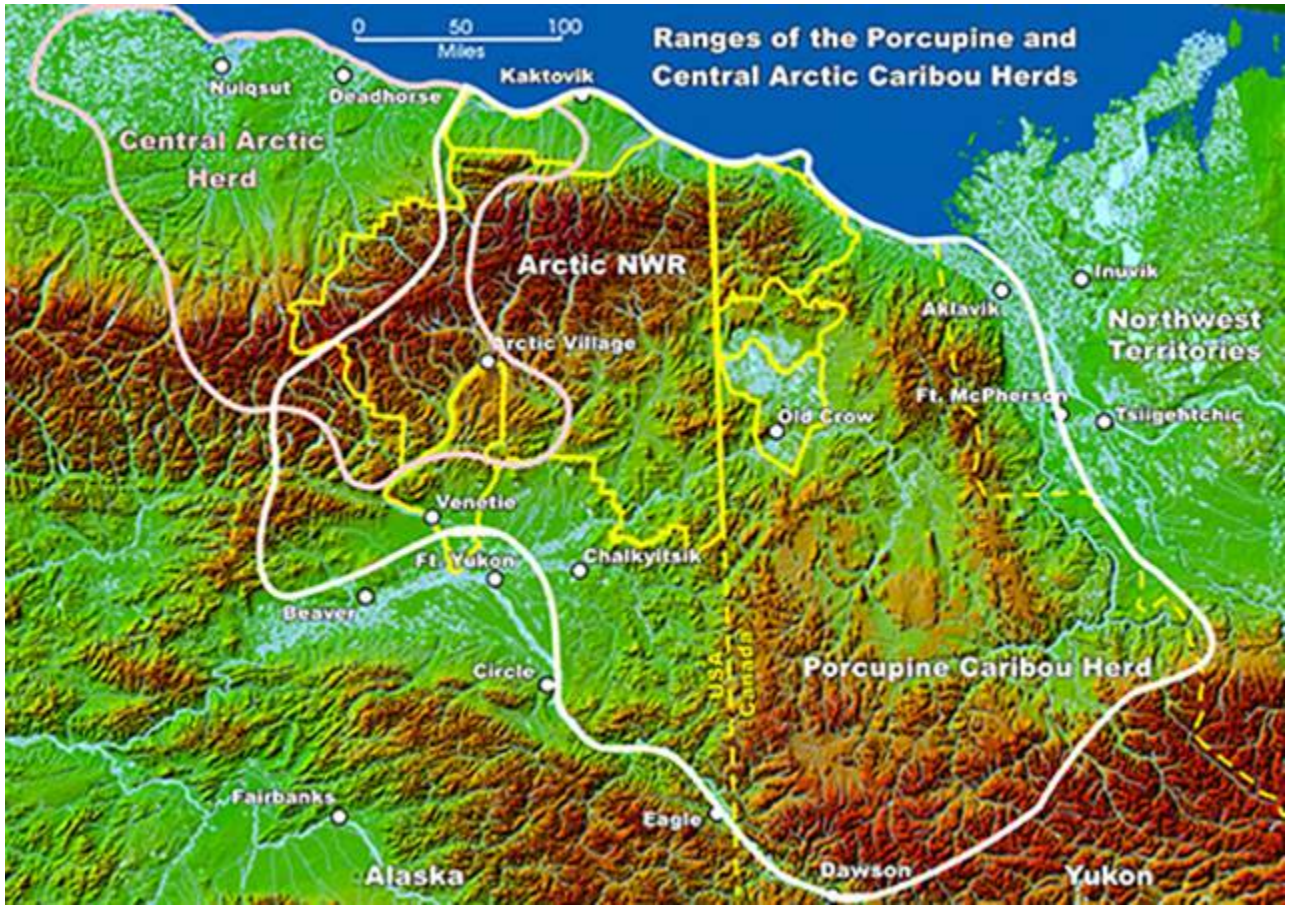


Figure 3.2-26 Caribou calving areas within the Arctic National Wildlife Refuge.

