Appendix A

EIS Distribution List

Appendix A
EIS Distribution List

Federal Elected Officials

U.S. House of Representatives, Congressman Michael Michaud, DC
U.S. Representative, Congresswoman Chellie Pingree, ME
U.S. Senate, Senator Susan Collins, Washington, DC
U.S. Senator Angus King, DC

Federal Agencies

Army Corps of Engineers, Department of Defense, John Furry, Senior Policy Advisor, Planning and Policy Division, DC
Assistant Chief of Staff for Installation Management, Arlington, VA
Bureau of Oceans & International Environmental & Scientific Affairs, Alexander Yuan, Foreign Affairs Officer Multilateral Team, DC
Council on Environmental Quality, DC
Council on Environmental Quality, Horst Greczmiel, Associate Director for NEPA Oversight, DC
Department of Defense, SCH Mission Evaluation Branch, Siting Clearinghouse, Steve J. Sample, DC
Department of Health and Human Services, Edward Pfister, DHHS Environmental Program Manager, DC
Department of Interior, National Park Services, Patrick Walsh, Chief, Environmental Planning and Compliance Branch, CO
Department of Interior, Office of Environmental Policy & Compliance, David Shire, Team Leader, Natural Resources Management, DC
Department of Justice, Natural Resources Section, NEPA Coordinator, Environmental and Natural Resources Division, Beverly Li, DC
Department of the Interior, Bureau of Land Management, Division of Decision Support, Planning and NEPA, Kerry Rodgers, Senior, NEPA Specialist, DC
Department of the Interior, Division of Environmental and Cultural Resources Management, Bureau of Indian Affairs, Mary Keller, VA
Department of the Interior, Environmental Policy & Compliance, National Resources Management, Vijai N. Rai, Team Leader, DC
Department of the Interior, Land Minerals Management Service, Deputy Assistant Secretary, DC
Department of Transportation, David Bernhardt, ME
Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Sherri Pappas, Office of Chief Counsel, DC
Department of Transportation, Surface Transportation Board, Victoria Rutson, DC
Energy & Natural Resources Committee Office, Jeff Bingaman, Chairman, DC
Installations & Environment, Office of the Deputy Under Secretary of Defense, DC
Installations and Environment, Under Secretary of Defense, Michael McAndrew, DC
National Center for Environmental Health (CDC), Division of Emergency and Environmental Health Services, Department of Health and Human Services, Sharunda Buchanan, Director, DC
National Marine Fisheries Service, Department of Commerce, National NEPA Compliance, Steve Leathery, MD
National Oceanic & Atmospheric Administration - Department of Commerce, NEPA Policy and Comp., Steve Kokkinakis, MD
National Oceanic and Atmospheric Administration Coast Survey, Andrew Beaver, RI
National Oceanic and Atmospheric Administration, Mary Scott, Marine Habitat Resource Specialist, MA
National Oceanic and Atmospheric Administration, National Marine Fisheries Service Northeast Regional Office, Habitat Conservation Division, Christopher Boelke, Marine Habitat Specialist, MA
National Oceanic and Atmospheric Administration, National Marine Fisheries Service Northeast Regional Office, Habitat Conservation Division, Mary Colligan, Assistant Regional Administrator for Protected Resources, MA
National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Assistant Regional Administrator for Habitat Conservation, Peter Colosi, MA
National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Fishery Biologist, H. Max Tritt, ME
National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Jeff Murphy, Fisheries Biologist, Maine Field Station, ME
National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Program Planning and Integration, NEPA Coordinator, MD
National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Sean McDermott, Fisheries Biologist, MA
Office of Environmental Management, Department of Energy, Dave Huizenga, Senior Advisor, DC
Office of Federal Agency Programs, Advisory Council on Historic Preservation, Don L. Klima, Director, DC
Office of Federal Programs, Assistant Director for Federal Programs, Advisory Council Historic Preservation, Charles D. Vaughn, DC
Office of the Assistant Secretary of the Army, Tribal and Regulatory Affairs, Chip Smith, Assistant for Environment, DC
Office of the Assistant Secretary of the Navy, Installations and Environment, Robert Uhrich, DC
Office of the Deputy Under Secretary of Defense, Installation and Environment, Peter Potochney, Director, Basing, DC
Policy Office of the Assistant Secretary of the Navy (EI&E), Thomas Egeland, Director, Environmental Planning and Conservation, DC
U.S. Air Force Basing & Units, Department of Air Force, Department of Defense, Jack Bush, Sr. Planner/NEPA Program Manager, DC
U.S. Air Force, Civil Engineer (A7C), Arlington, VA
U.S. Army Corps of Engineers, Jay L. Clement, Sr. Project Manager, Maine Project Office, ME
U.S. Army Corps of Engineers, Office of the Chief of Army Engineers, DC
U.S. Coast Guard 1st District, Captain Liam Slein, Chief, Prevention Division, MA
U.S. Coast Guard 1st District, Mr. Dan Hubbard, MA
U.S. Coast Guard Atlantic Area, Captain Richard Kaser, VA
U.S. Coast Guard, Curtis E. Borland, Chief (Acting), Deepwater Ports Standards Division, DC

U.S. Coast Guard Sector Northern New England, Lt Megan Drewniak, Waterways Management Division, ME
U.S. Coast Guard, 1st District, Captain Thomas Lennon Chief, Legal Division, MA
U.S. Coast Guard, BMC James Malcolm, Officer-in-Charge, Station Eastport, ME
U.S. Coast Guard, Chief, Operating and Environmental Standards, Michael Blair, DC
U.S. Coast Guard, Geological Survey Headquarters, Ken Smith, Commandant (CG-OES-2), DC
U.S. Coast Guard, LCDR Rogers Henderson, DC
U.S. Coast Guard, Maintenance and Logistics Command Atlantic, General Law Branch, Patrick Wycko, VA
U.S. Coast Guard, Office of Environmental Management, Department of Homeland Security, Ed Wandelt, Chief, Commandant (CG-47)
U.S. Coast Guard, Officer of Operating and Environmental Standards, Captain David Scott, DC
U.S. Coast Guard, Vessel & Facility Oper. Standards Div. (CG-5222), Chief, Commander Patrick W. Clark, DC
U.S. Customs & Border Protection, Department of Homeland Security, Environmental Programs Branch, Christopher Oh, Branch Chief, DC
U.S. Customs and Border Patrol, Barry Thompson, ME
U.S. Department of Agriculture, Ecologist Services Division, Andree DuVarney, National Environmental Coordinator, VA
U.S. Department of Defense, Office of Deputy Undersecretary Defense (Installations & Environment), Terry Bowers, Director, Environmental Sec.-EQ, DC
U.S. Department of Energy, Director for Import/Export Activities, DC
U.S. Department of Energy, Office of Intergovernmental Affairs, Director, OGC, Carol M. Borgstrom, DC
U.S. Department of Energy, Office of Intergovernmental Affairs, Steve Lerner, DC
U.S. Department of Homeland Security, U.S. Coast Guard, Captain James McPherson, ME
U.S. Department of Housing and Urban Development, Environmental Planning Division, James M. Porter, Community Planner, DC
U.S. Department of Interior, U.S. Geological Survey, Environmental Management Branch, Department of Interior, Esther, Engineering Chief, VA
U.S. Department of State, Office of Energy Diplomacy, Energy Resources Bureau, Michael Brennan, DC
U.S. Department of the Army, Assistant for Sustainability, Office of Deputy Assistant Secretary of the Army, DC
U.S. Department of the Interior, Bureau of Indian Affairs, Eastern Region, James T. Kardatzke, Ph.D., TN
U.S. Department of the Interior, National Park Service, Acadia National Park Service, John Kelly, Park Planner, ME
U.S. Department of the Interior, National Park Service, Dee Morse, Air Resources Division, CO
U.S. Department of the Interior, National Park Service, Roosevelt Campobello International Park, Harold Bailey, Natural Resource and Planning Manager, ME
U.S. Department of the Interior, Office of Environmental Policy and Compliance, Diane Lazinsky, MA
U.S. Department of the Interior, U.S. Fish & Wildlife Service, Moosehorn National Wildlife Refuge, William J. Kolodnicki, ME
U.S. Department of Transportation, Environmental Policies Team Leader, Camille Mittelholtz, DC
U.S. Department of Transportation, Environmental Policies, Team Leader, DC
U.S. Department of Transportation, Office of Pipeline Safety PHMSA, Kenneth Lee, Director Engineering and Research Div., DC
U.S. Department of Transportation, Office of Pipeline Safety PHMSA, Engineering and Research Div., M. Buddy Secor, Jr., DC
U.S. Department of Transportation, Office of Pipeline Safety PHMSA, Bryn Karaus, DC
U.S. Department of Transportation, Office of Pipeline Safety, Harold Winnie, MO
U.S. Department of Transportation, Office of Pipeline Safety, Mike Schwarzkopf, GA
U.S. Department of Transportation, Office of Pipeline Safety, Pipeline & Hazardous Material Safety Administration, DC
U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Jeffrey Wiese, Associate Administrator - Pipeline Safety, DC
U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Magdy El-Sibaie, Associate Administrator, DC
U.S. Department of Transportation, U.S. Coast Guard, Jason Smiley, Lieutenant, MSFO Belfast, ME
U.S. Environmental Protection Agency - New England, H. Curtis Spaulding, MA
U.S. Environmental Protection Agency - New England, Timothy Timmermann, Office of Environmental Review, MA
U.S. Environmental Protection Agency - Office of Federal Activities, Cliff Radar, Director of NEPA Compliance Division, DC
U.S. Environmental Protection Agency, Natural Gas STAR, Jerome Blackman, DC
U.S. Environmental Protection Agency, Office of Enforcement and Compliance Assurance, Cynthia Giles, Assistant Administrator, DC
U.S. Environmental Protection Agency, Office of Federal Activities, Susan E. Bromm, Acting Director, DC
U.S. Environmental Protection Agency, Phil Colarusso, Marine Biologist, MA
U.S. Environmental Protection Agency, Region 1, Betsy Higgins, MA
U.S. Fish and Wildlife Service, Department of Interior, Pat Carter, NEPA Coordinator, VA
U.S. Fish and Wildlife Service, Ecological Services Office, Michael Amaral, Wildlife Biologist, NH
U.S. Fish and Wildlife Service, Lori Nordstrom, ME
U.S. Fish and Wildlife Service, Wende Mahaney, Fish and Wildlife Biologist, ME
United States Coast Guard, Commandant Robert Papp, DC
USDA Forest Service, Farm Service Agency, Matthew Ponish, National Comp. Manager, DC
USDA Forest Service-Ecosystem Management Coordination, Joe Carbone, Assistant Director, NEPA, DC

State Agencies and Elected Officials

Department of Environmental Protection, Bureau of Land & Water, Judy Gates, Augusta, ME
Department of Environmental Protection, Bureau of Land and Water, Gregg Wood, PE

Department of Public Safety, Office of State Fire Marshall, Stephen W. Dixon, Sr., Inspector, ME
Maine Coastal Program, Department of Agriculture, Conservation and Forestry, Kathleen Leyden, Director, ME
Maine Coastal Program, Department of Agriculture, Conservation and Forestry, Todd Burrowes, Federal Consistency Coordinator, ME
Maine Department of Conservation, Bureau of Parks and Lands, Kathy Eickenberg, ME
Maine Department of Conservation, Don Cameron, Botanist, ME
Maine Department of Conservation, Maine Forest Service, Donald J. Mansius, Director, ME
Maine Department of Conservation, Natural Areas Program, Rachael Ross, Information Manager, ME
Maine Department of Conservation, Scott Ramsay, Director, ME
Maine Department of Economic and Community Development, Thaxter Traffon, Commissioner, ME
Maine Department of Environmental Protection, Bureau of Air Quality, Marc Cone, ME
Maine Department of Environmental Protection, Bureau of Land & Water, Bryce J. Sproul, ME
Maine Department of Environmental Protection, Bureau of Land and Water Quality, Gregg Wood, ME
Maine Department of Environmental Protection, Bureau of Land and Water Quality, ME
Maine Department of Environmental Protection, Bureau of Land and Water Quality, Robin Clukey, ME
Maine Department of Environmental Protection, Eastern Maine Regional Office, Heather L. Parent, Policy Director, ME
Maine Department of Environmental Protection, Eastern Maine Regional Office, James Beyer, ME
Maine Department of Environmental Protection, Ed Logne, ME
Maine Department of Environmental Protection, Office of the Commissioner, James E. Dusch, ME
Maine Department of Environmental Protection, Southern Maine Regional Office, Bureau of Land and Water Quality, Linda Kokemuller, ME
Maine Department of Inland Fisheries & Wildlife, Mark A. McCollough, ME
Maine Department of Inland Fisheries & Wildlife, Steve Timpano, ME
Maine Department of Inland Fisheries and Wildlife, Endangered and Threatened Species Group, Chandler Woodcock, ME
Maine Department of Inland Fisheries and Wildlife, Endangered and Threatened Species Group, Phillip DeMaynadier, ME
Maine Department of Inland Fisheries and Wildlife, Region A, Scott Lindsay, Regional Wildlife Biologist, ME
Maine Department of Inland Fisheries and Wildlife, Region B, James Connolly, Regional Wildlife Biologist
Maine Department of Inland Fisheries and Wildlife, Region C, Ron Brokaw, Regional Fisheries Biologist, ME
Maine Department of Inland Fisheries and Wildlife, Region C, Tom Schaeffer, Regional Wildlife Biologist, ME
Maine Department of Inland Fisheries and Wildlife, Region F, Vasco Carter, Regional Wildlife Biologist, ME
Maine Department of Inland Fisheries and Wildlife, Richard Bard, Wildlife Biologist, ME
Maine Department of Labor, Lauren Boyett, Commissioner, ME
Maine Department of Marine Resources, Brian Swan, Environmental Coordinator, ME
Maine Department of Marine Resources, Norman Olson, ME
Maine Department of Public Safety, Office of State Fire Marshall, John C. Dean, State Fire Marshall, ME
Maine Department of Transportation, Environmental Office, Mark Likus, ME
Maine Department of Transportation, Office of Legal Services, Toni Kemmerle, Chief Counsel, ME
Maine Emergency Management Agency, Robert S. Gardner, Technical Hazards Coordinator, ME
Maine Energy Resources Council, Beth Nagusky, Director of Energy Independency & Security, ME
Maine Forest Service, Maine Department of Conservation, Bill Beardsley, Commissioner, ME
Maine Historic Preservation Commission, Dr. Arthur Spiess, Sr., Archaeologist, ME
Maine Historic Preservation Commission, Earle Shettleworth, Jr., Historic Preservation Officer, ME
Maine Historic Preservation Commission, Mike Johnson, Review and Compliance Coordinator, ME
Maine Marine Patrol, Department of Marine Resources, Lt. Alan Talbot, ME
Maine Port Authority, Brian C. Nutter, ME
Maine Port Authority, Kevin Rousseau, ME
Maine State Planning Office, Todd Burrows, ME
State of Maine, Washington County Community College Facilities, ME
Washington County Emergency Management Agency, Michael Hinerman, ME

Local Governments

Calais, David Randall, Chief of Police, ME
City of Brewer, Gail Kelly, Mayor, ME
City of Eastport, City Manager, George Finch, ME
City of Lewiston, ME, Mayor Robert E. Macdonald
City of Saco, Mark D. Johnson, Mayor, ME
City of Westbrook, Colleen Hilton, Mayor, ME
Eastport Port Authority, Chris Gardner, Port Director, ME
Governor's Energy Office, Kenneth C. Fletcher, Director, Augusta, ME
Maine State Housing Authority, ME
Robbinston, ME, Fire Department, Fire Chief
Town Council, Windham, Donna M. Chapman, ME
Town of Appleton, ME, Pamela Tibert, Town Clerk
Town of Baileyville, ME
Town of Bowdoin, Leroy Letouneau, ME
Town of Bowdoin, ME, Debora Avery, Board of Selectmen
Town of Bowdoin, ME, Marc Berner, Board of Selectman
Town of Bowdoin, ME, Melanie Page, Town Clerk
Town of Bowdoin, Michelle Keleher, ME
Town of Bowdoinham, ME, Kathy Durgin-Leighton, Town Manager
Town of Bradley, ME, Melissa Doane, Town Manager
Town of Bucksport, ME, Roger Raymond, Town Manager
Town of Calais, Fire Department, Danny D. Carlow, Chief, ME
Town of Durham, ME, Administrator
Town of Eastport, ME, Police Chief
Town of Eddington, ME, Town Manager
Town of Eliot, ME, Town Clerk
Town of Frankfort, ME, Evelyn Adams, Board of Selectmen
Town of Frankfort, ME, Municipal Clerk
Town of Gorham, ME, Town Manager
Town of Great Pond, ME, Town Clerk
Town of Liberty, Board of Selectmen, ME

Town of Liberty, Gail Phillipi, Town Clerk, ME
Town of Liberty, John Krueger, Board of Selectmen, ME
Town of Lisbon, ME, Town Manager
Town of Milford, ME, Town Manager
Town of Monroe, ME, Town Clerk
Town of Montville, ME, Town Clerk
Town of New Gloucester, Summer N. Field, III, Town Manager & Clerk, ME
Town of Newington, NH, Town Clerk
Town of Orrington, Town Manager, ME
Town of Perry, Board of Selectman, Karen J. Raye, ME
Town of Pownal, Alfred N. Fauver, Selectmen, ME
Town of Pownal, Jonathan W. Morris, Selectman, ME
Town of Pownal, Timothy J. Giddinge, Chair, Selectman, Board of Selectmen, ME
Town of Princeton, ME, Town Clerk
Town of Richmond, David Peppard, Town Manager, ME
Town of Robbinston, Earle Stanhope, Commissioner, ME
Town of Sabattus, Andre Marquis, ME
Town of Sabattus, Don Fournier, Jr., ME
Town of Sabattus, Gino Camardese, Board of Selectmen, ME
Town of Sabattus, James Wood, ME
Town of Sabattus, Mark Duquette, ME
Town of Sabattus, ME, Suzzanne M. Adams, Town Clerk
Town of Sabattus, ME, Town Clerk
Town of Sabattus, Paul Gagne, ME
Town of Scarborough, ME, Town Manager
Town of Searsmont, Alice Pearse, Assistant to the Selectmen, ME
Town of Searsmont, ME, Town Clerk
Town of Somerville, Martha Staples, Town Clerk, ME
Town of Washington, ME, Town Clerk
Town of Windham, ME, Town Manager
Town of Windsor, ME, Town Manager
Town of Winterport, ME, Town Manager
Washington County, ME, County Commissioner

Canada - Canadian Environmental Assessment
Canadian Environmental Assess. Agency, Bill Coulter, Director, Nova Scotia, Canada
Canadian Environmental Assessment Agency, Yves Leboeuf, Director, Policy Analysis, Ontario, Canada

Canada - Coast Guard
Canadian Coast Guard, Ryan Green, New Brunswick, Canada
Canadian Coast Guard, Nancy Hurlburt, Director, Maritime Services, New Brunswick, Canada
Fisheries and Oceans Canada Communications Branch, Sophie Galarneau, Communications Officer, Ontario, Canada

Canada - Department of Intergovernmental Affairs
Canadian Providence of New Brunswick, Department of Intergovernmental Affairs, Jim McKay, Deputy Minister, New Brunswick, Canada
Dept Intergovernmental Affairs, Province of New Brunswick, Lynn MacKay, Senior Policy Advisor, New Brunswick, Canada

Canada - Embassy
Canadian Embassy, Ambassador, Gary Doer, DC

Canada - Environment Canada
Canadian Wildlife Service, Michelle Brenning, Director General, Quebec, Canada
Environment Canada, Claude Rivet, Environmental Emergencies - Quebec Region, Quebec, Canada
Environment Canada, Robert Reiss, Environmental Emergencies - Quebec Region, Quebec, Canada
EPOD - Atlantic, Environmental Stewardship Branch, Steve Zwicker, Senior Environmental Assessment Advisor, Environmental Assessment Section, Nova Scotia, Canada
National Marine Service Centre-Environment Canada, Blair Sparks, Manager, Newfoundland, Canada
Nova Scotia Regional Headquarters, Nova Scotia, Canada, Jim Abraham, Director General, Atlantic Region
Sierra Club-Canada, Mark Dittrick, Conservation Chair, Nova Scotia, Canada

Canada - Media
CBC Radio Canada, Michael Holmes, New Brunswick, Canada

Canada - Other Interested Parties
Atlantic Salmon Federation, Frederick Whorisky, V.P. Research & Environment, New Brunswick, Canada
Bayside Port Corporation, Michael Power, President, Nova Scotia, Canada
Friends of Head Harbour Lightstation, Terris Greene, New Brunswick, Canada
Jessie Davies, St. Andrews, New Brunswick, Canada
Leslie J. Pinder, St. Stephen, Canada
Michael R. Power, New Brunswick, Canada
Nature Trust of New Brunswick, Jessie Davies, Honorary Trustee, New Brunswick, Canada
New Brunswick Tourism Action Group, Victoria Cunningham, New Brunswick, Canada
Owen House Country Inn, Joyce Morrell & Janice Meiners, New Brunswick, Canada
Peter and Mary Louise Kane, New Brunswick, Canada
Premier of Canadian Province of New Brunswick, Shawn Graham, New Brunswick, Canada
Rita Raser, New Brunswick, Canada
Save Passamaquoddy Bay Canada, Inc., St. Andrews, Canada
St. Andrews Town Council, Mike Craig, New Brunswick, Canada

Canadian Agencies
Town of St. Andrews, Tim Henderson, New Brunswick, Canada
U.S. Consulate General of the USA in Halifax, Richard H. Rilely, IV, Halifax, Canada

Transport Canada
Transport Canada Marine Safety, Captain Michael Donald, Senior Marine Inspector, Ontario, Canada
Transport Canada, Atlantic Region, Nova Scotia, Canada, Mihai Balaban, Manager, Security Operations

Other Canadian Agencies/Organization
Foreign Affairs and International Trade Canada, Peter Fawcett, Acting Director, Ontario, Canada
Fundy Culture Museum Network, c/o Ross Memorial Museum, Margot Magee Sackett, Director, New Brunswick, Canada

Fundy North Fishermen's Association, Maria Recchia, New Brunswick, Canada
Huntsman Marine Science Centre, W.D. Robertson, New Brunswick, Canada
St. Croix Stevedores, Port of Bayside, David M. Brown, Labour Relations Officer, New Brunswick, Canada
U.S. Transboundary Division (NUE), Foreign Affairs and International Trade, Tyler G. Cummings, Policy Analyst-Energy, Ontario, Canada

Non-Governmental Organizations

American Gas Association, Dave Parker, President, DC
Carmody Marine Consultant, David L. Carmody, ME
Cobscook Bay Fishermen's Association, Harry Shain, Sr., Chair, ME
Conservation Law Foundation, Robert H. Gardiner, ME
Humane Society of the United States, Wildlife Trust, DC
Machias/East Machias River Watershed Councils, Bill Cherry, Coordinator, ME
Maine Advocacy Center (Conservation Law Foundation), Sean Mahoney, ME
Natural Resources Council of Maine, Dylan Voorhees, Energy Project Director, ME
Pan AM Railways, Sydney Culliford, MA
Sierre Club, Vivian Newman, ME
St. Croix International Waterway Commission, Lee Sochasky, Executive Director, ME
The Nature Conservancy, Barbara Vickery, Director of Conservation Programs, ME
The Wilderness Society, Pete Morton, Ph.D., Director of Economics, CO

Other Interested Parties

Danny and Sheila Stanhope, MN
Philip Ahrens, Pierce Atwood, ME
Mary Albright, Pierce Atwood, ME
Rosemary E. Bradshaw, PA
Michael Brown and Valerie Lawson, ME
Carol P. Bryan, ME
Calais Chamber of Commerce, Linda Howe, ME
Center for Disease Control and Prevention, Andrew L. Dannengert, MD, MPH, Assistant Director, Science, GA
CES, Inc., Dennis Sanborn, ME
CH IV International, Arthur A. Ransome, MD
CLF Ventures, Inc., James A. Hamilton, PE, MA
Cobscook Bay Resource, Will Hopkins, ME
Department of Economic and Community Development, Thaxter R. Trafton, Commissioner, ME
Downeast LNG Inc., Robert Wyatt, DC
Eastport Pilots USA, Captain Gerald S. Morrison, Master Mariner, ME
Enviromet, LLC, Gary Napp, PA
Joseph Footer and Nicole Footer, ME
Raymond Faulkner and Lana Perkins, ME
Rita Fraser, C/O Shems Dunkiel Kassel & Saunders PLLC, VT
Garrard Co., Edward S. O'Meara, Jr., ME
Edward Gomes, MA
Harris Point Shore Cabins and Motel, Linda Newcomb, ME
Fred Hartman, ME
Healy & Aldrich, Inc., Doug Cotton, MA
Installations and Environment, DoD Siting Clearinghouse, Alexandria, VA
David Jenkins, MA
Bill Kapaldo, ME
Mark and June Kennedy, ME
Stanley Kielb, ME
Roy Knights, ME
David and Denise Koehne, ME
Kevin Lane, ME
The Lane Construction Corporation, Eugene P. Weldon, ME
Edward Lewis Trust, FL
Walter Loring, ME
Marshall and Ruth Lucas, ME
Bernard J. Lukco, OH
Kirk Maenhout, ME
Matthew Manahan, ME
Hal and Amy Mann, VA
Maritime & Northeast, c/o Duke Energy, Lloyd Kelly, TX
Jeffrey & Leah McLean, ME
Tom McLaughlin, ME
William and Vicki McLaughlin, ME
Elaine, Bonny and Scott Merryfield, ME
Alva Mesman, ME
Richard Mingo, ME
Joe Moholland, VA
Kathy and Blair Moholland, ME
Warren and Thelma Moholland, ME
Aimee and Michael Morrell, ME
Darren and Jamie Morrell, ME
Kevin Morrell, ME
James Morris, ME
Merrill C. Morris, Jr., ME
Maynard and Rita Morrison Trust, ME
Ricky and Dorothy Muncey, ME
Pat Murphy, IL
Douglas Newman, ME
North East Energy Development Company LLC, Arthur E. Gelber, TX
Frank Ohara, ME
John and Pat Owen, ME
Janet and Thomas Parks, FL
Louis Paul, ME
Joseph and Pina Pilaro, ME
Troy Prout, c/o Bluebird Rauch, ME
James and Linda Raymond, ME
Marc Rhode, ME
Dennis Ryan, ME
Save Passamaquoddy Bay from LNG, ME
Maine Attorney General, William J. Schneider, ME
Ed Seeley, ME
Harold Smith, ME
Donald Soctomah, ME
Dennis and Virginia Sterner, ME
Shirley St. Pierre, ME
Erik Squire, ME
Bonnie Stronach, ME
Sunrise County Economic Council, Jennifer Peters, Interim Executive Director, ME
Tech Inc., Nathalie Schils, Environmental Scientist, MA
Tetra Tech, Inc., John Scott, MA
Tetra Tech, Inc., Sean Sparks, Biologist, MA
Kelli Toole, ME
Sidney Unobsky Trust, CA
Verizon New England, TX

Todd and Sarah Walters, AK
Darrell and Mavis Warren, ME
Jessica Welch, ME
John Wentworth and Susan Cox, ME
Susan Woodman, ME
Barry Woolaver, ME

Labor Unions
Carpenters Local Union 1996, Bruce King, Augusta, ME

Libraries
Appleton Public Library, ME
Balfast, ME, School Administrative District No 34
Bangor Mental Health Library, ME
Baxter Memorial Library, ME
Belfast City Free Library, ME
Bowdoinham Public Library, ME
Bucksport Library, ME
China Library, ME
City of Brewer Library, ME
Dorothy W Quimby Library, ME
Dyer Library, ME
Ellsworth City Library, ME
Freeport Community Library, ME
Gardiner Public Library, ME
Gibbs Library, ME
Hadley Parrot Health Science Library, ME
Isaac F. Umberhine Public Library, ME
Ivan O. Davis-Liberty Library, ME
Kennebunk Free Library, ME
Langdon Public Library, NH
Lewiston Public Library, ME
Lisbon Falls Community Library, ME
Martha M. Doore, ME
Mildred Stevens Williams Memorial Library, ME
Monroe Community Library, ME
New Gloucester Public Library, ME
Old Town Public Library, ME
Orono Public Library, ME
Orrington Public Library, ME
Portsmouth Public Library, NH
Princeton Public Library, ME
Raymond H Fogler Library, ME
Scarborough Public Library, ME
Searsmont Town Library, ME
Susan Farrell Caust Memorial Library, ME
Thorndike Library, ME
Topsham Public Library, ME
Waldo Pierce Reading Room, ME
Walker Memorial Library, ME
Weeks Public Library, NH
William Fogg Library
Windham Public Library, ME
Winterport Memorial Library, ME
Woodland Public Library, ME

Newspapers
American Journal, ME
Bangor Daily News, ME
Brunswick Times Record, ME
Camden Herald, ME
Dover Community News, NH
Eagle-Tribune, MA
Ellsworth American, ME
Foster's Daily Democrat, NH
Kennebec Journal, ME
Knox County Courier-Gazette, ME
Lakes Region Weekly, ME
Lewiston Sun Journal, ME
Lincoln County News, ME
Machias Valley News Observer, ME
Maine Biz Magazine, ME
Northern Forecaster, ME
Portsmouth Herald, NH
Quoddy Tides, ME
Rockland Free Press, ME
Saco Sun Chronicle, ME
Scarborough Leader, ME
Southern Forecaster, ME
St. Croix Printing & Publishing Co. Ltd., Kathy Bockus, New Brunswick, Canada
The Calais Advertiser, ME
The Current, ME
The Potter Leader Enterprise, PA
The Quoddy Tides, ME
The Saint Croix Courier, ME
The Sipayik Newsletter, ME
Union Leader, NH
Waldo Independent, ME
Windham Independent, ME
York County Coast Star, ME

Tribal Nation Elected Officials and Management
Aroostook Band of Micmacs, George Paul, ME
Houlton Band of Maliseet Indians, Honorable Brenda Commander, Tribal Chief, ME
Passamaquoddy Tribal Council, ME, Mark Altvater
Passamaquoddy Tribe at Indian Township Reservation, Donald Soctomah, Tribal Historic Preservation Officer, ME
Passamaquoddy Tribe at Indian Township Reservation, Richard Stevens, Governor, ME
Passamaquoddy Tribe at Pleasant Point Reservation, Dale Mitchell, ME
Passamaquoddy Tribe at Pleasant Point Reservation, ME
Passamaquoddy Tribe of Indian Township, Joseph Socolanson, Chief, ME
Passamaquoddy Tribe, Pleasant Point Reservation, Steve Crawford, ME
Penobscot Indian Nation Island Res., ME, John Banks, Director Department of Natural Resources
Penobscot Indian Nation, Indian Island Reservation, Bonnie Newsom, Tribal Historic Preservation Officer, ME
Penobscot Indian Nation, Indian Island Reservation, Clem Fay, Fisheries Manager, ME
Penobscot Indian Nation, Indian Island Reservation, Honorable James Sappier, Chief, ME

Service List
City of Calais, ME, Diane Barnes, City Manager
City of Eastport, Jonathan Southern, City Manager, ME
Cullen and Dykman, Kenneth Maloney, DC
Dean Girdis, President, Downeast Pipeline, LLC
Downeast Pipeline, LLC, Dean Girdis, President, DC
Eastport Port Authority, Port Director, Washington County, ME

Frank Seeley, ME
Fulbright & Jaworski LLP, Lisa Tonery, Attorney, NY
Gary Lee Guisinger Haines-Crawford & Associates, Paul and Suzanne Crawford, ME
Humane Society of the United States, Wildlife Land Trust, Stephen Swartz, General Counsel, DC
Humane Society of the United States, Wildlife Land Trust, Terrie McNulty, DC
Huntsman Marine Science Center, Frederick Whoriskey, Chairman of the Board, New Brunswick, Canada
K & L Gates LLP, David L. Wochner, DC
K & L Gates LLP, Sandra Safro, DC
Katie's on the Cove, Joseph and Lea Sullivan, ME
KeySpan Energy Delivery Companies, Dolores Chezar, NY
Ki McClennan, Nulankeyutmonen Nkihtahkomikumon, VT
Kim Clark, John & Hengerer, DC
Linda Newcomb, ME
M&N Management Company, Ashley Barret, Regulatory Affairs, TX
M&N Management Company, Joseph F. McHugh, Director, Rates & Regulatory Affairs, MA
M&N Management Company, Steven E. Hellman, Associate General Counsel, TX
Maine Atlantic Salmon Commission, Norman R. Dube, Fisheries Scientist, ME
Maine Office of the Governor, Honorable Paul LePage, Governor, ME
Maine Public Utilities Commission, Carol MacLennan, State Attorney, ME
Maine Public Utilities Commission, Secretary, ME
Margaret O. McGarvey, ME
Michael and Cathy Footer, ME
Mill River Pipeline, LLC, Ted Gehrig, President and COO, MA
Mobil Natural Gas, Inc., Michael V. Gabel, TX
Mobile Natural Gas, Inc., Ronald Moore, Alberta, Canada
National Grid USA Service Company, Inc., Roxane Maywalt, Senior Counsel, NY
Nulankeyutomonen Nkihtahkomikumon, c/o Mary Bassett, ME
Old Sow Publishing, Robert Godfrey, ME
Partner, Baker Botts LLP, Bruce Kiely, DC
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Passamaquoddy Lobstermen Association, Joel Stanhope, ME
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Passamaquoddy Tribe at Pleasant Point Reservation, Honorable Rick Doyle, Governor, ME
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Quoddy Pilots USA, Captain Robert J. Peacock, II, ME
Rebecca Boucher, VT
Roland and Kathy Chambers, ME
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Save Passamaquoddy Bay, Robert & Linda Godfrey, ME
Sherri Booye, Skadden, Arps, Slate, Meagher & Flom LLP, VA
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St. Mary's First Nation, Gina Brooks, Director, New Brunswick, Canada
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Olive and Thomas Bentum, ME
Richard and Katherine Berry, ME
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Bill and Pal Brett, RI
Gregg and Patricia Brooks, CT
John Brooks, ME
Norman and Lisa Brooks, ME
Patrick Burke, ME
Norman and Mary L. Burpee, ME
Kathleen Byron, ME
Sherry Campbell, ME
Paula McLaughlin and Carl McGouldrick, ME
Michael and Lori Carr, ME
Kenneth Carson, ME
Bernard and Gail Carter, MA
Richard and Lucy Carver, AZ
Troy and Luicha Case, ME
John and Rhonda Chambers, ME
Lydia DiCenzo and Charles Murray, ME
Lewis and Renee Cheverie, CT
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Daniel Cyr, ME
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Jesse Demmons, ME
Caroline Michalicki and Dick Oswell, FL
Wayne Diffin, Sr., ME
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Frank and Mary DiMarco, ME
Vincent and Patrick Dineen, ME
Direct TV, CA
Domtar, Inc., Toronto, ON
Patrick and Elaine Driscoll, ME
Thomas Driscoll, ME
David Dean and Duane Carlow, ME
Roger and Nancy Dumont, ME
Howard and Maryann Duvall, ME
Dalton B. Dwelley, ME
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Lawrence Elliott, CT
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David and Amy Gillis, ME
Carl, Peter and Calvin Goodwin, CT
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EMEC, Scott Hallowell, ME
Maine State Building & Construction Trades Co., John R. Hanson, ME
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Brandon Harriman, ME
John and Judith Hawkes, ME
Dr. Christopher Hayward, ME
Raymond Heffler, ME
Chris Heinig, ME
Robert and Barbara Henkel, ME
Marshall and Donna Hennequin, ME
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Eric and Beth Hinson, ME
Jay and Karen Hinson, ME
David and Estelle Holloway, ME
Jean Holmes, CT
John S. Hornbrook, ME
Billy Howard, ME
Edwina K. Howland, ME
Darren and Stephanie Ireland, ME
Irving Oil Corporation, ME
ISWASCW Limited Partnership, ME
Aaron James, ME
Calvin James, ME
Heirs of Wellington James, ME
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Wayne Diffin and Janie Honeck, ME
Trond Saeverud and Joan Siem, ME
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Bernard Johnson, ME
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Dorothy Johnson, ME
Downeast LNG Project, Jean Johnson, ME
Joseph Edward Johnson, ME
Sandra Johnson, ME
Scott Johnson, MA
Stanley and Eleanor Johnson, MA
Wayne and Anita Johnson, ME
Ernest & Eva Johnson and Judy Gillman, ME
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Randy and Therese McCormick, ME
John and Mary McDonald, ME
John McGovern, ME
Roger McIver, ME
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Thomas J. McLaughlin, AZ
Elaine McPhail, ME
Janice Meiners, ME
Edward and Kathryn Mekelburg, ME
Sheila Lambert Merrill, ME
Merrill, Gregory and Deanna Brooks, ME
Alden and Donna Mingo, ME
Arthur Mingo, c/o Alden Mingo, ME
William and Linda Moffett, ME
Tom and Cindy Moholland, ME
Waverly A. Moore, FL
Edith P. Murphy, IL
Norman and Barbara Mylen, ME
Mark and Susan Olson, ME
Town of Baileyville, Linda Pagels Wentworth, Town Manager & Clerk, ME
Nature Conservatory, VA
Omega Development, ME
Dale S. Perry, ME
Ronna M. Pisha, ME
Michael Pottle, ME
Jeffrey and Martha Pratt, ME
Joseph Pressley, ME
Prout Enterprises, ME

William and Sandra Pulk, ME
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Dorothy Linda Richardson, ME
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Craig Roderick, ME
William Roekrich, ME
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Fernand Roussel, ME
Sandbox Materials, Inc., ME
Donald and Heather Sargent, ME
Jeanne Schrumpf, ME
Rodney Brent Scott Heirs, ME
Sherman McCarter Trust, c/o E. Tyler, CA
Charles & Laurie Slavin, ME
Gary Small, ME
Harold Smith, ME
Jerry Smith, ME
Spendic Club, Inc., ME
Egil Straujups, MA
Paul and Sarah Strickland, MN
Sunrise Sand & Gravel, ME
Daniel Szatkowski, ME
Ada Taber, ME
Debra Taber, ME
Thomas Dicenzo, Inc., ME
VL Tommaro Oil Co., Inc., Vincent Tammaro, ME
Panamrails - Maine Central Railway, Rowland Theriault, MA
Pipe Line Contractors Assoc., J. Patrick Tielborg, TX
Terry A. Tracy, ME
Perry Improvement Association, David Turner, President, ME
Typhoon, LLC
V.L. Tammaro Oil Co., Inc., ME
Ronald W. Wallace, ME
Lane Construction Corp., John W. Wardwell, ME
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Woodland Pulp, LLC, ME
Mark and Arlene Wren, ME
Anna Writer and Elizabeth Kleinfield, FL

Appendix B

U.S. Coast Guard LOR and Waterway Suitability Report

20090302-0306 FERC PDF (Unofficial) 02/23/2009

U.S. Department of Homeland Security
United States Coast Guard

Commander
United States Coast Guard
Sector Northern New England

259 High St.
South Portland, ME 04106
Staff Symbol: PREV
Phone: (207) 767-0333
Fax: (207) 767-0308

16600

Federal Energy Rgulatory Commission
Attn: K. Bose
Secretary
888 First Street NE, Room 1A
Washington, DC 20426

CP07-52-000 et al

Dear Ms. Bose:

This letter is in follow-up to communication with Ms. Shannon Jones of the Federal Energy Regulatory Commission (FERC) staff and advises of a typographical error found in the Downeast LNG (DELNG) waterway suitability report (WSR).

On January 7, 2009 the Coast Guard provided the (FERC) with a Letter of Recommendation (LOR) and redacted and un-redacted versions of the associated WSR for the Downeast LNG project proposed for Robbinston, Maine. It has come to our attention that the WSR requires an edit be made; specifically, on page 46 of the redacted WSR; page 48 of the un-redacted WSR; and page ii of Appendix A, the acronym for *The Society of International Gas Tanker and Terminal Operators, LTD* should read SIGTTO vice SIGTO.

Accordingly, it is requested that a notice to this effect be posted in the DELNG docket to enable better 'word search' capability.

Should you have any questions in this regard please feel to contact Mr. Alan Moore, of my staff, at (207) 767-0338 or by e-mailing Alan.H.Moore2@uscg.mil.

Sincerely,

M. K. Sams

M.K. SAMS
Commander, U. S. Coast Guard
By direction of the Captain of the Port
Sector Northern New England

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20090325-0134 FERC PDF (Unofficial) 03/24/2009

ORIGINAL

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United States Coast Guard

Commander
United States Coast Guard
Sector Northern New England

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South Portland, ME 04106
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Phone: (207) 767-0333
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2009 MAR 24 A 9:52

16600

MAR 1 1 2009

Mar 11, 2009

Federal Energy Regulatory Commission,
Attn: K. Bose
Secretary
888 First Street NE, Room 1A
Washington, DC 20426

Dear Ms. Bose:

This letter is in follow-up to communication with Ms. Shannon Jones of the Federal Energy Regulatory Commission (FERC) staff and advises of a typographical error found in the Downeast LNG (DELNG) waterway suitability report (WSR); reference docket number PF06-13-000.

On January 7, 2009 the Coast Guard provided the (FERC) with a Letter of Recommendation (LOR) and redacted and un-redacted versions of the associated WSR for the Downeast LNG project proposed for Robbinston, Maine. It has come to our attention that the WSR requires an edit be made; specifically, on page 46 of the redacted WSR and page 48 of the un-redacted WSR. Accordingly, it is requested that the 2nd bullet be changed to read "During the LNG carrier's transit, a Zone 1 impact may well occur at Dog Island Light, affecting a small portion of Moose Island on the Maine side and the tip of Deer Island on the New Brunswick side." vice "During the LNG carrier's transit, a Zone 2 impact may very well occur at Dog Island Light, affecting portions of Moose Island on the Maine side and Deer Island on the New Brunswick side."

Should you have any questions in this regard please feel to contact Mr. Alan Moore, of my staff, at (207) 767-0338 or by e-mailing Alan.H.Moore2@uscg.mil.

Sincerely,

M. K. Sams

M.K. SAMS
Commander, U. S. Coast Guard
By direction of the Captain of the Port
Sector Northern New England

U.S. Department of Homeland Security
United States Coast Guard

Commander
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16611
January 6, 2009

Mr. J. M. Robinson
Director of Gas, Environment, and Engineering (PJ 11)
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

Dear Mr. Robinson:

This Letter of Recommendation (LOR) is issued pursuant to 33 C.F.R. § 127.009 in response to the Letter of Intent (LOI) that Downeast LNG submitted on December 20, 2005, proposing to transport liquefied natural gas (LNG) by ship to the Downeast LNG facility proposed for operation in Mill Cove, Robbinston, ME. It conveys the Coast Guard's determination as to the suitability of Passamaquoddy Bay, Western Passage, and Head Harbor Passage (hereafter Passamaquoddy Bay Waterway) for LNG marine traffic as it relates to navigational safety and maritime security. In addition to meeting the requirements of 33 C.F.R. § 127.009 and other applicable guidelines, this letter fulfills the Coast Guard's commitment to provide information to your agency under the Interagency Agreement signed in February 2004.

After reviewing the information in the applicant's LOI and completing an independent evaluation of the waterway in consultation with a variety of local port stakeholders, I have determined that the Passamaquoddy Bay Waterway is suitable for the type and frequency of marine traffic associated with this proposed project, provided that all of the recommended risk mitigation measures outlined in Section 4.6 of the attached Waterway Suitability Report (WSR) are fully implemented by the applicant. If and when these measures are put into effect, I conclude that they will sufficiently mitigate the identified risks associated with LNG traffic on the Passamaquoddy Bay Waterway to make it fully suitable for LNG vessels bound to and from the proposed facility. My determination is based on review of the information provided in accordance with 33 C.F.R. § 127.007(d)(3) through (d)(6) and in consideration of the items listed in 33 C.F.R. § 127.009(b) through (d)(6). The reasoning behind my determination is outlined below and in the attached WSR.

The Coast Guard has completed a comprehensive review of the LOI that Downeast LNG submitted and the Waterway Suitability Assessment (WSA) for the Downeast LNG facility that Det Norske Veritas submitted on behalf of Downeast LNG on December 19, 2006. This review was conducted following the guidance provided in the two applicable U.S. Coast Guard Navigation and Vessel Inspection Circulars (NVICs) in effect during this time frame, NVIC 05-05 and NVIC 05-08. The review focused on the navigational safety and maritime security risks posed by LNG marine traffic and the measures needed to responsibly manage those risks. During the review, the Coast Guard consulted a variety of stakeholders, including the Passamaquoddy Bay/Downeast Regional Sub-Committee of the Area Maritime Security Committee, the Maine and New Hampshire Port Safety Forum, and other ad hoc groups identified in Section 1 of the attached WSR.

16611
January 6, 2009

While this letter has no enforcement status, the determinations, analysis, and ultimate recommendation as to the suitability of this waterway, as contained in this letter, would be referenced in concert with a Captain of the Port Order, should an LNG transit be attempted along the Passamaquoddy Bay Waterway. Such an Order would be issued pursuant to my authority under the Ports and Waterways Safety Act of 1972, as amended by the Port and Tanker Safety Act of 1978, 33 U.S.C. § 1223 *et seq.*, and other applicable authorities.

For further information, please contact my project officer, Mr. Alan Moore, at (207) 767-0338, or email: Alan.H.Moore2@uscg.mil.

Sincerely,

J. B. McPherson

J. B. McPHERSON
Captain, U.S. Coast Guard
Captain of the Port, Sector Northern New England

Enclosures: (1) WSR
(2) WSR (Redacted version with SSI material removed)

Copy: Commander, First Coast Guard District (dl, dp, dpa)
Commander, Coast Guard Atlantic Area (Ap)
Commandant, U.S. Coast Guard (CG-5222, CG-0941)
Coast Guard Civil Engineering Unit Providence
Downeast LNG

REDACTED VERSION

Section 5.0 of this document contains Sensitive Security Information controlled under 49 CFR Part 1520. No part of that Section may be disclosed to persons without a "need to know," as defined in 49 CFR 1520.11, except with the written permission of the Secretary of homeland Security. Section 5.0 has been redacted from this document.