Source: USFWS 2008 The Teshekpuk Caribou Herd

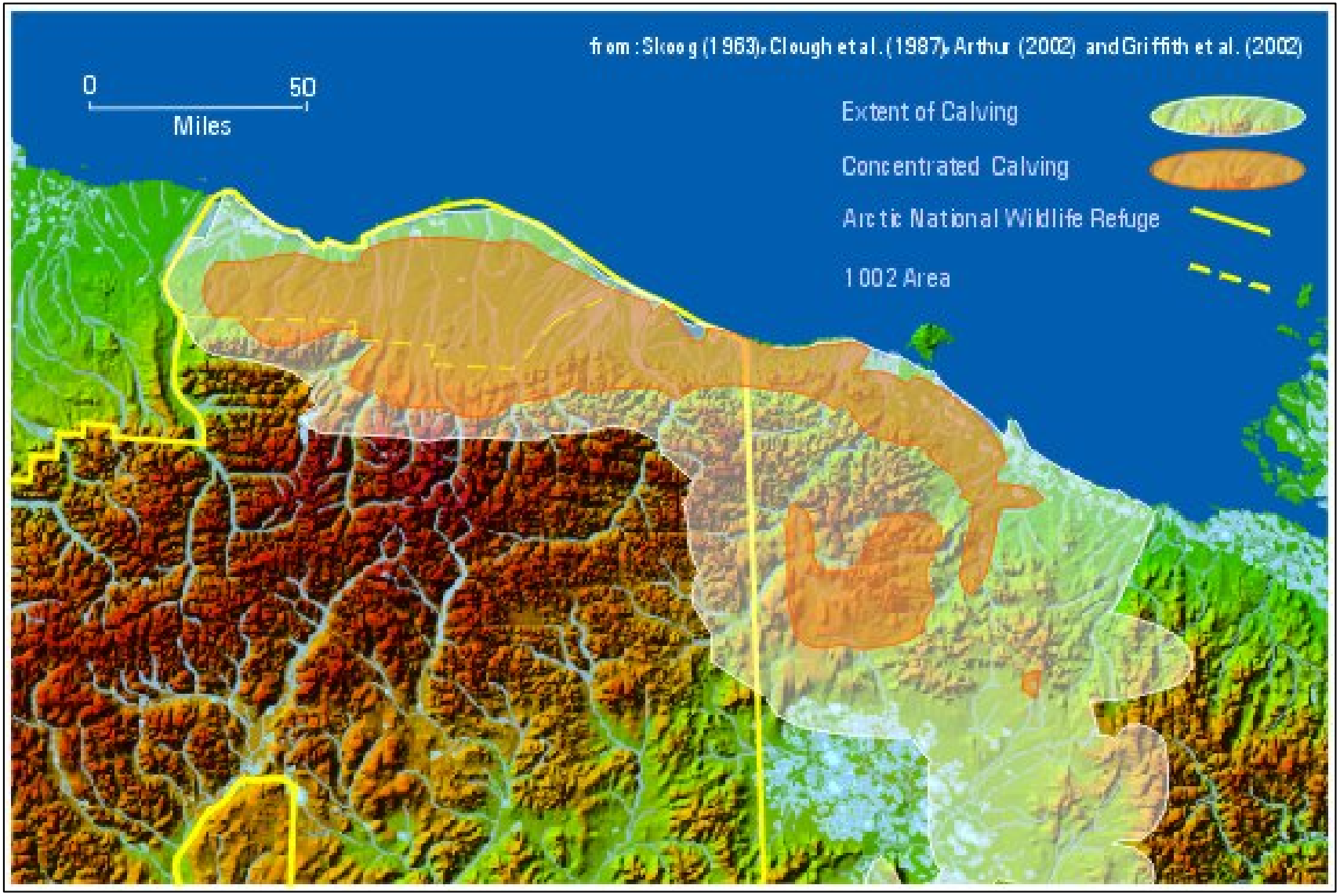
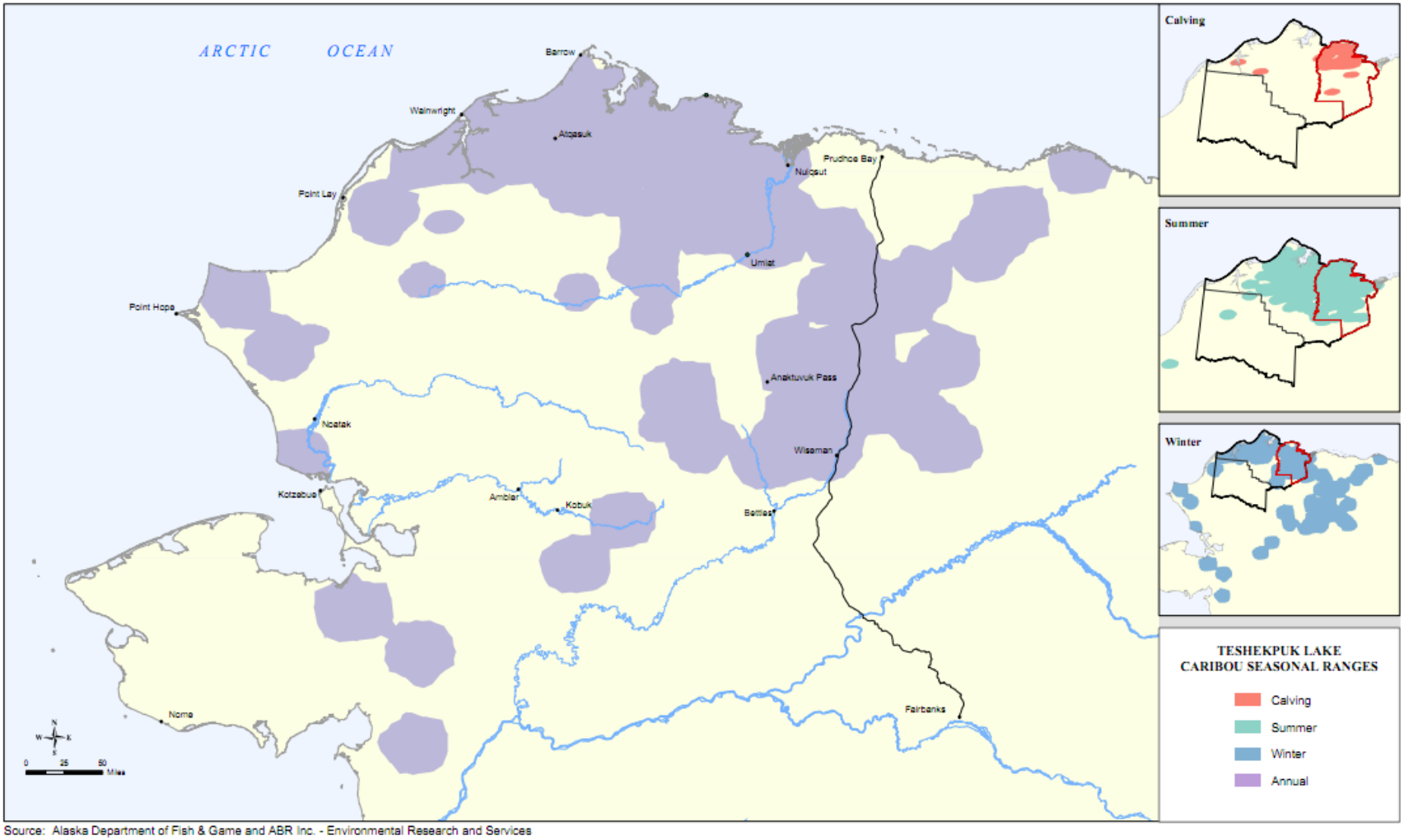


Figure 3.2-27 Teshekpuk Lake Caribou Herd Seasonal Ranges in Northern Alaska (1990 – 2005 Satellite Telemetry Data).
Source: BLM 2005