U. S. Coast Guard Captain of the Port Sector Northern New England Liquefied Natural Gas Facility Waterway Suitability Report

for the proposed

Downeast LNG Facility Robbinston, ME

January 6, 2009
Sector Northern New England

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DOWNEAST LNG
WATERWAY SUITABILITY REPORT

Executive Summary

The data and information regarding the proposed facility detailed in this Waterway Suitability Report (WSR) was derived from Downeast LNG's Application and supporting Resource Reports filed with the Federal Energy Regulatory Commission (FERC), as well as information provided directly to the COTP Sector Northern New England (COTP) in the Downeast LNG's Letter of Intent (LOI) and Waterway Suitability Assessment (WSA). Downeast LNG is proposing to build a Liquefied Natural Gas (LNG) import, storage, and regasification facility within an 80-acre tract of land on the south side of Mill Cove, Robbinston, Maine, near the confluence of Passamaquoddy Bay and the St. Croix River.

This report was developed using U.S. Coast Guard Navigation and Vessel Inspection Circulars (NVIC or Circular) 05-05, *Guidance on Assessing the Suitability of a Waterway for Liquefied Natural Gas (LNG) Marine Traffic and* NVIC 05-08, *Guidance Related to Waterfront Liquefied Natural Gas (LNG) Facilities* which replaced 05-05. NVIC 05-08 eliminated the term WSR and replaced it with "Letter of Recommendation Analysis". For the purpose of clarity, the WSR is equivalent to the LOR Analysis. As this report was originated under NVIC 05-05, we have elected to keep "Water Suitability Report" as the title of this document.

The project is intended to have the capability to receive, store, and vaporize LNG at a baseload sendout rate of 500 million standard cubic feet per day (mmscfd), with a peaking capacity of approximately 625 mmscfd, and an expansion potential for a total capacity of 1 billion standard cubic feet per day (bscfd). The proposed facility includes a 3,862-foot single-berth pier and vessel mooring system, LNG unloading pipeline, onshore storage tanks, regasification equipment, and ancillary, supporting infrastructure. An approximate 30-mile sendout pipeline will connect the facility to the existing interstate Maritimes and Northeast Pipeline. It is anticipated that an LNG carrier would be arriving from a foreign port and offloading to the terminal once every 5 to 7 days in the winter and once every 8 to10 days during the summer period. The proposed LNG vessel transit route passes through both United States and Canadian waters. This requires that Downeast LNG adequately address and resolve several transboundary safety and security risks, requirements, and impacts.

1.0 Introduction

This document constitutes the U.S. Coast Guard Captain of the Port (COTP) Sector Northern New England's Waterway Suitability Report (WSR) for the proposed Downeast LNG, Inc. (Downeast LNG) Liquefied Natural Gas (LNG) Facility. This Waterway Suitability Report (WSR) meets the intent of paragraph 6.a. of U.S. Coast Guard Navigation and Vessel Inspection Circular (NVIC or Circular) 05-05, entitled *Guidance on Assessing the Suitability of a Waterway for Liquefied Natural Gas (LNG) Marine*

Traffic, and NVIC 05-08 *Guidance Related to Waterfront Liquefied Natural Gas (LNG) Facilities.* NVIC 05-08 and it predecessor 05-05 establishes U.S. Coast Guard (USCG) policy for assessing the suitability of a waterway to support LNG carrier traffic.
This Report was compiled from several resources, some of which have been provided by the applicant, including the Application filed with the Federal Energy Regulatory Commission (FERC or Commission) and associated Resource Reports, Waterway Suitability Assessment (WSA), and amplifying information Downeast LNG provided directly to the COTP Sector Northern New England.

1.1 Background

The COTP Sector Northern New England received a Letter of Intent (LOI) in accordance with Title 33, Code of Federal Regulations (CFR), §127.007 from Downeast LNG, dated December 20, 2005. That LOI notified the COTP Sector Northern New England that Downeast LNG, Inc.; a Delaware based corporation, intended to construct a liquefied natural gas (LNG) import terminal and facility at a site located in Washington County on Mill Cove, Robbinston, ME.

The small town of Robbinston (population 525 in the 2000 census) lies at the northeastern edge of Washington County, with the small cities of Eastport (pop. 1640) lying to the south, and Calais (pop. 3447) to the north. The facility is to be sited within an 80-acre tract of land that abuts U.S. Route 1 on one end, and the southern half of Mill Cove, near the confluence of Passamaquoddy Bay and the St. Croix River, on the other. The marine portion of the project will be located entirely within U.S. waters.

The project is intended to have the capability to receive, store, and regasify (vaporize) LNG at a baseload sendout rate of 500 million standard cubic feet per day (mmscfd), with peaking capacity of approximately 625 mmscfd, and an expansion potential capacity of 1 billion standard cubic feet per day (bscfd). The marine terminal and single berth pier is intended to handle LNG vessels ranging from 70,000 to 165,000 m^3 in capacity. It will have the capability to support future vessels of up to 220,000 m^3 and corresponding lengths approximating 1,033 feet and drafts of nearly 40 feet (natural water depth at berth will be 50 feet at mean low, low water). It is anticipated that a carrier would be arriving and offloading once every five to seven days in the winter, and once every eight to ten days during the summer period. Figure 1 is an artist's rendering of the proposed project.

Figure 1

1.1.1 Marine Terminal and Storage Facility General Arrangement

The proposed import facility will consist of five major components: (1) Marine Terminal; (2) Storage Facility; (3) Pipeline Facilities; (4) Utilities, Infrastructure, and Support Systems; and (5) the natural gas pipeline. The following is an overview of these components of the project:

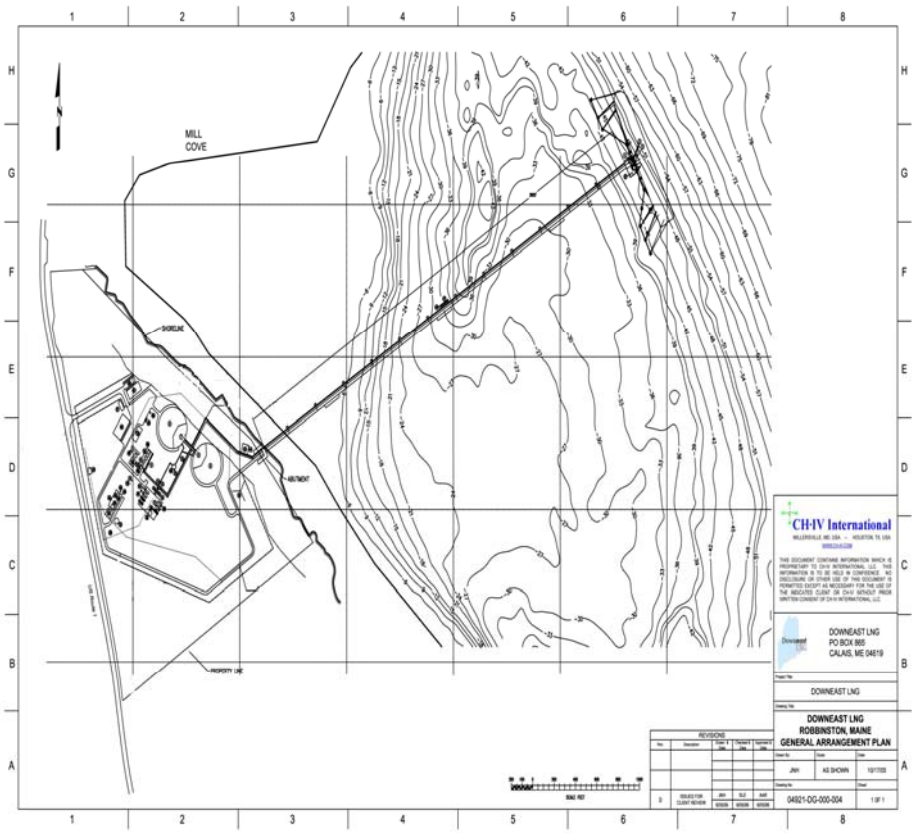
1. The Marine Terminal is comprised of a single berth pier arrangement with the trestle portion approximating 3,862 feet in length. The pier will be affixed with mooring systems to accommodate LNG carriers ranging from 70,000 to 165,000 m^3 in cargo carrying capacity, with future expansion capabilities to handle vessels approaching 220,000 m^3 in cargo carrying capacity. Three 16-inch manifold liquid unloading arms, equipped with emergency quick release couplings, are mounted mid-way along the vessel berth, as well as a 16-inch vapor return line and 36-inch cargo transfer pipeline.

2. The LNG Storage Facility will contain two storage tanks, with each having the capacity to store 160,000 m^3 of LNG. Only one tank will be initially built, with the second dependent on operational, permitting, and marketing conditions. The storage facility will also house two fully submerged, low pressure transfer pumps, boil-off gas recovery system, a submerged combustion vaporizer system, and high pressure natural gas pumps.

3. Pipeline Facility: The LNG will be offloaded from the carriers and pumped to the landside storage tank(s) using shipboard pumps. From the storage tank, the LNG will be regasified (natural gas) and ultimately fed into the M&NP pipeline via an approximate 30-inch diameter, 31-mile sendout pipeline and metering arrangement which serves the downstream States of Maine, New Hampshire, and Massachusetts. The entire capacity of the Downeast LNG facility is intended for the pipeline; no retail distribution is planned.

4. The Utilities, Infrastructure, and Support Systems contain the ancillary control, hazard detection and emergency shutdowns, vent system, fire detection and fire fighting, supply and control pneumatics, electrical control and transmission, and a host of administrative, utility, maintenance, and service facilities that are necessary to operationally support the facility.

Figure 2 – Proposed LNG Facility



1.2 COTP Role

The Federal Energy Regulatory Commission (FERC) conducts environmental, safety, and security reviews of LNG plants and related pipeline facilities, and as the lead federal agency for the process of authorizing the siting, construction, and operation of such facilities, prepares the overall National Environmental Policy Act (NEPA) documentation. In accordance with an Interagency Agreement between FERC and the Coast Guard, the Coast Guard is a cooperating agency with FERC under the NEPA

process, and will be providing input to FERC throughout the siting process. The Coast Guard exercises regulatory authority over LNG facilities which affect the safety and security of port areas and navigable waters under Executive Order 10173, the Magnuson Act, the Ports and Waterways Safety Act of 1972, as amended, and the Maritime Transportation Security Act of 2002. The Coast Guard is responsible for matters related to navigation safety and security, vessel engineering and safety standards, and all matters pertaining to security of facilities or equipment located in or adjacent to navigable waters. The Coast Guard also has authority for LNG facility security plan review, approval, and compliance verification as provided in 33 CFR subchapter H (parts 101-106)

1.3 Public Input and Interaction

The public had significant input into this Report. COTP Sector Northern New England representatives participated in five public meetings (of which two were joint scoping sessions) in concert with FERC: three in Washington County, ME, one on the Passamaquoddy Tribal Reservation at Pleasant Point, ME, and one on Campobello Island, New Brunswick (although premised on the safe and secure transportation of LNG in general, the Pleasant Point and Campobello sessions were conducted in conjunction with a competing project proposal). COTP Sector Northern New England attended a number of public outreach and informational sessions that were hosted by the applicant and/or their contracted consultants; meetings/sessions organized by the State of Maine Office of Energy Independence and Security; and a forum hosted by a tri-nation alliance/concerned citizens' group.

COTP Sector Northern New England has also considered numerous letters and electronic correspondence received from U.S., Canadian, and Tribal members of the public sector; local, county, state, provincial, and federal elected officials; non-profit organizations; environmental groups; and local, county, and state agencies commenting on the proposal. Many comments, both written and verbal, questioned the safe navigation of the intended waterway and expressed serious concerns for the maritime security and security of the vessels and port area.

Several articulated apprehension about LNG vessels being able to safely navigate through the approaches to Passamaquoddy Bay, especially within constrained portions of the channel where extreme currents and divergent eddies exist due to the extraordinary tides in the area. Comments also referenced local meteorological conditions, such as the prolonged periods of heavy fog and extreme winds common to the region. Several questioned the impact of these conditions on the safe movement of deep draft LNG carriers. In addition, numerous comments expressed grave concern regarding the perceived health hazards and property risks associated with the transportation of LNG to the coastal residents in the event of an intentional or unintentional release of LNG consequent to an act of terrorism or major marine casualty. These comments were carefully considered during the USCG's evaluation of this proposal.

Comments were also received that were not specifically relevant to the USCG's evaluation of the actual navigation safety and maritime security aspects of the proposed project. For example, comments included concern and opposition to potential

industrialization of the Passamaquoddy Bay area and the resultant impact it would have on ecotourism. Such comments reflected concern for the many environmentally sensitive areas and regional estuaries that the area is renowned for, some of which are outside of the immediate waterway. Others stressed potential adverse impacts on local aquaculture, marine life and fish, as well as the shellfish and lobster harvesting industries, claiming there would be crippling effects to the commercial fishermen. Some expressed concern about limiting public access to, and on, Passamaquoddy Bay and its tributaries. Several expressed general, overall opposition to the proposal, without further indicating specific areas of concern.

While all comments were not exclusively related to navigational safety and/or maritime security, which is the premise of this report, the USCG felt many of these issues and concerns have an overlapping effect on shipping, whether directly or indirectly, and consequently were taken into consideration where deemed germane. All documentary comments were placed in the public docket, and can be accessed via the FERC website. In addition, COTP Sector Northern New England proactively conducted a number of outreach campaigns to solicit input from, among others, the regional citizenry, local and state agencies, Canadian officials, the Passamaquoddy Tribe, and advocacy groups such as the "Save Passamaquoddy Bay 3-Nation Alliance."

1.4 Safety Working Group

Regional waterway users and stakeholders contributed to the information contained in this Report. As part of its assessment of the safety and security aspects of this project, the COTP Sector Northern New England convened safety and security working groups under the umbrella of the Passamaquoddy Bay/Down East Sub-Committee of the Area Maritime Security Committee (LNG Working Group) and Maine and New Hampshire Port Safety Forum, and participated in ad hoc meetings with the regional U.S. and Canadian response and law enforcement communities. For each of these working groups and sub-committees, a balanced group of representatives were invited to participate to ensure concerns on both sides of the international boundary were considered. None of the participants were asked to 'vote' or otherwise indicate whether the Downeast LNG proposal should be approved. Rather, participants were relied upon to provide valid input based on their expertise and regional familiarity in order to conduct a thorough assessment of potential risks to navigational safety and port security associated with the proposed project, and as well assist in the identification of possible mitigation measures.

The LNG Working Group, as a whole, convened initially in Ellsworth, ME, in March, 2006, and subsequent meetings were held in Ellsworth and Eastport, ME, in April and December, 2006, respectively. The consultation process has included subsequent collaboration with members throughout the WSA review and validation process. Additionally, LNG sub-committee sessions and related issues were regular agenda topics at quarterly Maine and New Hampshire Port Safety meetings held in Portsmouth, NH, Augusta, Bangor, and Eastport, ME. In addition to the Eastport Port Safety Forum venue, a tour through the waters of the intended LNG transit route was conducted for the benefit of the membership. In addition to the USCG sponsored LNG Working Group, COTP Sector Northern New England participated in LNG technical working group

sessions hosted by the State of Maine, which met periodically to collaborate on safety and emergency response aspects of the proposed project.

The LNG Working Group, Port Safety Forum, State assemblage, and project-related ad hoc safety and response meetings included representatives from the following:

- U.S. Coast Guard
- Maine Maritime Academy
- Moran Towing
- Portland Tugboat
- U.S. Army Corps of Engineers
- National Oceanographic and Atmospheric Administration
- National Marine Fisheries
- NI2 Center for Infrastructure
- Maine State Fire Marshall
- Maine Department of Environmental Protection
- Maine Department of Marine Resources
- Eastport City Manager
- Eastport Port Authority
- Maine Emergency Management Agency (MEMA)
- Washington County EMA
- Clean Harbors Response Corp
- Town of Calais, ME
- Maine Port Authority
- Harbor Master, Town of Bar Harbor
- Maine Bureau of Parks and Lands
- U.S. Department of Justice
- Royal Canadian Mounted Police
- Integrated Border Enforcement Team
- U.S. Customs and Border Protection
- Maine Marine Patrol
- Maine Energy and Policy
- Maine State Police
- Save Passamaquoddy Bay
- Roosevelt Campobello International Park Commission
- Passamaquoddy Tribe, Pleasant Point Reservation
- Town of Perry, ME
- Town of Robbinston, ME
- Federal Marine Terminal
- Eastport Pilots
- Quoddy Pilots
- Maine Ferry Service
- Pollution and Safety Advisor/LNG Consultant
- National Response Corp
- Penobscot Bay Pilots

This LNG Working Group was formed to review the safety risks outlined in Downeast LNG's WSA and those identified and compiled by the COTP, and to help evaluate proposed risk mitigation measures and vessel transit operational parameters.

1.5 Security Working Group

The USCG conducted its security assessment in conjunction with Law Enforcement (LE) elements of its LNG Working Group, the Passamaquoddy Bay/Down East Sub-Committee of the Area Maritime Security Committee, and ad hoc sessions involving the regional law enforcement community. Representation included:

- Maine State Fire Marshall
- Maine Department of Marine Resources
- City of Calais, ME
- Maine Pilotage Commission
- U.S. Coast Guard
- Maine State Police
- U.S. Department of Justice
- Royal Canadian Mounted Police
- Interagency Border Enforcement Team
- U.S. Customs and Border Protection
- Maine Marine Patrol
- Maine State Police
- Passamaquoddy Tribe, Pleasant Point Reservation
- Town of Perry, ME
- Town of Robbinston, ME
- City of Eastport, ME

This Report will not identify specific security mitigation measures, nor divulge any other information that could compromise security measures for the proposed facility. Such information is considered Sensitive Security Information (SSI) under 49 U.S.C. § 114(s) and 49 CFR, Part 1520. Because it discusses potential vulnerabilities or operational security measures for the proposed facility; this specific information has been provided to FERC as part of the Supplementary Record to this WSR. Members of the LNG Working Group were considered to have the "need to know" as defined by 49 C.F.R. §1520.11. Accordingly, each signed appropriate Non-Disclosure Statements, which gave them access to SSI material related to the safety and security assessment.

2.0 Port and LNG Route Characterization

The assessment of the projected route included the examination of waterway attributes, weather, port characterization, density and character of marine traffic, zones of concern as defined in the Sandia Study, sensitive environmental areas, and population density. Applicable navigation charts are NOAA 13394 (approach) and NOAA 13396 (inward passage).

2.1 General Features

The natural features in the area along the transit route are rolling hills meeting the waters of the passages. The channel is naturally deep and is not required to be maintained by dredging. Currents in the area run up to 5-6 knots due to the extreme tides in the area. The mean range of tide in the region is 18 feet, with a tidal range from 11-26 feet being common, and 28 feet under extraordinary circumstances. The shoreline quickly disappears into deep water very close to the shore at high tide. At low tide there is a considerable expanse of exposed sand and mud intermixed with a substantially rocky shoreline containing shoals and land points that jut out into the waterway. The waterway is dotted with large and small islands. The largest islands are located in Canadian waters and inhabited with year-round residents. The intended LNG carrier route skirts the shoreline of the three Fundy Isles - Deer Island, Campobello Island, and Grand Manan Island.

There are no known physical hazards, such as shipwrecks, reefs, shoals, etc., in this area. In addition, there are no man-made obstructions such as bridges, dams, or locks along the intended waterway. The only major chokepoint measures approximately 1,000 yards wide and is located between Dog Island and Deer Island Point. This area is subject to whirlpools on the ebb and flood tides where currents from Western Passage and Passamaquoddy Bay converge. Of interest, the so-named “Old Sow” whirlpool has garnered significant interest as a tourist attraction and has been blamed for small recreational vessels losing control when unknowingly caught in its vortex. Due to the extreme and divergent currents in this area, pilots favor the Maine coast off Dog Island when making this bend and primarily move ships only during periods of slack tide. Transit times are planned to ensure vessels pass through this area as close to slack water as possible. The second narrowest point between land masses occurs in Canadian waters, within Head Harbor Passage between Casco Bay Island and Head Harbor, and measures approximately 1,200 yards in width.

2.2 Transit Route Overview

The proposed Downeast LNG facility is to be constructed on the down slope of Mill Cove on the west side of the mouth of the St. Croix River. An LNG carrier’s transit from sea to the Downeast LNG terminal would follow a circuitous route through Canadian waters. This is virtually the same route as currently used by all deep-draft vessels servicing the Passamaquoddy Bay port area. Deep-draft vessels bound for the ports of Bayside, New Brunswick, or Eastport, ME, either enter the area via the Gulf of Maine and into Grand Manan Channel, or by transiting Grand Manan Basin into the Bay of Fundy.

A major issue of concern and routing factor for mariners is the protection of the North Atlantic Right Whale, which is known to aggregate in large numbers to the east of Grand Manan Island near the Roseway Basin off the coast of Nova Scotia. The North Atlantic right whale has been listed as “endangered” under the Endangered Species Act since 1973. Consequently, the right whale has been the subject of major concern throughout

the WSA-review process. The potential increase in vessel traffic, especially if other regional LNG facility proposals come to fruition, could result in increases in vessel strikes of whales. Additionally, potential vessel traffic increases could also raise the risk for a significant pollution incident that could result in habitat degradation. The plight of the right whale is obviously a trans-boundary issue. The topic is of significant research interest by both nations in that the Bay of Fundy and Gulf of Maine are both critical habitat for the right whale and represent the whale's primary foraging ground. In addition, the east-west ship traffic to port(s) bisects the north-south movements of reproducing female whales that congregate in this area. Therefore, protecting whales against ship strikes and other interference is a critical environmental management issue.

In July of 2003, the routing scheme through the Bay of Fundy was modified to reduce the likelihood of mortality or serious injury to these marine mammals as a result of ship collisions. Specifically, the northern segment of the shipping lanes was moved eastward approximately four miles at the maximum point and a designated turn-out lane for ships turning west towards Eastport, ME, was established. It was determined that this approach would be at least 80% effective in reducing strikes and yet afford safe and economical commercial marine operations.

While no mandatory deep draft vessel routing is currently prescribed for the proposed transit area, Downeast LNG proposes that LNG carriers en route to their Mill Cove terminal enter the area via the Grand Manan Channel only, thereby:

(1) avoiding the designated right whale conservation zones altogether, and

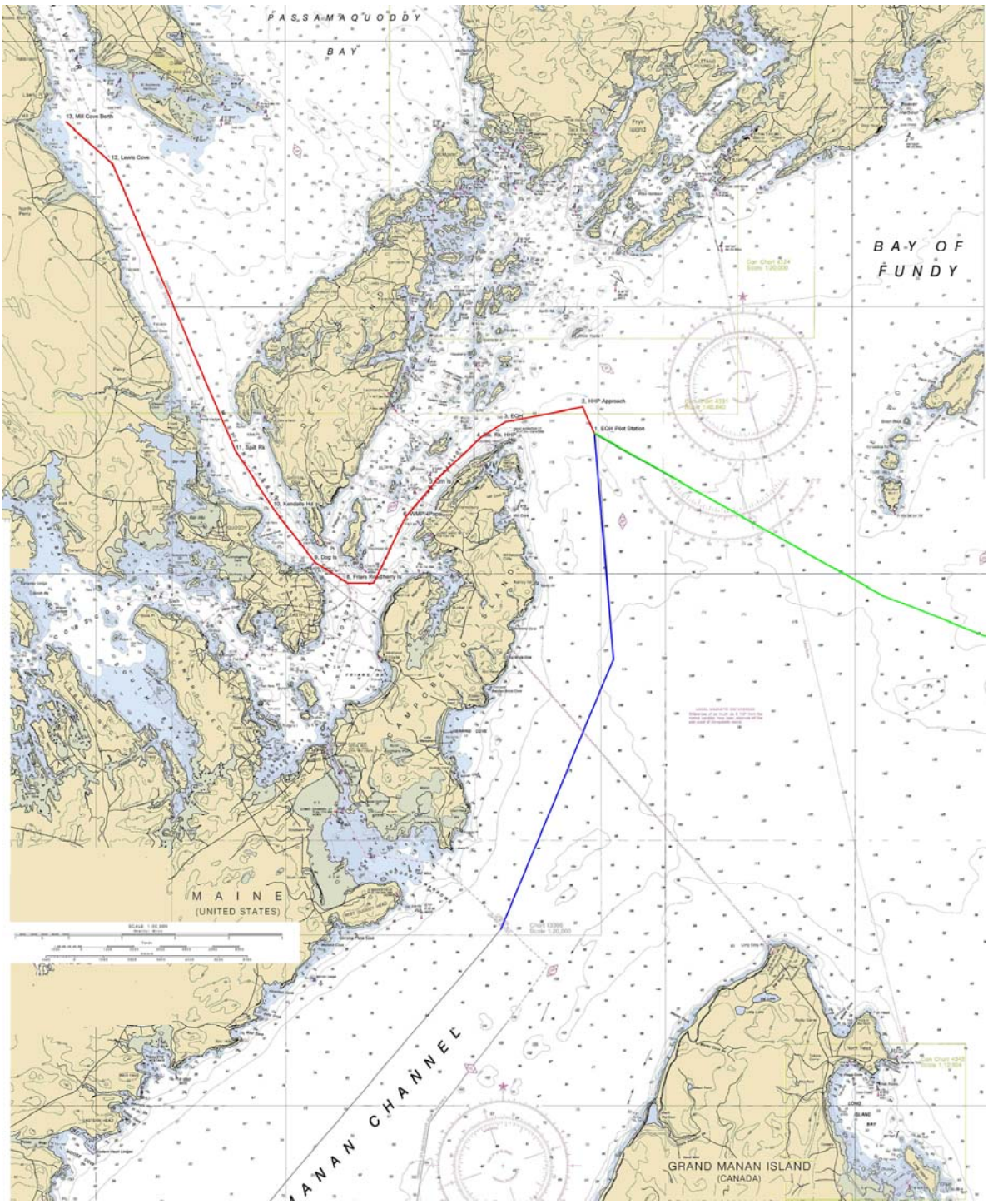
(2) providing a potential site for a USCG boarding in U.S. waters south of Quoddy Narrows in the vicinity of West Quoddy Head.

Figure 3 depicts the proposed route. Specifically, LNG vessels would approach the U.S. coast from the Atlantic Ocean to a point about five miles southeast of Cutler, ME, and ten miles northwest of the southern end of Grand Manan Island. From this point the ship would turn northeast and roughly parallel the coast of Maine between Cutler, ME, and Quoddy Head State Park at a distance of about two to three miles. Along this same segment, the ship's route would also parallel the northwest coast of Grand Manan Island at a distance of five to nine miles. The ship would continue on its northeasterly course into Canadian waters, roughly paralleling the east and northeast coasts of Campobello Island, New Brunswick, to the entrance of Head Harbor Passage.

The ship's transit would then enter Head Harbor Passage where it would pass Campobello Island along the island's north shore, to Friar Roads south of Indian Island and Cherry Isle, into U.S. waters as it neared Eastport, ME. It would pass along that city's eastern shore, up Western Passage, passing Quoddy, ME, to the west and Deer Island, New Brunswick to the east. The ship's transit would continue north through Western Passage along the international boundary between Canada and the United States, keeping Deer Island to the right and the Maine coast on the left until turning northwesterly back into U.S. waters opposite Lewis Cove to reach the intended project site near the mouth of the St. Croix River. A typical transit, from the time an LNG

carrier would enter Head Harbor Passage to the time it reaches the proposed Downeast LNG Terminal, would take approximately two and one half to three and one half hours.

Figure 3 - Proposed Route



2.3 Transit Route Alternatives

As discussed above, vessels bound for the Passamaquoddy Bay port area can take one of two routes; effectively transit Grand Manan Channel to the west of Grand Manan Island, or enter the traffic lanes in the Grand Manan basin and follow the traffic scheme on the easterly side of Grand Manan Island towards the port of St. John, New Brunswick, turning west at the established turn-out sector discussed above. Both routes converge offshore in the general vicinity of the entrance to Head Harbor Passage, north-northeast of Campobello Island. For the purposes of the Waterway Suitability Assessment (WSA) process, the transit starting point for the westerly route was deemed West Quoddy Head and for the north-easterly route the center of the designated Eastport turn-out lane in the St. John Fairway, at 66 degrees 12 minutes North latitude, by 44 degrees 47.5 minutes West longitude.

The only other entrance to the Passamaquoddy Bay port area, aside from Head Harbor Passage, is the Quoddy Narrows located between Lubec, ME, and the southern tip of Campobello Island. This passage, which is bisected by the international boundary along its course, has very strong currents and a relatively shallow depth (28 feet mid channel) making it impassable by deep-draft vessels. Moreover, in 1962 the Franklin D. Roosevelt Memorial Highway Bridge, an essential link connecting Campobello Island to the mainland and having a documented vertical fixed span of 47 feet, was built over the Lubec Narrows (10 feet at mid channel), further restricting the size of ship traffic.

As discussed previously, Downeast LNG has proposed that all prospective LNG carriers serving its facility enter the system via the Grand Manan Channel, which is relatively free of shoals and would be the most direct passage for those bound for the Bay of Fundy from the Gulf of Maine. The Company states that this would serve to avoid the right-whale-conservation area altogether and better situate the vessel for USCG safety and security boardings while still in U.S. waters.

2.4 Port Area Characterization

2.4.1 Maritime Commerce

The major commercial ports in the area are Eastport, ME, on the U.S. side, and Bayside, New Brunswick, on the Canadian side of the waterway.

The port of Eastport is operated by the Eastport Port Authority. The Eastport Breakwater Terminal has berthing for a vessel up to 700 feet in length with approach depths being over 100 feet and the mean low water depth averaging 42 feet. The downtown Fish Pier berths two tug boats on the north side, and has slips for transient boats on the south side. The Breakwater Terminal is also used by the aquaculture industry, commercial fishermen, and recreational boaters. Also located in Eastport is the Estes Head Cargo Terminal, which can accommodate a ship of 900 feet in length in Berth A and one up to

550 feet in Berth B. The 43 acre terminal contains several large warehouses and open storage areas. Office space for the Federal Marine Terminals is located just above the Estes Head Pier.

The Bayside Port Corporation in New Brunswick, Canada, is located south of the St. Croix River across from Calais, Maine. The facility has three berths with lengths of 330, 264, and 462 feet, and corresponding depths of 26.7, 21.5, and 32 feet, respectively. The approach channel has a depth of 70 feet, and the terminal is affixed with a ship loader used for quarried aggregate material. The terminal's main source of traffic consists of gypsum, potatoes, and sensitive cold food storage. A review of waterborne commodities being delivered to, and/or shipped from, the regional Passamaquoddy Bay ports was conducted. It was determined that:

- No bulk petroleum products are actually transported by vessel or barge through the Passamaquoddy Bay area; however, crude oil traffic traverses the Bay of Fundy itself in order to reach the port of St. John, New Brunswick.

- Ammonium nitrate, shipped in bags as low-grade agriculture fertilizer in support of potato farming in Maine and New Brunswick, has been transported by vessel to Bayside, New Brunswick, on the average of 1-3 times in any given year. The non-regular commodity is offloaded from vessels and transferred directly into awaiting trucks for immediate over-the-road delivery.

- No bulk chemical carriers call on either Eastport or Bayside.

There was some conjecture that dynamite was being routinely shipped by vessel to the port of Bayside in support of regional construction, mining, and quarry/aggregate operations. No documentary evidence was discovered that sustained this speculation, and the Bayside Port Corporation reported that there had been no dynamite shipped through, or to, their port since it has been in operation.

2.4.2 Port Level Impacts

Commerce in the area consists almost entirely of aquaculture, farming, ecotourism, and commercial fishing. Some of those who commented during this review process described commercial fishing and fisheries, occurring on both sides of the international border, as the "economic engine" of the region. Aquaculture and fishing related industries reportedly employ over 6,000 persons in Charlotte County, New Brunswick, and Washington County, ME.

The area also supports a good deal of lobster fishing, fish weirs, and aquaculture. Due to the strong currents, commercial fishing within the channel is relatively light. Most of the lobster fishing is conducted in the Grand Manan Channel and along the coast south of Lubec Narrows. Aquaculture has been a mainstay industry in the area, with salmon being the principal fish grown and harvested. Research is ongoing regarding the potential of cod farming as well. The state-controlled leases for these facilities are generally along the waterway in shallower water than that transited by deep-draft vessels. Reportedly, on

any given day there are approximately twenty small commercial draggers and lobster boats working in the inlets and coves. The regional pilots have estimated that about twenty fishing vessels operate out of the U.S. side, and fifteen to twenty from the Canadian side seasonally, but not necessarily all at the same time.

Primarily, the fish catch is lobster and herring, with limited amounts of scallops and other species. There are some shellfish (soft-shell clam) nurseries along the transit route; however, these areas are well inshore where manual harvesting of the clams is accomplished using hand rakes. The shorelines along most of Head Harbor Passage, Friar Roads, and Western Passage are steep and rocky, offering little habitat for the soft-shelled clam. The majority of the remaining area that would provide the necessary habitat is adversely affected by the "red tide," a "bloom" of damaging marine microorganisms; only a few of the coves/mud flats are actually open to shellfish harvesting. Scallops are harvested commercially by draggers, primarily in Cobscook Bay and South Bay, which are south and west of the transit route and proposed facility site. Due in large part to the strong tidal currents, the bulk of lobsters landed is caught along, and offshore, the outer Maine coast. Few traps are actually set inside Cobscook Bay, Western Passage, or Passamaquoddy Bay; the extreme currents make it difficult for fishermen to set and haul them. Although not formally documented, local fishermen contend that Mill Cove (the proposed Downeast LNG site) is a rich breeding, hatching, and nursery ground for lobsters, and that any major disturbance to the underwater bottom in connection with the proposed project trestle construction could significantly impact future lobster catches.

Members of the Fundy North Fishermen's Association, Cobscook Bay Fishermen's Association, Grand Manan Fishermen's Association, and others expressed anxiety about increased deep-draft vessel traffic, and more specifically LNG carriers, adversely affecting their industry. There was considerable apprehension that USCG established safety and/or security zones would adversely hamper their ability to freely fish and move about during LNG carrier transits, with the assumption being that the entire waterway would be closed to boaters. As denoted in Section 3, the USCG anticipates setting and enforcing safety/security zones in U.S. waters during carrier transits to ensure the safety of the surrounding communities, the boating public, and the carrier itself. However, there are specific boundary parameters applied to any such zones, and in most cases there will be ample room for boaters to still freely navigate the waterway along the outer periphery of the channel and ahead and astern of any LNG carrier present. As well, the zones will move with the vessel, with the average time for the zone to pass any given point corresponding to approximately eighteen minutes. While the zones could cause slight delays and/or interferences, proper voyage planning and attention to advance Broadcasts to Mariners should help alleviate potential impositions and conflicts.

The land and islands along the transit route and in the vicinity of the proposed facility site are relatively remote, rural, and sparsely-populated, especially during the wintertime. During the late spring, summer, and early fall seasons, however, the population density swells. Tourism along the entire Maine coast also increases significantly at that time, and contributes greatly to the regional economy. The tourism industry in the area is estimated at $300-400 million, with much of the attraction to the area centered on its natural beauty,

fish, whales, and other wildlife. Although the "down east corridor" does not presently experience the same tourist "pull" in comparison to communities further south in Maine, the region, nonetheless, depends on eco-tourism dollars to supplement its fishing, lobstering, agricultural, and wood harvesting industries. In addition, the City of Eastport and other municipalities along the regional shoreline are exploring a number of tourist-related ventures to increase local employment opportunities in the future.

St. Andrews, New Brunswick, a Canadian resort community located on the western shore of the St. Croix River geographically opposite of the proposed Downeast LNG site, relies almost exclusively on eco-tourism for its economic well-being. Other attractions and sources of eco-tourism related income include kayaking, recreational fishing, canoeing, and sightseeing by boat, including whale-watching.

As identified by USCG records and confirmed during a Ports and Waterways Safety Assessment (PAWSA), the number of maritime-related events that could potentially impact or impede deep draft vessel traffic flow for the region is relatively small. Historically, Fourth of July festivities in Eastport involve recreational boating events and usually include a U.S. Navy vessel port visit. A "Sailabration Parade," sponsored by the Save the Bay organization, also transits Head Harbor Passage during that festival. There are other annual events and festivals held in the immediate port area which attract a number of visitors, but do not significantly affect boating traffic. These include the Memorial Day weekend Down East Spring Bird Watching Festival, Fourth of July Old Home Week, Maine Salmon Festival in September, and the Eastport Festival of Lights held in December.

The entire Passamaquoddy Bay area is characterized by its pristine environment, many natural attractions, and abundant wildlife. The waters of the Bay of Fundy leading up the existing facilities and proposed Downeast terminal are known habitats for whales and other marine mammals, including, as discussed above, the North Atlantic right whale. Whale-watching is a major tourist attraction in the area, particularly for tours out of St. Andrews, New Brunswick. Consequently, significant efforts have been undertaken, including the shifting of the traffic scheme in the vicinity of Grand Manan Island, to protect this endangered species' breeding and feeding grounds. Other whales, such as minke, finback, and humpback, are also common. In addition, porpoises, seals, bald eagles, osprey, ducks, and many types of sea birds make their home in the waters of Head Harbor Passage and Friar Roads.

Obviously, a major concern to the regional boaters and residents in the area is the heightened risk of a maritime accident due to the potentially three-fold (pending multiple LNG proposals) increase in deep-draft vessel traffic along the transit route. Although a significant number of whale-watching and sight seeing tour boats operate out of the St. Andrew vicinity, they normally transit Letite Passage in order to get to the Bay of Fundy whale viewing and wildlife habitat areas. This effectively reduces the vessel traffic in Western Passage and Head Harbor Passage and would minimize any conflicts.

2.4.3 Iconic Value

The Roosevelt Campobello International Park is located on the southern end of Campobello Island, which directly abuts Head Harbor Passage and Friar Roads. The Park and its Commission were established in 1964 by a treaty between the U.S. and Canada as a symbol of friendship. As a result, the Park holds iconic value for both U.S. and Canadian citizens alike. One of the Park's main attractions is the historic summer home of President Franklin D. Roosevelt, which receives approximately 150,000 visitors annually. The Park is well known for its unspoiled natural beauty and offers spectacular, unbroken views of rugged coastline, estuarine bays, and the open ocean. Tourism dollars have a significant and positive ripple-effect on the economic health of the area.

The Roosevelt Campobello International Park Commissioners have voiced grave concern regarding the proposed development of the Downeast LNG terminal and resultant tanker traffic, citing safety and security concerns due to its extreme closeness to the transit route. They fear that a large-scale movement of LNG cargo in an area unsuited to such traffic poses an unacceptable risk. A release of fuel oil, lube oil, or LNG product as a result of an accidental grounding or intentional act of terrorism would result in unacceptable ecological harm to the unique environment and present an even greater health hazard to the surrounding population.

Some persons who commented on this proposal opined that an accidental or intentional release of LNG would not only be catastrophic to the Park and Island, but would be devastatingly compounded by the absence of trained personnel and proper response equipment needed to effectively combat a fire of such magnitude and proportion due to the remoteness of the area. In general, the law enforcement, public safety, and emergency response assets and capabilities in the U.S. and Canada are in keeping with the rural nature of the area – minimally staffed, minimally equipped and trained, and limited in their ability to expand due to their small tax base.

2.5 Areas of Environmental Significance

The Passamaquoddy Bay port area is characterized by its pristine environment, natural attractions and abundant wildlife. The Bay of Fundy, Passamaquoddy Bay, and Cobscook Bay (and all approaches) are areas of unusual biodiversity and are home to a number of species listed as endangered, threatened, or of special concern. A number of marine research and biological studies have been conducted by such institutions as Canada's Department of Fisheries and Oceans (DFO) and the New England Aquarium, with focus on protecting and preserving endangered aquatic life, and integrated marine management strategies within and for the Bay of Fundy, Passamaquoddy Bay, and Cobscook Bay, including adjacent estuaries. Subjects of study included the aquaculture industry, commercial fisheries and hatcheries, protection of seabirds, marine mammals and exploited species, among others. Collectively, the area has been reported as being the most diverse aquatic ecosystem on the eastern seaboard of North America.

The National Environmental Policy Act (NEPA) review process is designed to evaluate each project independently and ensure any and all potential impacts to the environment

have been carefully considered. The assessment includes an analysis of potential pollutants and the ability to reduce or eliminate such pollution.

Part and parcel to the NEPA assessment is the individual state permitting/application review process. Project applicants must demonstrate compliance with applicable federal and state laws and regulations regarding environmental protection to receive the necessary approvals needed to construct their respective project. Detailed information and data concerning environmentally sensitive areas, endangered species, wildlife refuges, estuaries, aquaculture, and general areas of environmental significance, which could be impacted in one way or another by the Downeast LNG project, are contained in Resource Report 3, filed with FERC.

The following is a sampling of some of the area's ecological and environmental concerns, followed by a "snapshot" of regional resource centers, sensitive sites, estuaries and refuges. It should be noted that not all identified environmentally-significant areas would be directly impacted by the Downeast LNG proposal due to their geographical location and/or distance; however, these sites are considered "common" to the region and often referred to collectively.

The waters of the Bay of Fundy leading up to the existing regional facilities and proposed LNG terminals are known habitats for whales, including the North Atlantic right whale, which is a federally endangered species. Along the entire Eastern seaboard, significant efforts are being taken to protect this marine mammal. Canada, through its Fisheries and Oceans Department, created two Right Whale Conservation Zones in the area. Zone 1, where right whales have been most frequently observed, includes Grand Manan Basin within the Bay of Fundy, and Zone 2 includes the Roseway Basin, located between Browns and Baccaro Banks on the southern Scotia shelf. Ships are asked to avoid this area, if possible. If they do transit the area, they are required to decrease speed without sacrificing maneuverability, post lookouts, avoid maneuvering around marine mammal activity, and report any marine mammal sightings or collisions with same.

Other whales such as minke, finback, and humpback are common to the waters of Head Harbor Passage and Friar Roads, as well as porpoises and seals. Bald eagles, Peregrine Falcons, Osprey, ducks, and a variety of sea birds, such as the Atlantic Puffin and Common Tern, make their home along the bay and waterway as well.

According to the referenced research studies, open ocean aquaculture must avoid areas of known deep draft vessel traffic and anchorages in order to be successful. For that reason, the safety of other craft, and the protection of the right whale, designated traffic lanes now exist for large ships traveling between the southeastern entrance to the Bay of Fundy and the port of St. John, New Brunswick. These sea lanes are used by approximately 840 vessels annually, most of them petroleum tankers bound for, or departing, St. John.

Environmentally sensitive areas include:

- The U.S. St. Croix Island is a designated heritage site. Access to the island is by boat only, from either the U.S. or Canadian shores of the St. Croix River.

- The Huntsman Marine Science Center is located adjacent to the DFO Biological Station in Brandy Cove, St. Andrews, New Brunswick. The Center houses an aquarium and is in the process of expanding to the shorefront to further encourage tourism and public access to the waterfront.

- Within Canadian boundaries, other environmentally sensitive areas include the coasts of Grand Manan Island and Deer Island (Clark Gregory Preserve and the Robert Stewart Preserve), and the West Isles area. As well, Campobello Island, with its coastline along the Bay of Fundy, houses numerous environmentally sensitive areas including the Roosevelt International Park.

- Other significant areas include the St. Croix Estuary, located along the coastal region of Charlotte and neighboring areas surrounding St. Andrews, and the Cobscook Bay region – a unique ecosystem and estuary of significance renowned for its eagle habitat.

- The Moosehorn National Wildlife Refuge, located immediately south of Calais, ME, consists of two divisions: the Baring Division, which covers 20,016 acres and is located southeast of Calais; and the Edmunds Division, which is comprised of 8,735 acres and borders the tidal waters of Cobscook Bay. The Refuge was established in 1937 and is first in the chain of migratory refuges extending from Maine to Florida.

3.0 Safety and Security Assessment

Downeast LNG contracted Det Norske Veritas, (USA), Inc. (DNV), to conduct the Follow-On Waterway Suitability Assessment, in accordance with the guidance contained in NVIC 05-05 on its behalf. A *Preliminary WSA*, providing the outline of the proposed project and projected impacts to the port community, had been prepared by TRC Security LP (TRC). The safety assessment evaluated the risks of an *accidental* release of LNG consequent to such incidents as collisions, allisions, and groundings. Potential problems that could lead to an accidental release were considered and the likelihood and consequences of those events evaluated. The consequence analysis evaluation was based on accidental release scenarios as outlined in the Sandia National Laboratories Report SAND2004-6258 (Sandia Report), a study commissioned by the Department of Energy (DOE), entitled *Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water*, dated December 2004. The corresponding Zones of Concern parameters related to an accidental release of LNG, as determined by DNV in conjunction with the Sandia Report, are depicted in Figures 6 through 10. The security assessment evaluated the risks of *intentional* releases of LNG and explored threat, vulnerability, and consequence. The probability of an incident was evaluated in terms of threat and vulnerability, where threat was considered as the likelihood of an attack and vulnerability being the likelihood that such an attack could succeed. As was done with the safety risk assessment, potential consequences relating to an intentional release of LNG were considered based on release scenarios outlined in the Sandia Report. The corresponding Zones of Concern for an intentional release are shown in Figures 11

through 15. This Report also contains a discussion of strategies aimed at managing the potential risks associated with the proposed project.

3.1 Ports and Waterways Safety Assessment

A Ports and Waterways Safety Assessment (PAWSA), conducted in October 2006, provided a baseline for analyses of navigational safety concerns for the Passamaquoddy Bay port area. The PAWSA is a systematic assessment process designed to identify major waterway safety hazards, estimate risk levels, and evaluate potential measures to reduce risk.

Participation in the PAWSA was through invitation and was designed to include a broad cross-section of waterway users, port stakeholders, and maritime professionals. Participants included representatives of the marine industry, pilots, tug operators, passenger/ferry operators, commercial fishing and aquaculture industry, environmental groups, state and local officials, local and regional law enforcement, and federal and provincial governments. Canadian government officials, members of the LNG industry, and concerned citizens' groups were on hand to observe the process.

The PAWSA covered existing navigation concerns for the Passamaquoddy Bay port area; including those anticipated should the proposed Downeast LNG terminal be approved. In consideration of an alternate LNG proposal, the potential for cumulative impacts relative to other LNG terminals that may be operating simultaneously was factored into the assessment process as well. As a baseline, the participants informally defined the geographic bounds of the waterway area under consideration as the contiguous waters of Passamaquoddy Bay and its tributaries, from the International Bridge at Calais, ME, seaward to the eastern shore of Campobello Island and West Quoddy Head, encompassing both the U.S. and Canadian waters, and including Head Harbor Passage.

The participants examined all risk factors along the waterway, including those presumptive risks associated with the proposed LNG traffic. Participants then cross-checked the identified risks against mitigation measures and practices that are currently in place. Further discussion of identified risk areas and potential mitigation factors for the port area are contained in the PAWSA. The PAWSA results are being used as part of the USCG's continued assessment of related waterway safety issues associated with this LNG proposal. A copy of the PAWSA Report is contained in Appendix B.

3.2 Thermal Radiation Analysis

An important consideration in assessing the suitability of the proposed transit route and its approaches to support LNG traffic along the intended transit route, as well as the suitability of the proposed terminal site, is establishing the size of the hazard zones, or Zones of Concern associated with a large release of LNG. The criteria used by Sandia National Labs to define the outer limits of the three hazard zones discussed in their report, (SAND2004-6285), "*Guidance on Risk Analysis and Safety Implications of a*

Large Liquefied Natural Gas (LNG) Spill Over Water", were used/applied in assessing potential risks associated with the proposed Downeast LNG project.

The criterion used to define the outer limits of Zone 1 and Zone 2 is incident heat flux, i.e., thermal radiation that would be expected from an intense LNG vapor fire over a specified time. Within Zone 1, the thermal radiation can cause serious injuries and/or significant damage to structures. Within Zone 2, thermal radiation can cause injuries or some damage to structures. The outer limit of Zone 3 is defined based on the lower flammability limit of LNG vapor, i.e., the lowest concentration of fuel by volume mixed with air that is flammable. Within all three zones, the level of risk of injury or property damage is reduced as the distance from the source increases and the thermal radiation decreases, as indicated in Figure 4.

Figure 4 - Hazard Zone Criterion

Zone	Distance from Release (in meters)	Criteria (10 minute exposure time)	Consequence
Zone 1	0-500	37.5 kW/m^{2*}	High potential for major injuries or significant structural damage consequent a pool fire and/or vapor cloud
Zone 2	500-1600	5 kW/m^2	Potential for injuries and limited property damage consequent a pool fire and/or vapor cloud
Zone 3	1600-3500	Lower flammability limit (5%)	Reduced potential for injury or damage if appropriately clothed or protected consequent a vapor cloud only

Source: Extrapolated data from Sandia Report and NVIC 05-05
Notes: (1) Zone distance from spill based on an intentional release; the zone criteria for accidental spill scenarios is significantly less.
*(2) kW/m^2 = Kilowatts per square meter

Therefore, the most significant impacts to public safety and property exist within approximately 500 meters of an LNG spill/release, due to the thermal radiation hazards from fire, with lower public health and safety impacts at distances approaching 1600 meters and beyond.

3.2.1 Hazard Zone Characteristics and Considerations

The intensity and linear size of the three hazard zones calculated in the Sandia Report for accidental and intentional spills/releases of LNG were determined only after extensive modeling and testing. However, the potential for an LNG cargo tank breach, the dynamics and dispersion rates, and the resultant hazards of such a spill are only generally understood and, as such, are only postulated estimates at best. The combination of LNG vessel double hull design and current safety management practices throughout the marine transportation industry have reduced LNG accidents to a point where there is little historical or empirical information from which to arrive at finite conclusions. This lack of information forces assumptions to be made when the size, dispersion rate, and thermal

hazards of a spill are calculated. Therefore, it should be understood that a level of variability exists with the many current models and techniques being used to provide adequate guidance on the hazards of an LNG spill. Some of the variables that affect the modeling techniques, assumptions, and simplifications include: the size, mass, speed, and loaded condition of the carrier; size, mass, collision velocities, and angle of impact if collided with another vessel; amount of penetration and whether or not the inner hull and primary tank boundary was compromised; size and number of breaches; whether or not there were multiple, cascading tank failures; climatic conditions (wind velocity and sea state); and reference of the breach to the waterline.

The Sandia Report, published in December 2004 (SAND2004-6258), based its findings on the capacities of LNG carriers in operation at the time. The vessels studied had an average upper cargo carrying capacity of 148,000 cubic meters (m^3), with individual tank capacities of approximately 25,000 m^3 of LNG, depending on number and type of design. The emerging generation of LNG carriers has cargo carrying capacities of as much as 265,000 m^3. In May of 2008, Sandia National Labs published an additional report (SAND2008-3153), *"Breach and Safety Analysis of Spills Over Water from Large Liquefied Natural Gas Carriers"* which analyzed impact of LNG spills associated with breaches from the emerging larger class of LNG tankers. Overall, the results obtained from the more detailed analyses conducted and presented by Sandia were found to be similar to the previous conclusions, recommendations, and guidance presented in the 2004 Sandia LNG report concerning the general scale of hazards to the public and property from a large LNG spill over water and approaches to reduce those risks and consequences.

For the purposes of this Report, the hazard zones used to assess the possible impacts of potential LNG releases resulting from either navigation safety accidents or terrorist attacks against the proposed LNG carriers transiting the waters of the Passamaquoddy Bay port area and its approaches are based on the computations conducted by Sandia National Laboratories in their December 2004 Report. Based on the conclusions presented in the Sandia Report of May 2008, the sizes of the hazard zones applied in association with the Downeast LNG site are considered applicable to vessels up to a maximum of 265,000 m^3 cargo capacity.

Figure 5 - Downeast LNG Project Hazard Zones

	Zone 1 (37.5 kW/m^2)		**Zone 2 (5 kW/m^2)**		**Zone 3 (Lower Flammability Limit)**	
Intentional Breaches	500 m	546 yds	1600 m	1750 yds	3500 m	2.2 miles
Accidental Breaches	250 m	273 yds	700 m	765 yds	1700 m	1.06 miles

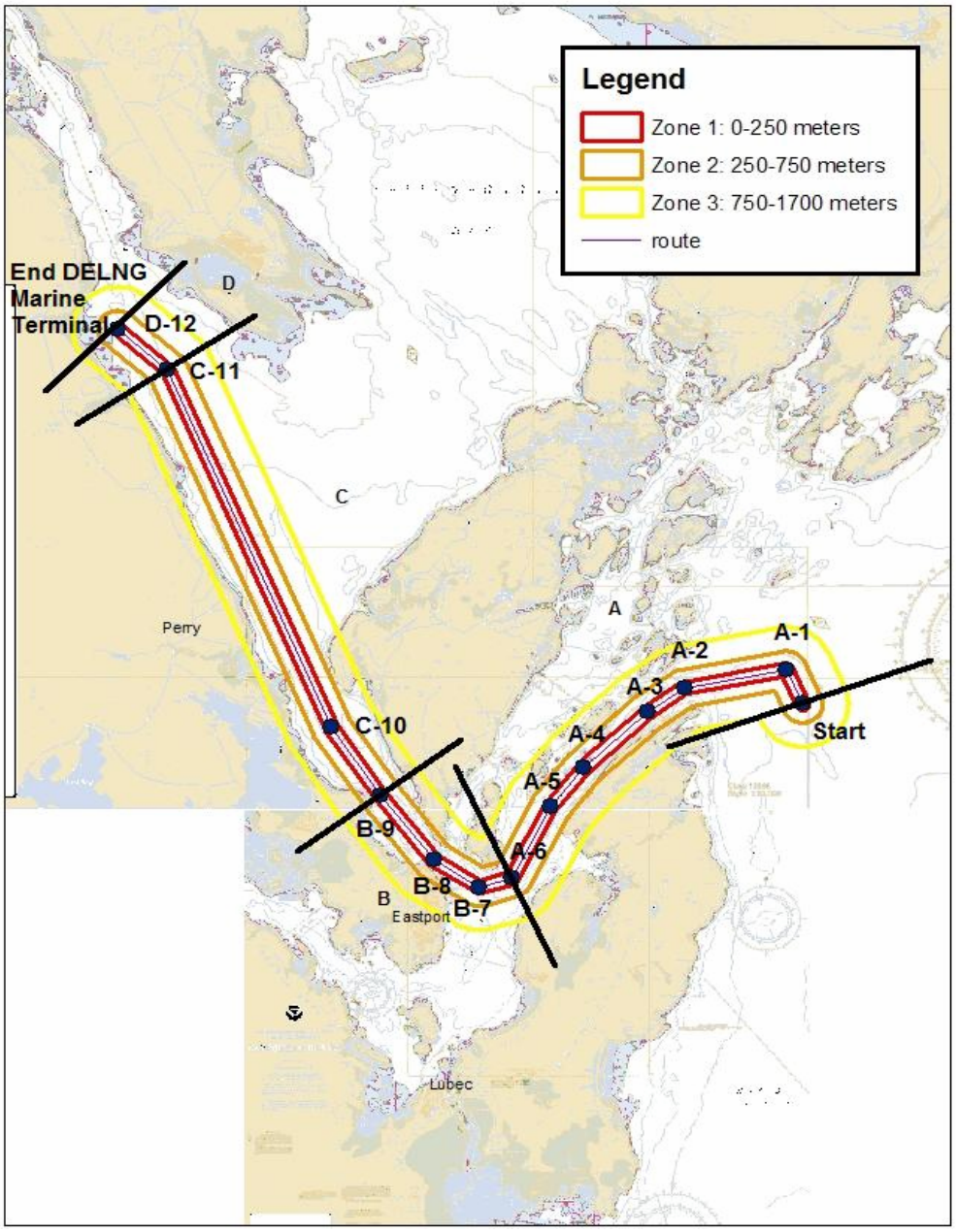
Ref: Sandia Report

As discussed in the December 2004 Sandia Report, Hazard Zone 3 is based on the simultaneous release of LNG from three tanks without being ignited. The size of the zone is established by calculating the distance the vapor cloud could travel before the lower flammability limit (LFL) is reached. Based on the modeling conducted, Sandia

National Laboratories established the size of Zone 3 to be 3,500 m from the source of the LNG release.

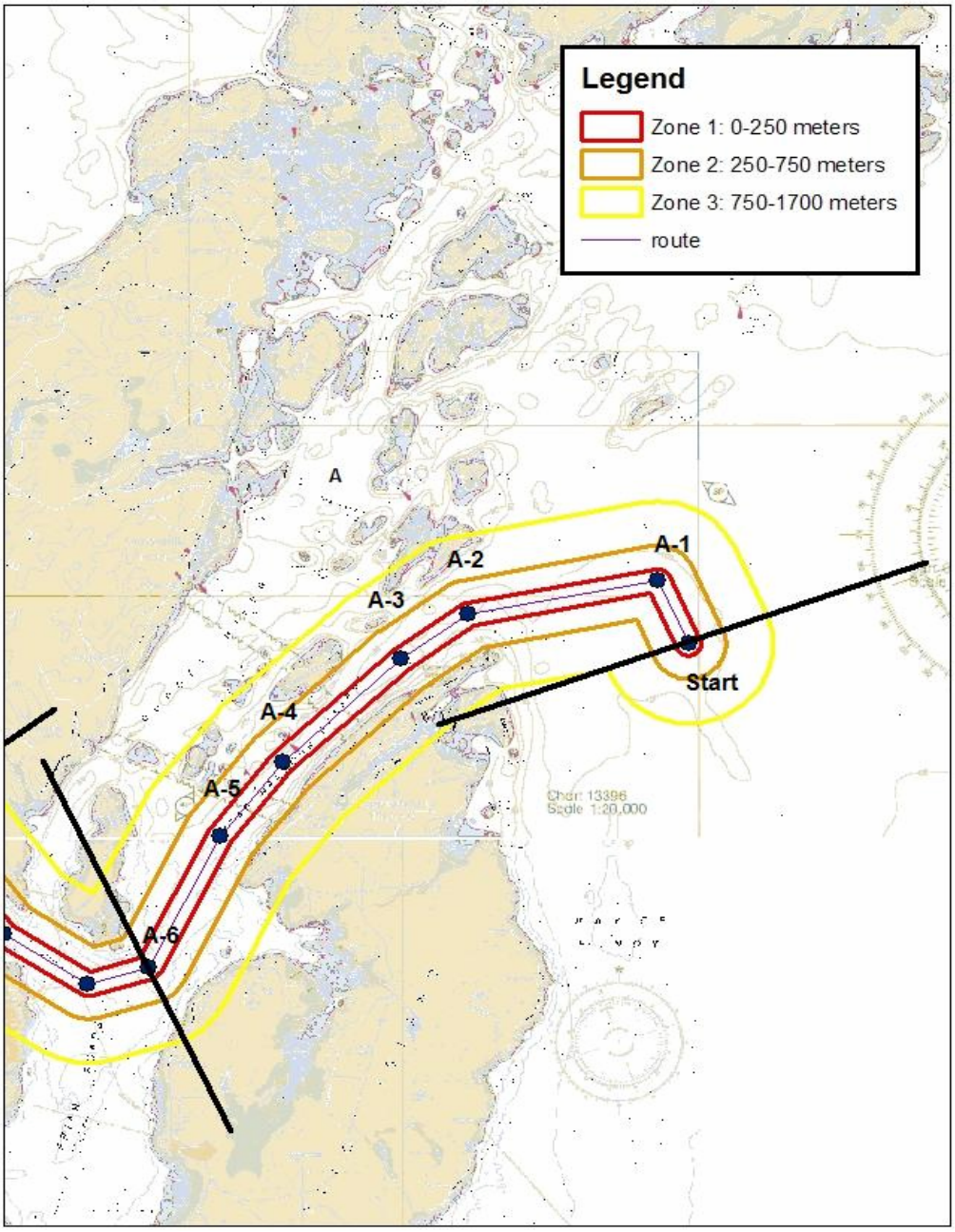
Figures 6-15 feature the projected zones of concern for LNG vessel traffic transiting from sea to the proposed Downeast facility site. Specifically, Figures 6-10 highlight the zones of concern through the proposed transit route based on an accidental cargo release. Figures 11-15 highlight the zones of concern through the proposed transit route based on an intentional cargo release.

Figure 6



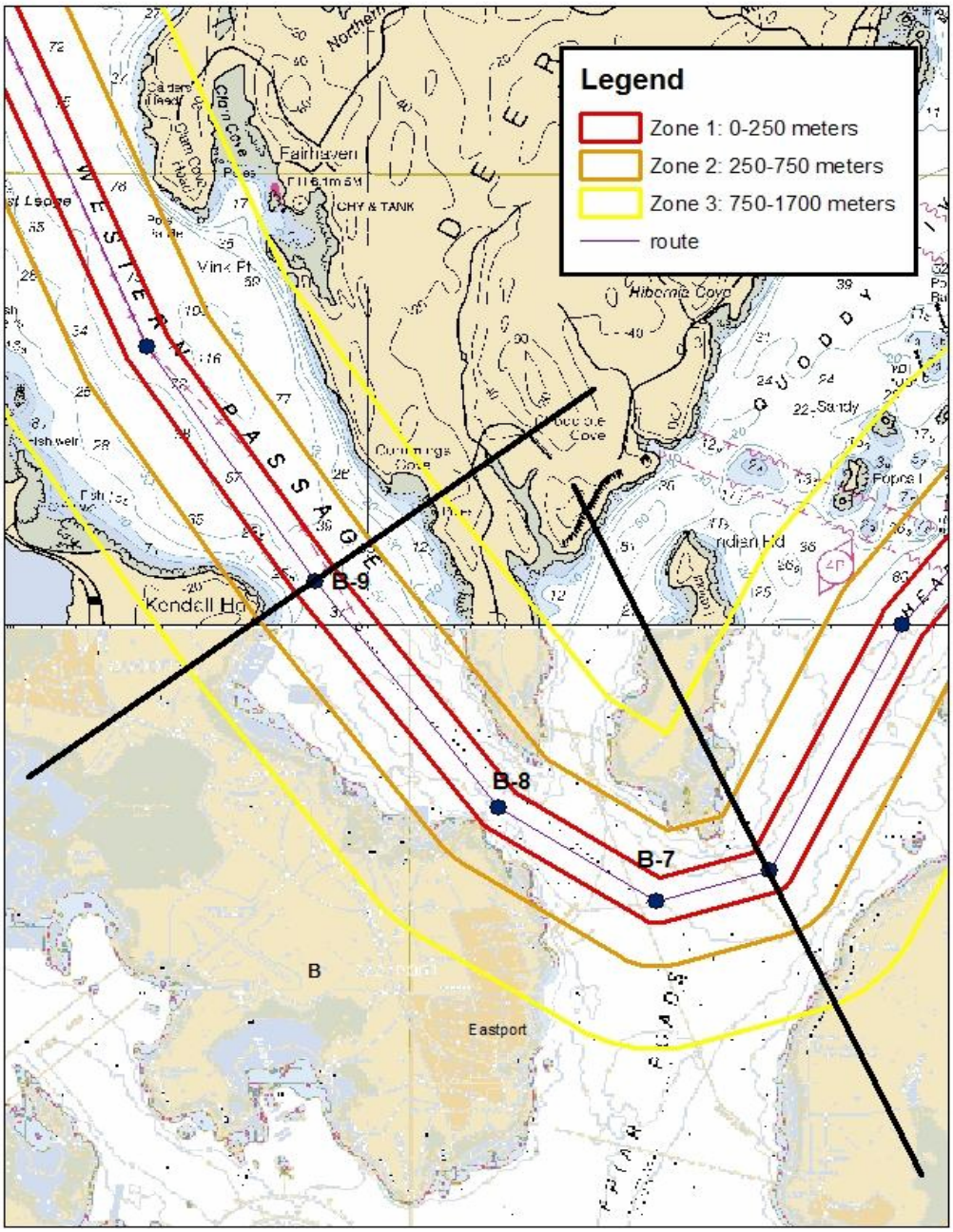
(Accidental Release)

Figure 7



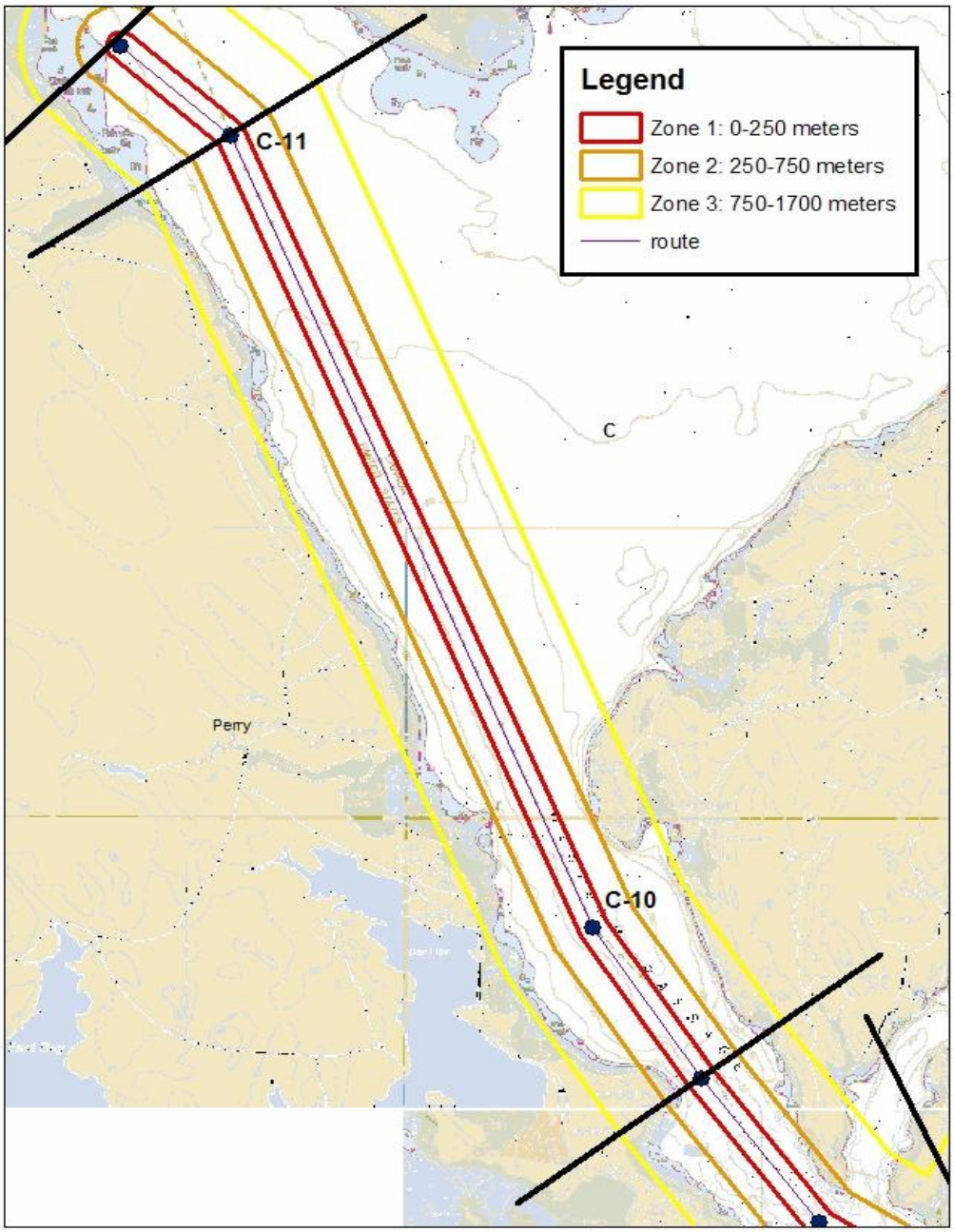
(Accidental Release)

Figure 8



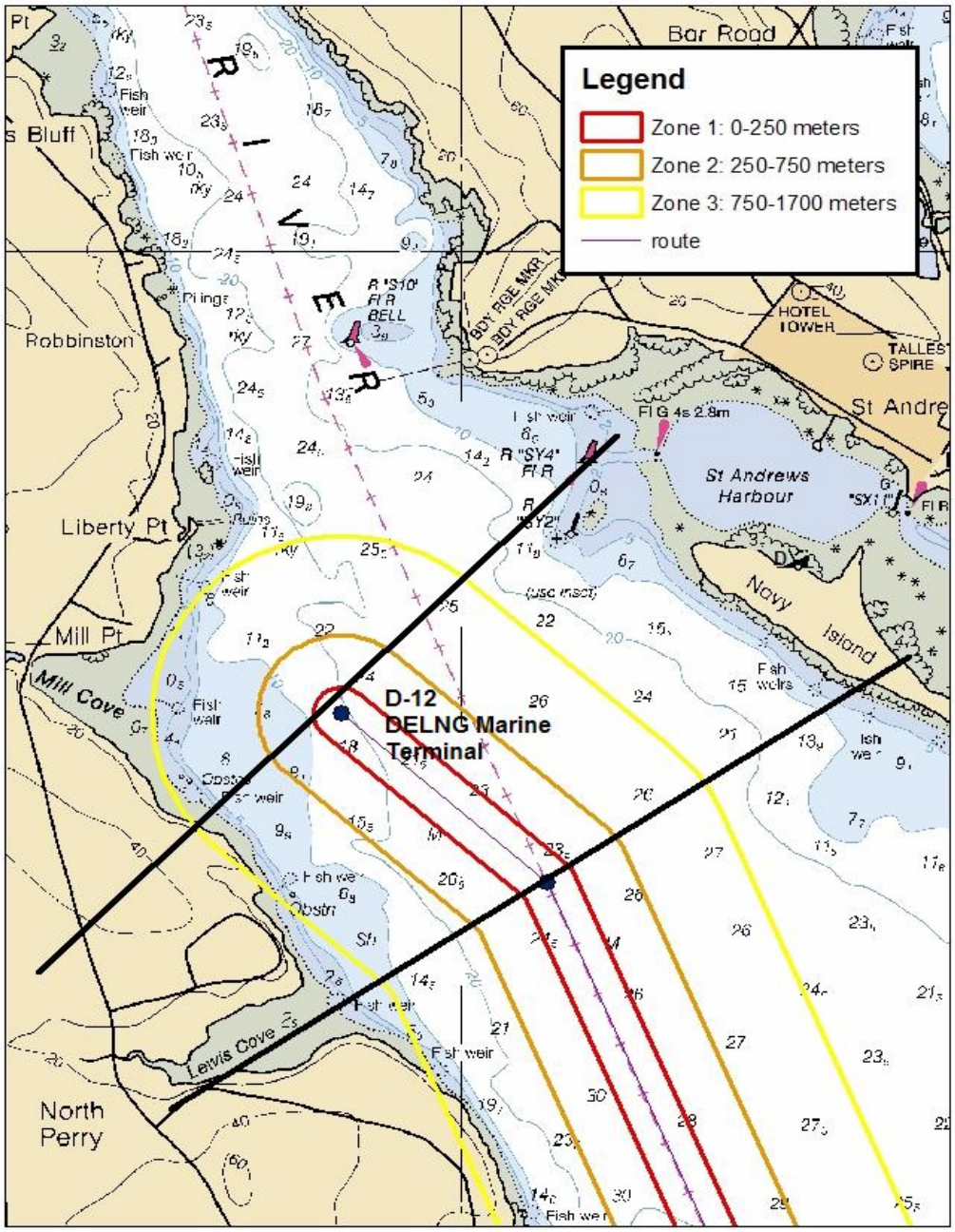
(Accidental Release)

Figure 9



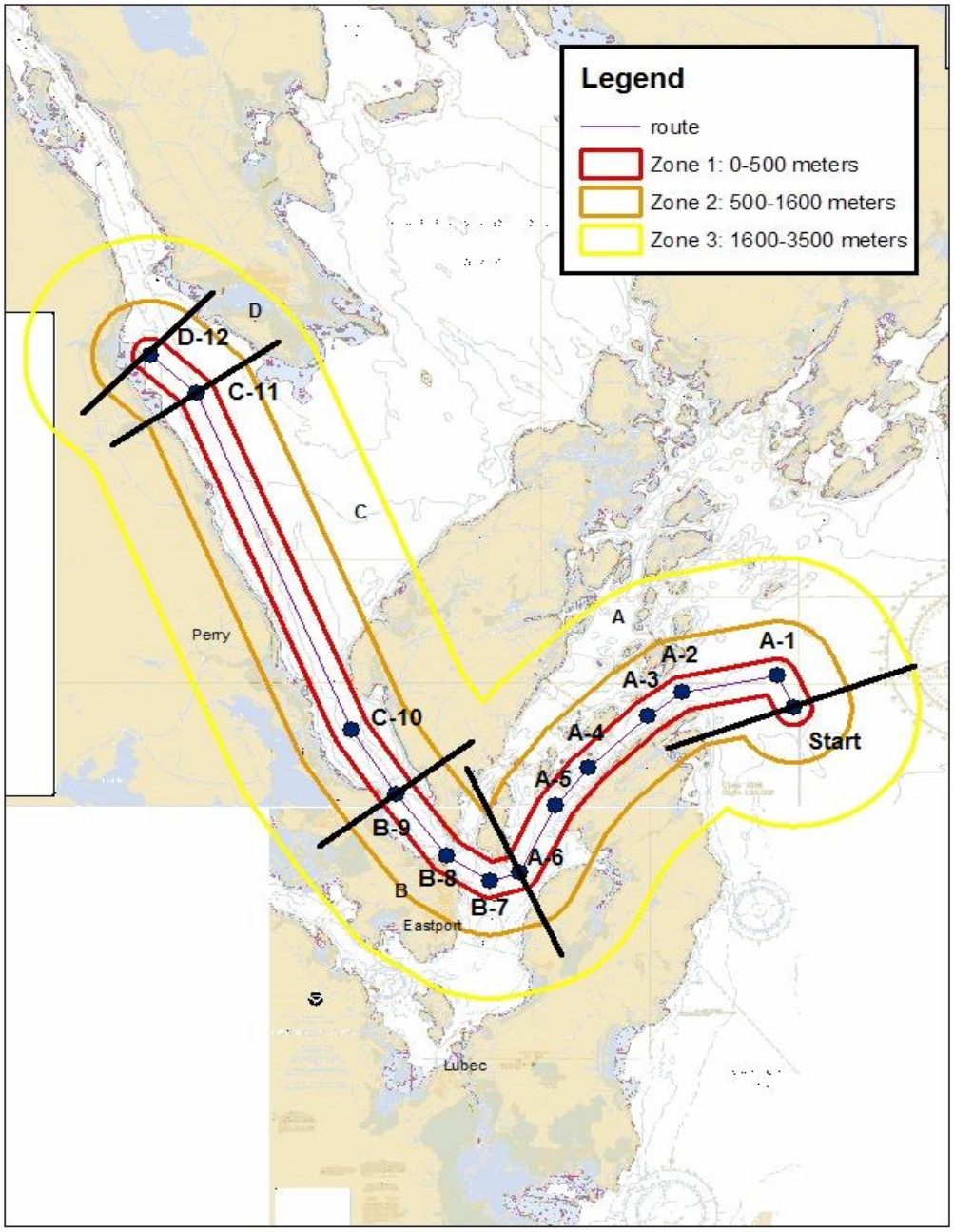
(Accidental Release)

Figure 10



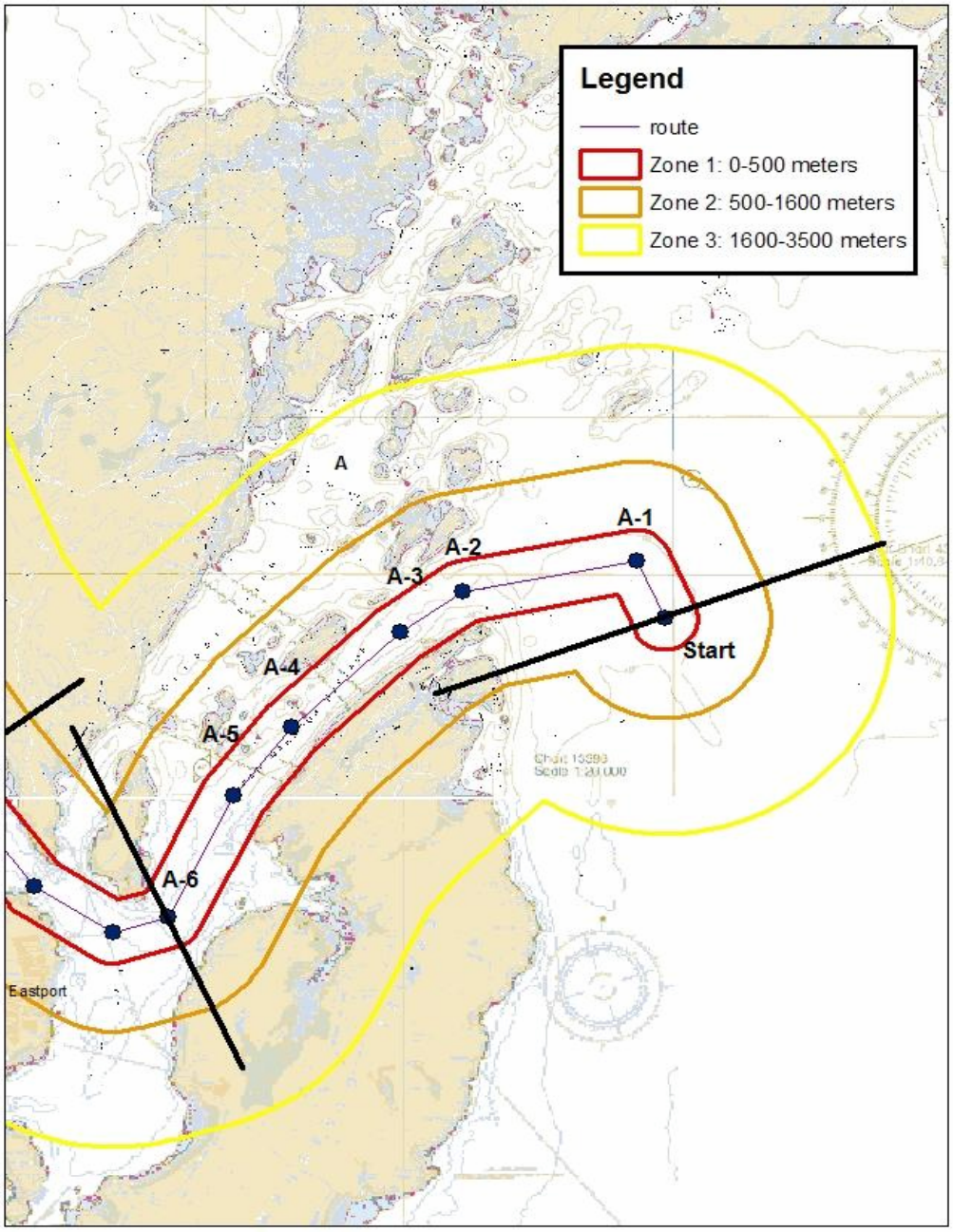
(Accidental Release)

Figure 11



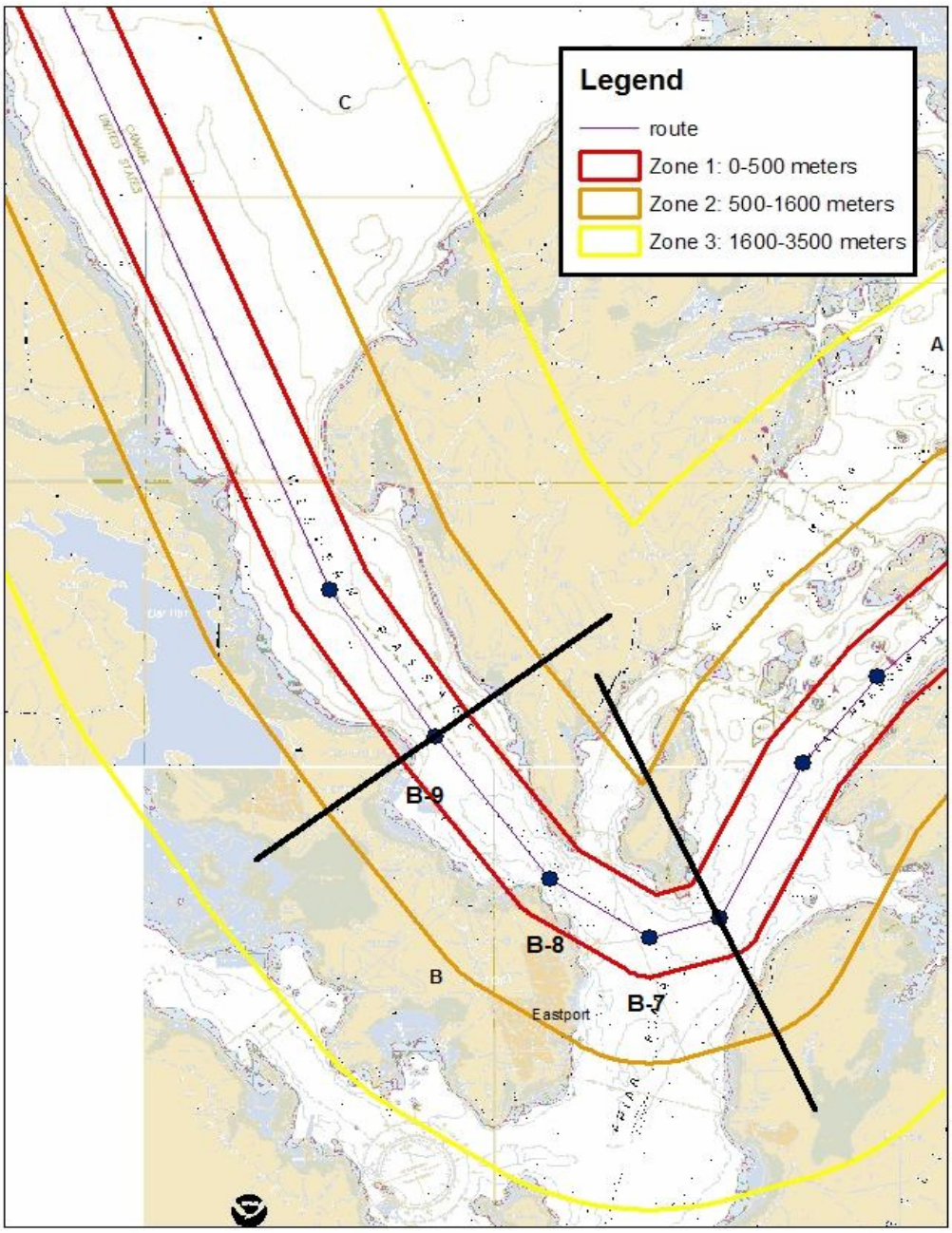
(Intentional Release)

Figure 12



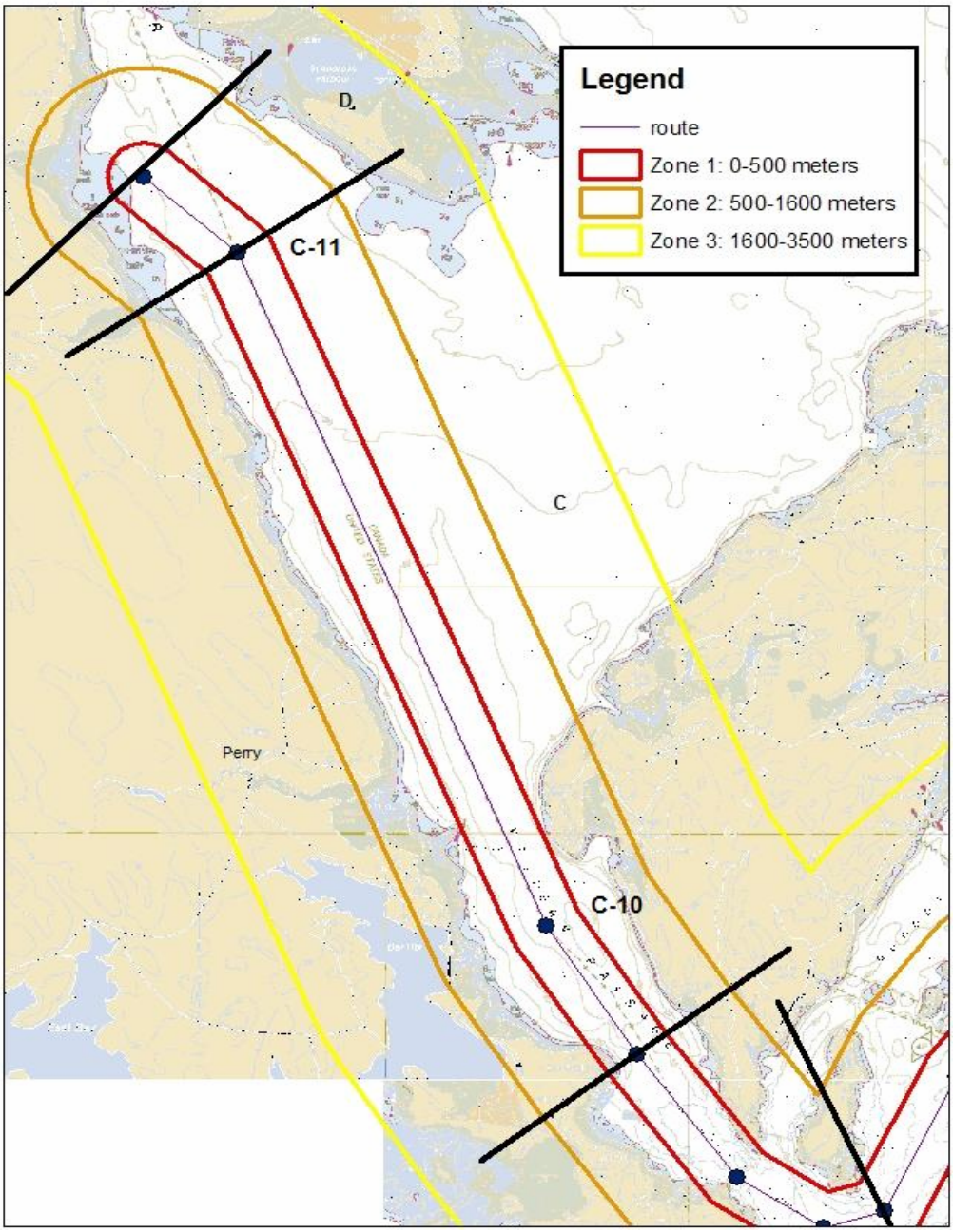
(Intentional Release)

Figure 13



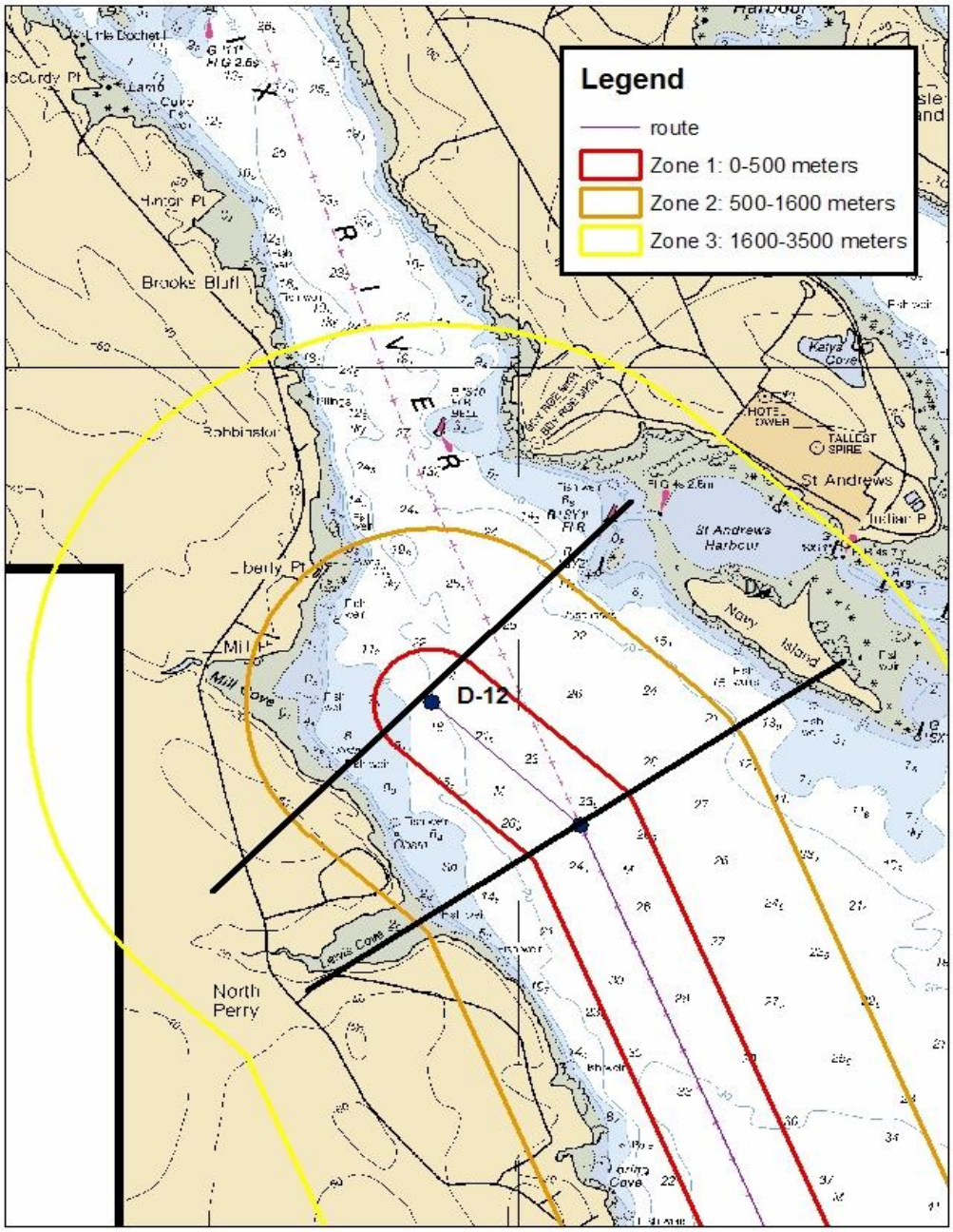
(Intentional Release)

Figure 14



(Intentional Release)

Figure 15



(Intentional Release)

3.2.2 Consequence-Zone Analysis

Consistent with the guidance contained in NVICs 05-05 and 05-08, the WSA submitted by Downeast LNG used the Sandia Report to describe the expected consequences of a large release of LNG from a carrier onto the water and into the surrounding atmosphere. The hazard zones, as discussed earlier, were applied along the intended carrier route to geographically depict where the zones may intersect with the population areas and major infrastructure elements in and adjacent to the transit waterway. As well, two different risk assessments, commensurate with the zones of concern, were conducted and incorporated into the Downeast WSA; one for accidental releases and one for intentional breaches.

3.2.3 Hazard-Zone Impacts

Preceding Figures 6-10 provide a graphic view of the hazard zones (accidental release) applied along the inland portion of the prospective LNG carrier's transit route. Preceding Figures 11-15 detail the same graphic depictions for an intentional release. [1]

Complementing the inland portion of the transit route, Figures 16 through 25 are provided to graphically depict the zones of concern for an intentional release along the LNG carrier approach route from sea. Of note, vessels may proceed up the Grand Manan Channel or take an alternate route via the port of St. John, New Brunswick. traffic separation zone, turning westerly at the turnout to Head Harbor Passage. Figure 16 shows a broad view of both possible routes from the sea. Figure 17 shows the zones applied to the traffic separation scheme. Figures 18 through 25 show the transit route and corresponding zones along the northeast coastline of Maine and Grand Manan Channel leading to the proposed facility site. Because these two offshore routes are relatively distant from land masses, intentional zones of concern were depicted, as they represent the worst-case scenario and corresponding zone size.[2]

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[1] Figures reprinted courtesy of DNV (USA), Inc. with permission by Downeast LNG.
[2] Reprinted courtesy of WOODLOT ALTERNATIVES, Inc. with permission of Downeast LNG.