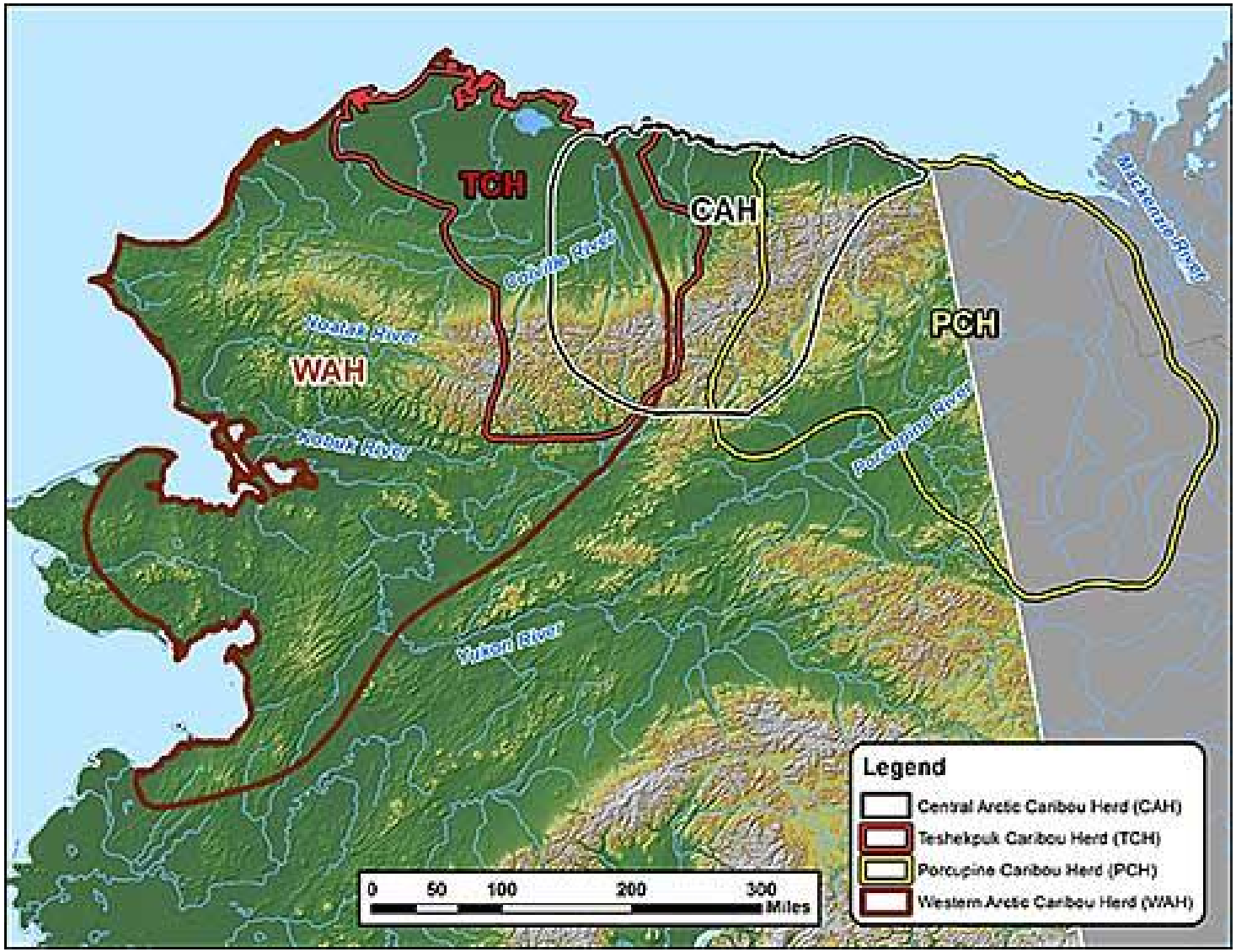


Source: Alaska Department of Fish & Game and ABR Inc. - Environmental Research and Services

Map 3-20. Teshekpuk Lake Caribou Herd Seasonal Ranges in Northern Alaska (1990 - 2005 Satellite Telemetry Data)

Figure 3.2-28 Ranges of the Northern Alaska Caribou Herds.