Figure 16

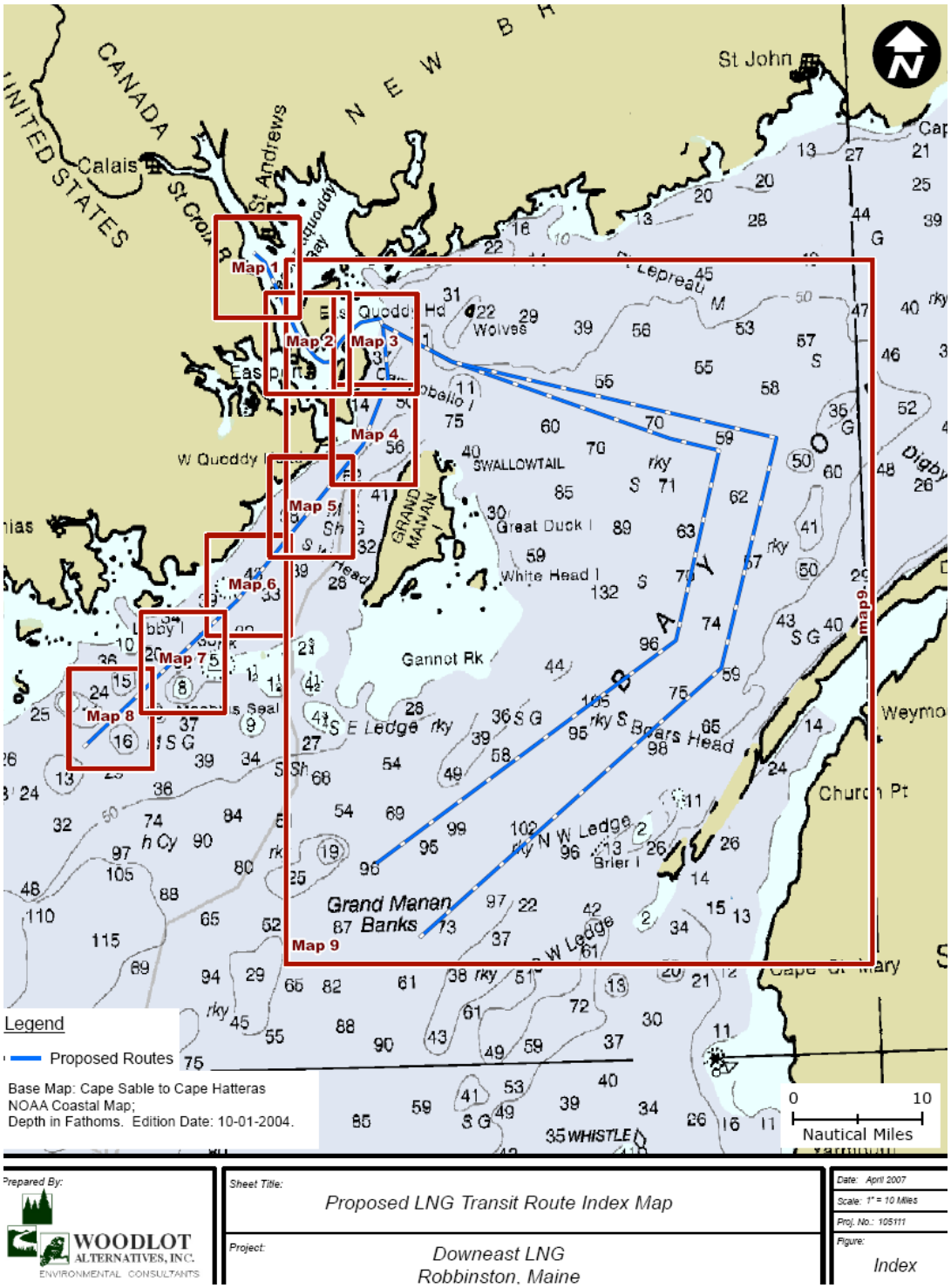

CANADA
UNITED STATES
Calais
St Andrews
St John
Map 1
Map 2
Map 3
Map 4
Map 5
Map 6
Map 7
Map 8
Map 9
map9
W Quoddy
SWALLOWTAIL
Great Duck I
White Head I
Gannet Rk
Grand Manan Banks
Bears Head
Brier I
Weymouth
Church Pt
Digby
Legend
Proposed Routes
Base Map: Cape Sable to Cape Hatteras
NOAA Coastal Map;
Depth in Fathoms. Edition Date: 10-01-2004.
0
10
Nautical Miles
Prepared By:
WOODLOT ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS
Sheet Title:
Proposed LNG Transit Route Index Map
Project:
Downeast LNG
Robbinston, Maine
Date: April 2007
Scale: 1" = 10 Miles
Proj. No.: 105111
Figure:
Index

Figure 17

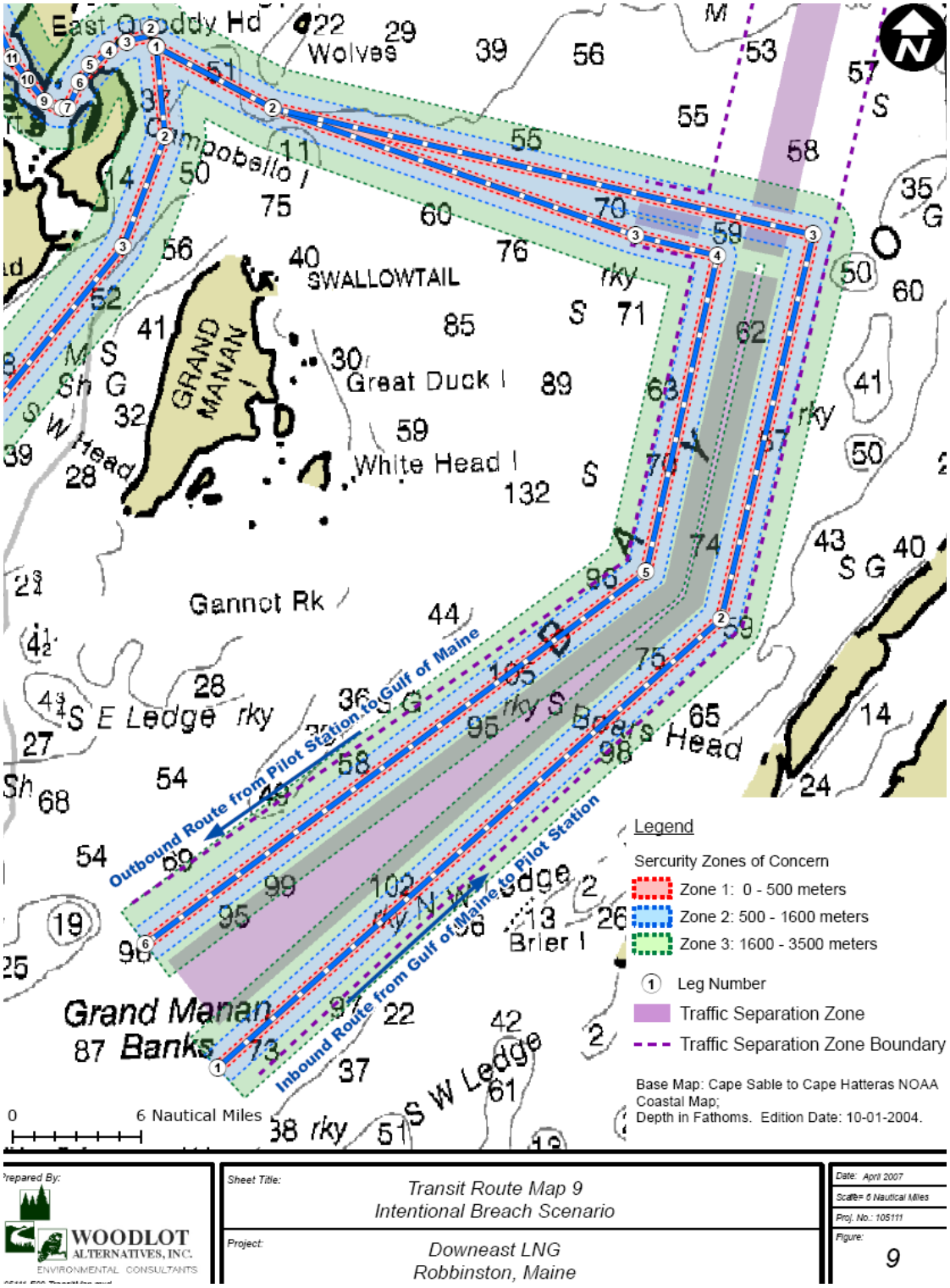
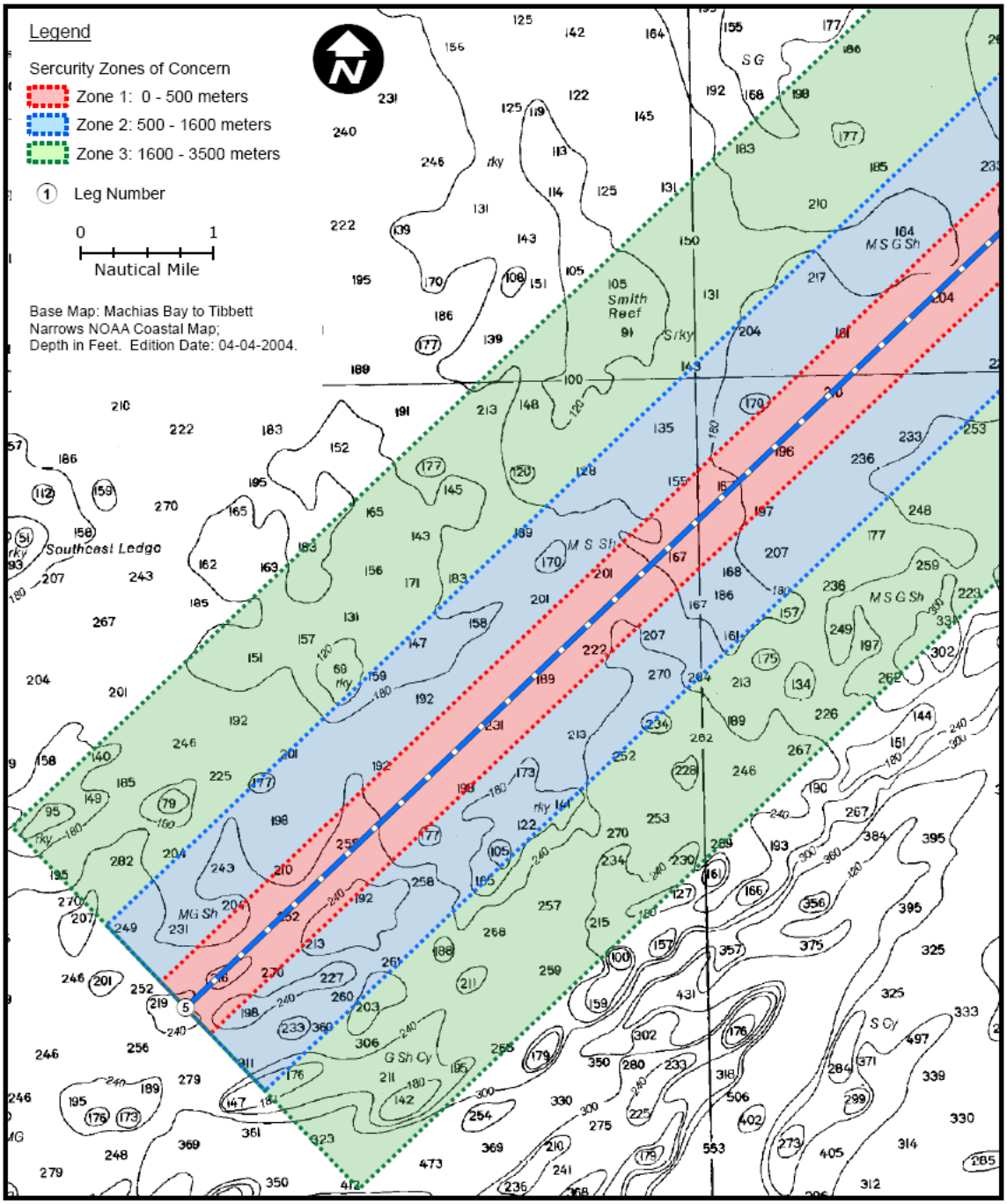

East Quoddy Hd
Wolves
Campobello I
SWALLOWTAIL
GRAND MANAN
Great Duck I
White Head I
Gannet Rk
S E Ledge
Bears Head
Brier I
Grand Manan Banks
S W Ledge
Outbound Route from Pilot Station to Gulf of Maine
Inbound Route from Gulf of Maine to Pilot Station
0
6 Nautical Miles
Legend
Sercurity Zones of Concern
Zone 1: 0 - 500 meters
Zone 2: 500 - 1600 meters
Zone 3: 1600 - 3500 meters
Leg Number
Traffic Separation Zone
Traffic Separation Zone Boundary
Base Map: Cape Sable to Cape Hatteras NOAA Coastal Map;
Depth in Fathoms. Edition Date: 10-01-2004.
Prepared By:
WOODLOT ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS
Sheet Title:
Transit Route Map 9
Intentional Breach Scenario
Project:
Downeast LNG
Robbinston, Maine
Date: April 2007
Scale= 6 Nautical Miles
Proj. No.: 105111
Figure:
9

Figure 18



Prepared By:
WOODLOT ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS
105111-F08-TransitMap.mxd

Sheet Title: Transit Route Map 8
Intentional Breach Scenario

Project: Downeast LNG
Robbinston, Maine

Date: April 2007
Scale: 1" = 1 Nautical Mile
Proj. No.: 105111
Figure: 8

Figure 19

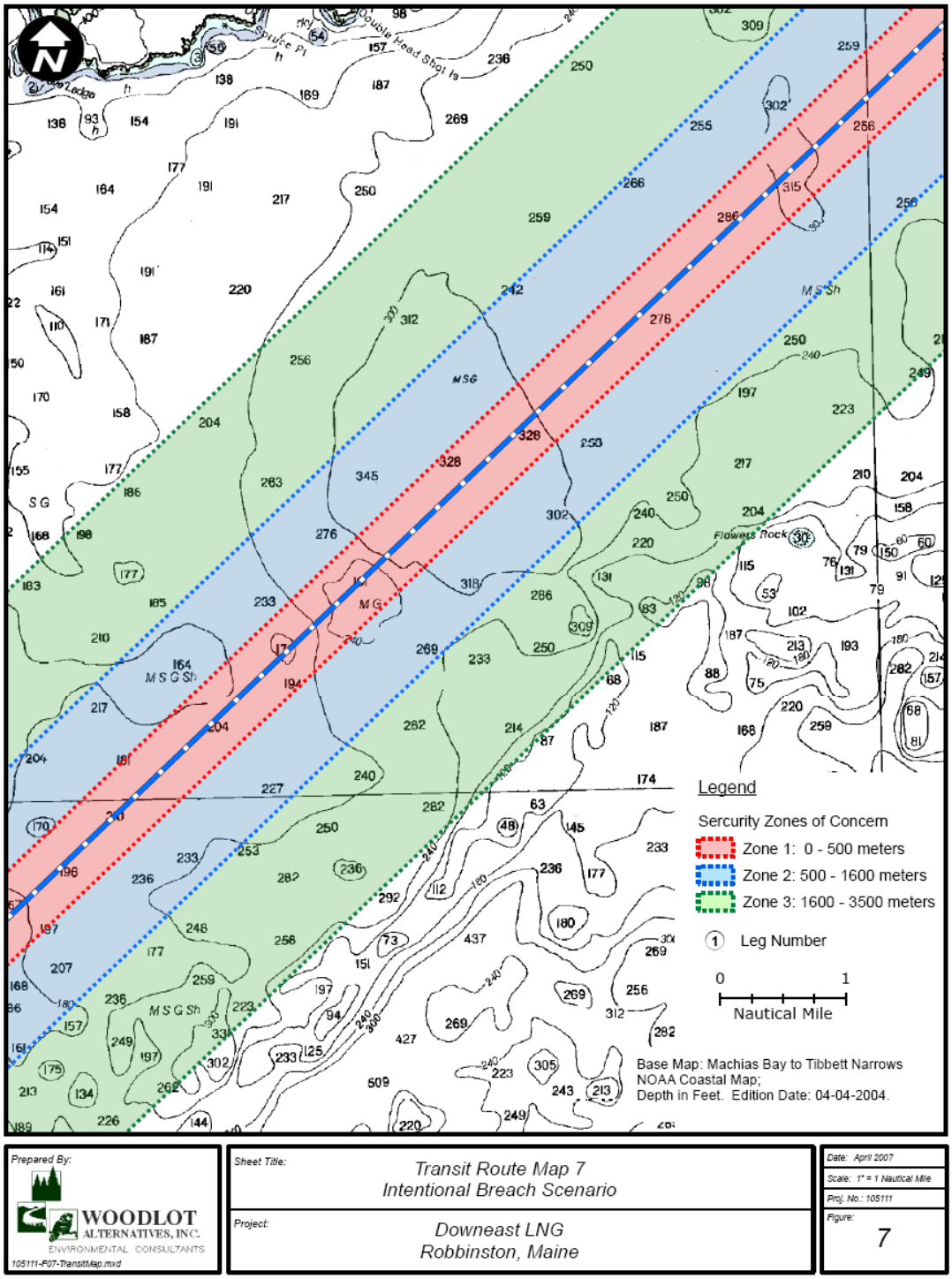
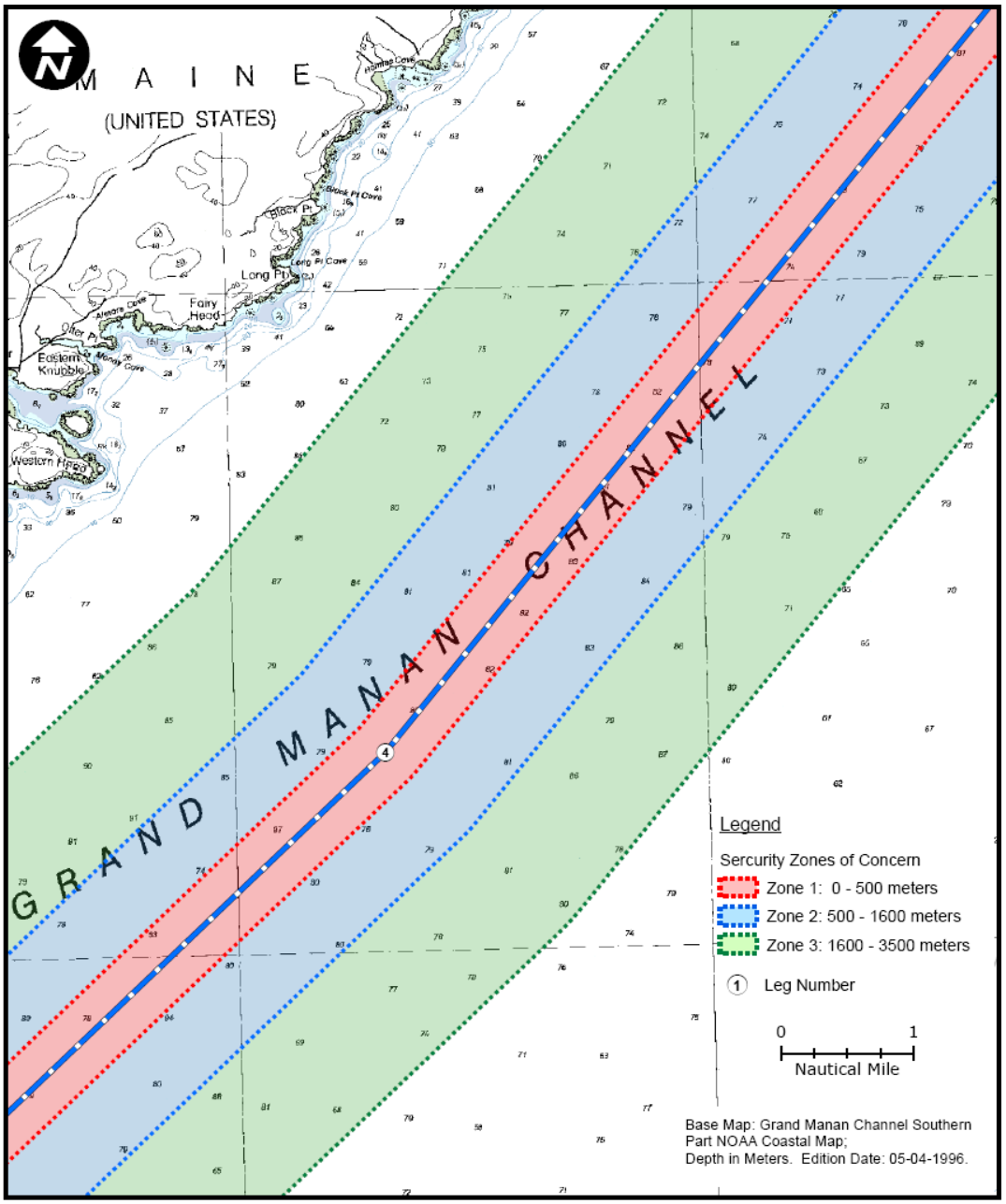

Legend
Sercurity Zones of Concern
Zone 1: 0 - 500 meters
Zone 2: 500 - 1600 meters
Zone 3: 1600 - 3500 meters
Leg Number
0
1
Nautical Mile
Base Map: Machias Bay to Tibbett Narrows
NOAA Coastal Map;
Depth in Feet. Edition Date: 04-04-2004.
Prepared By:
WOODLOT
ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS
105111-F07-TransitMap.mxd
Sheet Title:
Transit Route Map 7
Intentional Breach Scenario
Project:
Downeast LNG
Robbinston, Maine
Date: April 2007
Scale: 1" = 1 Nautical Mile
Proj. No.: 105111
Figure:
7

Figure 20



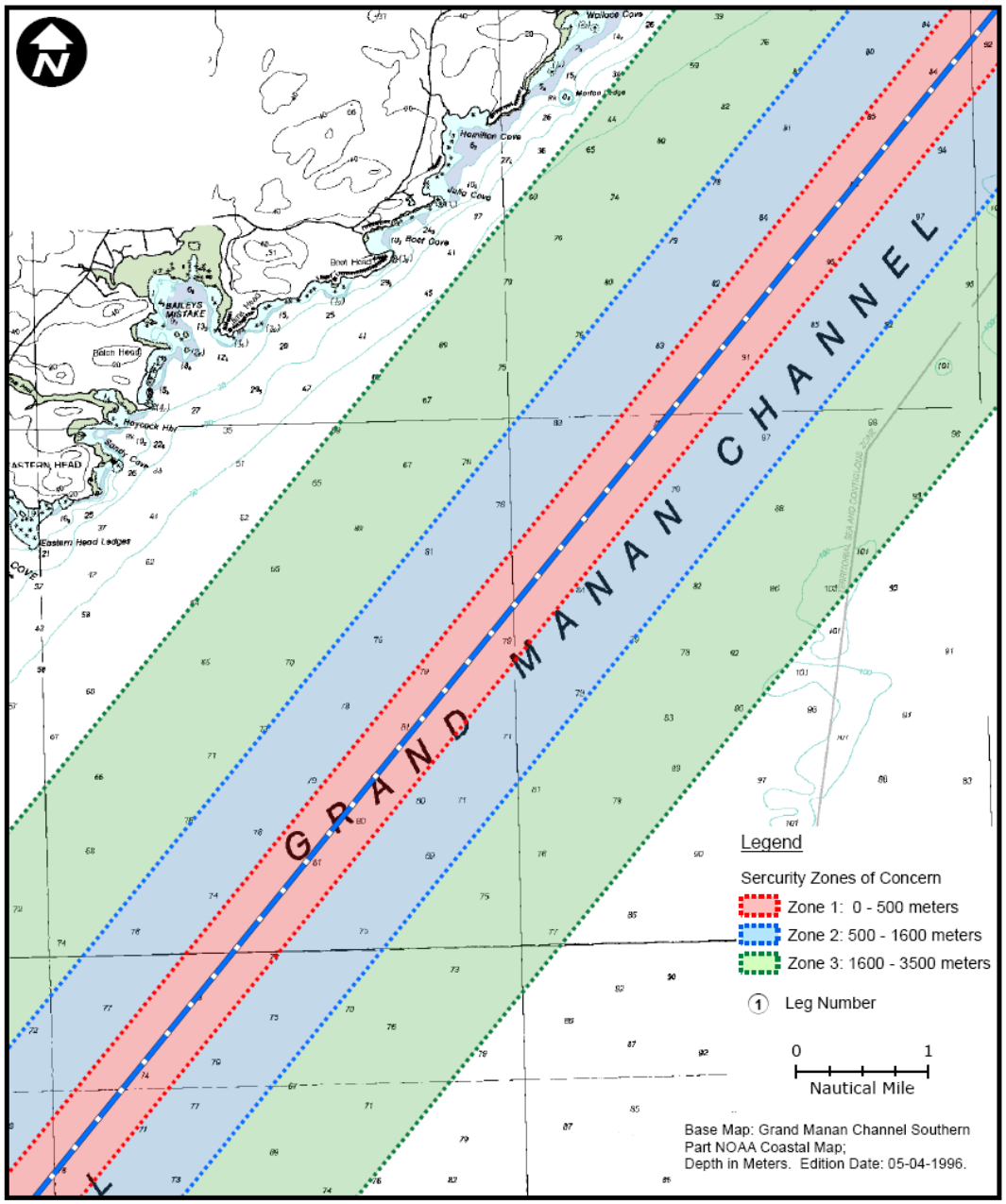
Prepared By: WOODLOT ALTERNATIVES, INC. ENVIRONMENTAL CONSULTANTS
105111-F06-TransitMap.mxd

Sheet Title: *Transit Route Map 6 Intentional Breach Scenario*

Project: *Downeast LNG Robbinston, Maine*

Date: April 2007
Scale: 1" = 1 Nautical Mile
Proj. No.: 105111
Figure: 6

Figure 21



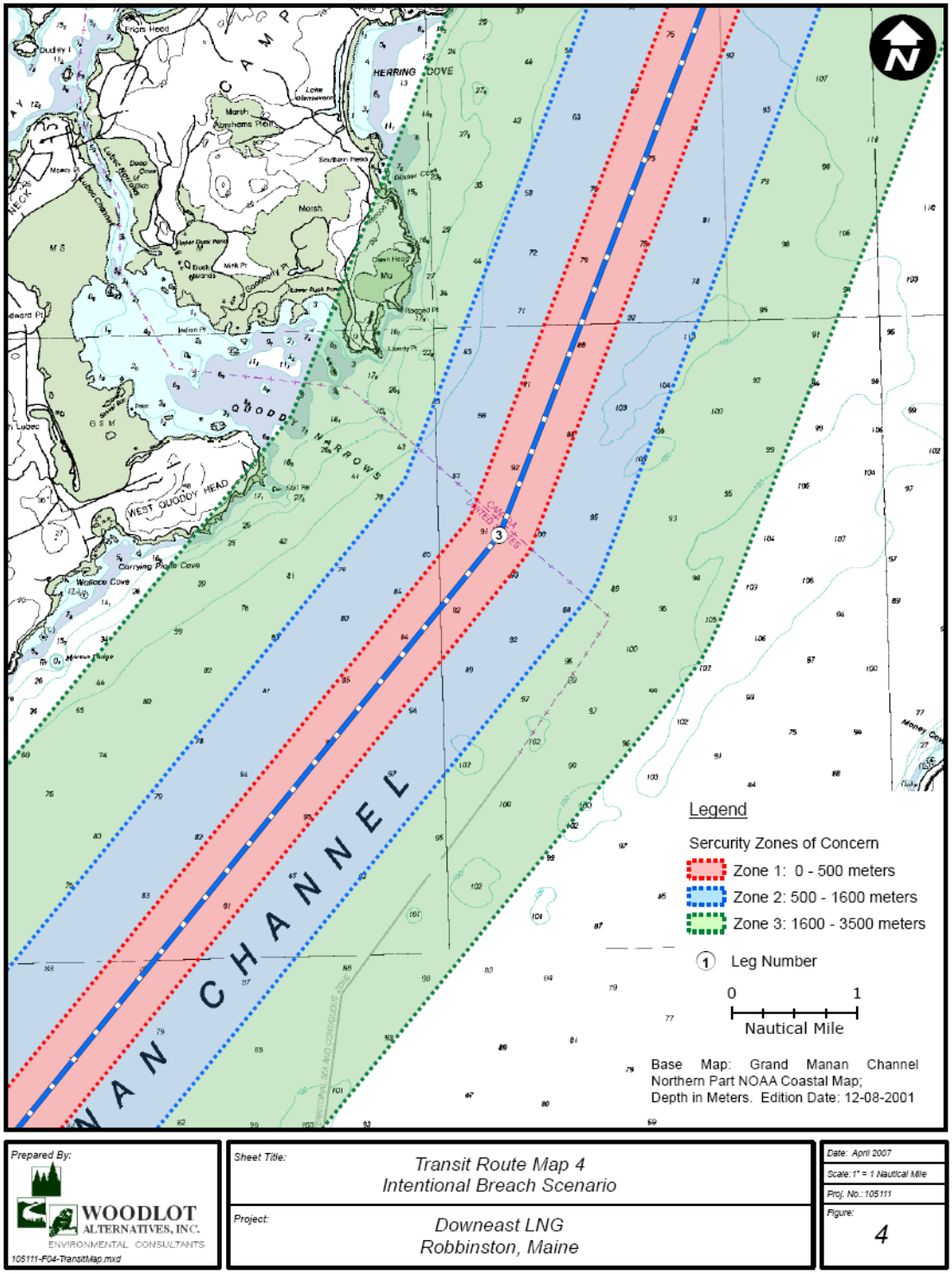
Prepared By:
WOODLOT ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS
105111-F05-TransitMap.mxd

Sheet Title: Transit Route Map 5
Intentional Breach Scenario

Project: Downeast LNG
Robbinston, Maine

Date: April 2007
Scale = 1 Nautical Mile
Proj. No.: 105111
Figure: 5

Figure 22



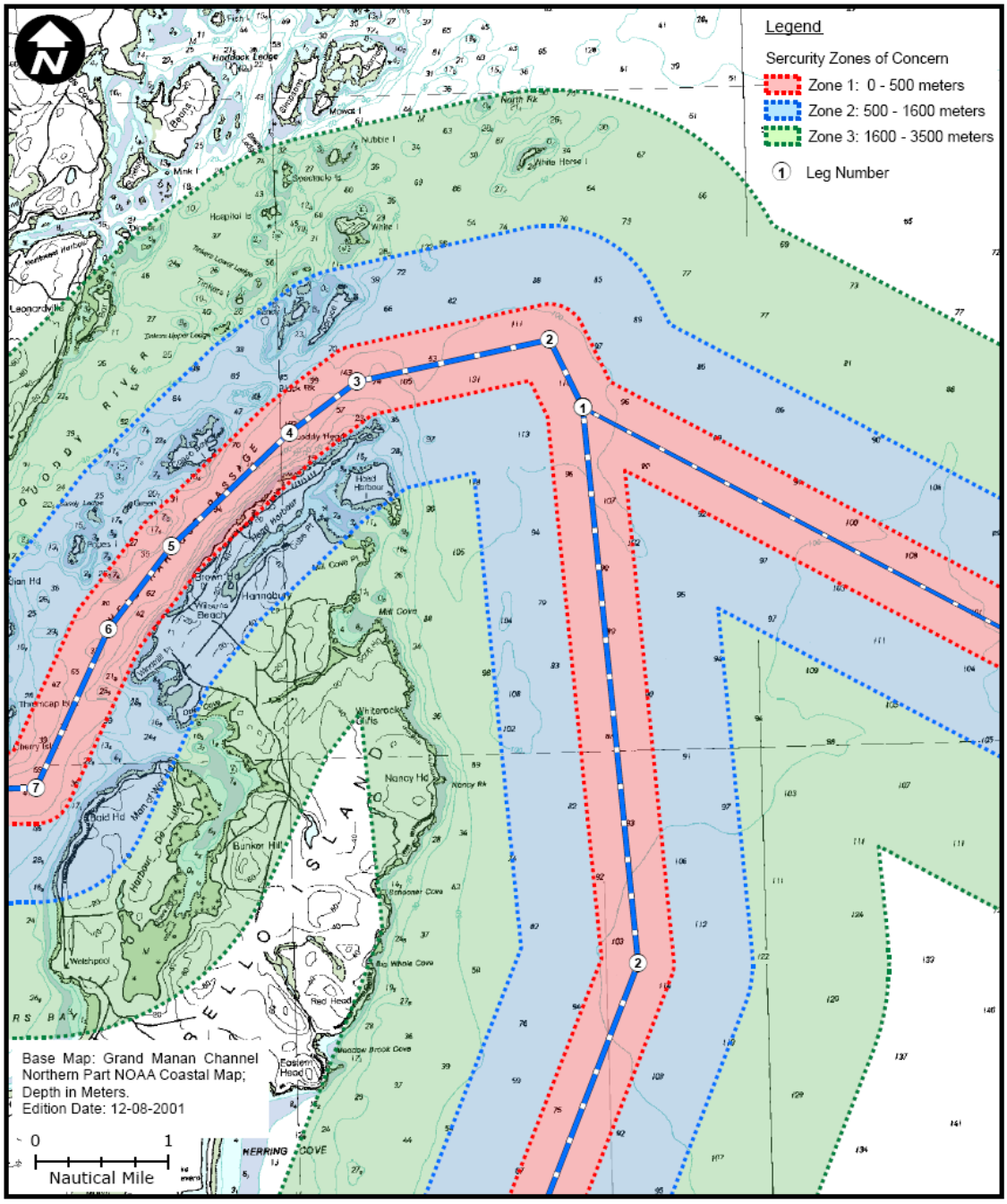
Prepared By:
WOODLOT ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS
105111-F04-TransitMap.mxd

Sheet Title: Transit Route Map 4
Intentional Breach Scenario

Project: Downeast LNG
Robbinston, Maine

Date: April 2007
Scale: 1" = 1 Nautical Mile
Proj. No.: 105111
Figure: 4

Figure 23



Prepared By:
WOODLOT ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS
105111-F03-TransitMap.mxd

Sheet Title: Transit Route Map 3
Intentional Breach Scenario

Project: Downeast LNG
Robbinston, Maine

Date: April 2007
Scale:1" = 1 Nautical Mile
Proj. No.: 105111
Figure: 3

Figure 24

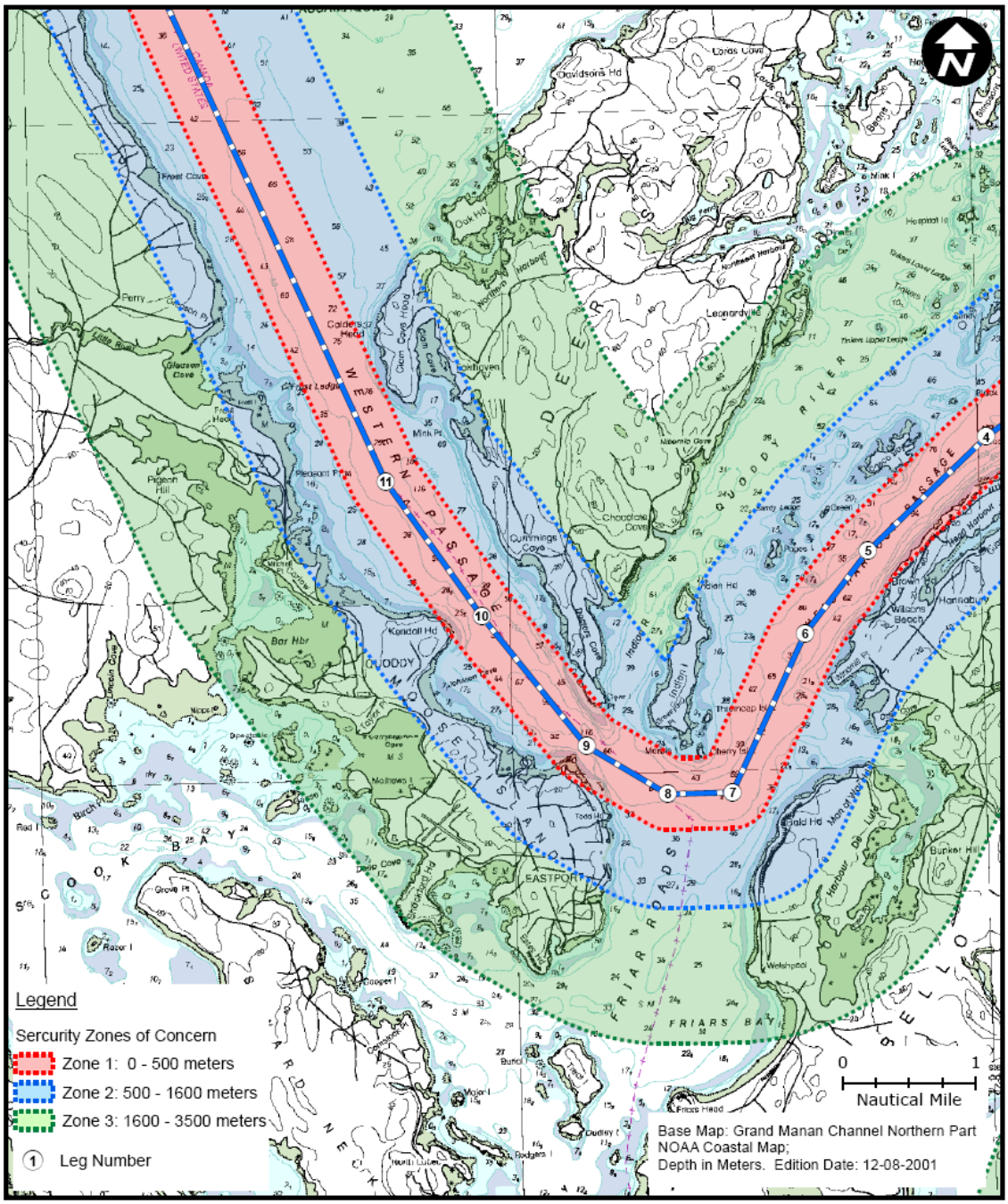
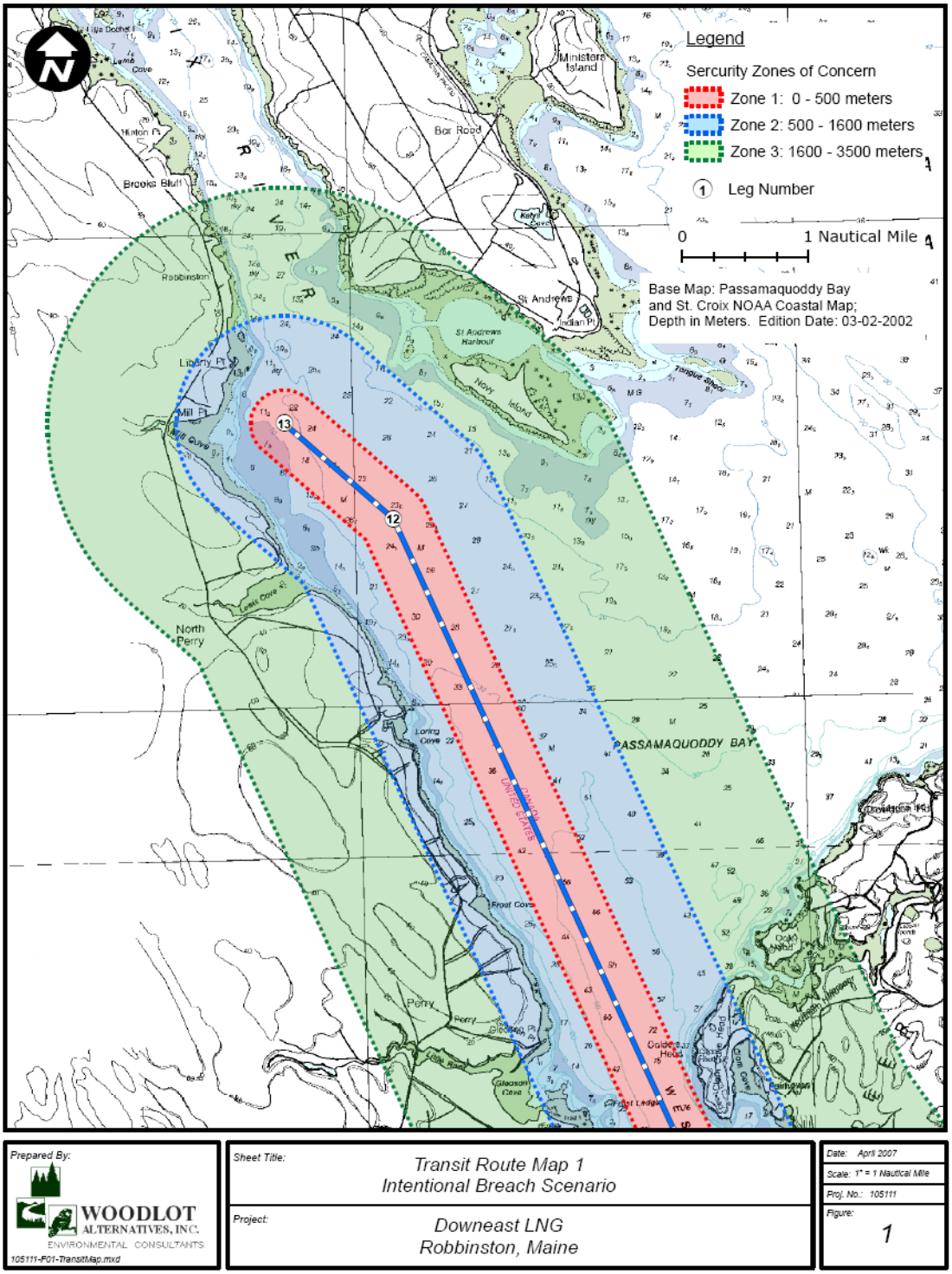

Legend
Sercurity Zones of Concern
Zone 1: 0 - 500 meters
Zone 2: 500 - 1600 meters
Zone 3: 1600 - 3500 meters
1 Leg Number
0
1
Nautical Mile
Base Map: Grand Manan Channel Northern Part
NOAA Coastal Map;
Depth in Meters. Edition Date: 12-08-2001
WESTERN PASSAGE
EASTERN PASSAGE
EASTPORT
FRIARS BAY
Prepared By:
WOODLOT ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS
105111-F02-TransitMap.mxd
Sheet Title:
Transit Route Map 2
Intentional Breach Scenario
Project:
Downeast LNG
Robbinston, Maine
Date: April 2007
Scale: 1" = 1 Nautical Mile
Proj. No.: 105111
Figure:
2

Figure 25



LNG burns at extremely high temperatures. Once started, a natural gas fire is quite difficult to extinguish. As indicated in the Sandia Report, scientists determined that should a large LNG spill on water be ignited, it could burn at 3,000 degrees F for 30 minutes to an hour, throwing off extreme, potentially damaging radiant heat for the first four-tenths of a mile from the vessel. Beyond that range, the degree of heat flux

decreases appreciably depending on surrounding climatic conditions (wave height, wind speed, ambient temperature, etc.) and geographical impediments such as man-made buildings or structures, and natural obstructions such as tree lines and hills. The affected distances and hazard parameters related to Sandia zones of concern for an intentional (i.e., terrorism related) release are:

- Zone 1 - 500 meter radius with resultant fire and severe thermal radiation hazards. By definition these are areas in which LNG shipments occur in relatively narrow harbors or channels, or ships pass under major bridges or over tunnels, or come in within 500 meters of major infrastructure such as military installations, commercial/business centers, or national icons.
- Zone 2 - from 500 to 1600 meters with less severe thermal radiation hazards to public safety and property. These are areas of broader channel widths, larger open harbors, or over 500 meters from major critical infrastructure elements.
- Zone 3 – from 1600 to 3500 meters with potential pockets of flammable vapor. These are areas where LNG traffic and deliveries occur approximately 1.6 kilometers from major infrastructure or in large bays or open water. The thermal radiation risks to public safety and property are significantly reduced.

As shown in the Figures on pages 25-34, zones of varying significance impinge on communities along both sides of the shared waterway. It should be noted, however, that the centerline from which the Zones of Concern are calculated follow the LNG carrier's anticipated course or track line. An LNG carrier "drifting" from the plotted route within the channel would, therefore, carry the zones of concern proportionately, where greater public safety and environmental effects could be experienced, if a worst case accidental or intentional release scenario were realized.

The other factor used to judge the potential impact of an LNG release is the concentration of populace threatened. The three levels of population density, as defined by NVICs 05-05 and 05-08, are:

- High population areas – residential areas with a population density of 9,000 persons or more per square mile;
- Medium population areas – residential areas with 1,000 to 9,000 persons per square mile; and
- Low population areas – residential areas with less than 1,000 persons per square mile.

Using the above criteria, Downeast LNG concluded in their WSA that the transit route passes through relatively low population areas, i.e., predominantly fewer than 1,000 persons per square mile. By definition, the Pleasant Point Passamaquoddy Tribal Reservation, having a population density of 1,376 persons per square mile and located about 7 nautical miles downstream of the proposed terminal site and approximately ¾ nautical miles from the centerline of the transit route, is considered a borderline medium population area (other sources report the population density as being 984 persons per square mile). By contrast, the popular tourist area of St. Andrews, New Brunswick, is located geographically opposite from the proposed Downeast LNG site, and is home to

approximately 2500 residents with a population density of 88 persons per square mile. The next highest population area affected by a transiting LNG carrier is the City of Eastport, ME, with a population density of 448 persons per square mile. Comparatively, Campobello Island, New Brunswick, Deer Island, and Robbinston, ME, have population densities of 78, 58, and 19 persons per square mile, respectively. Obviously, the demographics of the Passamaquoddy Bay port area do not meet the NVIC criterion for high population density, both with regard to the vessel's transit route or surrounding the proposed facility site. This statement is not meant to minimize the significance and/or importance of the surrounding communities, environment, and population living, working or using the waterway. Rather, it simply concludes that the risk of LNG movement through the waterway has been evaluated against pre-determined criteria in order to measure and prioritize those areas that would be most severely impacted.

Due to the relative remoteness of the shared waterway and comparatively low concentration of defined critical infrastructure and population densities, the following generalities, by zone consequence, are provided regarding an intentional release of LNG vice a detailed breakdown of the entire transit route by segments:

Zone 1

- Zone 1, the measure with the most severe impact, does not affect any high population area, public or government centers such as schools, hospitals or transportation infrastructure as LNG carriers proceed along the intended track line. However, any commercial vessel intended for the port of Bayside may well fall into Zone 1 as it passes docked LNG carriers (cumulative consideration if other proposed LNG facilities are also built), and similarly, recreational and fishing vessels may fall within the zone depending on their course. As well, the seasonal ferry crossings connecting Deer Island, New Brunswick and Eastport, Maine and Campobello Island, New Brunswick could possibly be within Zone 1 as an LNG carrier passes. Transit of such vessels through a Zone 1 area of concern can be avoided by timing and course changes, if conditions permit.

- During the LNG carrier's transit, a Zone 2 impact may very well occur at Dog Island Light, affecting portions of Moose Island on the Maine side and Deer Island on the New Brunswick side. This area presents the narrowest point in the entire transit route and the pilots tend to hug the U.S. side of the dogleg, rather than stay in the middle of the channel, in order to avoid the divergent currents common to this portion of the waterway.

- Although no major military post or camp is situated along the waterway, USCG Station Eastport, a Search and Rescue (SAR) and Law Enforcement (LE) installation, is located on the shore of Eastport and would fall within Zone 1 and/or 2, depending on the actual course taken by the pilots when navigating the bend off Dog Island.

- When the carriers transit Head Harbor Passage, the northern most edge of Head Harbor and shore side neighboring areas on Campobello Island would fall within

Zone 1. When the carriers transit Friar Roads and Western Passage, the western edge of Deer Island Point, New Brunswick, would also fall into this zone.

Zone 2

- Elements within the U.S. which would fall within Zone 2 while vessels transited Friar Roads and Western Passage include most of Eastport, Kendall Head, and Pleasant Point, ME. While not necessarily classified as "critical infrastructure", i.e. bridges, tunnels, etc., Route 190 provides the only vehicle access to and from the City of Eastport. A portion of Route 190 is within the zone of concern.

- During LNG vessel transits of Head Harbor Passage all Canadian areas and communities along the northern and westerly edges of Campobello Island such as Brown Head, Wilson's Beach, Windmill Point, and Bald Head would fall within Zone 2. Also within this zone would be the islands off the coast of New Brunswick to include Spruce Island, Sandy Island, Casco Bay Island, Green Island, Pope Island and Indian Island. Zone 2 would also impact land masses along Friar Roads and Western Passage such as West Deer Isle, New Brunswick communities west of Highway 772, Doctors Cove, Cummings Cove, and Mink Point.

Zone 3

- In addition to the localities identified in the above zones, areas impacted by Zone 3 in the U.S. include all of Moose Island, Pleasant Point, Perry, and Robbinston.

- On the Canadian side, in addition to all locales previously identified along Head Harbor Passage impacted by Zones 1 and 2, Welshpool and all of Northern Campobello Island would fall into Zone 3, as would the communities on the alternate side of Head Harbor Passage which would encompass areas such as Leonardville, Bar Island, and a portion of Southern Deer Island. And, when carriers navigate Friar Roads and Western Passage, a major portion of western Deer Island falls within this zone as well.

Within the context of the defined criteria contained in the Sandia Report and the guidance contained in the NVICs, Downeast LNG identified the following as not being contained within the Zones of Concern, as plotted from the centerline of their intended transit route:

- any wild and scenic rivers;

- any shellfish nurseries;

- any coral reefs; or

- any marine protected areas (assuming vessels used the Grand Manan Channel, which may be their preferred transit route as the North Atlantic right whale and Bay of Fundy conservation areas are located to the east of Grand Manan Island).

A number of comments were received regarding the site selection and proposed LNG operations in contrast to the guidelines and recommended industry best practices outlined in *The Society of International Gas Tanker and Terminal Operators Ltd.* (SIGTO) publications. As emphasized by SIGTO, each port environment presents a unique set of risk exposures for LNG operations and, as such, each requires a specific, detailed study of the operating environment in every case. The waterway suitability assessment process and the FERC site analysis closely parallels SIGTO's Quantitative Risk Assessment (QRA) methodology and, in fact, utilized many similar decision-making tools.

Of specific comment and concern was SIGTO's pronouncement that an LNG site location should be suitably distant from centers of population; and the associated mooring piers should not be situated in heavily trafficked areas or within constricting channels where other ships pose collision risks. There was expressed concern that Downeast LNG's proposed site did not follow SIGTO's site selection criteria in these regards. It must be understood that SIGTO's publications are meant as general *guidance* only. While based on industry "best practices," the recommended procedures and precautionary measures provided in their Information Papers are not regulatory standards. Rather, they are intended as transit/site-specific measures to reduce risk and to be applied where practical and within realistic limits. The USCG recognizes the significance of SIGTO and referred to their documents throughout the WSA process as a risk management measure.

As described above, Zones of Concern were applied along the carrier transit route to graphically identify and depict areas where an accidental release of LNG may cause the most severe consequences. Unique to the Passamaquoddy Bay port area, three separate and distinct LNG proposals are being evaluated for FERC approval. Although each proposal is being assessed on its own merits, there are cumulative impacts that should be taken into account on the event that each ultimately receives approval. There is one case of particular note: A competing LNG project proposal involves the construction and operation of a facility about 6.8 nautical miles downstream of the Downeast LNG site. The alternate proposal includes a marine terminal designed with two staggered berths near to affiliated regasification facilities. As part of that proposed operation, two LNG carriers will most likely be at the facility simultaneously; one will be actively offloading product into the sendout line via the regasification system, while the other stands by, ready to offload. According to the developer's stated plans, this event will be typical during its first phase of operation while storage tanks are being constructed in the neighboring town of Perry, but are expected to be rare thereafter. Although only one carrier will actually be transferring cargo at any given time, the gross amount of LNG attributable to two berthed carriers having a midpoint separation distance of about 575 yards, becomes an accumulative factor affecting the overall dimensional range of overlapping zones of concern – compounded by the likelihood of an LNG carrier passing relatively close aboard (approximately 1,100 yards to the centerline of the established vessel track line) when en route the Downeast LNG proposed site. (Note: Effective October 17, 2008, the FERC formally dismissed the application of this alternate proposal without prejudice. The applicant has stated intentions to re-apply in the future once the facility design plans are finalized.) Also of significance, a third prospective developer

has entered the pre-filing process with the FERC and filed a LOI with the Coast Guard to build and operate an LNG facility near the City of Calais on the St Croix River, also necessitating the need for cumulative impact assessments.

The above scenario is presented only to highlight the fact that there may be a need to re-calculate the hazard zone parameters in order to qualify the cumulative effects of double cargo loads being present at the opposing terminal site for the safety of the surrounding populous and infrastructure. Apart from any mitigating strategies and measures that may become apparent as a result of an impending analysis, the USCG will require, at a minimum, a tractor tug of minimum 60 ton bollard pull and equipped with American Bureau of Shipping (ABS) Class 1 (Fi Fi 1) equivalent firefighting capabilities to be moored outboard of all berthed LNG carriers at all times to assist with emergency departure maneuvers and/or assist in the fending off of uncontrollable craft.

3.3 International and Sovereignty Considerations

As denoted in the Transit Route Overview, LNG carriers bound for the proposed LNG facility site must travel through Canadian territorial waters, specifically Head Harbor Passage, before entering U.S. waters at the confluence of Friar Road. The vessels then straddle the international boundary before turning into exclusive U.S. waters to reach the intended terminal site, to be located on the Maine side of Passamaquoddy Bay near its confluence with the St. Croix River. Based on the sovereignty over their portions of these waters, the Canadian and provincial governments have publicly expressed strong opposition to any and LNG carriers traversing their waters, citing potential security, environmental, navigational, and safety risks. Also of expressed concern are the public health of its local residents, economic viability of the fishing and tourism industries, and the pristine environment of the region. Jurisdictional issues have been at the forefront as well. The Canadian government has indicated that it considers all of Head Harbor Passage to be the internal waters of Canada and that the international right of "innocent passage" does not apply. This has been a matter of extensive discussions and legal review ever since the Downeast LNG proposal was first announced. In contrast to Canada's assertion, it is the formal position of the United States that vessels departing to and from U.S. ports on the waters of the Passamaquoddy Bay port area enjoy the non-suspendable right of innocent passage under customary international law as reflected in the United Nations Convention on the Law of the Sea (UNCLOS).[3] Canada became a party to UNCLOS in December 2003; the United States is not party to the Convention in that the U.S. Senate has not yet provided the necessary approval.[4] One important consequence of the U.S.'s current non-party status is that the United States is not subject to, nor can the U.S. make use of, the compulsory dispute settlement provisions of

[3] United States, Message of President Clinton transmitting the United Nations Convention on the Law of the Sea to the U.S. Senate for Ratification in 1994, "Commentary -The 1982 united Nations Convention on the Law of the Sea and the Agreement on Implementation of Part XI," 103rd Congress, 2nd Session, Treaty Document 103-39, at p.19.

[4] Marjorie Ann Brown, "The U.N. Law of the Sea Convention and the United States: Development Since October 2003," (Congressional Research Service Report for Congress, Order Code RS21890, updated 27 January 2006).

UNCLOS, since this is clearly a right/obligation that arises from being a party and is not a right/obligation that arises from customary international law.[5]

The Province of New Brunswick has filed a *Motion for Leave to Intervene and Comment* with FERC, in addition to, a *Motion to Suspend Proceedings*. These documents, along with other official correspondence relating to the subject emanating from the offices of the Canadian Ambassador, Premier of New Brunswick, Chairman of FERC, U.S. State Department, and U.S. Senate, are maintained in the public docket by FERC and accessible on their website.

There has been ongoing correspondence and a continued dialogue between COTP Sector Northern New England and its counterpart Canadian agencies. Early on, the COTP initiated meetings with colleagues in Transport Canada, the Departments of Foreign Affairs, Fisheries and Oceans, Environment, and Public Safety and Security during trips to Halifax/Dartmouth, Moncton, and Fredericton, New Brunswick, to build on the existing professional rapport and discuss issues of the mutual concern regarding the project proposal and need for joint cooperation and a unified response capability. Additionally, the COTP met with the Mayor of St. Andrews and members of his council to discuss local safety, economic, and environmental concerns in relation to the proposed operation.

During the initial assessment proceedings, pertinent branches within the Canadian government, such as Transport Canada, were granted permission by the Ministry of Foreign Affairs to engage in "technical" discussions with COTP Sector Northern New England in an effort to identify mutual issues of concern, potential risks, and address possible mitigating factors surrounding the proposed LNG ventures. However, consequent to the official stance taken by the government in regards to "innocent passage" and the formal filing of the documents discussed above, Canadian officials curtailed further participation in the review process and subsequent joint interrogatories have since stalled. This action caused the assessment process to slow and ostensibly inhibited Downeast LNG's ability to assimilate resource information and fully assess environmental impacts to Canadian waters and property; requisites that were communicated via follow-on agency data requests. Developing bilateral arrangements and protocols is necessary on a number of fronts to ensure that adequate safety, security, and environmental response mechanisms are in place to ensure safe and efficient transits and for the protection and welfare of the surrounding marine communities. The eventual involvement and cooperation of Canada's maritime, environmental, and public safety authorities are paramount to ensure the safety and security of the waterway.

In addition to examining Canadian sovereignty issues, the inherent rights and concerns of the Passamaquoddy Tribal Nation, whose Sipayik members reside in the vicinity of the proposed project site, have been issues of significant concern and consideration by COTP Sector Northern New England. The Pleasant Point Reservation, which is located at the edge of the transit route on the banks of Western Passage, is approximately eight nautical miles downstream from the planned Downeast LNG site. The Indian Township

[5] Ted L. McDorman, "The International Legal Status of Head Harbor Passage," Research Memorandum, January 2007, p. 8.

Reservation, situated further upstream on the edge of the St. Croix River near Calais, ME, is beyond the transit route. However, that Reservation could be directly or indirectly impacted by an LNG terminal or vessel mishap. Additionally, some Passamaquoddy Tribal members live in Canada just across the St. Croix River.

Sovereignty, a critical feature of federal Indian law, has been an exceedingly complex and sensitive issue for the Wabanaki People (Coalition of Abenaki, Penobscot, Maliseet, Passamaquoddy and Mi'kaq Tribes) within the State of Maine for hundreds of years. In order to appreciate the complexity surrounding Passamaquoddy Tribal sovereignty issues the following historical overview is provided.

In 1790, the First Congress of the United States enacted the Nonintercourse Act, declaring that any transfer of land from Indians to non-Indians had to be approved by Congress. The law was designed to protect Indians from unscrupulous and unfair property transactions. However, during the 19th Century and much of the 20th Century, the Wabanaki People of Maine were considered "state" Indians, because they had never signed any treaties with the federal government. Thus, Indians in Maine were considered to have no inherent sovereignty, no right to self-government, and were excluded from land trust relationships; i.e., they were not protected under the Non-intercourse Act. Purportedly, the Maine State Legislature assumed the authority to make whatever decisions it thought necessary at any given time, and it was during this time period that most of the land of the Passamaquoddy and Penobscot People was transferred, through a variety of transactions, to the State of Maine. These land transfers were never approved by Congress.

In 1972, the Passamaquoddy Tribe filed suit in federal court seeking to force the federal government to return their lands; an area encompassing 60% of the State of Maine. The suit also sought to establish that the Passamaquoddy tribe and Penobscot Indian Nation were entitled to the special services that the federal government makes available to Indians in other parts of the country, that they still possess their inherent sovereignty, and that the State of Maine had no power to interfere with their self-government. The Passamaquoddy Tribe won this suit in U.S. District Court in 1975, and the U.S. Court of Appeals affirmed that decision. Neither the federal government nor the State of Maine sought to appeal that decision to the U.S. Supreme Court. Within months of this landmark decision, the U.S. Department of Justice announced that it would sue the State of Maine and its largest land holders on behalf of the Tribes for the return of the land if an out-of-court settlement could not be reached. At the same time, the federal government also announced that from then on the tribes would be eligible for the special services that the federal government provides to other tribes.

In a memorandum the Justice Department described the case as "potentially the most complex litigation ever brought before the federal courts with social costs and economic impacts without precedent …." This conclusion was based on the size of the claim (12.5 million acres, or 60% of the State of Maine, with an assessed value of $25 billion), and the fact that 350,000 people lived, worked, and often owned property within the disputed area. In 1979, the Maine Supreme Court determined and ruled that the inherent

sovereignty of the Passamaquoddy People survives and that the State of Maine had no power to interfere in their self-government.

Over the next few years negotiations were intense. The Governor of Maine persuaded the congressional delegation from Maine to ask Congress to pass legislation that would bar the Passamaquoddy Tribe and Penobscot Indian Nation from continuing in court by retroactively approving the treaties that their claims were based on. The tribes maintained that such a move would be illegal and unjust.

The situation was extremely tense until President Carter called for a resolution. Through the actions of an appointed work group, an agreement was ultimately reached. The Maine Indian Claims Settlement Act (MICSA), signed by President Carter in 1980, is the Federal codification for this agreement. In the end, the Passamaquoddy Tribe and Penobscot Nation received a total of $81.5 million, and 150,000 acres for each tribe.

The State of Maine enacted companion legislation to MICSA, known as the Maine Implementation Act (MIA). It attempted to define the relationship between the three Tribes and the State of Maine. Its interpretation has proven controversial, and many issues are still in dispute, including concerns of aboriginal rights. One unresolved issue is that the Passamaquoddy Tribe claims the waters from the head of the St. Croix River to Pemaquid Point as their own. There continues to be spirited debates about state versus tribal jurisdiction in many areas, including land-use regulation, tribal courts, and fish and wildlife enforcement.[6]

COTP Sector Northern New England is sensitive to the issues pertaining to Passamaquoddy Nation sovereignty and has reached out to the Pleasant Point Sipayik Tribal Council to seek clarification on the Tribe's perception of its authority with regard to the territorial waters of the Passamaquoddy Bay area. Additionally, Pleasant Point law enforcement, fire and emergency response, and environmental management personnel have been active participants in the LNG Working Group proceedings to assist in the evaluation of the Downeast LNG WSA process. In response to the COTP's focused outreach efforts, the Sipayik's, in consultation with the Joint Tribal Council, have retained legal council to address his concerns. While no formal response has yet been received, the COTP anticipates receiving helpful input and ongoing cooperation.

In response to a USCG-initiated FERC data request regarding the sovereignty issues discussed above, Downeast LNG submitted a legal précis rebuffing the Passamaquoddy Tribe's claims. Based on legal research the company stated: "The Passamaquoddy tribal fishermen lack sovereignty or any other special fishing or sustenance rights over the waters through which LNG carriers will transit to and from the Downeast LNG facility. Accordingly, Downeast LNG does not anticipate material legal issues regarding this matter." The legal argument included the following points:

- The rights of the Passamaquoddy Tribe in Maine are collectively governed by the MICSA MIA, and, accordingly, the Passamaquoddy Tribe does not maintain an

[6] Diana Scully, Executive Director Maine Indian Tribal-State Commission; summary/excerpts from *Maine Indian Claims Settlement: Concepts, Context, and Perspectives*, February 14, 1995.

interest as a sovereign in the waters in and surrounding Passamaquoddy Bay, though it does have some level of sovereignty in Passamaquoddy Indian Territory, which is limited to the Passamaquoddy Indian Reservation and certain lands acquired by he U.S. government in trust for the Tribe.[7]

- The Tribe does not have sovereign authority in any other lands or waters, and aboriginal title in other lands has been extinguished.[8]
- The Tribes retained "sovereignty in Passamaquoddy Indian territory exempts the Tribe from the laws of the State of Maine with respect to "internal tribal matters."[9] The scope of the internal tribal matters exception to State sovereignty, however, is narrow and "does not displace general Maine law on most substantive subjects, including environmental regulation."[10]

The intricacy of, and overall sensitivity to the sovereignty issues within the region have complicated the WSA process. Of significant concern is the COTP's jurisdictional authority to enforce risk reduction measures, such as safety/security zone enforcement, and/or how to quantify environmental risks and related potential impacts to hallowed hunting and fishing grounds and sacred ceremonial sites, if in fact Passamaquoddy sovereign rights prevail.

3.4 Marine Traffic Control

As previously indicated, all deep-draft vessel traffic entering the Passamaquoddy Bay port area initially traverses Canadian waters, and then straddle the international boundary throughout their respective transits. The existing scheme for ensuring traffic control involves the full cooperation of the U.S. and Canada, with vessel movements reported to and controlled by "Fundy Traffic," a Canadian Vessel Traffic System (VTS) in St. John, New Brunswick. Canadian authorities require vessels destined for Canadian waters to provide a 96-hour notice of arrival. In addition, 24-hour advance notification to Fundy Traffic is required for all vessels transiting this area. Similarly, the National Vessel Movement Center in the U.S. requires a 96-hour advance notice of arrival for those deep draft vessels calling on U.S. ports. Once inside the VTS Fundy Zone, all vessels are required to both maintain voice contact with controllers and check in on designated frequencies at established way points. Fundy Traffic has radar coverage of the entire Bay of Fundy, but does not have visual or radar coverage inside Head Harbor Passage. Voice communication (VHF-FM), however, is maintained with vessels transiting to Eastport and/or the port of Bayside, New Brunswick. Insufficient radar coverage for this port area was an issue of major concern and debate during the PAWSA workshop and the recommendation was made that a radar repeater be installed on either Campobello Island, Deer Island, or in Eastport, ME, in order to provide full coverage.

Both Transport Canada and the U.S. Coast Guard administer Port State Control procedures. If a U.S. Port State Control boarding is required prior to a vessel entering a

[7] Maine Revised Statutes Annotated (M.R.S.A.) § 6205(1).
[8] *See* 25 U.S.C. §§ 1723(b), 1725(a), 1725(h).
[9] 30 M.R.S.A. § 6206(1).
[10] *See* Maine v. Johnson, 498F.3d 37, 45 (1st Cir., 2007).

U.S. port, the boarding would need to take place in U.S. waters, most likely at a point south of West Quoddy Head.

Deep-draft vessels bound for ports within the Passamaquoddy Bay port area transit a shared waterway system that includes Head Harbor Passage, Friar Roads, Western Passage, Passamaquoddy Bay, and the St. Croix River. Head Harbor Passage is exclusively Canadian waters, while Friar Roads, Western Passage, Passamaquoddy Bay, and the St. Croix River incorporate the international boundary between Canada (Province of New Brunswick) and the U.S. (State of Maine).

Those vessels currently bound for the Port of Eastport, ME, access U.S. waters through Head Harbor Passage and Friar Roads. Potential Downeast LNG carriers would continue on through Friar Roads and transit Western Passage before turning northwesterly near the mouth of the St. Croix River to arrive at the proposed terminal site.

Vessels bound for the Bayside Marine Terminal in New Brunswick follow the same basic route. They continue on through Western Passage, pass through the westerly part of Passamaquoddy Bay, and then transit about 6 miles up the St. Croix River.

Pilotage is compulsory for foreign vessels and U.S. vessels under registry in the foreign trade when in U.S. waters. All deep draft ships currently entering the shared waterway via Head Harbor Passage and thence transiting Maine waters to Eastport must employ a U.S. pilot. In contrast, there is currently no requirement under Canada's *Pilotage Act* or *Atlantic Pilotage Regulations* mandating compulsory pilotage for vessels transiting these same waters bound for Canadian ports. In practice, however, unlicensed Canadian pilots are employed on 90-95% of all vessels bound for the Bayside Marine Terminal in St. Stephen, New Brunswick. Of note, pilotage is compulsory for all deep-draft vessels bound for the port of Saint John, New Brunswick, which is accessed via the Bay of Fundy.

In May, 2006, a risk-based review was conducted of the St. Croix River and its approaches to determine if the current practice of non-compulsory pilotage should remain in place. The assessment was conducted under the auspices of the Atlantic Pilotage Authority (APA), the Federal Crown Corporation charged with pilotage services, to ensure the waters meet the standards of safety of Transport Canada and the Minister of Transport. Six recommendations resulted from the study:

- The waters and approaches to the St. Croix River to the port of Bayside should be designated as a Compulsory Pilotage Area.

- The APA should adopt as much of the existing pilotage infrastructure as possible.

- A review of existing "Fundy North" monitoring capabilities should be conducted with a focus on improving VHF radio coverage, radar, and Automated Information Systems (AIS).

- The establishment of "designated" anchorages in concert with the commercial fishing industry and in coordination with U.S. authorities.

- Review the location and adequacy of the navigational aids currently in use and add/upgrade aids as necessary to mark all areas posing a hazard to navigation. Update charts of the area, to include the conjoining waters of Head Harbor Passage and Western Passage, to reflect current stationing of all aids and location of any unmarked hazards to navigation.

- Recommend that the U.S. Coast Guard include consultation with the local U.S. pilots when conducting the next Waterways Analysis and Management System (WAMS) review.

Complementing the risk management study, the APA also conducted a review of its pilotage regulations in cross-comparison to those existing, informal procedures currently in practice. After close collaboration with the USCG, joint consensus was tentatively reached on jurisdictional concerns in order that APA's proposal for compulsory pilotage move forward. A proposed amendment to the Atlantic Pilotage Authority regulations has been drafted and is pending further Canadian regulatory review and public comment. The draft regulation respects U.S. sovereignty over its own waters, and the right of U.S. authorities to imposed pilotage requirements on vessels bound for U.S. ports.

At present, there are no designated "anchorage grounds" (anchorage areas subject to pertinent rules and regulations) directly within the Passamaquoddy Bay area. However, deep-draft vessels routinely anchor in the Bay of Fundy (outside of the transit corridor and to the north of Head Harbor Passage – dictated by water depth), inside the waterway south of Eastport in the vicinity of Friars Bay, and within Passamaquoddy Bay itself while waiting for dock availability, to avert traffic, or wait out adverse weather and/or unfavorable tide/current conditions. Along Head Harbor Passage and portions of Friar Roads, there are submarine pipeline and cable crossings that would also preclude vessel anchoring – these are adequately charted.

Specific anchorage criteria were developed by the LNG working group and are contained in Section 3.7.

3.5 LNG Carrier Simulation Tests

During the period July 27-31, 2006, a proof of concept evaluation was performed by Marine Safety International (MSI) at their facility in Newport, RI. The evaluation was conducted on full mission simulators with fifteen trial runs based on inbound vessel transits, ten outbound trips, and eight simulations dedicated solely to docking and undocking maneuvers. For the purpose of the tests, a full transit run was considered to start at the pilot boarding area in the vicinity of East Quoddy Head and conclude at the proposed single-berth terminal site in Mill Cove, Robbinston. All simulations were conducted in 'real time,' with a 34-mile round trip taking about 5 to 6 hours in duration.

In attendance were MSI personnel, Downeast LNG principals and associated engineers/consultants, Canadian and U.S. pilots, U.S. Coast Guard, Federal Energy Regulatory Commission, Transport Canada, Maine Port Authority, and maritime professionals (master mariners).

The objectives of the maneuvering studies were:

- Prove the feasibility of navigating a variety of LNG carriers up to 165,000 cubic meters for Downeast LNG on the planned transit route to its respective terminal site (East Quoddy Head to Mill Cove).
- Identify wind and current windows for transits and dockings.
- Evaluate arrival and departure maneuvers in the vicinity of the berths.
- Ascertain the adequacy of existing aids to navigation for day and night transits.
- Determine the number, size, and bollard pull of tractor tugs needed.
- Define tethering locations, speeds, and arrangements for the tractor tugs.
- Define wind and tidal current limitations for transits and docking operations.
- Determine the need for additional ATON and strategic locations for tidal current meters.

The full mission bridge simulations were conducted “real time” and focused on both basic normal operating conditions and more complex, challenging considerations, such as:

- Various mechanical failures (i.e., loss of rudder/steering, loss of propulsion).
- Emergency departures from the dock with limited tug assistance.
- Extreme/severe climatic conditions (tides/current/winds/fog).

Simulation runs were made using LNG carriers in the 125,000 to 165,000 cubic meter cargo carrying capacity range, and incorporated varying rudder and propulsion configurations. Downeast LNG has preliminarily designed its marine terminal pier to handle vessels approaching 220,000 cubic meter capacity with corresponding drafts of up to 39.4 feet and maximum length overall of 1,033 feet for potential, future expansion. MSI employed a three dimensional analysis for these tests, which included the use of the actual U.S. and Canadian pilots employed in the Passamaquoddy Bay port area. The full-mission bridge simulation provided the pilot(s) with visual cues of the surrounding areas as well as the handling/maneuvering characteristics of each size vessel undergoing testing. The pilots were able to anticipate changing waterway characteristics and varying

traffic conditions commencing at the pilot pickup area to the proposed berth, based on their experience and astute familiarity with the area. This "hands on" simulation strategy provided the pilots with exposure to the proposed LNG carriers, and correspondingly identified potential areas of concern, without compromising real-life safety.

Due to the strength of currents in the area, adequate tug/escort power was determined to be critical, especially during berthing and departure maneuvers. Up to four 60 ton bollard-pull tractor tugs were used to assist with transit, docking, and undocking operations throughout the simulations. The tugs were modeled with fully azimuthing propulsion units, allowing them to quickly change propulsion direction and manage the speed and steering of the LNG carriers, even under "dead-ship" conditions. For the vessel maneuvering analyses a variety of climatic settings were introduced to simulate predominate, seasonal conditions common to the Passamaquoddy Bay region. The simulator interjected varying weather and hydrodynamic conditions, to include current directions and speed, stages of ebb and flood tides, wind velocities and changing directions, wind gusts, and low-visibility factors. The injected variables ranged from normal/routine to extreme conditions. Simulations were also conducted based on worst-case scenarios in order to ascertain breakaway limitations and confirm tug capabilities. Each pilot was advised of the prevailing environmental factors at the beginning of each computer/simulation run, and he then made up the tugs in whichever fashion best suited him to meet the existing and/or expectant, emergent conditions.

3.5.1 General results of the simulations:

- LNG carriers in the projected design ranges (125-165K cubic meter capacity) can be successfully navigated through the channels and passages, and safely maneuvered into and out of the proposed terminal berth. This assessment is largely attributable to the area's naturally deep waters, relatively wide channels, and calculated employment of tugs.

- Four 60 ton bollard pull tractor tugs of 5,000 horsepower each are sufficient for assisting and escorting the design range of LNG carriers to the terminal. Tethered escorting from the pilot boarding area to the terminal is recommended.

- Tests proved that real-time measurements of current velocities and directions are needed and this data be made available to the pilots on a 24-hour basis. The pilots should designate where the current meters will be placed for maximum effectiveness.

- Transits are not recommended when there are sustained winds of more than 25 knots.

- Prior to any LNG carrier nighttime transits, further simulation tests need to be accomplished to further ascertain the suitability of the current ATON system to support non-daylight/restricted visibility operations.

- Additional tractor tug training is needed to ensure the pilots are fully familiar with the tugs' capabilities.

- Transiting the Cherry Islet to Dog Island area should be avoided on a flood tide and during those times when ebb tide currents exceed three knots.

- ATON placement and optimum operability were evaluated by the pilots. Recommended ATON changes included:

    1. Establishing a lighted buoy at Stovers Ledge to mark the shoal area.
    2. Adding a light to the Clark Ledge day beacon.
    3. Intensifying the luminosity of the Dog Island and Deer Island fixed aids.
    4. Relocating and lighting the UH4 buoy at Popes Island.
    5. Establishing a lighted aid on Kendalls Head.

The above is an abridged summary of the MSI simulation results and observations made by the pilots and observers. Within the parameters of those tests conducted, the simulated passages were relatively uneventful, even during virtual mechanical breakdowns and other simulated crises, as long as escort tugs were utilized effectively and the environmental window limits adhered to.

3.6 Transit Analysis and Traffic Study

Quoddy Bay LNG, an alternate firm proposing to build and operate an LNG facility approximately eight nautical miles downstream of the proposed Downeast LNG facility, retained Moffatt & Nichols International (MNI) to evaluate the impact of LNG carriers on the existing marine traffic within the passages and approaches to Passamaquoddy Bay. While specific to the Quoddy Bay planned operation, there were, nonetheless, several conclusions made in that study that lend themselves to both proposals and, therefore, considered relevant to this Report. *(Note: Although the FERC formally dismissed Quoddy Bay LNG's application effective October 17, 2008, the results of the MNI traffic study are still relevant, although perhaps to a lesser degree, in light of a third proposal now under consideration (Calais LNG).*

A computer simulation model was developed and a number of scenarios were run in order to estimate potential delays that could be encountered by other waterway users and to judge the distinct and cumulative impacts of LNG carriers on existing traffic. Scenarios and corresponding data more specific to the Quoddy Bay proposal have not been included for proprietary reasons.

For the purposes of this study the LNG vessel traffic pattern was determined based on the anticipated number of carrier arrivals at the terminal(s) per year. The traffic pattern for all other vessels was based on historical statistics. Climatic information and data was based on weather conditions prevalent for the region and season. The existing scheme for ensuring traffic control involves vessel movements reported to and controlled by the CCG (i.e., "Fundy Traffic"). As well, locally conceived cooperative agreements and transiting practices that exist between the U.S. and Canadian pilots were factors

considered, including an informal one-way vessel traffic scheme. It should be noted that specific operational parameters under consideration by COTP Sector Northern New England were not available at the time the analysis was conducted. Consequently, the simulation was carried out using a number of assumed risks and operating conditions based on input from the local pilots and rules and procedures germane to existing LNG operations. As well, fishing vessels and recreational craft were not factored into the study. The authors reasoned that there would be minimal impact to deep draft traffic due to the seasonal nature of recreational craft and the relatively limited numbers of commercial fishing vessels in operation.

General results of the study concluded that:

- Based on delays computed at key locations along the waterway, vessels transiting to Estes Head and Bayside would be slightly impacted. This would result in a small number of vessels experiencing longer delays in their in-bound transit through Head Harbor Passage and Western Passage.

- Vessels waiting to sail outbound would experience the largest impact. Statistics show that at the existing traffic level (no LNG carriers) 64% of the vessels experience a weather delay of up to 5 hours; 2% between 5 and 10 hours; and 1% experience even longer delays. With the introduction of about 62 LNG carriers, an additional 4% of vessel traffic will experience some form of delay; with the proportion of longer delays increasing, with an additional 6-7% experiencing delays exceeding 5 hours.

- When ferry traffic was incorporated into the simulation runs, using a factor of four crossings every hour throughout the day during the period of mid-June through mid-September, the calculations ultimately showed a ferry-crossing coinciding closely in time with an inbound or outbound LNG carrier transit approximately once every 1.5 days.

Quoddy Bay LNG recognized that, if both operations were to materialize, the cumulative consequences of LNG traffic serving the pair of facilities would have a further impact on regional marine traffic. Consequently, aside from its site-specific scenarios, a further simulation was run by MNI to consider the effect of both terminals operating simultaneously. For the purposes of this particular study, 63 Downeast LNG carriers, serving the proposed Mill Cove facility, were factored into the analysis. Results of this simulation run indicated:

- With both, the Downeast LNG terminal and Quoddy Bay LNG terminal operating, an additional 6% of vessels (as compared to existing traffic conditions) could experience some type of delay when outbound in the waterway. An additional 9% of vessels could experience delays that exceed 5 hours.

- With both facilities operating, an LNG carrier could conceivably cross a ferry route, in the proximity of an underway ferry, approximately once a day.

- The actual impact that LNG carriers will have on ferry traffic is dependent, to a certain degree, on the stand-off distances specified in any safety/security zone established by COTP Sector Northern New England.

The aforementioned simulation results are abridged and only provide a snapshot of the overall study. The full *Transit Analysis and Marine Traffic Study*, prepared by MNI, is contained in Appendix N to the Quoddy Bay LNG WSA.

3.7 Safety/Security Zones and Operational Parameters

Throughout the Waterway Suitability Assessment process the LNG workgroup identified a significant number of issues, concerns, and risks (ICR's) relating to the proposed project. The ICR's were categorized and distributed to ad hoc subcommittees for further consideration and recommended resolution. The subcommittees were comprised of USCG personnel, local officials, stakeholders, and members of the marine community having subject expertise in each of the respective areas. After considerable deliberation the subcommittees developed an inventory of perceived risks and corresponding mitigating measures for the USCG's review. "Operational Parameters" were then developed based on the ICR's and working group input. It was collectively agreed that these measures, once implemented by the COTP, would have a moderate to significant impact on reducing the potential for safety related accidents. Of note, a substantial number of the recommended measures paralleled the findings and conclusions of the Ports and Waterways Safety Assessment (PAWSA) that was conducted independent of the WSA review process. The following is a synopsis of the working group's efforts.

3.7.1 Safety and Security Zone Considerations

Early on in the assessment process, the COTP recognized that a considerable amount of confusion and misconception existed regarding the terms *safety* and *security zones,* and the respective enforcement action of each. In an effort to qualify the terms, COTP Sector Northern New England developed an overview and distributed it to the LNG working group membership to assist in the formulation of tenable operating parameters.

Overview: Interested parties have inquired as to the nature of potential USCG safety/security zones relative to the LNG facility siting proposals in Downeast Maine, and if imposed, the extent of the restrictions and who would have authority to enforce these limitations. This discussion below explains this authority.

The USCG has the responsibility of safeguarding the nation's ports, waterways, port facilities, vessels, persons, and property in the vicinity of the port, from accidental destruction, damage, loss, or injury. In order to protect the navigable waters and adjacent shore areas of the U.S., minimize death, personal injury and property loss, and prevent pollution of the marine environment, the COTP administers multi-mission Marine Safety and Security and Marine Environmental Protection Programs by enforcing federal laws and regulations.

The statutory authority to enforce these laws and regulations is derived from a number of sources, but primarily the Ports and Waterways Safety Act (PWSA) of 1972, 33 USC 1221 *et. seq*. Using this authority, the COTP may, when safety, security, or other national interests dictate, establish certain access areas to control the movement of any vessel, vehicle, or person in, or on, the navigable waterways and adjacent shorelines. A control mechanism commonly used to safeguard navigation, vessels and facilities, and to protect the marine environment includes the setting and enforcement of safety zones.

Regulations applicable to safety zones are codified in 33 Code of Federal Regulations (CFR) Part 165.

A safety zone is a water area, shore area, or combination of water and shore areas to which, for safety and/or environmental protection purposes, access is limited to persons, vehicles, or objects specifically authorized by the COTP or U.S. Coast Guard District Commander. No person may enter a safety zone, remain in a safety zone, or allow any vehicle, vessel, or object to remain in a safety zone, unless authorized by the COTP or the District Commander. Additionally, each person in a safety zone, who has notice of a lawful order or direction, must obey that order or direction, under penalty of law. A safety zone may be described by fixed limits, or it may be a specified zone around a vessel in motion. Safety zones may be established as temporary measures, such as in response to an emergency situation, or they may be established for indefinite periods, such as along the waterfront and shore area of a high-risk waterfront terminal or facility.

Security zones are another control mechanism available to the COTP. Security zones are designated areas of land, water, or combination of land and water, established for such time as necessary to prevent damage or injury to any vessel or waterfront facility; to safeguard ports, harbors, or waters of the United States; or to secure the obligations of the U.S. Security zones are established under the authority of the Ports and Waterways Safety Act, see 33 CFR Part 165, Subpart D; the Magnuson Act, as reflected in 50 USC § 191 and 33 CFR § 6.04-6; or both. Security zones are primarily used for national security interests rather than strictly for safety considerations. To achieve heightened security postures, combinations of safety and security zones are often being employed when the need dictates.

The establishment and enforcement of controlled access areas, such as safety and security zones, are not arbitrary measures. They are established through the federal rulemaking process and must be published in the Federal Register. Rulemaking of a non-emergency nature, as in the case of long term LNG siting proposals, requires the opportunity for public comment. This process provides “constructive legal notice” to the general public and the maritime community as to the rulemaking’s existence and legal enforceability and provides an opportunity to shape the rule in such a way that makes sense for the local area.

Historically, safety and security zones have been control mechanisms employed by COTPs to ensure the safe navigation of vessels transiting U.S. waters carrying bulk products such as liquefied petroleum gas, liquefied natural gas, explosives, and other dangerous articles. Safety/security zones serve important dual purposes. A level of safety is provided to the transiting vessel by minimizing waterway congestion, and a layer of protection is afforded to the surrounding port community through the reduction in casualty risk.

It should be noted that all safety and security zones are site specific and the conditions and parameters of each are solely dependent on the surrounding and/or extenuating conditions. For example, the stand-off distances cited in a safety zone may vary significantly from one waterway to another, depending on local circumstances, cargoes carried, and other needs identified. What does not change, for U.S. safety/security zones, is that only the USCG COTP has authority to determine who may enter a zone, and under what conditions. The COTP may delegate that authority to lawful designated on-scene representatives, who are usually USCG personnel. In Maine and New Hampshire however, under a memorandum of agreement (MOA) with each respective state, the Maine and New Hampshire Marine Patrols may also enforce U.S. Coast Guard safety/security zones.

The USCG's jurisdiction is limited to U.S. navigable waters and its territorial seas (for the purposes of this part of the regulations). Obviously then, COTP Sector Northern New England does not have the authority to establish and/or enforce a safety and/or security zone in Canada's, or any other country's, waters. In the case of the Passamaquoddy Bay proposals, a significant portion of the transit route intended for use by transiting LNG carriers to reach proposed LNG terminals in Maine is contained entirely in Canadian waters. As well, much of the proposed transit route straddles the international boundary. Due to the international maritime boundary and distinct jurisdictional authorities of the U.S. and Canada, bilateral discussions, coordination, and procedures will be necessary relative to the setting and enforcement of complementing safety and security regimens.

3.7.1.1 Safety Zone

Taking the above factors into consideration, coupled with regional concerns, the collective group formulated a recommended safety zone. In arriving at its recommendation, a number of factors, assumptions, and expectations were deliberated. These included:

1. The USCG should establish and enforce a safety zone around LNG carriers while they are underway in U.S. navigable waters within the intended transit route for the safety of transiting and moored deep-draft vessels, excursion boats and ferries, commercial fishing craft, recreational boats, and the surrounding maritime communities.

2. A safety zone around an LNG carrier would result in a moderate reduction in risk in the event a navigation safety accident did occur and resulted in a breach of the LNG containment.

3. The size of the safety zone should not be smaller than the Sandia calculated Zone 1, which for 250,000 cubic meter range LNG carriers is approximately 0.43 miles (750 yards) and for 148,000 cubic meter range carriers about 0.31 miles (547 yards). This is consistent with the Sandia Report's findings and guidance provided in NVIC 5-05.

4. The narrowest portion of the transit route, which is approximately 1000 yards in width, is at the confluence of Head Harbor Passage, Friar Road, and Western Passage, between Dog Island and Deer Island. The second narrowest point between land masses occurs in Head Harbor Passage between Casco Bay Island and Head Harbor and measures approximately 1,200 yards wide; however, this is entirely within Canadian territorial waters.

5. The safety zone should extend sufficiently far ahead of the LNG carrier to reduce the potential for a close-quarters situation between the carrier and small craft, e.g., kayaks, sail boats, other small recreational craft, and commercial/fishing vessels. It should also be sufficiently large to reduce the risk of collision with other vessels, such as ferries, crossing ahead of the carrier. For example, a small craft moving at 2 knots would require approximately 7 ½ minutes to transit from the center of the channel to the outer edge of a 1000 yard diameter safety zone. During this same period an LNG carrier moving at 10 knots (which was the upper speed assumption employed during the simulation trials) would travel approximately 1 ¼ nautical miles, depending on current direction and velocity. At these rates, the small craft would arrive at the outer edge of the safety zone concurrent with the LNG carrier's passing. Therefore, a safety zone extending 2 nautical miles ahead of the carrier would provide a small craft moving at 2 knots adequate time to move out of the channel well in advance of the LNG carrier's passing. Likewise, this distance also provides adequate separation space for vessels that cross the transit path.

6. The distance the safety zone extends astern of the carrier should be sufficient to prevent vessels from crossing too close astern, as well as to ensure that tugs following and/or tethered astern have room to maneuver in the event that the LNG carrier loses steering or propulsion.

7. Examples of **safety** zones currently in place around LNG carriers while they are underway in other U.S. ports are:

   - Boston Harbor, MA: 2 nautical miles (NM) [4,000 yards] ahead, 1 NM (2,000 yards) astern and ¼ NM (500 yards) abeam (on each side).

   - Chesapeake Bay, MD: ¼ NM (500 yard) radii around the LNG carrier.

- Savannah River, GA: 2 NM (4,000 yards) ahead and astern for all vessels greater than 1600 gross tons. Vessels less than 1600 gross tons may be allowed in the safety zone provided they maintain a safe distance (minimum 70 yard approach limit), as determined by the COTP.

- Lake Charles, LA: 2 NM (4,000 yards) ahead, 1 NM (2,000 yards) astern, and the width of the shipping channel on either side.

- Long Island Sound, NY/CT (proposed facility): 2NM (4,000 yards) ahead, 1 NM (2,000 yards) astern, and 0.37 NM (750 yards) on each side of the carriers.

- Piscataqua River (Portsmouth/Newington, NH – Liquefied Petroleum Gas (LPG) cargo carried within COTP Sector Northern New England zone): 1 NM (2000 yards) ahead, ¼ NM (500 yards) astern, and ½ NM (1000 yards) abeam each side of the carrier.

Therefore, taking all factors into consideration the recommended moving Safety Zone for Passamaquoddy Bay would be: 2 NM (4,000 yards) ahead, 1 NM (2,000 yards) astern, and ¼ NM (500 yards) abeam (each side) of the carrier, assuming a maximum LNG carrier transit speed of 10 knots.

3.7.1.2 Security Zone

As with the safety zone, a number of factors were deliberated by the LNG Working Group during the formulation of a recommend security zone. These included:

1. The USCG should establish and enforce a security zone around LNG carriers while they are underway in U.S. navigable waters within the intended transit route. It should be noted that the purpose of the security zone is to protect the LNG carrier from external threats. Public safety and navigation concerns are addressed through the use of a safety zone, as aforementioned above.

2. Based on the assessment of potential risks to the LNG carrier the minimum size of the security zone should be a 500 yard radius around the moving vessel. This distance is based, in part, on existing DoD set-back requirements for U.S. naval vessels.

3.7.1.3. Combined Safety and Security Zone for Vessel Transits

Although the terms safety and security zones are often used interchangeably, safety and security zones are established using different statutory authorities and are intended to accomplish different purposes. Simply stated – safety zones are intended to protect what is outside of the zone from what is inside; whereas, security zones are intended to protect what is inside from what is outside.

In contrast to the purpose of a security zone, the purpose of the safety zone is to protect the public and marine transportation system from the hazards associated with a breach of the LNG carrier's tanks. Therefore, to ensure both the security of the LNG carrier and the general safety of the public, the necessary security zone should have dimensions of the greater of the two – in this case, the safety zone. In other words, the moving zone would be considered to be a combined safety and security zone, and would have the dimensional boundaries of the above recommended safety zone.

The burden of having to adjust traffic patterns/schedules on ferries and other non-LNG related traffic, both commercial and recreational, should be minimized as much as possible. To put the recommended combined safety & security zone into prospective, the time it would take for the total zone of an LNG carrier traveling at an estimated speed of 10 knots to pass any given point would correspond to about 18 minutes.