Source: ADFG 2014



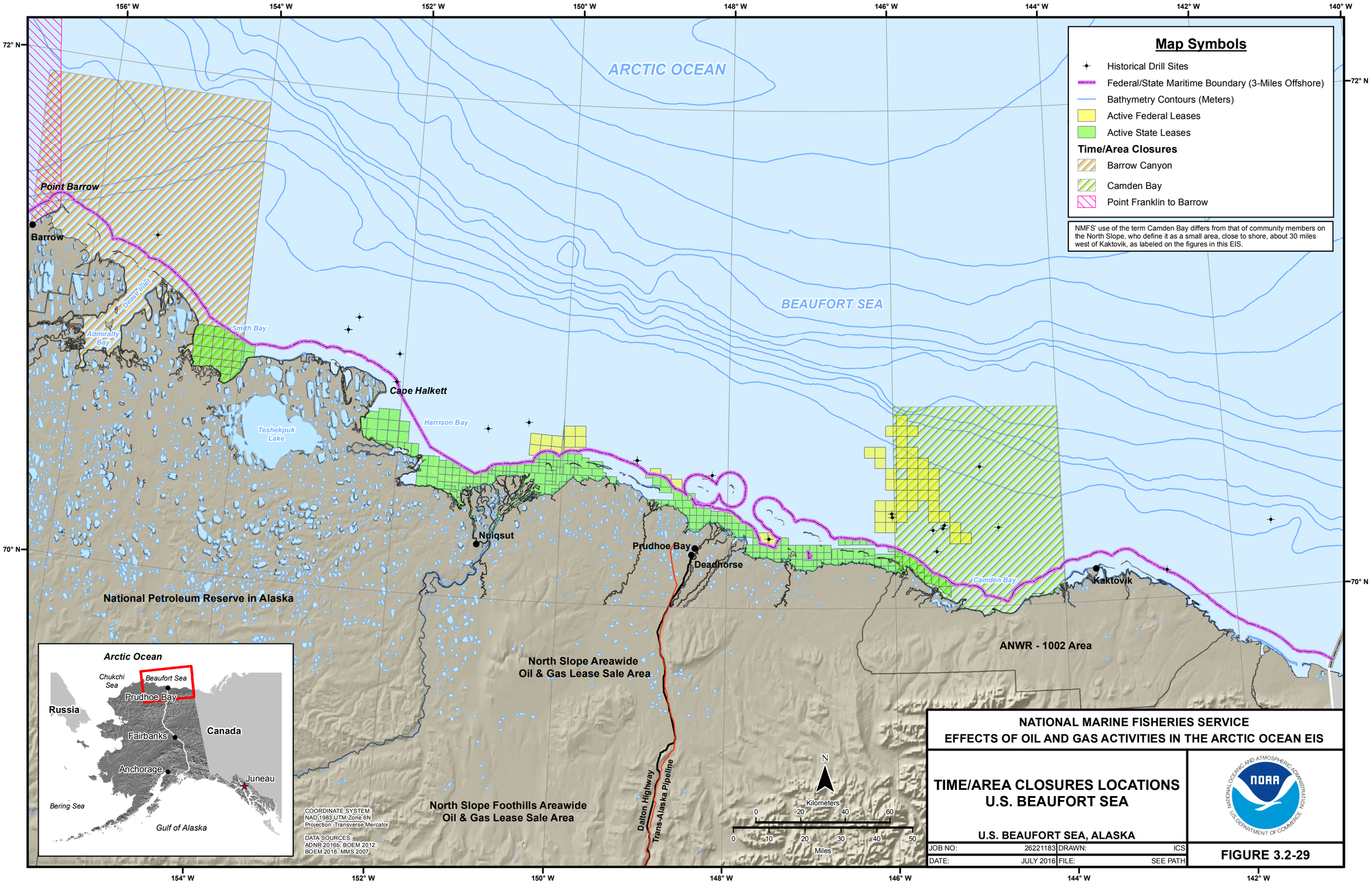

156° W
154° W
152° W
150° W
148° W
146° W
144° W
142° W
140° W
72° N
70° N
ARCTIC OCEAN
BEAUFORT SEA
Point Barrow
Barrow
Dease Inlet
Admiralty Bay
Smith Bay
Cape Halkett
Harrison Bay
Teshekpuk Lake
Nuiqsut
Prudhoe Bay
Deadhorse
Camden Bay
Kaktovik
National Petroleum Reserve in Alaska
North Slope Areawide Oil & Gas Lease Sale Area
North Slope Foothills Areawide Oil & Gas Lease Sale Area
ANWR - 1002 Area
Dalton Highway
Trans-Alaska Pipeline
Map Symbols
Historical Drill Sites
Federal/State Maritime Boundary (3-Miles Offshore)
Bathymetry Contours (Meters)
Active Federal Leases
Active State Leases
Time/Area Closures
Barrow Canyon
Camden Bay
Point Franklin to Barrow
NMFS' use of the term Camden Bay differs from that of community members on the North Slope, who define it as a small area, close to shore, about 30 miles west of Kaktovik, as labeled on the figures in this EIS.
Arctic Ocean
Chukchi Sea
Beaufort Sea
Prudhoe Bay
Russia
Canada
Fairbanks
Anchorage
Juneau
Bering Sea
Gulf of Alaska
COORDINATE SYSTEM:
NAD 1983 UTM Zone 6N
Projection: Transverse Mercator
DATA SOURCES:
ADNR 2016b; BOEM 2012;
BOEM 2016; MMS 2007
N
Kilometers
0 20 40 60
0 10 20 30 40 50
Miles
NATIONAL MARINE FISHERIES SERVICE
EFFECTS OF OIL AND GAS ACTIVITIES IN THE ARCTIC OCEAN EIS
TIME/AREA CLOSURES LOCATIONS
U.S. BEAUFORT SEA
U.S. BEAUFORT SEA, ALASKA
JOB NO: 26221183
DRAWN: ICS
DATE: JULY 2016
FILE: SEE PATH
NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