For efficiency, LNG vessels always maintain a small percentage of cargo in their tanks, termed *heel,* in order to keep the cargo tanks and lines in a refrigerated/liquefied state and ready for the next loading. (*No cargo refrigeration system is employed on LNG vessels*). Consequently, as they are not in an inert or gas-free condition, escort requirements and safety/security zones would continue to apply as determined by the COTP.

3.7.1.4. Safety and Security Zone around Moored LNG Carriers

Assuming the same DoD setback parameters as applied to U.S. Navy Protection Zones, the minimum security zone surrounding an LNG carrier while berthed should be no less than 500 yards. Although the LNG carrier is no longer moving and is moored at a terminal pier/berth, there are still inherent fire risks involved during the transfer of cargo that could substantially impact the surrounding population and infrastructure; therefore, a safety zone needs to be set and enforced to mitigate the overall risk factor. In addition, a security zone is needed to protect against subversive acts.

Examples of fixed **safety/security** zones currently in place around liquefied gas carriers while they are moored pier side in other U.S. ports include:

- Boston Harbor, MA: 400-yard radius while at the dock (increased from a previous 150 feet requirement).
- Chesapeake Bay, MD: 500-yard radius around the berthed vessel.
- Savannah River, GA: 70-yard radius around the vessel while transferring cargo.
- Lake Charles, LA: 50 feet beyond the carrier.
- Long Island Sound, NY/CT (proposed): 1,210 yards around the floating LNG storage and regasification unit (FSRU).
- Piscataqua River, NH: 500-yard radius while the (LPG) carrier is moored at the receiving terminal.

Taking all factors into consideration, the recommended size of the fixed safety/security zone for an LNG carrier berthed at the Downeast LNG terminal would be a 500-yard radius around the moored vessel. Of significance, the distance from the proposed pier-end to the center of the typical commercial vessel track line is approximately 1,200 yards.

This distance figure does not take into account the average beam of a berthed LNG carrier or attending, standby tug.

3.7.2 Assist/Escort Tugs

Preliminary transit runs and docking maneuvers were simulated at Marine Safety International. The simulation tests validated specific tug operating characteristics needed to ensure maximum maneuverability during transits under varying hydrodynamic conditions, adverse weather, and emergency/casualty situations (such as steering/rudder failure and/or loss of propulsion aboard the carrier). Based on these simulations and expertise of the attending pilots, the following escort tug criteria were determined:

- Three to four tractor tugs (depending on carrier size), having azimuthing propulsion units (ASD) rated at a minimum of 5,000 HP, with 60-70 metric ton bollard pull ahead, and 65 metric ton astern, are required to satisfy the entire range of LNG carriers being considered. LNG carriers ranging from 125,000 to 165,000 cubic meter capacity were used in the simulations. For vessels at or below 125,000 cubic capacities, 60 ton bollard pull ASDs were deemed adequate.

- One tug should be made up (tethered) at all times during the transit to berth in the event of a sudden loss of steering or propulsion in order to prevent a collision, allision, or grounding. Tug stationing/arrangements will be as per the attending pilot.

Bulk carriers and break-bulk freighters proceeding to the Bayside Terminal in New Brunswick could potentially pass three moored LNG carriers (two at the proposed Quoddy Bay LNG facility and one at Downeast LNG) at relatively close quarters (less than 1,000 yards separation distance). Historically, vessels currently plying the region and carrying aggregate and other less-valued cargo per ton, by the very nature of their services, may be older and less than optimally maintained. These vessels currently transit the waters without tug assistance and/or escort. A mechanical breakdown, such as sudden loss of steering and/or propulsion, could potentially result in an allision with one of the berthed LNG tankers during cargo offload, resulting in a serious casualty. In order to afford an additional margin of safety, it is therefore deemed prudent to require a standby tug be moored outboard, and at the ready, of all berthed LNG vessels.

- One tug must be on immediate stand-by and moored outboard of the berthed LNG carrier at all times the vessel is at the receiving terminal for emergencies.

- In addition to the determined assist/escort tugs, LNG carriers should also be escorted into and out of “port” by USCG and/or USCG authorized assets, as determined by the COTP.

3.7.3 Marine Firefighting Capability

In addition to the onboard firefighting capabilities of the LNG carriers, which must comply with the requirements established by the International Gas Carrier Code, the

assist tugs are to be equipped with firefighting equipment that meets the International Association of Classification Societies (IACS) "Fi-Fi 1" notation.

The National Fire Protection Association (NFPA) also requires similar criteria for towing vessels in order that they are Class 1 certified. This requirement is outlined in its publication NFPA 1915 – *Standard on Marine Fire-Fighting Vessels*, which addresses the construction of marine fire-fighting vessels and contains criteria on a wide-range of specific standards including outfitting, stability, propulsion, auxiliary machinery, electrical systems, fire pumps and fire-fighting equipment.

It is logical to expect shore-based fire departments to also have appropriate training and equipment to respond to a LNG fire/emergency. Among the local fire departments that would be responsible to respond, none have any LNG capability or significant marine firefighting resources.

3.7.4 Marine Traffic, Anchorages, and Boarding Areas

An LNG carrier transiting to the proposed Downeast LNG terminal site requires an indirect route through Canadian waters, and then follows the international boundary throughout the Passamaquoddy Bay approaches. The transit time would approximate two and one half to three and one-half hours in duration. The existing scheme for ensuring traffic control involves the full cooperation of the U.S. and Canada, with vessels over 20 meters in length and/or over 500 gross tons falling under the operational control of Saint John, New Brunswick Traffic Control (Fundy Traffic). All deep draft vessel movements are reported to and controlled by Fundy Traffic, and are subject to Canadian Shipping Act traffic services, zones, regulations, and requirements. Vessel movements are coordinated though local cooperative agreements among the U.S. and Canadian pilots, Fundy Traffic, and an informal, one-way traffic scheme.

There are distinct differences in how the U.S. perceives and addresses the risks of LNG safety and security as compared to Canada. Under the Canadian Shipping Act and other authorities LNG carriers frequenting Canadian ports are usually subject to routine Port State Control procedures only. For LNG vessels destined for U.S. ports though, standing USCG policy and pertinent federal regulations require specific safety and security functions be performed to responsibly manage and reduce the risk to public safety.

Downeast LNG is anticipating approximately 53 carriers per year, in the 70,000 to 165,000 cubic meter range, to meet their anticipated maximum throughput of 500 million standard cubic feet per day (mmscfd). This number is an average figure, as the actual amount will vary depending on the vessel sizes and cargo carrying capacities of each.

Although this WSR is Downeast LNG specific, for comparison sake, Quoddy Bay LNG anticipates approximately 180 LNG carrier arrivals per year (for its first year of operation) in order to maintain its maximum anticipated throughput of 2 Bcfd and Calais LNG estimates approximately 54 vessel transits. When combined with current numbers of deep draft arrivals, the prospective total for the port area climbs from 125 to about 380, equating to a three-fold, or tripling, of the current deep-draft traffic flow. To put this

anticipated change into perspective, on the average the port area currently experiences arrivals at the rate of one vessel every 3 days. With the addition of LNG carriers (assuming the Downeast and Quoddy Bay proposed facilities receive approval), the average number of arrivals would potentially increase to over one vessel arriving per day. Although the FERC formally dismissed Quoddy Bay LNG's application, Quoddy Bay LNG has indicated that it intends to re-file at a later date; therefore these figures are considered relevant for cumulative considerations. Should the Quoddy Bay LNG facility not materialize and the Downeast LNG and Calais LNG go into operation the average annual vessel arrivals for the port area would equate to about one vessel per day.

Current practice employs informal one-way traffic patterns for deep-draft transits. This would be strictly enforced whenever LNG carriers are moving; i.e., there would be no meeting or passing situations authorized.

At the discretion of the attending pilots and in consultation with vessel masters and Fundy Traffic, all vessel transits will be on a first-come, first-served basis. Inbound vessels should have priority over outbound.

Loaded, inbound LNG carriers transiting Head Harbor Passage and Western Passage must maintain ample separation distance and uphold, at a minimum, the safety and security zone parameters. The intent of this limitation is to preclude the possibility of incurring overtaking situations or causing the need for non-LNG vessels to hold at, or anchor in, Friar Roads.

There are presently no *designated* anchorages; however, three routine anchorages exist for the area: one located in the Bay of Fundy (controlled by Fundy Traffic) outside of the transit corridor and to the north of Head Harbor Passage; one inside the waterway in the vicinity of Friars Bay southeast of Eastport; and one inside Passamaquoddy Bay. LNG vessels will not be allowed to anchor in Friar Roads while waiting for a berth – anchoring or holding under this circumstance must occur offshore. Non-LNG vessels may anchor in, or hold at, Friar Roads while waiting for a vessel proceeding in the opposite direction to transit Head Harbor Passage or Western Passage.

With the exception of temporary boarding areas established by and for USCG authorized resources, the anchoring or holding of LNG vessels within Friar Roads is limited to emergency situations only, such as major mechanical malfunctions and reduced visibility consequent to non-forecasted, abrupt weather changes (fog, squalls, etc.), and/or as directed by, and in consult with, the COTP.

Presently, through locally conceived, informal agreement, U.S. pilots board the majority of deep-draft vessels bound for Eastport in Canadian waters, in the vicinity East Quoddy Head. LNG vessels are designated Certain Dangerous Cargo (CDC) carriers and as such, specific safety inspections and security precautions must be undertaken prior to entering port. These USCG boardings would need to take place in U.S. waters.

3.7.5 Environmental Controls

Loaded or partially loaded LNG carriers (inbound) would only be allowed to transit U.S. waters during daylight hours. Daylight is interpreted as "Civil Twilight" in which the sun may be below the horizon but the "Horizon is clear and larger stars visible". (*Dutton's Navigation and Plotting*). In practical terms, the horizon, shoreline, and receiving berths must be clearly seen with natural light.

Inbound fully or partially laden LNG transits can only begin if there is sufficient time to arrive in the Cherry Islet to Dog Island area near slack tide due to the unpredictability of tide and current patterns in that vicinity. As a general policy and as per the pilots' recommendations and prevailing practice, all transits should be conducted at high slack water or on an early ebbing tide. Transits through the Cherry Islet and Dog Island area should always be avoided on a flood tide and as well, on an ebb tide when currents are in excess of three knots.

Likewise, outbound "empty" LNG transits can only begin if cast-off is within a period of time that permits the carrier to be in the vicinity of the Cherry Islet to Dog Island area during slack tide and there is no vessel departing the port of Bayside and/or deep draft vessels inbound Head Harbor Passage or transiting Western Passage that could possibly result in a meeting or overtaking situation.

Prior to conducting nighttime transits of the area, nighttime conditions should be simulated to best appreciate the suitability of current aids to navigation for nighttime operations.

Depending on the outcome of the simulation tests, outbound, or "empty" (with "heel" allowance) LNG carriers *may* (in the future) be allowed to transit after sunset during periods of fair weather and clear periods of unrestricted visibility (actual and forecasted) upon concurrent agreement between the attending pilot(s) and the COTP. The minimum visibility limits must be commensurate with combined safety and security zone distance parameters.

A minimum of two nautical miles of visibility is required for the movement of LNG vessels in U.S. waters. In marginal weather conditions visibility can vary significantly along the route. The decision as to whether sufficient visibility exists, and is likely to continue for the duration of the transit, is a judgment call to be made jointly by the attending pilot(s) and Fundy Traffic in consultation with, and concurrence by, the COTP.

Wind: 25 knots is the maximum sustained wind speed (ascertained during the simulation tests), as measured on the vessel, in which an inbound or outbound transit shall commence. As with visibility, significant variation in wind conditions can exist along the route, and the decision as to whether wind conditions permit a safe transit will be made by the pilots in consultation with, and concurrence by, the COTP.

3.7.6 Communications, Radar, and Aids to Navigation

As identified during the PAWSA process, the existing communications network (and associated interoperability) is marginal for the port area. As well, regional radar coverage is very limited. Fundy Traffic has radar coverage in the Bay of Fundy, but does not have visual or radar coverage once inside Head Harbor Passage. Upgrades to the current navigation systems and/or acquisition of new technology, such as Physical Oceanographic Real-Time System (PORTS), Differential Global Positioning System (DGPS), and closed circuit television (CCTV), that are cross-border compatible and jointly supported, are needed to ensure safe transits of the carriers and for the safeguard of all water-way users and abutting shore-side communities along the intended route. Without navigation safety system expansion and/or increased coverage, additional operational parameters may need to be considered and implemented accordingly.

The PAWSA and MSI simulation trials also identified several locations within the port area waterway that require the placement of additional navigational aids and/or modification to existing ones in order to better mark obstructions and enhance the pilots' capabilities. These include establishing a lighted buoy to mark Stovers Ledge; adding a light to the Clark Ledge day beacon; intensifying the power of the Dog Island and Deer Island fixed aids; placing a lighted aid at Clam Cove Head; relocating and lighting the HU4 buoy at Popes Island; and establishing a lighted aid on Kendall Head. With the exceptions of the Dog Island aid, Clark Ledge beacon and Kendall Head marker, the manufacture, placement, and servicing of the remaining aids fall under the authority of the Canadian government. It would be helpful if the applicant could establish that the CCG would undertake to make the recommended modifications to its waterway infrastructure in support of LNG and other deep-draft traffic

4.0 Risk Assessment and Management Strategies

Based on a review of the risk factors identified during this assessment and the PAWSA Report, it was concluded that it will be necessary to implement mitigation measures to effectively manage potential risks to navigation safety, security, and environmental impact if FERC does approve the proposed Downeast LNG project and it is subsequently constructed and operated. Mitigation measures generally fall into one of two categories: prevention and consequence management. Whereas prevention seeks to avoid an accident, consequence management seeks to reduce the negative impacts should an accident or incident occur.

As part of the WSA process, a safety and security risk assessment was performed. The analyses were based, in part, on data collected during site and location visits, interviews conducted with area stakeholders, and information gleaned from, and in support of, the FERC Resource Reports. Safety and security measures that are currently in place that help mitigate the associated risks were identified and quantified. Where the identified risk appeared to not have sufficient resource capability to adequately offset or diminish the consequences, a gap was identified and alternate mitigation strategies explored.

The focus of the risk assessment was on the identification of potential measures for mitigating risks associated with either a navigation safety accident or a terrorist attack against the LNG carrier. Downeast LNG performed and documented its safety risk assessment and analyzed security risks utilizing the USCG Risk-Based Decision-Making (RBDM) Guidelines. These assessments used the thermal hazards associated with the respective accidental and intentional zones of concern contained in the Sandia Laboratories Report to describe the expected consequences of large releases of LNG from a carrier onto the water.

In addition to the plotting of Zones of Concern, NVICs 05-05 and 05-08 also require the development of risk assessment scenarios and management strategies to correspond with the calculated zones. Downeast LNG's WSA contained a comprehensive inventory of potentially strategic scenarios and corresponding, well-conceived risk reduction measures. These scenarios took into consideration a number of assumptions on which the overall mitigation strategies were based. Included in the study were parameters and assumptions such as waterway boundaries, carrier size and capacity for the defined hazard zones, potential for vessel groundings, collisions and allisions, hazards consequential to spill/release scenarios, potential vulnerabilities, security risks, existing safeguards, and terrorist-related attacks and activities, among others.

For the purpose of the safety and security assessments, Downeast LNG made the favorable assumption that Canada and the United States would reach joint agreement and bilateral consensus regarding the employment of safety, security, and response capabilities for the protection of the vessel, its crew, and communities and other interests along both sides of the transit route. However, Downeast LNG has not been able to demonstrate that it will be feasible to achieve this level of cooperation. Consequently, in response to Coast Guard initiated data requests disseminated by FERC, alternate safety, security, and mitigation strategies were submitted for further consideration and validation.

Downeast LNG's risk-based assessment methodology suggests that the likelihood of accidental releases and/or threats of intentional interference are relatively low. Its assessment was based on the relative remoteness of the area, virtual width and depth of the transit route, comparative absence of national iconic and/or critical infrastructure, and reduced population densities more common to heavier industrialized and strategically located urban port areas. Nonetheless, potential consequences, albeit proportionately less for the Passamaquoddy Bay port area, do exist. Consequently, COTP Sector Northern New England, in coordination with FERC, will require specific risk reduction measures as outlined throughout this Report.

4.1 Risk Assessment Scenarios

Following the guidelines contained in NVIC 05-05, Downeast LNG applied the Risk Management Quick-Reference Tool in conjunction with the Sandia Report to develop an inventory of safety and security scenarios. After overlaying the calculated Zones of Concern along the proposed transit route, the scenarios were then analyzed to determine the likelihood and severity of risk. Based on the potential impact, resource needs were

then considered to identify and recommend scalable prevention, mitigation, and response strategies necessary to support the proposed operation. A summary of identified concerns, needed resources, and recommended actions was then provided in the WSA. Scenarios were categorized under the headings *Prevention, Mitigation, Potential Prevention, and Potential Mitigation*, with applicability assigned to *Safety* and/or *Security*. A brief discussion of each risk-reduction measure/strategy (existing and/or proposed) was provided, along with corresponding recommendations for each. An abstract of the specific security-related findings is contained in the separate, sensitive Security Supplement of this Report; an overview of the safety-related recommendations is as follows:

- 33 *Prevention* measures were considered, with 21 being related to safety, 30 to security, and 15 applying to both. Examples include the application of or requirement for:

  1. Safety and Security Zones, Notice of Arrivals, Port State Control Programs, pre-arrival safety and security boardings, Broadcast Notice to Mariners, and standards prescribed by international classification societies.

  2. International conventions and protocols such as Standards of Training, Certification and Watchkeeping (STCW), International Safety Management (ISM) Code, Vessel Automatic Identification Systems (AIS), and standards for the design, construction, and operation of LNG carriers under the International Maritime Organization (IMO).

  3. Vessel escorts, vessel traffic management, enhanced Aids to Navigation, mandated pilotage, formalizing one-way traffic, and the development of bilateral safety regimens.

- 15 *Mitigation* measures were considered, with all of them related to combined safety and security. Examples include:

  1. Utilization of escort vessels in numbers and capabilities as determined in the simulation testing.

  2. Application and enforcement of Safety and Security Zones, or their equivalent, in both U.S. and Canadian waters.

  3. Development of emergency response plans; national, regional, and local emergency contingency plans; regional and local incident management plans; and creation of a regional crisis alarm/notification system.

  4. Regional and local emergency preparedness and response training, drills and exercises, and marine firefighting training.

- 11 *Potential Prevention* measures were considered; 6 applied to safety, 11 to security, and 6 applied to both. Examples included:

  1. Establishment of a USCG Regulated Navigation Area (RNA).

  2. Use/establishment of a regional harbormaster and/or port traffic controllers.

  3. Development of a remote maritime surveillance system; increased harbor patrols by Federal, State, and private assets; utilization of aerial surveillance; and

employment of law enforcement personnel (armed with either lethal or non-lethal weaponry depending on jurisdictional authority) aboard LNG carriers.

- Six *Potential Mitigation* measures were considered; five applied to safety, six to security and five to both. Examples included:

1. Development of an interoperable communications system.

2. Periodic incident management training and exercises for local, state, and provincial officials.

3. Development and implementation of an LNG gas cloud ignition system commensurate with applicable procedures and acceptable parameters.

4. Implementation of a rapid civil emergency advisory system (audible alarm, radio, TV, etc., as well as a community awareness protection program in the event of an LNG release (i.e., shelter in place procedures).

- In summary, findings and/or *Recommendations* drawn directly from the risk management and resource needs identification processes employed by Downeast LNG and listed in Part D of their respective WSA include:

1. The safety and security scenario inventory revealed that there are risk-reduction measures currently in place that promote the safe transit of LNG carriers along the proposed route.

2. The development and implementation of many of the proposed mitigation measures would reduce the risks associated with the marine transportation of LNG.

3. Due to the relative remoteness of the projected site and associated waterway, current law enforcement, fire fighting, medical and emergency response capabilities are inadequate to capably respond to a shipboard casualty involving a cargo of LNG.

4. A form of bilateral agreement with Canada is necessary in order to promote and implement:

- A mechanism for the setting and enforcing of safety and security zones (or equivalent) in Canadian waters.

- The development of Safety and Security Communications Plans.

- Formalized vessel traffic management throughout the transit route.

- Community programs for safety/security awareness along both sides of the shared waterway.

- Joint training and exercising programs to enhance safety, security, and response capabilities.

- The establishment of general marine and LNG-specific firefighting and incident management training for shoreside firefighters; and revision of local contingency plans to address joint response strategies.

- The establishment of vessel positive control procedures.

- The implementation or acknowledgement of established Maritime Security (MARSEC) Levels and Department of Homeland Security (DHS) Advisories.
- The recognition of USCG established Regulated Navigation Areas.
- The possible utilization of private security force assets.
- Emergency communications compatible with Canadian emergency response agencies.
- The implementation of natural gas cloud ignition systems and procedures for New Brunswick communities.
- The implementation of rapid civil emergency advisory systems to cover the New Brunswick populace.

4.2 Environmental Protection and Response

An accidental spill or release of LNG consequent to a marine casualty or intentional act could pose potential hazards to the public, waterway, and surrounding environment. The nature and severity of the spill, climatic and sea conditions, and whether or not oil pollutants were also spilled are all factors that must be taken into consideration in order to mount a rapid and effective response.

An environmental response protocol is in place between the U.S. and Canada for spills of oil and other noxious substances. The original Canada-United States Joint Marine Pollution Contingency Plan (JCP) was developed to cover the Great Lakes; subsequent geographic annexes have since been added to cover all waters of U.S/Canadian mutual interest where the use of combined resources would improve the response posture and capability of each nation. The Atlantic Geographic Annex to the JCP applicable to the Passamaquoddy Bay region is known as CANUSLANT. CANUSLANT is tested regularly and improved by way of biennial exercises, under coordination of the U.S. USCG, District 1, and CCG, Atlantic Maritimes Region. CANUSLANT also recognizes the rights of U.S. Tribes and Canadian Aboriginal people, and even applies when only one country is affected, if the incident is of significant magnitude to require assistance from the other country.

The primary objectives of CANUSLANT are to:

- provide a joint cross-border mechanism for a coordinated and integrated response by both nations;
- establish a Canada-United States Joint Response Team (JRT) for the Atlantic region under co-leadership of the CCG and the USCG;
- if needed, establish and set up a Joint Command Post (JCP);

- ensure timely notification of cross-border incidents and the accurate transmission of information between responders, and the general public and media;

- facilitate the safe and timely flow of personnel, equipment, and supplies across the international border; and

- complement the Canada-U.S. Joint Inland Pollution Contingency Plan, and its CANUSEAST operational supplement, if needed.

It should be noted that the JCP provides for a coordinated response to "Harmful Substance Incidents," a broadly defined term that encompasses much of the domestic pollution response authority held by the two Coast Guards. CANUSLANT may be invoked when a harmful substance incident presents an imminent and substantial risk to public health and welfare, and/or poses potential danger to the environment on either side of the maritime international boundary. The definition of "harmful substance" is relatively wide-ranging and subject to both Canadian and U.S. laws and regulations. *Harmful substance* includes, but is not limited to, substances subject to control by a number of both national and international conventions and protocols such as the International Convention for the Prevention of Pollution from Ships (more commonly known as MARPOL 78), Federal Water Pollution Control Act, as amended, and the Oil Pollution Act (OPA) of 1990, just to name a few. Conceptually, CANUSLANT provides for a strong and coordinated response regime to combat a noxious substance and/or petroleum-based spill.

There have only been a few vessel-related accidents or allisions reported in the Passamaquoddy Bay area. The only commercial shipping accident in recent memory was on January 12, 2008, when the empty bulk carrier ALEXANDERGRACHT suffered a temporary loss of propulsion in Head Harbor Passage (Canadian waters). The ship was safely anchored in Head Harbor Passage, where the engine failure was quickly diagnosed and temporarily repaired. The vessel was able to continue to its berth at Estes Head, where final repairs and regulatory verification were conducted. The case did not impact navigation or result in any pollution. Additionally, PAWSA workshop participants were aware of only a couple of commercial fishing vessel groundings in the recent past, and a review of USCG records did not reveal any significant marine casualties involving deep draft vessels. According to the local pilots, over 2,400 deep draft vessels have safely transited the waterway during the past 25-year period without major incident or pollution. As typical for an area lacking a large industrial base and metropolitan setting, the region is currently not currently prepared to accept LNG carriers. The extent and nature of the resources, training, and equipment necessary to address emergency response, safety, and security, have yet to be fully determined.

4.3 Consequence Management

Concerns related to emergency response and marine firefighting have been consistently raised by the general public, representatives of emergency response organizations, and elected officials on both sides of the international border throughout the process of identifying and assessing potential risks associated with the Downeast LNG proposal. As

noted during the PAWSA, there are currently very limited resources immediately available to respond to a large marine fire along the current transit route. The consensus of the LNG Working Goup and AMSC subcommittee was that, if the Downeast LNG proposal is approved by FERC, it is imperative that issues relating to emergency response and marine firefighting be addressed during the development of the emergency response plan required by Section 311 of the Energy Policy Act of 2005. Additionally, bilateral arrangements to ensure appropriate cross-boundary emergency response capabilities under the existing CANUSLANT agreement would be required.

4.4 Resource Identification and Needs

The area along the proposed transit route presents a number of significant response challenges due to the relative remoteness of the area (equating to limited resources), jurisdictional implications surrounding the U.S. and Canadian border, and potentiality for high consequences in the event of an LNG spill/release. Downeast LNG was required to categorize safety, security, and response resources that are available to manage the risks associated with LNG carriers along the shared waterway, and concurrently, identify potential prevention/mitigation measures or short falls posed by the proposed operation in their WSA. The following is an abstract of the major public and private assets as provided, as well as a number of recommended prevention and mitigations measures as proposed. The listings are not all inclusive; they are intended solely as a comparative overview.

4.4.1 U.S. Federal Resources

All USCG Marine Safety related activities (Marine Inspection, Port State Control, International Ship and Port Facility Security (ISPS) and Maritime Transportation Security Act (MTSA) compliance exams and vessel boardings, and Pollution Prevention and Response) are handled by the Marine Safety Detachment located in Belfast, ME (under Commander, Sector Northern New England). The following is a representative listing of federal units/resources located in the vicinity of the Downeast LNG proposed route.

- USCG Station Eastport: equipped with a 41’ Utility Boat (UTB), and 25’ Response Boat Small (RBS).
- USCG Station Jonesport: equipped with a 47’ Utility Motor Life Boat (MLB), 25’ RBS, and 27’ Response Boat Homeland Security (RBHS).
- USCGC Moray (WPB 87331): an 87' Coastal Patrol Boat, also home ported in Jonesport, ME.
- U.S. Customs and Border Protection (CBP) for the Eastport area is equipped with 25' RBS and 22' Sea-Ark watercrafts.

4.4.2 State, County, and Local Resources

Along with federal assets, there are a number of trained emergency management, fire, law enforcement, and environmental response agencies available to provide assistance throughout the region. These resources include:

- Maine State Police
- State Fire Marshall's Office
- Maine Emergency Management Agency
- Washington County Regional Communications Office
- Washington County Sheriffs Office
- Washington County Emergency Management Agency
- Calais Fire and Emergency Management Service Dispatch
- Local city and town fire and rescue departments
- Oil Spill Response Organizations (OSRO) for Down East Region 4

The majority of local, on-site public and private emergency response services within the immediate area are predicated on 'everyday' emergent situations based on a largely rural population and risk model. In the event of a large-scale crisis or catastrophe, the acquisition of enhanced response capabilities, such as bomb squads, hazardous materials response, marine firefighting/salvage operations, and major medical assistance, etc., would require significant coordination through the major Federal, State, and County agencies. Due to the relative geographic remoteness of the area, this could be a time-consuming, problematic, and complex evolution.

4.4.3 Canadian Resources

Canada has also developed national prevention, preparedness, and response mechanisms to manage environmental emergencies. Federal policy exists to effectively manage all types of emergencies, including natural ones, such as hurricanes and tornadoes, and human-caused events, such as fire and hazardous materials spills. It should be emphasized, however, that the physical response to emergencies is almost exclusively carried out by the private sector, with monitoring conducted by the government. Within the federal Canadian government, emergency preparedness and response falls under Public Safety and Emergency Preparedness Canada (PSEPC). The mandate of the PSEPC is to lead the national effort to protect the Canadian citizenry from natural disasters, crime, and terrorism.

In addition to the federal PSEPC, each province has an Emergency Management Office or Emergency Measures Organization (EMO). The EMO works at both provincial and municipal levels, and administers disaster financial assistance programs.

The Canadian emergency response system is premised upon the following:

- Initial response action lies with the responsible party (RP).
- If the incident is beyond the scope and capacity of the RP, then municipal services, as directed by the respective mayor respond.
- If the municipality cannot effectively manage the emergency, provincial services are expected to come to the aid of the local authorities.
- If the response capacity of the province or territory is exceeded, then the federal government intervenes and provides emergency assistance.

In Canada, the federal government normally only intervenes upon request, or when the emergency clearly lies within federal jurisdiction. In the event of intervention, a lead Minister heads the Department whose normal responsibilities closely relate to the circumstances of the incident (e.g., Environmental Canada in the case of an environmental emergency on federal land; or the CCG for spills originating from a vessel).

In Atlantic Canada, the key groups which would respond to an LNG spill/release at sea or during docking evolutions are the CCG, the Habitat Management Division of the Department of Fisheries and Oceans, Environment Canada, the Regional Environmental Emergency Team (REET), and Regional Response Organizations (ROs).[11]

Canadian resources identified in the Downeast LNG WSA depend on risk management measures being implemented in agreement with the federal and provincial governments. Identified resources include:

- Transport Canada – Provides experience and expertise in vessel design, construction, stability, and salvage.
- Canadian Coast Guard – Lead federal agency for all spills originating from a ship in Canadian waters. Responds with spill response equipment to all ship source spills either as the primary responder or as a monitor.
- The Royal Canadian Mounted Police (RCMP), an agency of the Ministry of Public Safety and Emergency Preparedness Directorate, provides policing and constable service for national, federal, provincial, and local municipalities.
- Regional volunteer fire/rescue departments.

Due to the relative remoteness of the communities along the Canadian shoreline, low population densities, and lack of critical infrastructure, emergency response inventories and capabilities are limited for the Passamaquoddy Bay region.

4.5 Emergency Response Plan Process

In accordance with Section 311 of the Federal Energy Policy Act of 2005, Downeast LNG is required to develop an Emergency Response Plan in consultation with the USCG and State and local agencies. This plan must be examined by the USCG and approved by FERC before the developer receives an approval to begin construction of its facilities.

During the typical 3-year construction period, the requirement to annually review and update Downeast LNG's WSA may identify changes to the project and/or port area that require the USCG to review and validate the updated WSA.

At least 30 days before transferring LNG, the actual terminal operator must submit copies of its emergency manual to the USCG COTP for examination and approval.

[11] "A Study of the Anticipated Impacts on Canada from the Development of Liquefied Natural Gas terminals on Passamaquoddy Bay by SENES Consultants Ltd

The Community Assistance & Technical Services (CATS) Managers in each Department of Transportation (DOT) region are the primary contacts for state and local governments concerning the Commission's process for approving Emergency Response Plans.

After an LNG terminal is commissioned, LNG inspectors from the DOT Pipeline and Hazardous Materials Safety Administration (PHMSA) regional Office will examine the emergency response and preparedness plan for compliance with applicable regulations as part of their standard facility inspections.

The Plan must incorporate response sections to include:

1. Organization and Contacts

    - Incident management structure, identification of primary contacts, team responsibilities and functions.

2. Responses to emergency incidents such as fires, release of vapors, hurricanes emergency vessel departures, bomb threats etc.

    - Procedures for communications
    - Procedures for responses, shelter and evacuation
    - Description of detection and shutdown systems
    - Hazard control equipment and local agency response

3. Training and exercises

4. Documentation

5. Cost sharing: The Energy Policy Act and Commission orders require a cost sharing plan identifying the mechanisms for funding all project-specific security costs and safety/emergency management costs that would be imposed on state and local agencies. The cost sharing plan must specify what the LNG terminal operator will provide to cover the cost of state and local resources required to manage the security of the terminal and vessel to include:

    - Direct reimbursement (overtime for police and fire etc.).

    - Capital costs associated with emergency management equipment (patrol boats, fire fighting equipment etc.)

    - Annual costs associated with specialized training for fire departments, mutual aid, etc.

The emergency response plan is developed through a transparent, public process that actively involves the USCG, appropriate agencies, and key officials of state and local governments. How this process applies to Canada and whether Canadian officials will wish to be involved are issues as yet to be determined.

4.6 Risk Mitigation Measures

Based on the comprehensive assessment of the waterway, the COTP Northeast New England recommends that the following Risk Mitigation Measures should be implemented prior to allowing Downeast LNG's Passamaquoddy Bay facility to begin operation.

- The development, by the applicant, of standard operating parameters approved by the U.S. Coast Guard and coordinated with the Government of Canada to enable the safe and secure movement of LNG tankers through Canadian and U.S. waters, taking into account the need for:
    1. Number and performance capabilities of assist tugs and escort vessels as well as determining appropriate staging areas. The minimum specified number of escort/assist tugs must be employed at all times to escort LNG carriers throughout their transit and during berthing and unberthing. It should be noted that additional requirements for escort tugs may be identified during the emergency response planning process.
    2. Safe operating parameters and environmental constraints, to include but not limited to: visibility, wind, sea state, currents, and tides.
    3. Identification and implementation of navigation safety upgrades and enhancements, as identified in the applicant's WSA, to include but not limited to: radar, communications interoperability, data buoys, and critical Aids to Navigation.
    4. These parameters must include the following:
        - Daylight Transits - Loaded or partially loaded LNG carriers may only transit the waterway during daylight hours. "Daylight" is interpreted as "civil twilight" in which the sun may be below the horizon, but the "horizon is clear and larger stars visible (*Dutton's Navigation and Plotting*). In practical terms, the horizon, shoreline and receiving berths must be clearly seen under conditions of natural light.
        - Visibility - A minimum of two miles of visibility is required for the movement of LNG vessels in U.S. waters. Since in marginal weather conditions visibility can vary significantly along the route, the decision as to whether sufficient visibility exists, and is likely to continue to exist for the transit, is a judgment call that will be made jointly between the attending pilot(s) and Fundy Traffic, in consultation with and the concurrence of the COTP. The minimum visibility limits must be commensurate with the combined safety and security parameters.
        - Wind – 25 knots is the maximum sustained wind speed (determined during simulation tests), as measured on the vessel, in which an inbound or outbound transit will be allowed to commence. As with visibility, significant variation in wind conditions can exist along the route, and the decision as to whether

wind conditions permit a safe transit will be made by the attending pilot(s) in consultation with, and concurrence by, the COTP.

- Traffic Control – One-way traffic patterns for deep-draft transits will be required and strictly enforced whenever LNG carriers are moving to avoid meeting or passing situations. At the discretion of the attending pilots and in consultation with vessel masters and Fundy Traffic, all vessel transits will be on a first-come, first-served basis, with inbound vessels having priority over outbound.
- Anchoring - There are presently no *designated* (i.e., anchorages specified in regulation) for the area. However, three locations are routinely used: one located in the Bay of Fundy (controlled by Fundy Traffic) just outside of the transit corridor and to the north of Head Harbor Passage; one in the vicinity of Friars Bay southeast of Eastport; and one inside of Passamaquoddy Bay. LNG vessels will not be allowed to anchor, or hold, in Friar Roads while waiting for a berth – anchoring or holding under this circumstance must occur offshore.
- Loaded, inbound LNG carriers transiting Head Harbor Passage and Western Passage must maintain ample separation distance and uphold, at a minimum, the safety and security zone parameters. The intent of this limitation is to preclude the possibility of incurring overtaking situations and/or the need for holding at, or anchoring in Friar Roads. Non-LNG vessels may anchor in, or hold at Friar Roads while waiting for a vessel proceeding in the opposite direction to transit Head Harbor Passage or Western Passage.
- With the exception of temporary boarding areas established by and for USCG authorized assets, the anchoring or holding of LNG vessels within Friar Roads is limited to confirmed emergency situations only, such as major mechanical malfunctions and reduced visibility situations following non-forecasted, abrupt weather changes (fog, squalls, etc.) and/or as directed by, and in consultation with, the COTP.

- The development by the applicant, of an Emergency Response Plan required by Section 311 of the Energy Policy Act of 2005, 15 U.S.C § 717b-1(e), that is approved by the Federal Energy Regulatory Commission and accepted by the U.S. Coast Guard to enable a comprehensive and coordinated response to an LNG emergency, taking into account the need for:

  1. In-transit and dockside emergency procedures in the event of fire, mechanical malfunction, allision, grounding, and/or need of safe anchorage or refuge.
  2. The potential environmental impact of an LNG release and the identification and acquisition of joint resource needs to respond to the potential release.
  3. A contingency response plan specific to LNG and focusing on a layered response approach.
  4. Coordinated marine firefighting training and emergency response, with an emphasis on containing and extinguishing LNG fires.
  5. An incident management training and collaborative exercise program.

- Collaborate with all appropriate jurisdictions on joint, complementary rulemaking to formalize vessel traffic management practices and the establishment and enforcement of comprehensive safety and security zones for the protection of the LNG carrier, alternate waterway users, and area residents, taking into account the need for:
    1. A one-way vessel traffic scheme during transit operations
    2. Deep-draft vessel tug escorts and assistance services.
    3. Mandatory pilotage throughout the transit route and during docking and undocking evolutions at all ports along the waterway.
    4. Implementation of an Automatic Identification System for all vessels involved in the transport of LNG on this waterway.
    5. Implementation of appropriate vessel speed restrictions.
    6. Implementation of appropriate environmental operating parameters (e.g. currents, tides, visibility, wind velocity, ect.)
- The applicant must develop and successfully conduct full mission bridge simulator training for all pilots providing services to LNG carriers. The training must take into account the full spectrum of vessel design and length, cargo carrying capacity, method of propulsion, steering and rudder configuration, thruster arrangements, and maneuvering characteristics for those carriers being considered for charter. In addition, expanded simulator training incorporating the number and design of tug boats having the minimum performance and operating criteria previously outlined, will be required.

- The applicant must develop a Transit Management Plan or other document, in consultation with the USCG and other cognizant agencies, that clearly outlines the roles, responsibilities, and specific procedures for the LNG carrier, the LNG terminal, and all federal, state/provincial, and local stakeholders with responsibilities related to the proposed project and/or whose jurisdiction may reasonably be expected to be impacted by a potential navigation safety accident or terrorist attack.

- The applicant must prepare and submit an Operations Manual, as required by 33 C.F.R. § 127.305, an Emergency Manual, as required by 33 C.F.R. § 127.307, and a Facility Security Plan as required by 33 C.F.R. § 105.120 to the COTP Sector Northern New England for review and approval at least 6 months but no more than 12 months before the facility would begin operations.

- The applicant must provide written verification of collaboration with and acceptance from the Passamaquoddy Nation, ensuring its jurisdictional interests and public safety and security needs associated with this project are adequately met.

Downeast LNG must determine and comply with all applicable Canadian laws and regulations applicable to the safe and secure navigation and the regulation of maritime traffic that comply with customary international law. Such laws and regulations shall not discriminate among foreign ships or in their application have the practical effect of

denying, hampering, or impairing the right of non-suspendable innocent passage through an international strait. Moreover, consistent with international law, the Coast Guard will not require compliance with such laws and regulations that apply to the design, construction, manning, or equipment of foreign ships unless they are giving effect to generally accepted international rules or standards

5.0 Sensitive Security Supplement

This section contains Sensitive Security Information controlled under 49 CFR Part 1520 and has been redacted. This information may not be disclosed to persons without a "need to know", as defined in 49 CFR 1520.11, except with written permission of the Secretary of Homeland Security.

6.0 Conclusions and Recommendations

Based on the results of the assessment of potential risks to navigation safety and maritime security associated with the Downeast LNG proposal, the USCG has determined that the waterway along the intended transit route, which takes in waters of the Gulf of Maine, Bay of Fundy, Grand Manan Channel, Head Harbor Passage, Friar Roads, Western Passage, and Passamaquoddy Bay, is suitable for the type and frequency of marine traffic associated with this proposed project, provided that the Risk Mitigation Measures outlined in Section 4.6 of this report are fully implemented. The hydrographic characteristics of the waterway are suitable to sustain deep draft vessel movement and the simulation tests and traffic studies conducted confirm that the transit and maneuvers are feasible for the design range of LNG carriers anticipated.

If the conditions of the waterway change and or the applicant is unable to implement the recommended mitigation measures, the COTP, Sector Northern New England, may reconsider this determination.

Whether or not the Downeast LNG proposal is approved by FERC, the USCG will continue to systematically analyze the waters of Passamaquoddy Bay and its approaches to effectively manage the potential risks to navigation safety and maritime security associated with the project.

If FERC approves the project and the facility begins operations, additional resources would be needed to mitigate safety and security risks identified during the suitability assessment. The required security resources, in particular law enforcement personnel and associated security craft, and associated operational procedures are based on existing USCG policies. These policies take into account a changing threat environment and the potential for unknown threats. The most probable security regime should consist of a mix of U.S. and Canadian federal, state/provincial, and local law enforcement, which may require cost-sharing arrangements, as outlined in the Energy Policy Act of 2005. As mentioned previously, a major portion of the vessels' route is initially through Canadian waters. Downeast LNG must be able to adequately demonstrate that an effective security regime has been established during the Canadian portion of the vessels' planned route prior to a loaded LNG vessel being allowed to transit to the facility.

Appendices

A. List of Acronyms
B. Ports and Waterways Safety Assessment for the Passamaquoddy Bay Port Area

Appendix A: List of Acronyms

ABS	American Bureau of Shipping
AIS	Automated Information System
AMSC	Area Maritime Security Committee
APA	Atlantic Pilotage Association
ASD	Azimuthing Propulsion Unit
ATON	Aid to Navigation
BCFD	Billion Standard Cubic Feet per day
BLEVE	Boiling Liquid Expanding Vapor Explosion
CANUSLANT	Canada, United States, Atlantic
CATS	Community Assistance & Technical Services
CCG	Canadian Coast Guard
CCTV	Closed Circuit Television
CDC	Certain Dangerous Cargo
CFR	Code of Federal Regulations
COLREGS	International Regulations for Preventing Collisions at Sea
COTP	Captain of the Port
CVTS	Cooperative Vessel Traffic Services
DGPS	Differential Global Positioning System
DOT	Department of Transportation
DNV	Det Norske Veritas
EIS	Environmental Impact Statement
ERP	Emergency Response Plan
EMO	Emergency Measures Organization
FERC	Federal Energy Regulatory Commission
FSRU	Floating LNG Storage and Regasification Unit
IACS	International Association of Classification Societies
ICR	Issues, Concerns and Risks
IMO	International Maritime Organization
ISM	International Safety Management
LE	Law Enforcement
LNG	Liquefied Natural Gas
LOI	Letter of Intent
LOR	Letter of Recommendation
LPG	Liquefied Petroleum Gas
MARPOL	Convention to Prevention Pollution from Ships
MARRSEC	Maritime Security
M & NP	Maritimes and Northeast Pipeline, L.L.C.
MEMA	Maine Emergency Management Agency
MNI	Moffatt & Nichols International
MMBCF	Million Standard Cubic Feet per day
MSI	Marine Safety International
MTSA	Maritime Transportation Security Act

NEPA	National Environmental Policy Act
NOAA	National Oceanographic and Atmospheric Administration
NVIC	Navigation Vessel Inspection Circular
OPA	Oil Pollution Act of 1990
PAWSA	Ports and Waterway Safety Assessment
PHMSA	Pipeline and Hazardous Materials Safety Administration
PORTS	Physical Oceanographic Real-Time System
PSEPC	Public Safety a Preparedness and Emergency Canada
PWSA	Ports and Waterway Safety Act
QRA	Quantitative Risk Assessment
RBDM	Risk-Based Decision-Making
REET	Regional Environmental Emergency Team
RCMP	Royal Canadian Mounted Police
SAR	Search and Rescue
SIGTO	Society of International Gas Tanker and Terminal Operators
SSI	Security Sensitive Information
VHF-FM	Very High Frequency-Medium Frequency
VTS	Vessel traffic Service
UNCLOS	United Nations Convention on the Law of the Sea
USC	United States Code
USCG	United States Coast Guard
WAMS	Waterways Analysis and Management System
WSA	Waterway Suitability Assessment
WSR	Waterway Suitability Report

Appendix B: Ports and Waterways Safety Assessment Workshop Report, Passamaquoddy Bay, ME

Ports and Waterways Safety Assessment
Workshop Report
Passamaquoddy Bay, ME

Introduction

Risk identification and mitigation are and have been ongoing activities within the Passamaquoddy Bay area. As a step toward standardizing methodology, a formal Ports and Waterways Safety Assessment (PAWSA) for Passamaquoddy Bay was conducted in Bangor, ME, on 3-4 October 2006. A group of experts examined the waterway using the risk model pictured here.

Vessel Conditions	Traffic Conditions	Navigational Conditions	Waterway Conditions	Immediate Consequences	Subsequent Consequences
Deep Draft Vessel Quality	Volume of Commercial Traffic	Winds	Visibility Impediments	Personnel Injuries	Health and Safety
Shallow Draft Vessel Quality	Volume of Small Craft Traffic	Water Movement	Dimensions	Petroleum Discharge	Environmental
Commerical Fishing Vessel Quality	Traffic Mix	Visibility Restrictions	Bottom Type	Hazardous Materials Release	Aquatic Resources
Small Craft Quality	Congestion	Obstructions	Configuration	Mobility	Economic

The results of that workshop are provided in this report and include the following information:

- Geographical Area
- Numerical results for the factors listed above as derived from the following activities:
  - Team Expertise
  - Risk Factor Rating Scales
  - Absolute Risk Levels
  - Present Risk Levels
  - Intervention Effectiveness
- Brief description of the process used for the assessment
- List of participants

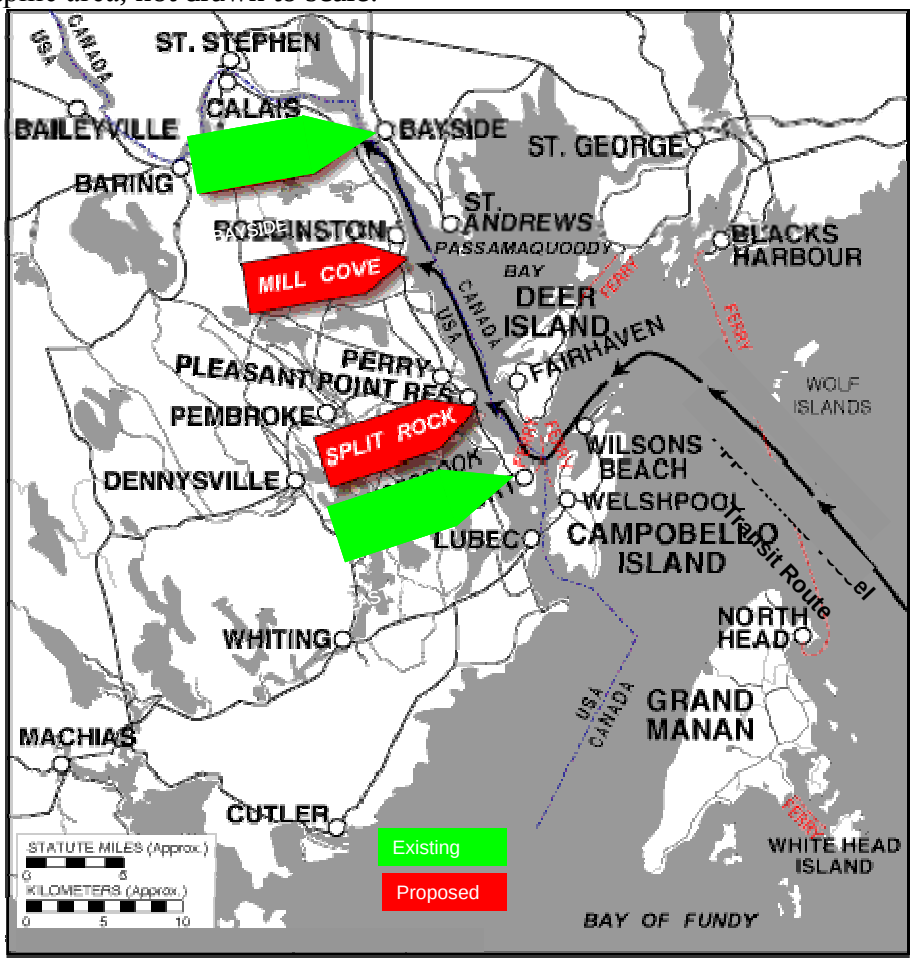
- Planned Actions: Summary of risk(s) and mitigation(s) dialogue
- Survey results presented in tabular format

Geographic Area

The participants defined the geographic bounds of the waterway area to be discussed as:

> The contiguous waters of Passamaquoddy Bay and its tributaries, from the International Bridge at Calais, ME seaward to the eastern shore of Campobello Island and West Quoddy Head.

What follows is a diagram of the geographic area (courtesy of Old Sow Publishing) of the geographic area, not drawn to scale:



Numerical Results

Book 1 – Team Expertise

In *Book 1*, the participants were asked to assess their level of expertise, in comparison to the other workshop participants, for each of the six categories in the Waterway Risk Model. Overall, 41% of the participant teams placed themselves in the upper third, 34% in the middle third, and 25% in the lower third of all teams. This distribution is fairly typical because the participants were chosen for their acknowledged expertise.

Book 2 – Risk Factor Rating Scales

The purpose of *Book 2* is to produce the risk scale numbers that are used in *Book 3*. Participants calibrated intermediate points on the risk assessment scale for each risk factor.

On average, participants from this waterway calculated the intermediate risk points as 2.9 and 5.4, which are close to the national values (2.9 and 5.5) established by the prior PAWSA workshop participants from around the country.

A tabular display of the results of *Book 2* is found at the end of this report.

Book 3 – Absolute Risk Levels with no mitigations

The participants evaluated the absolute risk level in the waterway by selecting a qualitative descriptor for each risk factor that best described conditions in the Passamaquoddy Bay area. Those qualitative descriptors were converted to numerical values using the scales from the *Book 2* results.

On those scales,

1.0 represents low risk (best case) and
9.0 represents high risk (worst case), with
5.0 being the mid-risk value.

In the Passamaquoddy Bay area, 9 of the 24 risk factors were scored at or above the mid-risk value. They were (in descending order):

Risk Category	Score	Risk Category	Score
Visibility Restrictions	7.9	Configuration	7.7
Environmental	7.5	Aquatic Resources	7.5
Small Craft Quality	6.9	Commercial Fishing Vessel Quality	6.4
Water Movement	6.4	Economic	5.9
Hazardous Materials Release	5.3		

Specific hazardous locations identified

Only one location along the transit route was identified as being "hazardous." It was at the approximate confluence of Head Harbor Passage, Friars Road, and Western Passage, which is off the southern tip of Deer Island and opposite Dog Island, where the turn north exceeds 45 degrees.

Book 4 – Present Risk Levels after applying existing mitigations

The participants examined all risk factors along the waterway, including those presumptive risks associated with proposed LNG traffic and cross-checked these risks against mitigation measures and practices currently in place. Group consensus, which is defined as 2/3 majority, indicated that

only one risk factor was fully offset by existing mitigation measures, while 21 other risk factors were NOT adequately balanced. Consensus could not be reached on two of the factors regarding the adequacy of existing measures to nullify the identified risks.

Book 5 – Intervention Effectiveness

The participants selected those specific actions, or interventions, that would be most effective in reducing the identified risks. The Risk Improvement is the perceived reduction in risk when taking the actions specified by the participants. A green "Balanced" indicates that no intervention is needed and risk is balanced in the waterway.

For five of the 21 risk factors identified as needing additional risk reduction action, the intervention categories listed below were judged as being most effective.

Risk Category Selected	Intervention Category	Specific Actions
Vessel Conditions	Active Traffic Mgmt	• Develop joint USCG / CCG requirements to control vessel movements • Make radar, AIS, and VTS compliance mandatory • Improve VHS radio coverage • Update previous WAMS to reflect critical port status (pending LNG approval) • Conduct Port State inspections (U.S. and Canada respectively) • Enhance communications (radio repeaters) • Develop designated traffic lanes • Expand radar coverage
Traffic Conditions	Active Traffic Mgmt	• Specify traffic lanes; develop non-meeting traffic procedures • Formalize designated one-way traffic schemes • Provide designated holding zones • Provide VTS with enhanced radar coverage • Enhance radar and communications capabilities • Improve / upgrade ATON; provide NDBC buoy
Waterway Conditions	Active Traffic Mgmt	• Formalize one-way traffic zones; establish designated no passing zones • Update current WAMS • Establish lighted navigation aids at Stovers and Clarks Ledges; intensify the power of the Dog Island and Deer Island lighted buoys; establish a lighted aid on Kendall Head; install a lighted aid on Clam Cover Head, relocate and light the current HU4 buoy • Provide z-drive tugs having sufficient bollard pull, HP, and fire fighting capabilities • Provide updated hydrographic survey

Intervention Category Definitions

- *Coordination / Planning* – Improve long-range and/or contingency planning and better coordinate activities / improve dialogue between waterway stakeholders
- *Voluntary Training* – Establish / use voluntary programs to educate mariners / boaters in topics related to waterway safety (Rules of the Road, ship/boat handling, etc.)
- *Rules & Procedures* – Establish / refine rules, regulations, policies, or procedures (nav rules, pilot rules, standard operating procedures, licensing, require training and education, etc.)
- *Enforcement* – More actively enforce existing rules / policies (navigation rules, vessel inspection regulations, standards of care, etc.)
- *Nav / Hydro Info* – Improve navigation and hydrographic information (NTM, charts, coast pilots, AIS, tides and currents tables, etc.)
- *Radio Communication* – Improve the ability to communicate bridge-to-bridge or ship-to-shore (radio reception coverage, signal strength, reduce interference & congestion, monitoring, etc.)
- *Active Traffic Management* – Establish / improve a Vessel Traffic Service: information / navigation / traffic organization
- *Waterway Changes* – Widen / deepen / straighten the channel and/or improve the aids to navigation (buoys, ranges, lights, DGPS, etc.)
- *Other Actions* – Risk mitigation measures needed that do NOT fall under any of the above strategy categories

Intervention categories providing the highest mitigation factor for subsequent consequent risk categories focused on coordination, planning, and training.

Risk Category Selected	Intervention Category	Specific Actions
Immediate Consequences	Coordination / Planning	Coordinate with Provincial, State, and local response agencies to formulate joint emergency response plan; identify / assess response assets and capabilities
Subsequent Consequences	Coordination / Planning (for three risk factors)	Coordinate with Canadian, State, and local governments on response plan development and associated training and exercising criteria

Two "consensus alerts" occurred. Consensus alerts can be triggered by a less than strong / majority agreement on risk factor interventions, and/or no real consensus being reached at all. The two alerts, by Risk Factor and associated Intervention, were:

- Volume of Small Craft Traffic (Traffic Conditions) – mitigated by implementing and enforcing rules & procedures.

- Bottom Type (Waterway Conditions) – mitigated by navigation / hydrographic information.

Assessment Process

The PAWSA process is a structured approach for obtaining expert judgments on the level of waterway risk. The process also addresses the effectiveness of possible intervention actions for reducing risk in the waterway. A select group of waterway users / stakeholders evaluate risk factors and the effectiveness of various intervention actions. Thus the process is a joint effort involving waterway users, both professional and recreational, and the agencies / entities responsible for implementing selected risk mitigation measures.

The PAWSA methodology employs a generic model of waterway risk that was conceptually developed by a National Dialog Group on National Needs for Vessel Traffic Services and then translated into computer algorithms by Potomac Management Group, Inc. In that model, risk is defined as the product of the probability of a casualty and its consequences. Consequently, the model includes variables associated with both the causes and the effects of waterway casualties.

The first step in the process is for the participants to assess their expertise with respect to the six risk categories in the model. Those self assessments are used to weight inputs during all subsequent steps. The second step is for the participants to provide input for the rating scales used to assess risk. The third step is to discuss and then numerically evaluate the absolute risk levels in the waterway using pre-defined qualitative risk descriptors. In the fourth step, the participants discuss and then evaluate the effectiveness of existing mitigation strategies in reducing risk. Next, the participants are asked to offer new ideas for further reducing risk, for those factors where risk is not well balanced with existing mitigations. Finally, the effectiveness of various intervention actions in reducing unmitigated risk is evaluated.

The process produces the group's consensus of risks in this waterway and is an excellent tool for focusing risk mitigation efforts. However, risk factors evaluated as being adequately balanced may still be worthy of additional risk mitigation actions. Any reasonable steps for minimizing or preventing the impacts of marine accidents should be encouraged for the benefit of the waterway community.

Participants

The following is the list of waterway users and stakeholders who participated in the process:

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Participation in the PAWSA was through invitation and was designed to include a broad cross-section of waterway users, port stakeholders, and maritime professionals, with the greatest emphasis placed on deep-draft vessel interests. As indicative of the above list, a large segment of the regional marine industry, emergency response and law enforcement community, environmentalists, state, provincial, and local governments, and the fishing and aquaculture industry were well represented by participants from both sides of the border. A number of academia were on hand as well, and contributed to the workgroup discussions. In addition,

representatives of state agencies and elected officials, Canadian governmental officials, members of the LNG industry, and concerned citizens' groups were on hand to observe the assessment process. Other central interests invited, but unfortunately unable to attend, included representation for the Pleasant Point Passamaquoddy Tribe, Canadian commercial fishing industry, and the regional estuaries.

Planned Actions

The catalog of risks and possible mitigation strategies derived from the Passamaquoddy Bay port area PAWSA workshop is set forth on the following pages. This provides an excellent foundation from which the local maritime communities in both, the U.S. and Canada, respective harbor safety organizations, and representative government, state, and provincial authorities can further examine and take appropriate risk mitigation actions for both near-term action and for future risk mitigation planning.

The section has been annotated to include those initial actions that appear appropriate in response to the participants' expressed concerns. Identification of initial actions will help focus subsequent discussions with the local maritime community, waterway users, and stakeholders regarding each risk, permitting the testing of each proposed action for validity and appropriateness prior to implementation. The listing of initial possible actions should be viewed as a starting point for continuing dialogue within the local maritime communities, leading to clear identification of risks and well conceived mitigation measures.

Each new idea is listed along with how many times it was suggested by the participant teams in *Book 5*.

Vessel Conditions: Deep Draft Vessel Quality

Today:

- The majority of the vessels using the waterway are bulk, refrigerated, and general cargo carriers. Problems experienced ten years ago with the bulker fleet have diminished significantly.
- Overall risk is considered relatively minimal.
- Communication and navigation concerns exist due to the lack of full radio and radar coverage by Fundy Traffic.
- Although the bulkers calling on the FEDMAR and Bayside terminals are relatively older than other classes of vessels, there have been no reported casualties in the port area. Deep drafts approximate 130 in number annually, with 60% to Bayside; 40% to Eastport.
- Engineering is usually good; however, shipboard crane maintenance is a concern.
- The U.S. completed a WAMS study in 2005; an ATON study by Canada has not yet been conducted.

Trends:

- Deep draft vessel quality is improving
- LNG cargo and deep draft ships may be coming into the area. Will require additional fire fighting.
- Number of service vessels needed to support LNG traffic will increase.
- Hazardous materials introduced into area will increase. Currently, one ship per year transits area with hazmat.

Existing Mitigations:

- International and domestic safety and construction standards have been improved.
- Crew training standards must be met as per STCW.
- Deep draft vessels must be in full compliance with MARPOL requirements. Both, the U.S. and Canada administer Port State Control procedures and inspections to ensure compliance with STCW, SOLAS, and ISM.
- Risk-based decision making methodologies now exist and emergent systems and procedures are being implemented.
- Deep draft vessels fall under the operational control of Fundy Traffic.
- U.S. has compulsory pilotage requirement. Canadian pilotage is not compulsory; however, 90% take on pilots. A recent Canadian study recommends mandatory pilotage.
- Ferry operators are very competent and well accustomed to the mix of high currents and tides.
- The majority of deep draft operators are fluent in English.
- The pilots have their own stand-alone navigation system.
- Vessels feature safety, machinery, and navigation redundancy to reduce operating risks, downtime, and insurance costs.
- U.S. and Canada has a vessel clearance system that includes an advanced notice of arrival.

Trends (if LNG ships begin to call):

- Additional security issues will be addressed.
- Enhanced / improved communications, radar, and AIS.
- LNG carriers are quality constructed with double hulls.
- Tug / escort vessels with increased HP, bollard pull, and increased fire fighting capabilities.
- USCG safety / security zones will be implemented.
- Proficiency and training standards are higher on LNG vessels than ships carrying low-value cargo.
- Simulator training obtained by pilots.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Provide regulations that rule vessel movement (includes VTS, designated traffic lanes, and radar requirements) or formalize existing practices and policies under joint U.S. and Canada effort.	10	Active Traffic Mgmt
• Compulsory radar, AIS, and VTS.	7	Active Traffic Mgmt
• Enhance VHF radio coverage.	6	Radio Communications
• Have design in place to make vessels and the environment safe as soon as possible after a casualty.	5	Rules & Procedures
• Conduct / update WAMS (pending LNG).	5	Waterway Changes
• Expand safety inspection program and oversight of commercial fishing fleet.	4	Enforcement
• Provide appropriate (number, size) assist / support tugs, escorts, and service vessels.	4	Other Actions
• Promote vessel vetting.	4	Coordination / Planning
• W.R.T. international agreements, consider the arrangements with Canada in Puget Sound and along the Detroit River as a possible best practice. Include pilots in the process.	3	Coordination / Planning
• Compulsory pilotage for Canada.	2	Rules & Procedures
• Required mandatory training for pilots on navigation (simulator).	2	Rules & Procedures
• Possibly restrict all “hazardous” cargo.	1	Rules & Procedures
• Restrict vessel size and tonnage.	1	Other Actions
• Provide education and training for pilots on a voluntary basis.	1	Voluntary Training
• Use technology in ship control, spill detection, and for first responders.	1	Other Actions
• Increased liability (for spills).	1	Enforcement
• Provide terminal specific equipment (for first responders).	1	Other Actions
• Build vessel to meet the unique environmental conditions.	1	Other Actions
• Provide safety management system for shore side facilities.	1	Other Actions
• Provide infrastructure improvements for first responders.	1	Other Actions

Vessel Conditions: Shallow Draft Vessel Quality	
Today: • Tug boat captains are licensed, most crews carry MMDs; however, these vessels are uninspected (and thus operate under less authority and oversight). • Subchapter T and K vessels have licensed captains but crews are undocumented and may be seasonally employed with high turnover rate. • On the whole, commercial tug fleet crews are knowledgeable and experienced. **Trends:** • Stricter safety requirements for tugs / tow vessels forthcoming. • STCW and Responsible Carrier Program have improved the tug / barge fleet and crew competency. • Regional tourism is slowly increasing and the number of tour / whale watching boats is rising. • Increased construction shore side • Need greater public relations to deal with additional LNG ships.	**Existing Mitigations:** • Tug and tow crews are STCW qualified. • Additional / enhanced aids to navigation being employed. • Bridge Resource Management training. **Trends (if LNG ships begin to call):** • More responder vessels. Additional, highly sophisticated emergency response vessels are needed. • Consistent coordination and communication needed between LNG ships and ferries / passenger vessels due to the three-fold increase in traffic and moving safety / security zones.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Require vessel inspections (U.S. and Canada).	9	Enforcement
• Enhance communication capabilities (AIS, radio repeaters).	7	Radio Communications
• Provide / formalize designated traffic lane scheme.	4	Active Traffic Mgmt
• Compulsory VTS and AIS	3	Other Actions
• Mandate additional crew size.	3	Rules & Procedures
• Provide better instrumentation for ship control and communication.	2	Other Actions
• Examine multipurpose use of support craft.	2	Coordination / Planning
• Increase education and training.	2	Voluntary Training
• Require mandatory training.	1	Rules & Procedures
• Provide federal safety and/or security zone enforcement.	1	Active Traffic Mgmt
• Develop contingency plans.	1	Rules & Procedures
• Develop updated WAMS.	1	Nav / Hydro Info
• Provide infrastructure improvements to first responders and for community communication.	1	Other Actions
• Provide public service safety announcements in the event of a spill (similar to those provided to communities surrounding nuclear power plants).	1	Other Actions
• Crossing vessels to set and follow schedules.	1	Other Actions
• Mandatory training to pilots for ship control and navigation.	1	Enforcement

Vessel Conditions: Commercial Fishing Vessel Quality

Today:

- Overall professionalism of operators is relatively low to moderate.
- Fishing vessel maintenance is sensitive to economic conditions; overall material condition is marginal.
- There have been recent deaths on fishing boats.
- Boats used for inland fisheries are marginally maintained.
- Area knowledge is high; few fishing vessels are from outside of the area.
- Lack of required certification, navigation equipment, and cold water immersion gear.
- Trouble with communications to other commercial vessels; some operators don't respond to VHF calls or are unintelligible.

Trends:

- Adapting vessels to other fisheries has sometimes led to stability and structural issues.
- More violations of Rules of the Road.
- Casualty investigations reveal about two vessel groundings per year; fatigue and auto-pilot are significant factors.
- USCG and Canada are considering licensing requirements.

Existing Mitigations:

- F/V traffic is minimal. Most boats only go out during good weather; usually just day trips.
- Canadian fishing boats are well maintained.
- The increased market value of product is parlaying into boat improvement.
- Voluntary USCG fishing vessel inspection program inspections gradually improving maintenance and quality of boats.

Trends (if LNG ships begin to call):

- Need greater education / training to deal with additional LNG traffic.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Consider citizenship requirements; require licensing.	1	Not Defined
• More enforcement of existing regulations; conduct more at sea boardings.	1	Not Defined
• Require mandatory standardized equipment and associated training.	1	Not Defined
• Increase enforcement staff; provide more ME State and provincial LE presence.	1	Not Defined
• Provide for a grant for vessel modification. Consider an excise tax break.	1	Not Defined
• Require stability criteria.	1	Not Defined
• Develop better safety procedures within the recreational boating community.	1	Not Defined
• Provide tariffs on imports.	1	Not Defined

Vessel Conditions: Small Craft Quality

Today:

- Number of small craft increasing; recorded the highest number this year. Risk is still considered minimal.
- Increased from 3 marine event permits to 12; ranged from kayak races to regattas.
- The number of USCG boardings escalated from 50 to 170 in three years.

Trends:

- Number of kayaks increasing (maybe involving operation with inebriation).

Existing Mitigations:

- Very few jet skis.
- Guides take out first time kayakers.
- Coast Guard conducts boating education classes.
- Locals know the area and what to expect and how to dress for the weather in their small craft.
- Newer boats being purchased are usually safer and better equipped.
- Relatively small community – pilots share commercial vessel information with the public.
- USCG Station centrally located.

Trends (if LNG ships begin to call):

- No trends in this area were discussed.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Conduct boardings / inspections (Canada and U.S.).	9	Enforcement
• Provide information at the boat ramps… signage. Include public service announcements.	6	Rules & Procedures
• Provide appropriate training.	5	Voluntary Training
• Provide for more voluntary dockside inspections.	4	Rules & Procedures
• Provide weather information at the boat ramps. Include public service announcements.	2	Other Actions
• Require mandatory safety / navigation training.	2	Rules & Procedures
• Mandate licensing.	2	Voluntary Training
• Enforce Rules of the Road with monetary fines.	1	Enforcement
• Better communications with international agencies.	1	Radio Communications
• Provide Canadian assets for possible SAR response to the small craft.		
• Need appropriate education / training to deal with additional LNG traffic.	1	Other Actions
• Provide small craft with auxiliary channel.	1	Waterway Changes
• LNG Safety Zone Escort.	1	Waterway Changes
• Conduct a WAMS.	1	Waterway Changes

Traffic Conditions: Volume of Commercial Traffic

Today:

- Volume is relatively light – approx 130 arrivals per year.
- Volume has decreased in the last 30 years.
- Sometimes have 4-5 ships queuing up.
- U.S. and Canada both require a 96-hour pre-arrival notification.
- U.S. Navy vessels make port calls at least once annually.

Trends:

- If LNG is approved, vessel traffic will increase from 1 ship every 3.5 days to 1.3 ships every day.
- Possibly increased tourism.
- Two new dock areas will be added; to be built well into the waterway. Pier lengths and security zones may restrict the movement of small vessels.

Existing Mitigations:

- Light volume of ships spreads out the traffic.
- Fundy Traffic controls vessel movements and coordinates same with U.S. and Canadian pilots.
- Well defined transit pattern along the waterway.
- Seasonality of the ferry transits.
- Fishery stocks are down, so there is less fishing vessel traffic.
- Deep draft ships transit only on the slack tide.
- Pilots check in with Fundy Traffic at established way points along the transit routes.
- One-way traffic for deep draft vessels.

Trends (if LNG ships begin to call):

- The effect on traffic volume will depend on how transits are handled in relation to imposed operating parameters (security and safety zones size, limitation and duration, day / night transits, wind and visibility restrictions, etc.). Ships may queue up, waiting to come in. This will increase during the winter and heavy periods of fog.
- Additional tug boats will escort the LNG vessel – requirements to be determined.
- More education and training will be provided.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Specify traffic lanes. Develop non meeting traffic situations. Require / formalize designated one-way traffic zones. Provide designated holding zones.	12	Active Traffic Mgmt
• Provide VTS coverage with enhanced radar coverage for entire transit route.	8	Active Traffic Mgmt
• Boost radar coverage and communications capabilities.	7	Radio Communications
• Improve / upgrade ATON. Provide NDBC buoy.	7	Nav / Hydro Info
• Facilitate better scheduling.	5	Active Traffic Mgmt
• More utilization of tugs. Require compulsory Canadian pilotage.	3	Rules & Procedures
• Provide enhanced training for the pilots.	1	Rules & Procedures
• More U.S. / Canadian law enforcement presence.	1	Enforcement

Traffic Conditions: Volume of Small Craft Traffic

Today:

- Three-month seasonal activity, primary volume occurs only in the summertime.
- Volume increases significantly during marine events and major holidays.

Trends:

- Rapidly growing numbers, especially trailered boats.
- Kayak use exploding.

Existing Mitigations:

- Major small boating activity is seasonally related. Foul weather curbs the bulk of small craft activity.
- Safe boating courses and related education is regionally available.
- Fair to good on-the-water enforcement presence.
- Recent, higher fuel prices deterred some boaters.
- Oversight of major marine events (4th of July).

Trends (if LNG ships begin to call):

- No trends in this area were discussed.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Establish / enforce small vessel traffic lanes, safety and security zones. Publish for local dissemination.	5	Rules & Procedures
• Enhance radar and communications capabilities. Monitor N to M information. Require radio reporting / check-in.	5	Radio Communications
• Enhance VTS; provide traffic lanes.	4	Active Traffic Mgmt
• Provide training, workshops, and navigation safety education. Provide public service announcement (awareness campaigns).	3	Voluntary Training
• Mandatory education / training.	3	Rules & Procedures
• Require licensing.	2	Rules & Procedures
• Enhanced State, Canadian, and USCG presence.	2	Enforcement
• Provide weather, current buoy (NDBC).	1	Nav / Hydro Info
• Mandatory AIS.	1	Active Traffic Mgmt

Traffic Conditions: Traffic Mix	
Today: • Waterway is multiple use. • Canadian and U.S. traffic mixes and mingles. • Aquaculture farms exist. **Trends:** • Aquaculture business is currently flat but is cyclical and speculated to return to the bay; including farming for sea urchins and mussels. • Additional escort vessels and service vessels will arrive.	**Existing Mitigations:** • Well-marked channels show boaters where ships must transit. • Foul weather deters recreational boaters. • Permitted marine events published in BNM. • Extensive local knowledge by pilots, ferry operators, and the majority of commercial fishermen and neighboring recreational boaters. • Small craft activity tends to be closer to shore on both sides of the Boundary. **Trends (if LNG ships begin to call):** • Highly trained / quality vessels as the new escort vessels are added. • Safety zones will alleviate potential close quarter crossings. • Compulsory pilotage may be required in Canadian waters. • Dual pilots (1-U.S., 1-Canadian) being considered for all LNG carriers. • Number in pilot pool will increase. • LNG may transit Grand Manan Channel to avoid Right Whale activity.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Establish traffic patterns (formally establish a one-way traffic scheme) and publish same.	10	Active Traffic Mgmt
• Provide better routing and transit scheduling.	6	Coordination / Planning
• Enhance VTS, AIS.	4	Active Traffic Mgmt
• Establish better communications between boats, associations, and community. Provide public service announcements.	4	Radio Communications
• Conduct / update WAMS, update Coast Pilot, and consider NDBC buoy.	4	Nav / Hydro Info
• Provide a training / informational symposium / seminar.	4	Voluntary Training
• Provide an auxiliary traffic lane, VTS, and day / night rules.	3	Rules & Procedures
• Step up enforcement presence (USCG and Canada) and related training.	2	Enforcement
• Require VHF monitoring of security channels; require radio reporting / check-ins.	2	Radio Communications
• Provide recommended routes around fixed fishing gear.	1	Not Defined
• Maintain the Fundy Traffic system; maybe add radar atop the USCG Eastport station for more coverage; also add communication repeaters.	1	Not Defined
• Make agreed upon mitigations a condition of LNG construction.	1	Not Defined

Traffic Conditions: Congestion

Today:

- There are seasonal ferry crossings connecting Deer Island, Eastport, and Campobello, and St. Andrews, NB operating on frequent schedules.
- Presence of kayaks in the shipping lanes is becoming a major problem.

Trends:

- Number of head boats (whale boats) is pretty steady.
- Number of recreation boats increasing.
- Small cruise liners may be entering the waterway.
- LNG vessels may queue up – consequent weather delay.

Existing Mitigations:

- Federal, State, and Provincial LE presence and patrols.
- With current traffic numbers, there is minimal risk.
- Waterway is moderately expansive; due to overall depth channel is relatively broad.

Trends (if LNG ships begin to call):

- Mandatory VTS may result.
- AIS will be improved.
- Increase in the number of pilots.
- Greater USCG asset / resource presence.
- Added escort and supply craft and tugs.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Establish recommended routes for deep draft vessels. Formalize anchorage policies.	16	Active Traffic Mgmt
• Require AIS on all commercial vessels. Enhance VTS and radar coverage.	8	Active Traffic Mgmt
• Mandatory monitoring of security channels. Enhanced VHF communications capabilities.	6	Radio Communications
• Provide and publish traffic scheduling.	4	Coordination / Planning
• Conduct a WAMS, update Coast Pilot, and consider NDBC.	4	Nav / Hydro Info
• Provide navigation instruments, equipment, and publications.	2	Other Actions
• Limit hazardous cargoes.	1	Rules & Procedures
• Update Coast Pilot – possibly add information on types of vessel transiting.	1	Not Defined
• Upgrade USCG resources.	1	Not Defined

Navigational Conditions: Winds

Today:

- Most high winds occur in the winter.
- Sustained winds oppose tides from Bay of Fundy and cause high, rough seas – problem for the pilot boat, not for large ships.
- Prevailing winds are from the NE and NW during September through May, and predominately SW from June through August. Wind speeds average 15-20 km per hour in winter and 12-15 km during summer.
- University of Maine R&D is planning to remove one of their weather buoys which gives real time data from the internet. It was claimed to be redundant. Pilots agree there is no accurate reading on the beach and the buoy is important.
- The buoy also has temperature, sea state, and current sensors that aids in fish farming, especially feeding cycles.
- Islands act as a wind block, sometimes giving erroneous readings at the existing wind sensors.
- Funnel effect at Western Passage. Causes wind to swirl / change direction at various locations around the island – challenging traffic transits.
- Approximately every 20 years, a storm comes up that brings strong winds; funnels through the harbor and damages the shorefront of Eastport (from the storm surge).
- 30 kts is the maximum limiting wind speed for effective thruster use on deep draft vessels.
- Maneuvering and docking operations are severely impacted by wind direction, speed, and dock alignment.

Trends:

- USCG is developing vessel operating parameters.

Existing Mitigations:

- Weather avoidance practices are in place.
- Seasonal high winds are strongest during the winter, when recreational boaters are less prevalent.
- Weather buoy maintained by the University of Maine effectively monitors wind speed, direction, current, and wave height data that is available online, in real time.
- Wind trends are historically tracked and reported.
- Buoys off Jonesport are critical in providing real time weather information.
- The Matinicus, Mt. Desert Rock, and Jonesport buoys are relied upon extensively by pilots.
- Tugs stabilize the vessel and provide a large berthing window in terms of weather and design of the pier.
- NOAA broadcasts accurate weather data via radio.

Trends (if LNG ships begin to call):

- Strict vessel operating parameters will be established.
- Extensive simulator training has been provided to the pilots in the navigating and docking of the LNG carriers under varying weather and hydrographic conditions to include emergency maneuvers consequent to machinery failures.
- Downeast meteorological tower to provide extensive weather data information.
- LNG ship berthing parameters will be established.
- LNG ships will have sophisticated mooring monitoring systems.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Provide Physical Oceanographic Real-Time System (PORTS), GoMOOS (University of Maine weather buoy), and down east meteorological tower.	10	Nav / Hydro Info
• Utilize z-drive tugs.	7	Other Actions
• Require specific vessel berthing parameters.	4	Rules & Procedures
• Maintain and/or provide weather buoys.	3	Nav / Hydro Info
• Provide more accurate weather forecasting.	2	Coordination / Planning
• Provide warning signs for small craft.	1	Other Actions
• Establish and enforce freeboard limitations.	1	Rules & Procedures
• Establish vessel operating parameters.	1	Rules & Procedures
• Provide better communications capabilities for weather forecasting.	1	Radio Communications

Navigational Conditions: Water Movement

Today:

- Currents in the area run up to 5-6 kts due to extreme tides.
- Transit times are figured in reverse to ensure vessels enter Western Passage off Dog Island as close to slack water as possible.
- Area off Deer Island is subject to whirlpools consequent to currents converging from Western Passage and Passamaquoddy Bay.
- Tide and current tables are good predictors except when there are high-wind conditions that alter water levels. Study shows that predictions of slack water are less reliable.
- Small vessels (mostly recreational craft) are unfamiliar with the unusually high currents and tides common to the region.

Trends:

- No trends discussed.

Existing Mitigations:

- Tide and current meters generate relatively accurate information.
- Voyage planning / established way point reporting via Fundy Traffic by pilots to avert strong currents.
- Pilot boat precedes ship and provides sea-level traffic report and redundant radar.
- Specific transit timing and docking maneuvers based on slack water.

Trends (if LNG ships begin to call):

- No trends discussed.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Formalize slack water transit practice.	9	Coordination / Planning
• Provide PORTS.	8	Nav / Hydro Info
• Provide highly maneuverable / powerful tractor tugs.	6	Other Actions
• Establish additional weather buoys.	2	Nav / Hydro Info
• Formalize berthing / docking parameters and procedures.	2	Rules & Procedures
• Consider limiting transits during strong ebb / flood tide conditions.	1	Rules & Procedures
• Establish vessel operational parameters.	1	Rules & Procedures
• Follow / enforce required Rules of the Road.	1	Active Traffic Mgmt
• Place a current meter at down east location	1	Other Actions

Navigational Conditions: Visibility Restrictions

Today:

- Fog occurs more than 25% of the days of the year, and has been reported to be as high as 36% of the days during July, often for 24 hrs straight. There have been occasions of no fog… no real predictability.
- Sea fog is much more prevalent at night and during early morning hours. Local knowledge of fog patterns allows pilots to generally work around the winter sea fog.
- Occasionally snow storms can cause vessels to be weather bound for days. Perilous to navigate in snow squalls / white-out conditions.
- Fog is generally localized in the bay.
- Comparatively, less fog at Bayside.

Trends:

- Appears to be less fog over the past 20 years.
- Difficult and dangerous to respond to a casualty in the fog.
- In the event of a release, one cannot see an LNG plume in fog.

Existing Mitigations:

- Radar (increasing number of boaters have it but may not be able to use it well).
- GPS gives precise position.
- Automatic fog signals on electronic equipment.
- Commercial vessels:
  - Are using chart plotting software programs (ECDIS), but may over rely upon it.
  - Radar interpretation instruction / license endorsement.
- NOAA electronic navigation charts are free (S57 standard vector charts). See http://chartmaker.ncd.noaa.gov.

Trends (if LNG ships begin to call):

- Tug / barge will soon be required to carry AIS.
- Establish vessel operating parameters / procedures; vessel movement may be restricted due to reduced visibility.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Improve Fundy Traffic radar coverage.	9	Active Traffic Mgmt
• Enhance VHF radio communication capabilities.	7	Radio Communications
• Decrease the WAMS review cycle – address potential LNG operations. Provide RACONS. Provide better ATON.	7	Waterway Changes
• Regulate all deep draft vessel movements; publish recommended transit routes.	6	Rules & Procedures
• Limit deep draft vessel movement by initiating visibility standards.	4	Rules & Procedures
• Provide weather buoys.	2	Nav / Hydro Info
• Provide PORTS.	2	Nav / Hydro Info
• Mandate ferries and fishing vessels carry AIS.	2	Nav / Hydro Info
• Establish operational parameters.	2	Rules & Procedures
• Reinforce need to monitor VHF security calls.	1	Radio Communications

Navigational Conditions: Obstructions

Today:

- Mean range of tide is 18 ft.; however, 28 ft. tides occur under extraordinary conditions.
- Ice seldom obstructs navigation due to swift currents downstream of Passamaquoddy Bay (St. Croix Island). One-in-twenty year cycle.
- On the average heavy, floating debris and deadheads surface due to the extreme tidal action.
- Commercial fish pens are prevalent, especially off-shore near many of the islands.
- Waters of Fundy Bay and Passamaquoddy Bay approaches are known habitats for whales. Northern Atlantic Right Whales are predominant along the Eastern seaboard, especially north of Grand Manan.

Trends:

- New piers are being built; if approved, LNG facility piers will significantly extend into the waterway.
- LNG ships may have to anchor in Canadian anchorages, or slowly steam in the Bay of Fundy if weather conditions cause delays.

Existing Mitigations:

- Significant efforts are being taken to protect the right whales to include ship traffic zones, speed limits, and whale sighting / reporting procedures.
- Pilot boat listens for whales in the fog and advises the deep draft pilot accordingly.
- Whale Conservation Zones have been established.
- If LNG proposals come to fruition, the carriers will not be allowed to anchor once they've entered Head Harbor Passage, except for emergent, extenuating circumstances.
- Pilots report dangers to Fundy Traffic for further public distribution.

Trends (if LNG ships begin to call):

- No new ideas discussed.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Update current WAMS. Install lighted buoy to mark Stover's Ledge.	15	Nav / Hydro Info
• Initiate NOAA hydrographical survey; consolidate current charts (three needed for navigating the area) into one.	7	Nav / Hydro Info
• Limit pier length.	1	Coordination / Planning
• Provide enhanced VTS.	1	Active Traffic Mgmt

Waterway Conditions: Visibility Impediments

Today:

- Channel visibility is obscured when making the turn off Cherry Island.
- Back scatter from lights on the reservation obscures view of navigational aids and shoreline.

Trends:

- Potential for increased LNG traffic and associated escort boats.
- LNG ships may be moored at new, extended length piers.
- Small boats will have to venture out around the piers and deep draft berths.

Existing Mitigations:

- Intensity of Cherry Island Light increased to take care of backscatter from Eastport.
- Once inside the VTS Fundy Zone, all vessels maintain voice contact with controllers and check-in at designated way points.
- AIS aids in situational awareness and assists in tracking vessels.

Trends (if LNG ships begin to call):

- Due to the relatively constant draft and vessel design height LNG carriers have a higher field of vision.
- The channel is naturally deep and relatively wide; the narrowest points occur in Head Harbor Passage and off Dog Island in the Western Passage approach – width provides sufficient room to navigate. Vessel simulation testing that involved machinery breakdowns (i.e., loss of rudder, propulsion failure, etc.) were conducted at these narrowest points and in the direct vicinity of the alternate LNG site proved successful – tug assistance prevented follow-on collisions or allisions.
- Moored ships will block out lights along the shoreline.
- Education aimed at the small boat operator.
- Provide navigational aids around piers extending out into the waterway or close to the navigating channel.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Update WAMS; consider placing a lighted aid to delineate Stover's Ledge.	15	Nav / Hydro Info

Waterway Conditions: Dimensions

Today:

- Head Harbor Passage narrows to 1,200 yds. between Casco Bay Island and Head Harbor, and the confluence of Head Harbor Passage, Friars Road, and Western Passage narrows to approximately 850 yds. between Dog Island and Deer Island – the two narrowest points between land masses within the waterway.

Trends:

- No trends discussed.

Existing Mitigations:

- Although the channel width potentially permits opposing traffic flow of smaller vessels, the policy is for one-way traffic only to reduce the risk of casualty.
- Pilots time transits to coincide with slack water – way points are pre-established and communicated with Fundy Traffic.

Trends (if LNG ships begin to call):

- No trends discussed.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Formalize one-way traffic zones. Establish designated no passing areas.	10	Active Traffic Mgmt
• Update WAMS. Mark Stover's Ledge.	7	Nav / Hydro Info
• Provide highly maneuverable tractor tugs.	5	Other Actions
• Invoke speed restrictions.	4	Other Actions
• Establish operational parameters.	3	Rules & Procedures
• Provide recommended transit routes and expand VTS coverage.	3	Active Traffic Mgmt
• Limit vessel length.	1	Rules & Procedures
• Provide navigational aids such as GoMOOS and PORTS.	1	Nav / Hydro Info

Waterway Conditions: Bottom Type

Today:

- Bottom composition is hard, gravel / rocky ground with rock ledge prevalent in shoal areas.
- Casualty statistics indicate periodic commercial fishing vessel groundings.
- There have been reported sailing vessel groundings.

Trends:

- No trends discussed.

Existing Mitigations:

- Most shoaling well marked with buoys.
- Charting, Coast Pilot, and hydrologic publications well serve the area.
- Channel is naturally deep, no dredging required.
- More double-hulled vessels being used vice "single-skin."
- Transits are timed with slack water.

Trends (if LNG ships begin to call):

- No trends discussed.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Provide updated hydrographic survey	13	Nav / Hydro Info
• Update WAMS. Establish lighted buoy at Stovers Ledge; add light to buoy at Clark Ledge; intensify power of the Dog Island and Deer Island fixed aids; establish lighted aid at Clam Cove Head; relocate and light the HU4 buoy (Popes Island); and establish a lighted aid on Kendall Head.	2	Nav / Hydro Info
• Enact / enforce reduced speed limitations.	2	Rules & Procedures
• Develop and set operational parameters. Formalize policy of vessel movements based on slack tide conditions.	2	Rules & Procedures

Waterway Conditions: Configuration	
Today: • Sharp course change in vicinity of Dog Island approximating a 45-degree turn. In addition, vessels must hug the U.S. side of the channel due to strong currents during the ebb and flood. • Seasonal risk of crossing traffic. Two small car / passenger ferry services connect Deer Island, Eastport, and Campobello; scheduled runs are hourly. A small ferry has operated between St. Andrews and Campobello Island in the recent past. **Trends:** • No trends discussed.	**Existing Mitigations:** • Ferry service is seasonal (mainly during the summer months) and scheduled service is primarily during daylight hours. • VHF communications and security calls among operators. • Deep draft vessel transits are spread out; roughly 130 ships call on the two ports annually. • Pilots are acutely familiar with the waterway. • Fundy Traffic maintains traffic control and commercial vessels adhere to the Rules of the Road. **Trends (if LNG ships begin to call):** • No trends discussed.
New Ideas: • Risks and mitigations were balanced. There were no ideas captured.	

Immediate Consequences: Personal Injuries	
Today: • In the past, small cruise ships have made seasonal port calls to St. Andrews. • Ferries are relatively small; passenger capacity approximates 45 persons. • Extremely limited emergency response capabilities. • A number of whale watching and excursion boats operate seasonally. **Trends:** • Small cruise vessels carrying 110-120 passengers had previously called on the port area; regional commerce / tourist bureaus are trying to attract 300-400 passenger capacity vessels. • Evacuation and emergency response routes are limited. Only one road serves the communities surrounding Eastport. Route 1 is the primary road utilized for area travel and direct access to regional hospitals.	**Existing Mitigations:** • Presently, no cruise ships. • Joint Marine Contingency Plan (U.S. & Canada) and CANUSLANT annex is in place for spill response; however, it exempts LNG. • USCG Station Eastport is centrally located and SAR capabilities provide framework for other emergency responses. **Trends (if LNG ships begin to call):** • LNG terminals to provide response procedures, resources, and associated training for responding to emergencies at the terminals, communities surrounding the terminal, and along the transit route. • Joint LNG emergency response training to LNG release / fire is needed and must involve local, state, and provincial responders and LE personnel. • Regulatory process will ensure safety and emergency response assets / resources are provided via cost sharing in accordance with the ERP process before the process can move forward. • Potential exposure of crews on board commercial and recreational vessels in the direct vicinity if cargo breach occurs. • Incident Command System training needed. • Zones of Concern, as specified in the Sandia Lab Report, establish concentric risk levels for death, injury, and property damage in the event of an LNG release. • At present, there are less than minimal response / emergency capabilities along the shared waterway and within the surrounding maritime communities to effectively deal with a sizeable LNG release. • The paper mill, located 25 miles away, maintains the only available hazmat response capability.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Revisit interagency and international plans – update as necessary and provide associated training with respect to mass casualty response.	11	Voluntary Training
• Improve radio communication interoperability among all agencies and bi-national infrastructure. Make available an additional radio tower. Identify / publish emergency radio channels.	10	Radio Communications
• Develop / update local contingency / emergency management plans. Identify egress routes.	10	Rules & Procedures
• Enhance cell phone coverage.	6	Other Actions
• Develop mass-casualty plan; identify available emergency medical personnel, medical hospital and clinics, and life flight capabilities. Provide shortfalls where needed.	4	Coordination / Planning
• Provide a warning system and procedures to implement emergency broadcasts.	3	Other Actions
• Develop better coordination / planning for a catastrophic event; conduct interagency / international training / simulations / exercises.	2	Voluntary Training
• Limit hazardous cargoes.	1	Rules & Procedures
• Conduct safety audit inspection.	1	Enforcement

Immediate Consequences: Petroleum Discharge

Today:

- 130 annual ship transits by deep draft vessels… 2,000 tons (500,000 gallons) of bunkers per ship. Two vessels are present in the waterway at any one time.
- Petroleum products:
  - Eastport and Bayside terminals do not handle petroleum cargo in bulk nor bunker vessels via fuel barge or ship.

Trends:

- Will need plan to fuel all the support vessels.
- A petroleum based fire will burn longer than an LNG fire; however, with much less intensity and at a lower temperature.
- Waterside / floating fire mitigation capabilities are extremely limited.

Existing Mitigations:

- Joint bi-national agreement exists (CANUSLANT) between U.S. and Canada for oil spill response.
- Canadian spill response equipment is pre-positioned in St. John; USCG response equipment maintained in Portland, ME.
- Minimum of six hours to respond by commercial spill response entities such as NRC, Clean Harbors, etc.
- Mandatory double hull compliance under MARPOL; aggressive phase out dates for single hull tankers.
- ME DEP has hazardous materials response team and limited resources to assist in oil spill mitigation and recovery.

Trends (if LNG ships begin to call):

- No trends discussed.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Provide more response / preposition teams and equipment; include OSROs.	10	Coordination / Planning
• Provide more response training; hold annual joint spill response drills.	6	Voluntary Training
• Provide improved cell coverage and tower.	6	Radio Communications
• Designate response vessels as multipurpose escorts and spill response vessels.	4	Rules & Procedures
• Re-establish Quoddy Oil Spill Coop.	4	Coordination / Planning
• Establish speed controls.	1	Rules & Procedures
• Improve bilateral agreements; update all contingency plans; install PORTS for spill tracking.	1	Coordination / Planning
• Provide multiple tug escorts; ensure tugs have FiFi 1 fire fighting capability.	1	Other Actions
• Consider ship / cargo owner liability.	1	Other Actions

Immediate Consequences: Hazardous Materials Release

Today:

- Bulk ammonium nitrate is shipped to Bayside, NB on the average of one ship / 2,000 tons annually.