FIGURE 3.2-29

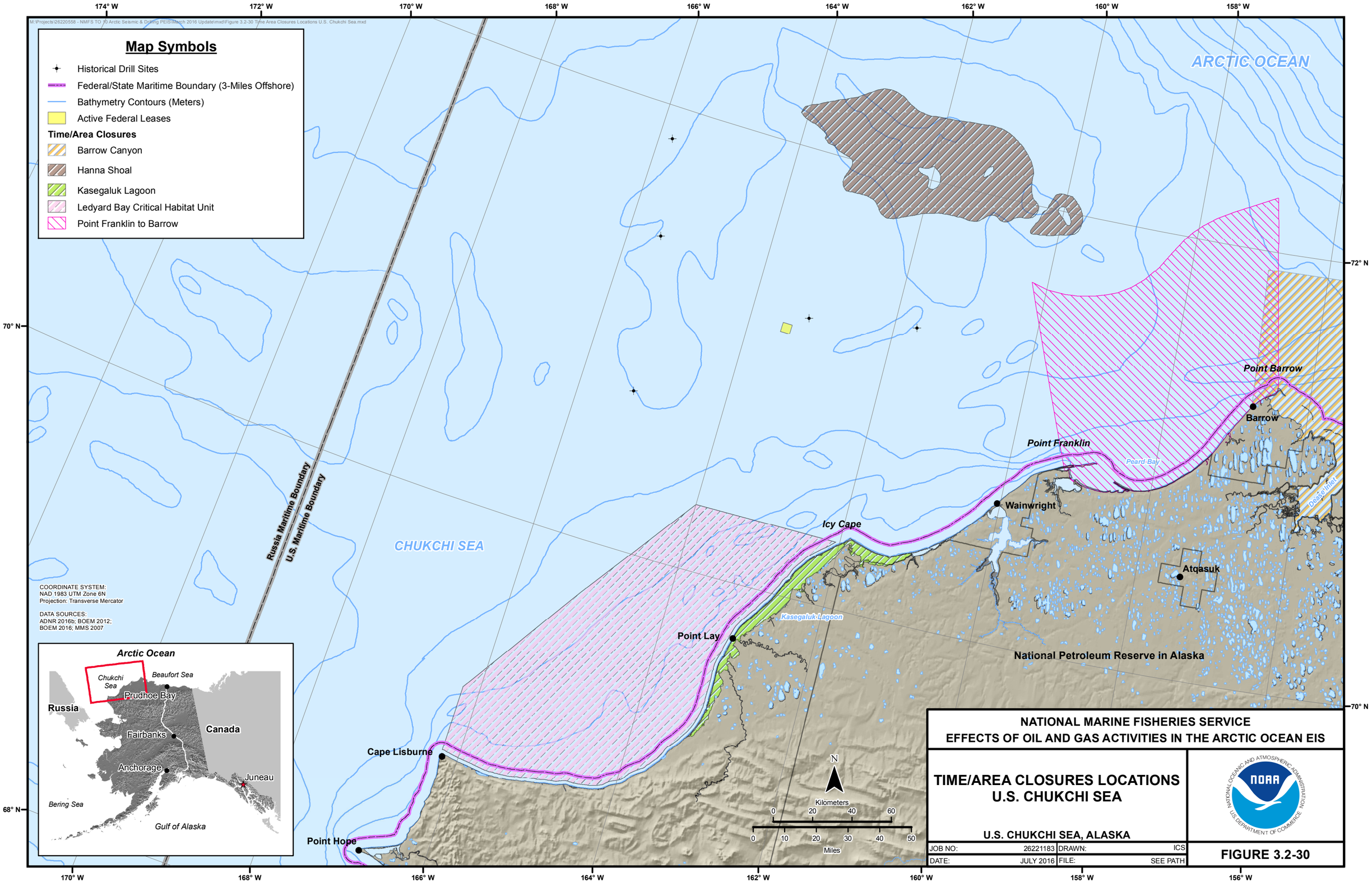

M:\Projects\26220558 - NMFS TO 70 Arctic Seismic & Drilling PEIS\March 2016 Update\mxd\Figure 3.2-30 Tyhe Area Closures Locations U.S. Chukchi Sea.mxd
Map Symbols
Historical Drill Sites
Federal/State Maritime Boundary (3-Miles Offshore)
Bathymetry Contours (Meters)
Active Federal Leases
Time/Area Closures
Barrow Canyon
Hanna Shoal
Kasegaluk Lagoon
Ledyard Bay Critical Habitat Unit
Point Franklin to Barrow
ARCTIC OCEAN
CHUKCHI SEA
Russia Maritime Boundary
U.S. Maritime Boundary
Point Barrow
Barrow
Point Franklin
Peard Bay
Dease Inlet
Wainwright
Icy Cape
Atqasuk
Kasegaluk Lagoon
Point Lay
National Petroleum Reserve in Alaska
Cape Lisburne
Point Hope
COORDINATE SYSTEM:
NAD 1983 UTM Zone 6N
Projection: Transverse Mercator
DATA SOURCES:
ADNR 2016b; BOEM 2012;
BOEM 2016; MMS 2007
Arctic Ocean
Chukchi Sea
Beaufort Sea
Prudhoe Bay
Russia
Canada
Fairbanks
Anchorage
Juneau
Bering Sea
Gulf of Alaska
N
Kilometers
0 20 40 60
0 10 20 30 40 50
Miles
174° W
172° W
170° W
168° W
166° W
164° W
162° W
160° W
158° W
156° W
72° N
70° N
68° N
NATIONAL MARINE FISHERIES SERVICE
EFFECTS OF OIL AND GAS ACTIVITIES IN THE ARCTIC OCEAN EIS
TIME/AREA CLOSURES LOCATIONS
U.S. CHUKCHI SEA
U.S. CHUKCHI SEA, ALASKA
JOB NO: 26221183
DRAWN: ICS
DATE: JULY 2016
FILE: SEE PATH
FIGURE 3.2-30

Figure 3.3-1 2009 Alaska Economic Performance Report.

Source: ADCCED 2011d

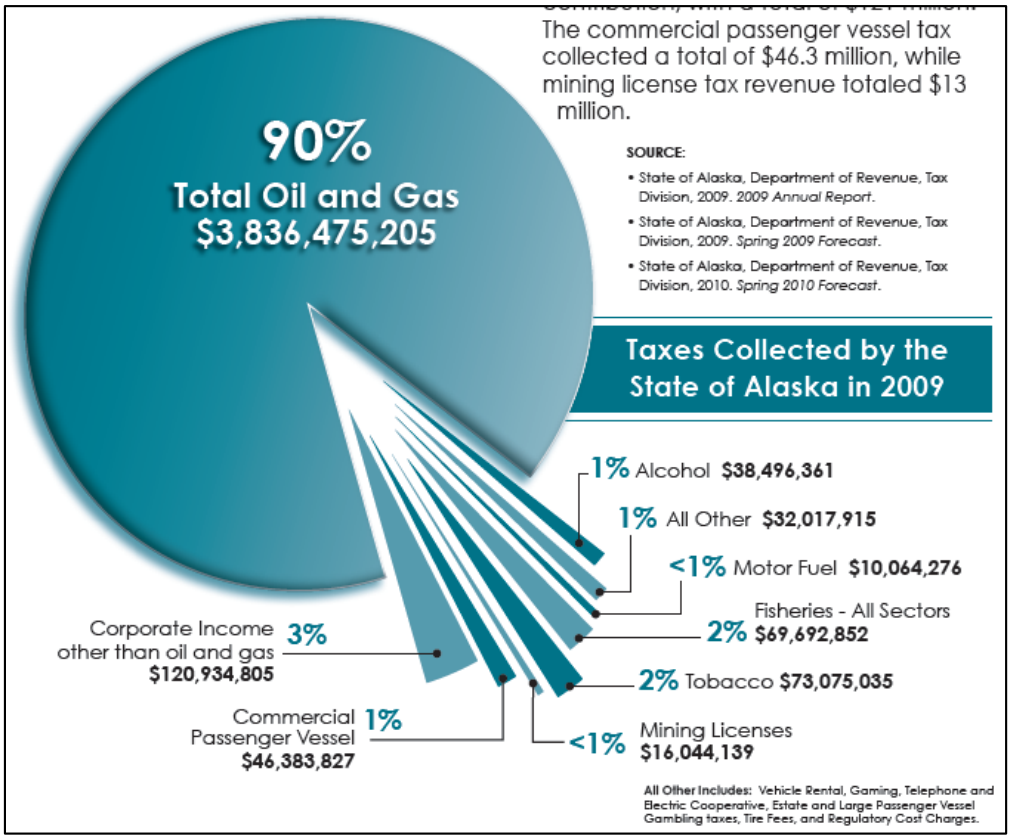


Figure 3.3-2 Statewide Employment by Section (February 2011).

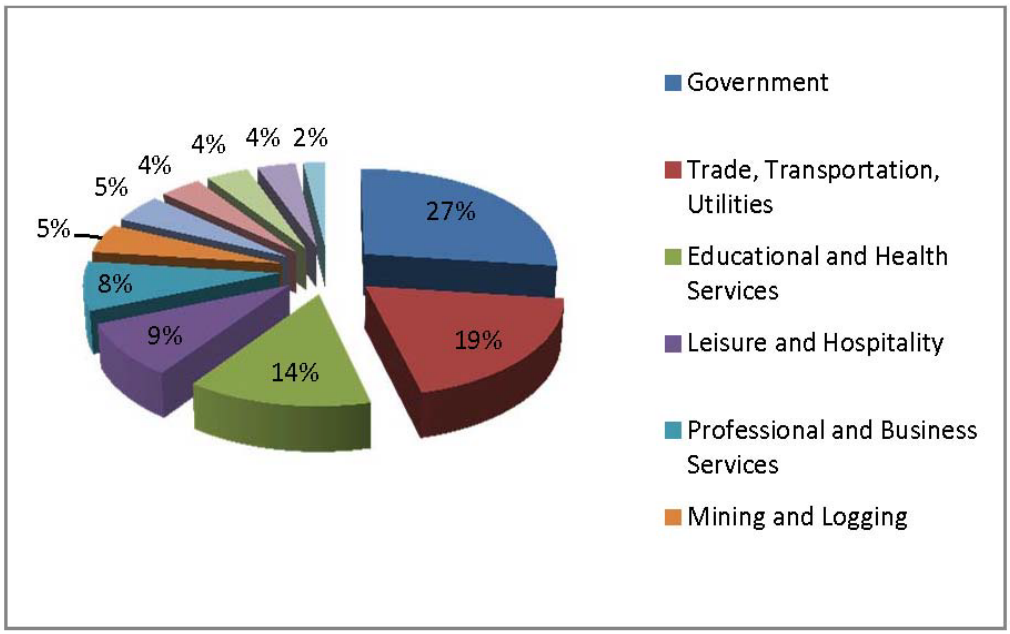


Figure 3.3-3 Local Capture of Large-Scale Resource Extraction from Remote Region Alaska (Million $).

Source: Goldsmith 2007 Calculated by URS in 2003 dollars

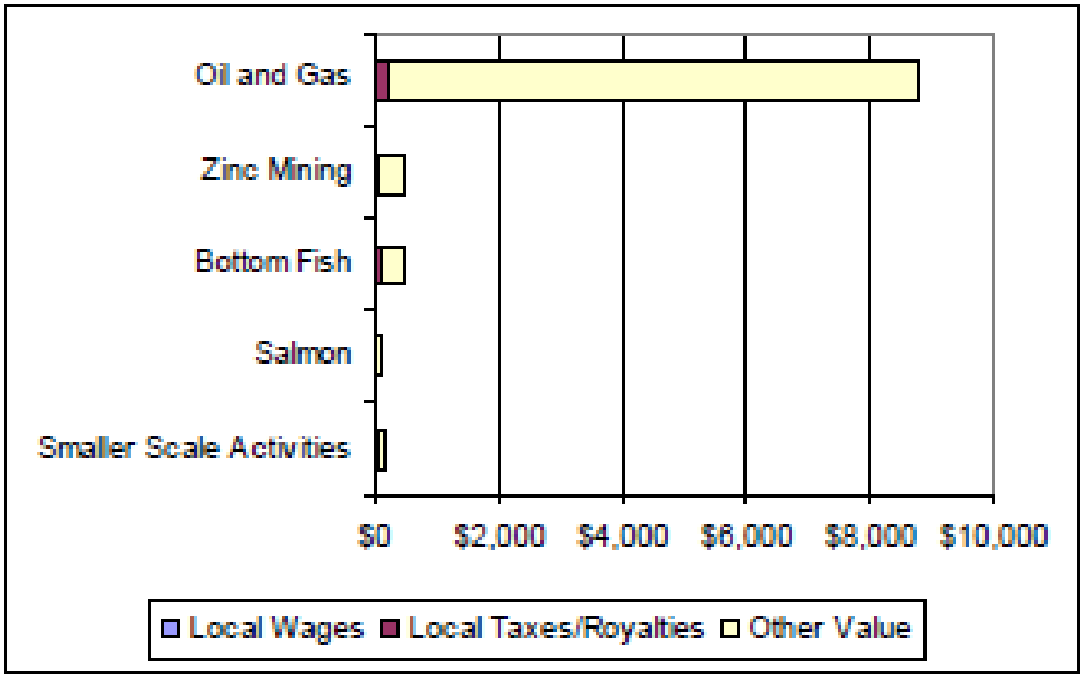


Figure 3.3-4a Top Employers in the NSB (2003).

Source: NSB 2003 Economic Profile and Census Report

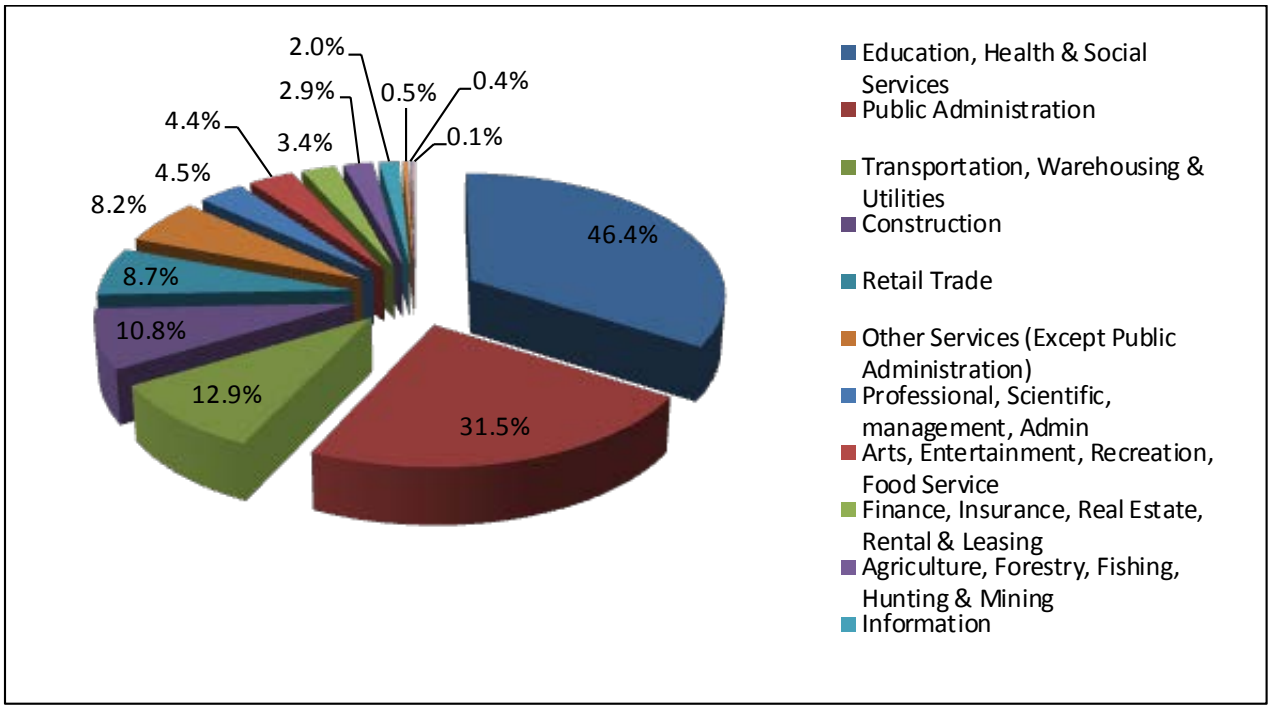


Figure 3.3-4b NSB Employment by Sector (2000).

Source: Alaska Department of Community & Regional Affairs, Community Database Online from 2000 Census

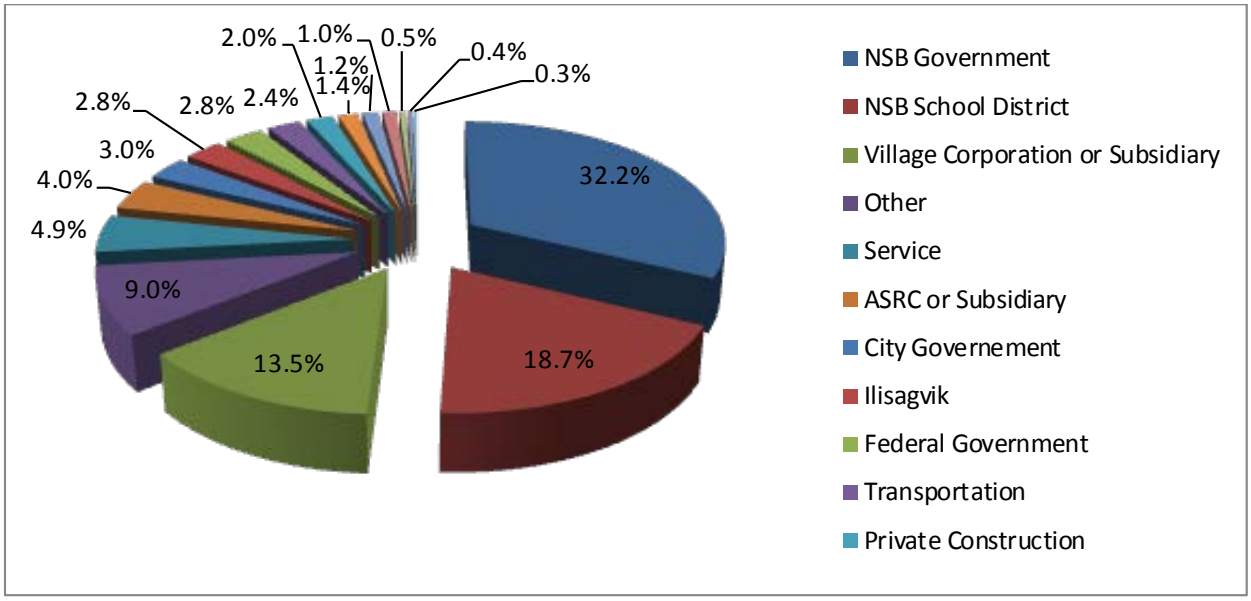


Figure 3.3-4c NAB Major Employment Sectors

Source: Alaska Department of Community & Economic Development, Community Database Online (from 2000 Census)

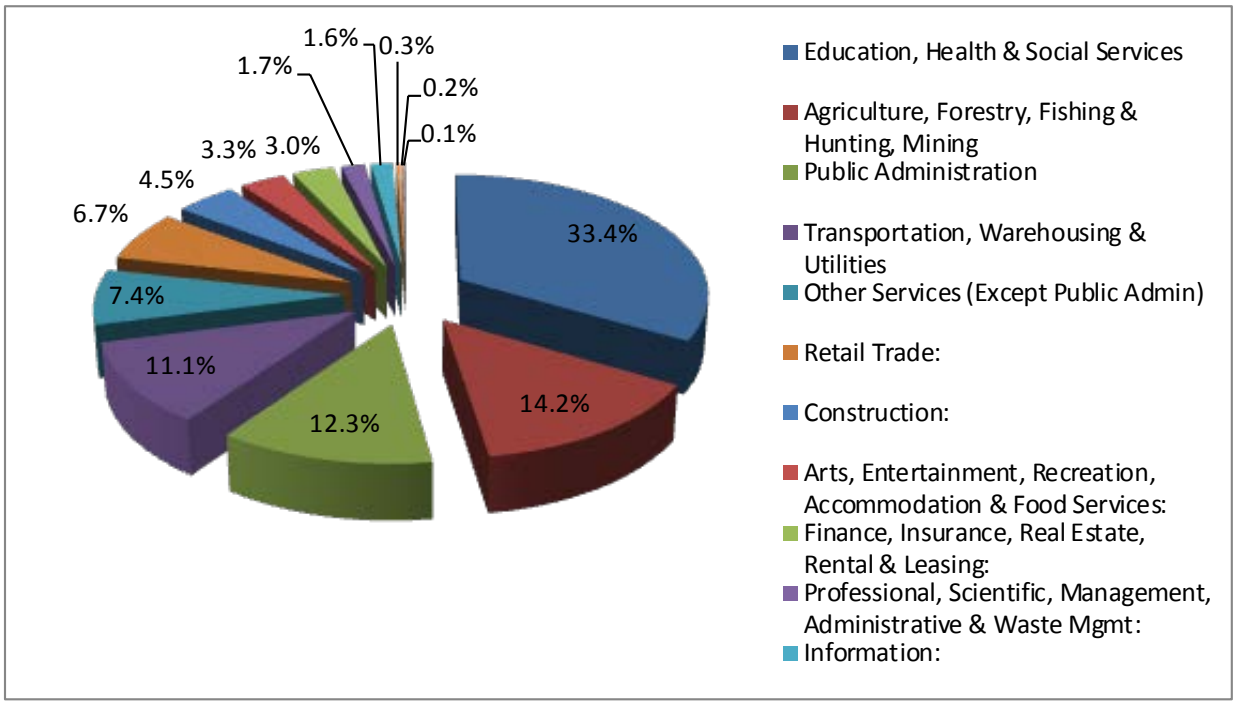


Figure 3.3-5 Percent of Resident Workers by Wage Range (2009).

Source: ADLWD 2011a

Note: Northern Region is indicated in blue (North Slope Borough, Northwest Arctic Borough, and Nome Census Area); State of Alaska is indicated in black.

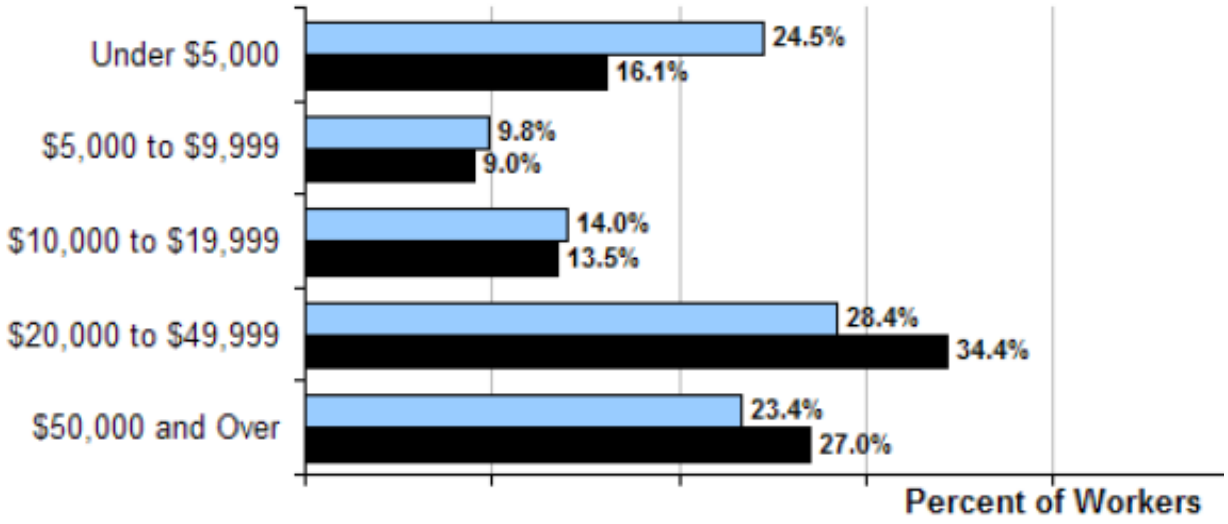


Figure 3.3-6 Efficiency (number landed / number struck) of the bowhead whale subsistence harvest 1973 to 2007.

Source: Suydam et al. 2007

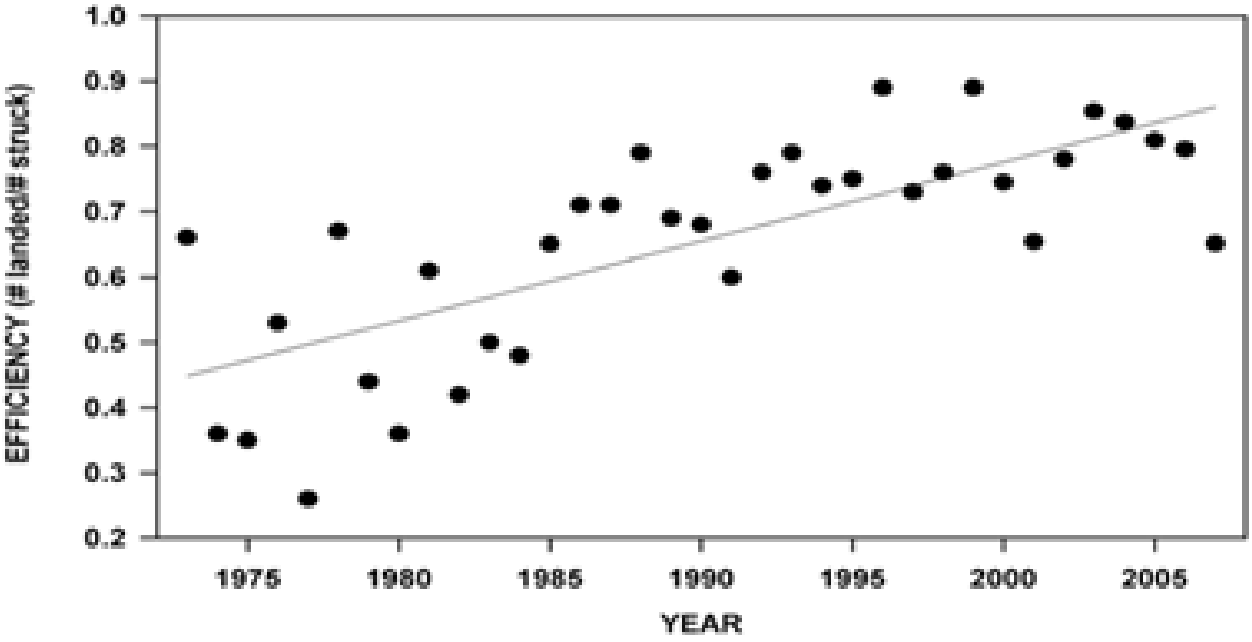
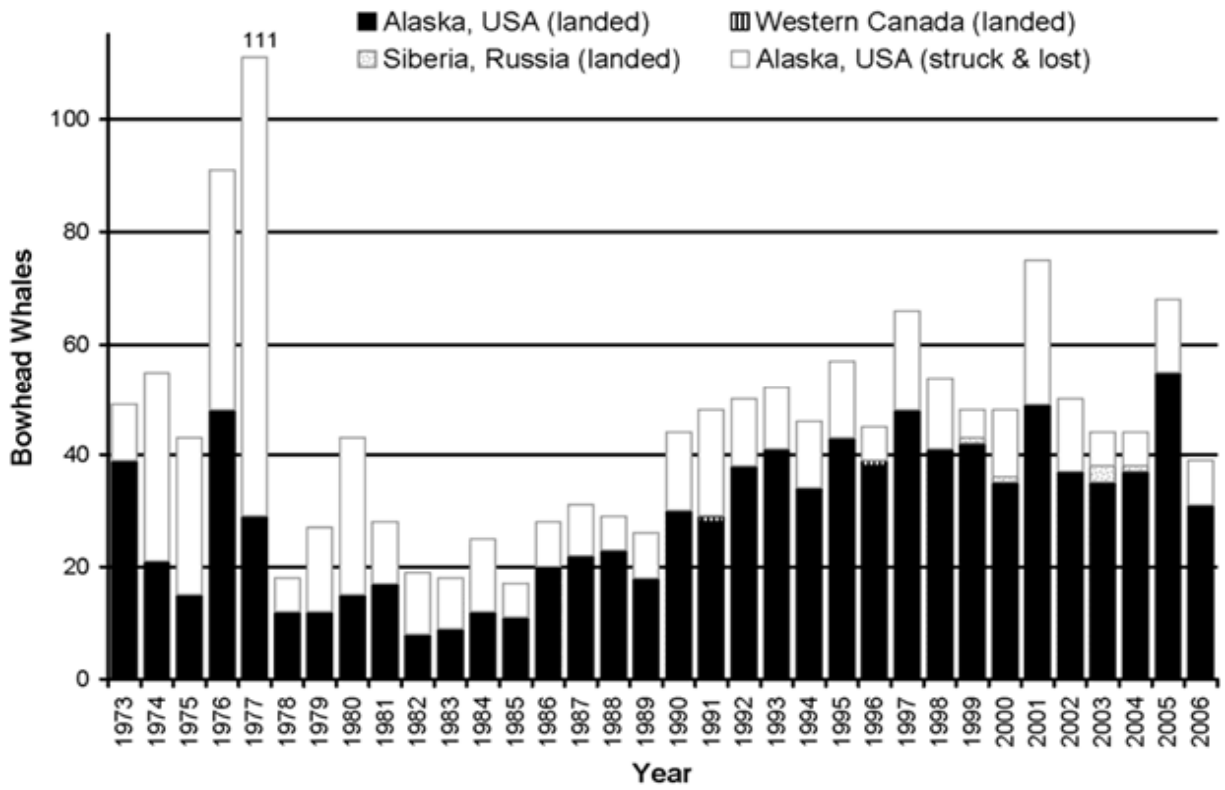


Figure 3.3-7 Number of bowheads landed, and struck by subsistence hunters in the U.S., Canada, and Russia from 1974 to 2006.

Source: NMFS 2008