Trends:

- Hazardous materials entering the area would dramatically increase if LNG is approved.

Existing Mitigations:

- NOAA has a Scientific Support Coordinator to assist with response planning / mitigation.
- Federal, State, and local agency training in ICS.
- Pre-identified / designated incident command post and associated response structure in place.
- Response software (such as CHRIS) exists.

Trends (if LNG ships begin to call):

- No trends discussed.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Conduct training / drills / exercises (consider CANUSLANT). Obtain additional fire fighting and response assets; improve coordination efforts among state, provincial, and local.	10	Coordination / Planning
• Follow prescribed regulations regarding facility inspections; incorporate local enforcement where available. Bolster local USCG assets and resources to meet regional demands and requirements.	5	Enforcement
• Provide better education / outreach; certify training.	4	Voluntary Training
• Improve radio communications and interoperability.	3	Radio Communications
• Incorporate evacuation planning / routing into current contingency plans.	2	Coordination / Planning
• Conduct extensive LNG carrier oversight.	2	Enforcement
• Designate response vessels and tugs as multipurpose escort and spill response vessels.	2	Other Actions
• Improve first responder training focusing on fire fighting and hazmat release; recognize increased possibility of significant personnel casualties.	1	Other Actions
• Establish speed limits.	1	Rules & Regulations
• Develop and exercise joint response management procedures.	1	Coordination / Planning
• Provide floating barriers and/or booms for docked vessels.	1	Other Actions
• Improve cell coverage.	1	Other Actions

Immediate Consequences: Mobility

Today:

- There is only one main channel / transit route into the port area. A casualty occurring in one of the bottlenecks along Head Harbor Passage or at the entrance to Western Passage would effectively shut down both port facilities and/or the shared international waterway.
- Route 1, which basically runs along the entire Maine coastline, is vital to regional traffic flow; closures and/or temporary interruptions will significantly impact the area.
- Residents of Deer Island, Campobello Island, and other island communities are particularly dependent on ferry service for supplies / deliveries.
- Route 190 is the main and only source of road access to / from Eastport and the communities along the way. A major casualty resulting in the blocking of this roadway would significantly impact evacuation efforts by land.

Trends:

- If approved, LNG and natural gas will be piped under the only access road to the peninsula.

Existing Mitigations:

- Small vessels have access to the coast via an alternate channel (i.e., Lubec Narrows). Vessel size / height is restricted by the International Bridge to Campobello.
- Fundy Traffic and the associated VTS procedures provide a significant margin of safety while in Canadian waters; however, there is no formal vessel traffic system for vessels transiting on the U.S. side of the international boundary.

Trends:

- Two LNG facilities have been approved by Canada and are under construction – Canaport in St. John, NB, and Bear Head at Cape Breton Island. Can Maritimes Northeast Pipeline capacity accommodate two additional U.S. terminals

Trends (if LNG ships begin to call):

- No trends discussed.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Develop alternate means of transportation to supplement the local highway to move response equipment.	6	Other Actions
• Explore local and regional (U.S and Canada) salvage capabilities.	4	Other Actions
• Provide enhanced communications.	1	Radio Communications
• Conduct air patrols.	1	Enforcement
• Install and use mooring system arrangements that meet the demands of the extreme tidal range, winds, and high currents of the region.	1	Coordination / Planning
• Provide tug escort of sufficient number, HP, and bollard pull.	1	Other Actions

Subsequent Consequences: Health and Safety

Today:

- Relatively speaking, the Passamaquoddy Bay port area is considered "rural" with population figures for the U.S. side approximating 3,450 persons.
- Eastport is the largest populated town on the U.S. side of the port area with an approximate total of 2,000 persons, equating to 540 persons per sq. mi.
- Population density criteria for the WSA, as set forth in NVIV 05-05, is: High – 9,000 persons per sq. mi.; Medium – 1,000 persons per sq. mi; and low – <1000 persons per sq. mi.
- A significant petroleum discharge could seriously affect fish farms and other forms of aquaculture.
- Bulk ammonium nitrate in sizeable quantity poses potential health, safety, and hazard risks.
- No site specific evacuation plans have been generated. Maine Emergency Management Agency (MEMA) has developed general egress plans. No formal evacuation plans.
- Majority of regional fire fighting capability rests on all-volunteer forces with dated, limited equipment. There is little to no waterside fire fighting capability.

Trends:

- LNG ships entering the area will increase health and safety risks.

Existing Mitigations:

- Strong prevailing winds help disperse spills.
- Calais is the nearest hospital. It has a bed capacity of 25 and is located approximately 20 miles from Eastport. Eastern Maine Medical Center, located in Bangor, is the nearest large medical facility and trauma center; life flight helicopter transports utilized.
- "Mass casualty" numbers potentially lowered due to current population densities.
- Joint federal, state, county, and provincial planning and exercising for nuclear power stations has laid the framework for other types of energy programs and emergency procedures.
- Multiple local, county, and state agencies have trained and worked together to combat forest fires.
- MEMA very proactive in and health / safety arena.

Trends (if LNG ships begin to call):

- Washington County Emergency Preparedness is updating regional response and evacuation plans.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Develop / update local, county, and regional (including joint Canadian) contingency plans. Provide egress routes.	9	Rules & Procedures
• Provide warning system and emergency broadcast.	7	Other Actions
• Coordinate emergency preparedness, fire fighting, and training plans with Canadian resources.	5	Voluntary Training
• Pre-position equipment.	4	Coordination / Planning
• Provide enhanced fire fighting capability; land and water.	4	Other Actions
• Formalize U.S. / Canadian agreements.	3	Coordination / Planning
• Provide additional emergency medical personnel, medical clinics, and life flight capabilities.	2	Coordination / Planning
• Enhance cell phone coverage.	1	Other Actions
• Limit hazardous cargoes.	1	Rules & Procedures
• Conduct interagency / international training / simulations / exercises.	1	Voluntary Training
• Conduct predictive modeling and plume trajectories.	1	Coordination / Planning
• Develop emergency response web page.	1	Other Actions

Subsequent Consequences: Environmental

Today:

- 250 feet around the shoreline of Eastport… development setback
- The area is characterized by its pristine environment and natural attractions.
- The waters of Fundy Bay are known habitats for right whales. Minke, finback, and other whales have been sighted in the approaches to Passamaquoddy Bay.
- Cobscook Bay, St. Croix Estuary, Campobello International Park, and Moosehorn Refuge are extremely environmentally sensitive areas containing a myriad of endangered species.
- Cultural resources and archeological-based studies need to be conducted on tribal land.
- Some ships carry different grades of fuel oil in their bunker tanks as they shift from heavy bunker (no. 2) oil to lighter diesel fuel during maneuvering operations. A spill of either could be devastating to the regional environment.
- Stressed ecosystem; aquaculture farming, ecotourism, sea urchin farming, shellfish, lobsters, and oysters would be affected by pollution.

Trends:

- Vessel strike risk to the federally protected Northern Right Whale.
- New ships… bunker tanks are double hulled… may not be used here.
- LNG ships will enter the waterway, resulting in more traffic, and the potential for increased air pollution, noise, and the introduction of invasive species (Note: LNG carriers do not deballast).
- LNG is odorless, colorless, non-corrosive, and non-toxic; environmentally benign until flammability range is reached and source of ignition provided.
- Some LNG ships use boil off from cargo tanks; others burn IFO fuel, which could taint fish if spill involved.

Existing Mitigations:

- Ballast water program required.
- Right whale sighting / reporting program, speed limits, and traffic schemes to route ships away from breeding / feeding areas.
- Fundy Traffic notifies ships of whale sightings.
- Extensive knowledge / studies of species and locations that might be impacted.
- Spill notification infrastructure is well established.

Trends (if LNG ships begin to call):

- LNG ships do not deballast.
- Some ships use a blend of diesel fuel and heavy fuel oil vice boil off.
- Scientific resources are available to assist with monitoring and mitigating effects of pollution discharges.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Conduct training / drills / exercises (consider CANUSLANT) and develop priorities.	7	Coordination / Planning
• Improve real-time hydrographic / navigation information (PORTS).	7	Nav / Hydro Info
• Conduct response / equipment training.	4	Voluntary Training
• Conduct predictive modeling.	3	Other Actions
• Develop evacuation contingency planning and spill response.	2	Coordination / Planning
• Develop routing methodology for environmentally sensitive areas.	2	Active Traffic Mgmt
• Develop and formalize an environmental / whale informational system.	2	Other Actions
• Implement pre-positioned spill response resources.	2	Coordination / Planning
• Establish contracts with spill contractors such as NRC, Clean Harbors, MSRC, etc.	1	Other Actions
• Have vessels provide bunker fuel oil specifics for spill pre-planning.	1	Rules & Procedures
• Develop joint response management plans, OSROs.	1	Coordination / Planning
• Provide better education / outreach, training, and proficiency certifications.	1	Voluntary Training
• Improve radio communications.	1	Radio Communications
• Develop web page.	1	Other Actions

Subsequent Consequences: Aquatic Resources

Today:

- Marine commerce in the area consists almost entirely of aquaculture, fish farming, ecotourism, and commercial fishing.
- The area is populated with lobster fishing, fish weirs, and aquaculture.
- Due to strong currents in the approaches to Passamaquoddy Bay commercial fishing inside the Bay of Fundy is relatively light to moderate; most of the lobster fishing is done in the Grand Manan Channel and along the coast south of Lubec Narrows.
- Aquaculture is one of the largest industries, with salmon and cod being the primary marine commodity.
- State issued leases are generally closer to the channel edge in shallower water vice the deep draft transit route.
- A variety of marine life and shellfish (e.g., sea cucumbers, herring, clams, quahog, scallops, etc.) are commercially harvested throughout the geographic area. A spill would be devastating to the industry.
- Recreational fishing is very active during the summer season.

Trends:

- Commercial and recreational fishing and ecotourism is increasing.
- If both LNG facilities are approved the resultant three-fold increase in deep draft traffic will negatively affect fishing reducing the number of spaces to fish.

Existing Mitigations:

- Existing authorities close shellfish beds during periods of red tide and probable pollution.
- NOAA has a sensory analysis lab available to test and chemically analyze the fitness of fish product.
  - Active State and local fisheries enforcement capabilities.
- Depending on the season, some fisheries are less impacted by a pollution event.
- Whale alerts are provided by Fundy Traffic.
- Maine DEP, St. Croix Estuary, Passamaquoddy Tribe, and other U.S. and Canadian organizations map and record sensitive aquatic resources.

Trends (if LNG ships begin to call):

- No trends discussed.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Establish definitive post spill fisheries opening and closing protocols in concert with Canada.	6	Rules & Regulations
• Improve communications; develop joint U.S. / Canadian call-down list.	6	Radio Communications
• Develop and formalize an environmental / whale information system.	2	Other Actions
• Develop web page dedicated to aquatic resource management.	2	Other Actions
• Conduct baseline assessment of water quality and aquatic resources; update sensitivity maps.	1	Coordination / Planning
• Provide better education / outreach; certify training. Improve spill response / coordination planning / preparedness.	1	Voluntary Training

Subsequent Consequences: Economic

Today:

- Fish contamination consequent to a hazmat spill would be economically devastating to the industry.
- Closure of the waterway due to a spill would significantly impact fisheries in both countries. The industry contributes more than $2M annually into the economy.
- Severe economic disruption would be felt within two weeks of a port closure.
- The salmon market is strong along the entire East Coast; lobster and sea urchins are marketed internationally as well.
- Potential income derived from tourism and fishing would be negatively affected, even if there is just a perception that the area has been "tainted" by spills, etc.
- Reimbursement through claim process possible for loss of income attributable to an oil spill.
- May not be able to get product to market… may affect the regional and national economy.
- A major casualty would affect tourism, especially in St Andrews, NB, a major resort community. Likewise, whale watching tours would be significantly impacted.
- Regional paper mills depend on waterborne commerce; approximately 350,000 tons of product are exported from the region annually.
- In the event the waterway was closed due to a casualty / spill, Bayside Terminal could lose revenues at the rate of one ship per week.
- OPA 90 framework for oil spill response and mitigation.

Trends:

- No trends discussed for this section.

Existing Mitigations:

- No existing mitigations were discussed.

Trends (If LNG ships begin to call):

- People like to watch deep draft traffic.
- May add $250M to the regional tax base.
- Young people may remain in the area.
- Will provide site specific compensation package to local fishermen.
- Will provide a fish / gear trap replacement program for U.S. and Canadian fishermen.
- LNG industry will increase local job market, spin-off; additional support vessels / chandlery, agents, etc. will boost local economy and job potential.
- People may stop coming to tourist area in Canada (St. Andrews, Campobello Island, etc.); environmentally pristine areas.
- Additional traffic may push the whales elsewhere, hurting the whale-watching / tourist industry.
- Energy Policy Act (U.S. only):
  - Provides extensive emergency response plan for communities along the waterway and surrounding the proposed terminal sites.
  - Provides cost sharing plan to provide additional emergency response, medical, and enforcement assets and resources.
- Potential for international concessions.

New Ideas:

Idea	Times	Risk Mitigation Categories
• Pre-positioned spill response recovery / mitigation.	10	Coordination / Planning
• Joint Canada / U.S. MOU for hazmat response.	7	Other Actions
• Fishermen compensation plan.	5	Other Actions
• Trap / fish gear replacement program.	2	Other Actions
• LNG via offshore terminal vice on-shore.	1	Coordination / Planning
• Develop web page devoted to ideas and activities about economic issues and development.	1	Other Actions

Book 2 Tabular Results:

Risk Factor	A Value	B Value	C Value	D Value
Deep Draft Vessel Quality	1.0	3.0	5.6	9.0
Shallow Draft Vessel Quality	1.0	3.0	5.6	9.0
Commercial Fishing Vessel Quality	1.0	3.0	5.6	9.0
Small Craft Quality	1.0	3.0	5.6	9.0
Volume of Commercial Traffic	1.0	3.0	5.3	9.0
Volume of Small Craft Traffic	1.0	2.8	5.7	9.0
Traffic Mix	1.0	2.3	4.7	9.0
Congestion	1.0	2.7	5.0	9.0
Winds	1.0	2.5	5.2	9.0
Water Movement	1.0	2.9	5.0	9.0
Visibility Restrictions	1.0	2.9	5.7	9.0
Obstructions	1.0	2.0	4.5	9.0
Visibility Impediments	1.0	3.1	5.5	9.0
Dimensions	1.0	3.1	5.5	9.0
Bottom Type	1.0	2.4	5.1	9.0
Configuration	1.0	2.8	5.3	9.0
Personnel Injuries	1.0	3.1	5.7	9.0
Petroleum Discharge	1.0	3.8	6.2	9.0
Hazardous Materials Release	1.0	3.7	6.2	9.0
Mobility	1.0	3.0	5.3	9.0
Health and Safety	1.0	3.1	5.6	9.0
Environmental	1.0	3.2	5.9	9.0
Aquatic Resources	1.0	2.8	5.5	9.0
Economic	1.0	3.1	5.7	9.0

Book 3 Tabular Results:

Vessel Conditions	Traffic Conditions	Navigational Conditions	Waterway Conditions	Immediate Consequences	Subsequent Consequences
Deep Draft Vessel Quality	Volume of Commercial Traffic	Winds	Visibility Impediments	Personnel Injuries	Health and Safety
1.3	1.3	4.5	3.9	3.0	2.5
Shallow Draft Vessel Quality	Volume of Small Craft Traffic	Water Movement	Dimensions	Petroleum Discharge	Environmental
1.7	1.6	6.4	3.3	2.1	7.5
Commercial Fishing Vessel Quality	Traffic Mix	Visibility Restrictions	Bottom Type	Hazardous Materials Release	Aquatic Resources
6.4	3.1	7.9	7.0	5.3	7.5
Small Craft Quality	Congestion	Obstructions	Configuration	Mobility	Economic
6.9	2.1	3.5	7.7	3.2	5.9

Book 4 Tabular Results:

Vessel Conditions		Traffic Conditions		Navigational Conditions		Waterway Conditions		Immediate Consequences		Subsequent Consequences	
Deep Draft Vessel Quality		Volume of Commercial Traffic		Winds		Visibility Impediments		Personnel Injuries		Health and Safety	
1.3	2.4	1.3	4.6	4.5	6.0	3.9	3.9	3.0	6.5	2.5	6.2
RISING		RISING		RISING		Balanced		RISING		RISING	
Shallow Draft Vessel Quality		Volume of Small Craft Traffic		Water Movement		Dimensions		Petroleum Discharge		Environmental	
1.7	2.9	1.6	4.1	6.4	7.1	3.3	3.4	2.1	4.2	7.5	8.1
RISING		RISING		RISING		RISING		RISING		RISING	
Commercial Fishing Vessel Quality		Traffic Mix		Visibility Restrictions		Bottom Type		Hazardous Materials Release		Aquatic Resources	
6.4	6.3	3.1	5.2	7.9	7.8	7.0	7.3	5.3	7.3	7.5	8.1
Maybe		RISING		NO		RISING		RISING		RISING	
Small Craft Quality		Congestion		Obstructions		Configuration		Mobility		Economic	
6.9	6.8	2.1	4.7	3.5	5.1	7.7	6.8	3.2	4.9	5.9	6.3
NO		RISING		RISING		Maybe		RISING		RISING	

KEY

Risk Factor	
Book 3	Book 4
Consensus	

Book 3	Absolute level of risk
Book 4	Level of risk taking into account existing mitigations
Balanced	Consensus that risks are well balanced by existing mitigations
Maybe	No consensus that risks are adequately balanced by existing mitigations
NO	Consensus that existing mitigations do NOT adequately balance risk

Book 5 Tabular Results:

Vessel Conditions	Traffic Conditions	Navigational Conditions	Waterway Conditions	Immediate Consequences	Subsequent Consequences
Deep Draft Vessel Quality	Volume of Commercial Traffic	Winds	Visibility Impediments	Personnel Injuries	Health and Safety
Active Traffic Mgmt	Active Traffic Mgmt	Nav / Hydro Info	Balanced	Radio Communications	Other Actions
1.8	4.1	5.9		6.4	5.9
Shallow Draft Vessel Quality	Volume of Small Craft Traffic	Water Movement	Dimensions	Petroleum Discharge	Environmental
Enforcement	Rules & Procedures	Rules & Procedures	Active Traffic Mgmt	Other Actions	Coordination / Planning
2.7	3.9 Caution	6.4	2.8	3.7	6.9
Commercial Fishing Vessel Quality	Traffic Mix	Visibility Restrictions	Bottom Type	Hazardous Materials Release	Aquatic Resources
Balanced	Active Traffic Mgmt	Rules & Procedures	Nav / Hydro Info	Coordination / Planning	Coordination / Planning
	4.7	7.2	6.7 Caution	7.2	8.0
Small Craft Quality	Congestion	Obstructions	Configuration	Mobility	Economic
Voluntary Training	Active Traffic Mgmt	Nav / Hydro Info	Balanced	Other Actions	Coordination / Planning
6.5	4.0	4.8		4.8	6.2

KEY	
Risk Factor	Intervention category that was judged most effective in further mitigating risk
Intervention	Expected improvement in risk level if new mitigation measures were implemented
Risk Improvement	Caution — No consensus alert

Legend:

The intervention category listed is the one category that most participant teams selected for further reducing risks. The Risk Improvement is the perceived reduction in risk when taking the actions specified by the participants. A green Balanced indicates that no intervention is needed and risk is balanced in the waterway, and a yellow Caution indicates that there was a difference between the most effective category and the category most selected by the participants for action. Intervention category definitions are:

Coordination / Planning	Improve long-range and/or contingency planning and better coordinate activities / improve dialogue between waterway stakeholders
Voluntary Training	Establish / use voluntary programs to educate mariners / boaters in topics related to waterway safety (Rules of the Road, ship/boat handling, etc.)
Rules & Procedures	Establish / refine rules, regulations, policies, or procedures (nav rules, pilot rules, standard operating procedures, licensing, require training and education, etc.)
Enforcement	More actively enforce existing rules / policies (navigation rules, vessel inspection regulations, standards of care, etc.)
Nav / Hydro Info	Improve navigation and hydrographic information (NTM, charts, coast pilots, AIS, tides and current tables, etc.)
Radio Communications	Improve the ability to communicate bridge-to-bridge or ship-to-shore (radio reception coverage, signal strength, reduce interference & congestion, monitoring, etc.)
Active Traffic Mgmt	Establish / improve a Vessel Traffic Service: information / navigation / traffic organization
Waterway Changes	Widen / deepen / straighten the channel and/or improve the aids to navigation (buoys, ranges, lights, LORAN C, DGPS, etc.)
Other Actions	Risk mitigation measures needed that do NOT fall under any of the above strategy categories

Appendix C

Biological Assessment

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DOWNEAST LNG PROJECT

Revised Biological Assessment

June 2012

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ACRONYMS AND ABBREVIATIONS

API	American Petroleum Institute
ATBA	area to be avoided
BA	Biological Assessment
BMPs	Best Management Practices
BOG	boil-off gas
BSEE	Bureau of Safety and Environmental Enforcement
CFR	Code of the Federal Regulations
COE	U.S. Army Corps of Engineers
Commission or FERC	Federal Energy Regulatory Commission
dB	decibel
DMA	dynamically managed area
DOT	U.S. Department of Transportation
Downeast	Downeast LNG, Inc. and Downeast Pipeline, LLC collectively
DPS	Distinct Population Segment
EEZ	economic exclusion zone
EI	Environmental Inspector
EIS	Environmental Impact Statement
EMEC	Eastern Maine Electric Cooperative
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FR	Federal Register
FWS	U.S. Fish and Wildlife Service
GIS	Geographic Information Systems
gpm	gallons per minute
HDD	horizontal directional drill
IMO	International Maritime Organization
IWC	International Whaling Commission
LNG	liquefied natural gas
LOR	Letter of Recommendation
M&NE	Maritimes and Northeast Pipeline L.L.C.
Maine ASC	Maine Atlantic Salmon Commission
Maine DEP	Maine Department of Environmental Protection
Maine DIFW	Maine Department of Inland Fisheries and Wildlife
Maine DMR	Maine Department of Marine Resources
Maine NAP	Maine Natural Areas Program
Maine PDES	Maine Pollutant Discharge Elimination System
MARPOL	International Convention for the Prevention of Pollution from Ships
MLLW	mean lower low water
MLV	mainline valves
MMscfd	million standard cubic feet per day
MMPA	Marine Mammal Protection Act
Moosehorn NWR	Moosehorn National Wildlife Refuge
MOU	Memorandum of Understanding

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MP	milepost
mph	miles per hour
MRSA	Maine Revised Statute Annotated
MSRS	Mandatory Ship Reporting Systems
NEPA	National Environmental Policy Act of 1969
NFPA	National Fire Protection Association
NGA	Natural Gas Act
NOAA Fisheries	National Oceanic and Atmospheric Administration, National Marine Fisheries Service
NOI	Notice of Intent
NRPA	Maine Natural Resources Protection Act
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
OSP	Optimal Sustainable Population
PBR	potential biological removal
PEM	palustrine emergent
PFO	palustrine forested
Plan	Upland Erosion Control, Revegetation and Maintenance Plan
Procedures	Wetland and Waterbody Construction and Mitigation Procedures
PSS	palustrine scrub-shrub
RTE	rare, threatened, and endangered
SCV	submerged combustion vaporizer
Services	FWS and NOAA Fisheries collectively
SMA	seasonal management areas
SOPEP	Shipboard Oil Pollution Emergency Plan
SPCC Plan	Spill Prevention, Control and Countermeasure Plan
Strategy	Strategy for Sea Turtle Conservation and Recovery in Relation to Atlantic and Gulf of Mexico Fisheries
SVP	significant vernal pools
SWPPP	Stormwater Pollution Prevention Plan
TED	turtle excluder devices
TSS	Traffic Separation Schemes
USC	United States Code
VGP	Vessel General Permit
USGS	United States Geological Survey
VTS	Vessel Traffic Scheme
WSR	Waterway Suitability Report
μPa	micro-Pascal

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1.0 INTRODUCTION

Downeast Pipeline, L.L.C., a wholly owned subsidiary of Downeast LNG, Inc. (hereafter collectively referred to as Downeast) has filed applications with the Federal Energy Regulatory Commission (FERC or Commission) under Sections 3(a) and 7(c) of the Natural Gas Act (NGA). Downeast seeks authorization to site, construct, and operate a liquefied natural gas (LNG) import terminal and associated natural gas sendout pipeline in Washington County, Maine (collectively referred to as the Downeast LNG Project). The project would consist of offshore facilities for unloading LNG vessels (the pier), and onshore facilities for storing up to 320,000 m^3 of LNG, vaporizing the LNG, and sending out the natural gas at a baseload rate of 500 million standard cubic feet per day (MMscfd), with peaking capacity of approximately 625 MMscfd. The facilities would be constructed on the south side of Mill Cove in the Town of Robbinston, near the confluence of Passamaquoddy Bay and the St. Croix River. The pipeline would consist of approximately 29.8 miles of 30-inch-diameter pipeline that would interconnect with the interstate natural gas transmission system of Maritimes and Northeast Pipeline (M&NE) near M&NE's existing compressor station at Baileyville, Maine.

We[1] note that Downeast's project would transport between 500 and 625 MMscfd. M&NE's existing system is capable of transporting about 800 MMscfd. We originally considered an M&NE expansion in our biological assessment (BA); however, our new internal engineering analysis concludes M&NE's existing system would be capable of transporting the additional gas volume provided by Downeast, with some changes in gas flow. Market conditions and new gas supplies, principally from shale gas in the northeast, could change the economic landscape for gas supplies and the direction of gas flows on the M&NE system. Further, M&NE has not proposed an expansion of its existing system to transport the gas from Downeast's proposed facilities, and our analysis of an expansion at this time would be presumptive, mostly guesswork on our part, and premature. Additionally, M&NE must file an application with the FERC for authorization to construct any expansion facilities that could impact threatened or endangerd species. The FERC would conduct a full environmental analysis of the proposal, including ESA consultations, before the Commission would consider authorizing M&NE to construct any downstream facilities. Therefore, we have eliminated the discussion of M&NE's facilities from this BA.

The FERC is the primary federal agency responsible for authorizing applications to construct and operate onshore LNG import and interstate natural gas transmission facilities. Other federal action agencies with significant authorities over the Downeast LNG Project include the U.S. Army Corps of Engineers (COE), the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries); the U.S. Fish and Wildlife Service (FWS), the U.S. Department of Homeland Security, and the U.S. Coast Guard (Coast Guard). The COE has authority to issue dredging and wetland permits for the Downeast LNG Project. The Coast Guard determines the suitability of the waterway for LNG marine traffic by issuing a Letter of Recommendation (LOR). The FERC has and will continue to work closely with both the COE

[1] The pronouns "we," "us," and "our" refer to the environmental staff of the FERC's Office of Energy Projects.

and the Coast Guard to allow all of the agencies to adopt the results of this ESA consultation process.

Since issuance of the draft environmental impact statement (EIS) in May of 2009, the U.S. Department of Transportation (DOT) began addressing issues raised by the public, the National Fire Protection Association, the Fire Protection Research Foundation, and the National Association of State Fire Marshalls on the exclusion zone requirements contained in Title 49 of the Code of Federal Regulations, Part 193 (49 CFR 193). As the proposed Downeast facility would be subject to these regulations, we were unable to continue further work on this project until DOT resolved questions relating to dispersion modeling. In October 2011, DOT issued final decisions approving specific alternative dispersion models for use in complying with these federal safety standards. Since that time, Downeast has filed compliance information with the FERC regarding Part 193 of the regulations and we are once again actively reviewing this project.

Section 7 of the ESA, as amended, states that any project authorized, funded, or conducted by any federal agency should not "...jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined...to be critical..." (16 United States Code [USC] Section 1536(a)(2)(1988)). The FERC, or Downeast as our non-federal representative, is required to consult with the FWS and NOAA Fisheries (known collectively as the Services) to determine whether any federallylisted or proposed endangered or threatened species or their designated critical habitats could be affected by the Downeast LNG Project. The FERC has prepared this BAto request formal consultation with the Services for the Downeast LNG Project. We included the BA as an appendix to the draft EIS issued in May 2009. Both the FWS (letter dated September 24, 2009 (FWS 2009)) and NOAA Fisheries (letter dated August 31, 2009 (NOAA Fisheries 2009)) provided comments on the 2009 BA. We have revised the appropriate sections of this BA to address comments from the FWS and NOAA Fisheries, as well as address changes to listed species and other updates since 2009.

1.1 COORDINATION AND COMMUNICATION RELATED TO SECTION 7 CONSULTATION

Downeast informed the agencies of its plan to file an application with the FERC on Januray 5, 2006 (Woodlot 2006b). Downeast initiated informal coordination with FWS and NOAA Fisheries in a letter dated February 21, 2006, requesting information on federally listed species (Woodlot 2006a).

On March 13, 2006, the FERC issued its Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) for the Downeast LNG Project (FERC 2006a). The FWS and NOAA Fisheries responded to the NOI in a letter to FERC received on April 27, 2006 (NOAA Fisheries 2006, FWS 2006a).

Coordination and consultation with federal, state, and local agencies, as well as the government of Canada and groups with special expertise regarding federally listed species, has included:

- March 3, 2006 – The FWS commented to the FERC about endangered Atlantic salmon habitat in the project area;
- March 27, 2006 – The FERC held the first NEPA Scoping/Interagency Meeting for both the Quoddy Bay and the Downeast projects;
- April 13, 2006 – The Atlantic Salmon Federation commented to the FERC about impacts on Atlantic salmon;
- May 4, 2006 – The FWS commented to the FERC to coordinate with federal and provincial (New Brunswick) fish and wildlife agencies in Canada to obtain information on fish and wildlife resources in the project area, recommending that the FERC carefully consider a broad range of alternatives for the proposed project, expressing concern about additional impacts from stream crossings in habitat used by the endangered Atlantic salmon in the Dennys River watershed, suggesting that appropriate surveys for rare species, including the presence of bald eagle nests, be conducted, requesting that the FERC evaluate potential impacts on Atlantic salmon, shorebird, and seabird resources, wetlands, lands within or near the Moosehorn NWR, and the islands owned by The Maine Coastal Islands National Wildlife Refuge; the need for compensation for the loss of important fish and wildlife habitats; the cumulative environmental impacts of the Downeast LNG Project and other proposed LNG projects;
- June 4, 2006 – NOAA Fisheries commented to the FERC regarding impacts on Atlantic salmon, and requested an evaluation of potential adverse effects on fishery resources resulting from seawater intakes and construction and operational discharges, expressing concern about potential impacts on icthyoplankton and zooplankton resources, fishery resources, marine mammals, endangered salmon, leatherback sea turtles, and endangered whales from construction and operation activities, and requested an analysis of the cumulative impacts of the project and other energy infrastructure projects in the area;
- November 14 and December 1, 2006 – The FWS commented that the FERC should only make a conditional project approval (i.e., one that approves a pipeline route over refuge lands) if Downeast has filed a right-of-way application with the FWS and evaluated impacts in the refuge on biological resources including wetlands, rare or listed species, migratory and non-migratory birds, mammals, reptiles, amphibians, and fishes, advising that the only biologically suitable construction window in the refuge would be from December 1 through January 31 of any given year, and again expressed concerns about effects on bald eagles and Atlantic salmon;
- January 16, 2007 – The Cove Brook Watershed Council commented requesting that the FERC evaluate impacts on endangered species and their ecosystems within the Cove Brook Watershed and the Penobscot River;
- January 16, 2007 – The Maine Atlantic Salmon Commission (ASC) commented about the potential adverse impacts on listed and non-listed Atlantic salmon populations of the Downeast sendout pipeline and any M&NE pipeline expansion and requested that such impacts be addressed in the EIS;
- January 23, 2007 – The FWS requested that the EIS evaluate how the disturbance of riparian vegetation could impact Atlantic salmon habitat, examine the location of bald

eagle nests, and determine the effects of the project on the New England cottontail, a candidate species for federal listing. The FWS also requested that the FERC prepare a BA to evaluate the potential effects on listed species in the action area; and pointing out that a M&NE expansion could impact stream ecology and stream-side vegetation, vernal pools, state-listed species, wetlands and forested wetlands, and bird nesting habitat;

- January 23, 2007 – The U.S. Department of the Interior commented about potential impacts on the Saint Croix Island International Historic Site, the Roosevelt Campobello International Park, the Moosehorn NWR, the threatened bald eagle (which has since been delisted) and endangered Gulf of Maine Distinct Population Segment (DPS) of the Atlantic salmon, and other fish and wildlife resources in the ecologically unique and productive Cobscook Bay ecosystem, and wildlife resources of the Maine Coastal Islands NWR off the coast of Maine;
- January 31, 2007 – The Maine ASC commented that a significant portion of the Downeast LNG Project would be within the range of the endangered Atlantic salmon DPS;
- January 31, 2007 – NOAA Fisheries commented that the EIS should examine the potential effects of the Downeast LNG Project on each species listed on the ESA, including the Gulf of Maine DPS of Atlantic salmon, leatherback sea turtles, North Atlantic right whales, humpback whales, and fin whales and requested that the FERC prepare a BA;
- February 20, 2007 – The Maine ASC claimed that low numbers of adult salmon returned to the St. Croix River in 2005 and 2006, and the Passamaquoddy Bay, the Magaguadavic, and Digdeguash Rivers have salmon which migrate to the bay;
- February 20, 2007 – Downeast responded to the Maine ASC's comments stating that there are no known Atlantic salmon runs north in the Passamaquoddy Bay or the St. Croix River, and the Downeast LNG Project pier would not occur within any substantial migration pathway;
- February 20, 2008 – The Passamaquoddy Tribe at Pleasant Point transmitted comments to the FERC relative to the Downeast LNG Project indicating its concern about potential impacts on Atlantic salmon, water quality, and the tribe's sovereign lands that occur in the area of the Downeast LNG Project;
- March 14, 2008 – The Maine Natural Areas Program indicated that no rare plants are known to occur near the modified sendout pipeline route;
- June 25, 2009 – NOAA Fisheries submitted its comments on the draft EIS and BA recommending seasonal work restrictions; requesting that Downeast develop in consultation with NOAA Fisheries a vessel strike avoidance plan and a compensatory mitigation plan; that FERC provide more information on Atlantic Salmon sampling protocols, winter flounder habitat in the project area, and methods to avoid egg and larval entrainment; and that FERC consider a co-located sendout pipeline, among other comments;

- July 6, 2009 – The EPA commented on the draft EIS that the geographic study area for cumulative impacts on marine mammals be extended and that the EIS include a discussion of acoustic monitoring devices to reduce vessel strike risks on marine mammals;
- August 31, 2009 – NOAA Fisheries responded to FERC's letter dated May 19, 2009, which requested NOAA Fisheries' concurrence with the determinations of effect in the BA included as an appendix to the draft EIS, indicating that the ship strike avoidance plan had not yet been received;
- September 24, 2009 – The FWS commented on the draft EIS that expansion of the M&NE system to accommodate the gas imported at the Downeast LNG terminal is an interdependent action that should be considered as part of the Section 7 consultation for the Downeast LNG Project and requested updates to tables and text of the EIS to reflect the new, expanded Gulf of Maine DPS and designated critical habitat for Atlantic salmon, among other comments.

1.2 ACTION AREA

The action area for the purposes of this BA is defined in 50 CFR 402.02 as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." The action area for the Downeast LNG Project includes the terminal and surrounding waters that would be ensonified by noise levels exceeding NOAA Fisheries criteria for acoustic harassment, and the right-of-way and construction work areas for the proposed sendout pipeline (figure 2-1; EIS appendices E and F) and a nonjurisdictional electric transmission line and substation. In addition, the action area includes the vessel transit paths for all vessel traffic associated with the Downeast LNG Project, including the waterway to the LNG terminal and the approaches to the waterway from the LNG vessels' point of entry into the U.S. Exclusive Economic Zone (EEZ) (defined as 200 nautical miles), as well as the route of construction vessel transits from the Port of Bangor to the terminal (figure 2-4; EIS, appendix F-1). All waters between the EEZ and the terminal are included in the discussion of impacts in the action area. Impacts in the Grand Manan Channel, Western Passage, and Passamaquoddy Bay would be the same as those in the open water. This area encompasses several agency jurisdictions including the FWS (all onshore portions of the Downeast LNG Project), NOAA Fisheries (all surface waters, extending out to the EEZ), and the Coast Guard (from the terminal out to the limit of the territorial seas [12 nautical miles]).

1.3 SPECIES AND HABITATS CONSIDERED

This BA was prepared in accordance with FWS regulations, found at 50 CFR 402, to address the construction and operation of the Downeast LNG Project and covers the federally endangered and threatened species and designated and proposed critical habitat that may occur in the Downeast LNG Project action area.

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Federally Listed Endangered or Threatened Species and Designated Critical Habitats

In the general Downeast LNG Project area, 18 species are currently listed as threatened or endangered under the ESA (table 1.2.1-1). The bald eagle was delisted from federal protection under the ESA effective August 8, 2007; this species is addressed in the EIS in the context of its protected state status and as a protected resource under the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act. Of the federally listed species, three fish species, one reptile species, and six mammal species potentially occur within the Project area and thus are considered in detail in this BA. This includes the Atlantic sturgeon for which the status has changed from candidate to threatened since we issued the initial BA in 2009. The Downeast LNG Project occurs outside of the known range of the loggerhead and Kemp Ridley's sea turtles and these species are not considered further here. The roseate tern, prairie white-fringed orchid, small whorled pogonia, and Furbish's lousewort are not considered further here due to a lack of suitable habitat in the Downeast LNG Project area. The piping plover and Canada lynx have designated critical habitat; however, the critical habitat does not occur within the project area. Moreover, there is no suitable habitat for the piping plover or Canada lynx within the project area; therefore, these species are not considered further. We conclude that the project would have no effect on the roseate tern, prairie white-fringed orchid, small whorled pagonia, Furbish's lousewort, piping plover, or Canada lynx.

Designated critical habitats exist for the North Atlantic right whale and the Atlantic salmon in the project area, as listed in table 1.2.1-1 and discussed in sections 4.4.1.1 and 4.1.1, respectively. Critical habitat has also been designated for the leatherback sea turtle; however, as explained below (section 4.3.1), the critical habitat for this species occurs well outside the project area.

Table 1.2.1-1

Species Listed Under the Endangered Species Act

Species	Status	Designated Critical Habitat	Habitat Type in Proximity to Project	Occurrence in the Project Area
Fish				
Atlantic salmon (*Salmo salar*)	Endangered	Yes – occurs in action area	Dennys River (ME) and other streams within the DPS Geographic Range	Waterway; LNG Terminal; Sendout pipeline
Atlantic sturgeon (*Acipenser oxyrinchus*)	Threatened; (Gulf of Maine DPS)	No	Coastal bays, estuaries, and rivers	Waterway; LNG Terminal
Shortnose sturgeon (*Acipenser brevirostrum*)	Endangered	No	Coastal bays, estuaries, and rivers	Waterway; LNG Terminal
Reptiles				
Loggerhead sea turtle (*Caretta caretta*)	Threatened	No	Project area is beyond known habitat range for the species.	None known
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered	Yes – does not occur in action area	Marine – offshore	Waterway; LNG Terminal
Atlantic Ridley sea turtle (*Lepidochelys kempii*)	Endangered	No	Project area occurs north of typical range; extremely rare occurrence within Gulf of Maine.	None known
Mammals				
North Atlantic right whale (*Eubalaena glacialis*)	Endangered	Yes – may occur in action area	Coastal	Waterway; LNG Terminal
Sei whale (*Balaenoptera borealis*)	Endangered	No	Coastal	Waterway; LNG Terminal
Blue whale (*Balaenoptera musculus*)	Endangered	No	Offshore	Waterway
Fin whale (*Balaenoptera physalus*)	Endangered	No	Coastal	Waterway; LNG Terminal
Humpback whale (*Megaptera novaeangliae*)	Endangered	No	Coastal	Waterway; LNG Terminal
Sperm whale (*Physeter macrocephalus*)	Endangered	No	Offshore	Waterway
Canada lynx (*Lynx Canadensis*)	Threatened	Yes – does not occur in action area	Suitable habitat not present in action area.	None known
Birds				
Piping plover (*Charadrius melodus*)	Threatened	Yes – does not occur in action area	Suitable habitat not present in action area.	None known
Roseate tern (*Sterna dougallii dougallii*)	Endangered	No	Suitable habitat not present in action area.	None known
Plants				
Prairie white-fringed orchid (*Platanthera llecuophaea*)	Threatened	No	Suitable habitat not present in action area.	None known
Furbish's Lousewort (*Pedicularis furbishiae*)	Threatened	No	Suitable habitat not present in action area.	None known
Small whorled pogonia (*Isotria medeoloides*)	Threatened	No	Suitable habitat not present in action area.	None known

1.4 EVALUATION METHODOLOGY

Our analysis of potential effects focuses on facilities that are under the FERC's jurisdiction in Downeast's application (i.e., the proposed LNG terminal and 29.8 miles of sendout pipeline) and the waterway used for LNG marine traffic to reach the LNG terminal under the Coast Guard's jurisdiction. One nonjurisdictional facility (an electric transmission line and substation) would also be constructed in association with the project.

This BA describes existing environmental conditions and the current status of listed species in the action area; discusses direct, indirect, interdependent, and interrelated effects of the proposed action on the status of each species and any critical habitat; and addresses cumulative effects. Factors considered in evaluating potential effects include changes to the physical environment (habitat impacts), alteration of prey species distribution and abundance, exposure to contaminants, inadvertent spills, vessel strikes and physical harassment, impingement/ entrainment during water intakes, ingestion of marine debris, and acoustic disturbance and harassment. The potential to avoid, minimize, or mitigate for any adverse effects was also an important part of the determination.

Four levels of impact duration were considered: temporary, short-term, long-term, and permanent. Temporary impact generally occurs during construction with the resource returning to preconstruction condition almost immediately afterward. Short-term impact could continue for up to three years following construction. Impact was considered long-term if the resource would require more than three years to recover. A permanent impact would be any activity that modifies a resource to the extent that it would not return to preconstruction conditions during the life of the project, such as the construction of an LNG terminal.

This BA is based on the best available scientific and commercial data. Data and information pertaining to the proposed action and its potential effects were collected through a combination of coordination and communication with interested parties, review of the best available data in existing literature and reference materials, and field site assessment. Although we used information provided by Downeast in developing this assessment, including an applicant-prepared BA and supplemental information, the information presented has been independently reviewed and verified. The FERC is responsible for the content of the assessment and for the findings of effect presented herein.

1.4.1 Existing Literature and Reference Materials

Supporting documents and studies providing specific information about local populations used in this BA include both general and specific references related to the biological resources in the action area, listed species status reviews and recovery plans, the Maine Natural Area Program's (Maine NAP) Natural Landscapes of Maine classification system (Gawler and Cutko 2004), and surveys and studies prepared by Downeast. The Services provided lists of federally endangered or threatened species for the action area.

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In addition to the documents described above, the Maine Department of Inland Fisheries and Wildlife (Maine DIFW), Maine Department of Marine Resources (Maine DMR), Maine NAP, and Maine ASC were consulted for information about federally listed species that might occur within the action area. The following databases were searched for records of listed and proposed species occurrences that could be affected by construction and operation of the LNG terminal and sendout pipeline: Maine Large Whale Take Reduction Program, Recent Whales Sighting Map; and Maine NAP.

Downeast's documents, data, and other resource information are on file with the FERC and are part of the administrative record for the project. Public information included in the FERC's administrative record can be accessed from our eLibrary site (http://www.ferc.gov/docs-filing/elibrary.asp) by referencing FERC Docket Nos. CP07-52-000, CP07-53-000, CP07-54-000, and CP07-55-000. The most relevant information is summarized and presented and/or included as an attachment to this BA.

1.4.2 Field Site Assessment

Downeast conducted a pre-construction reconnaissance survey for state and federally listed rare, threatened, and endangered (RTE) species and critical habitats at the proposed 80-acre import terminal site and along the proposed sendout pipeline right-of-way. The Maine NAP, Maine DIFW, Maine ASC, and FWS were initially contacted for information regarding documented occurrences of RTE species within or near the project area. Prior to performing the survey, Downeast reviewed existing maps, aerial photos, bedrock geology and soil maps, and National Wetlands Inventory (NWI) data to identify areas likely to support RTE species and critical habitats (i.e., wetlands, shoreline outcrops, and intertidal habitat). Downeast conducted a field survey of the import terminal site between July 12 and July 15, 2005. Downeast's survey for the presence of RTE plant species along the sendout pipeline right-of-way was conducted concurrently with the wetland delineation. Documentation regarding the field surveys is included in attachment A.

If new information regarding threatened or endangered species occurring in the Downeast LNG Project area becomes available during the course of construction, the FERC would reinitiate consultation under the ESA, as appropriate.

2.0 DESCRIPTION OF THE PROPOSED ACTION

Downeast would construct the LNG terminal in the Town of Robbinston, at the northeastern edge of Washington County, Maine (figure 2-1). Downeast selected this location after an intensive regional site analysis evaluating 27 potential sites in Maine, Massachusetts, Rhode Island, and Connecticut. The Downeast LNG Project site would be south of the confluence of Passamaquoddy Bay and the St. Croix River between the larger towns of Eastport/Perry and Calais, Maine. The LNG vessels would transit through Head Harbor Passage, Western Passage, and Passamaquoddy Bay to arrive at the proposed terminal (figure 2-4). The LNG terminal would be on the south side of Mill Cove within an approximate 80-acre parcel of private land that Downeast holds an option to purchase (figure 2-2). Revaporized LNG would then be transported from the terminal through a single 30-inch-diameter natural gas pipeline which would stretch 29.8 miles to interconnect with the interstate gas pipeline system of M&NE near M&NE's Baileyville, Maine compressor station[2] (figure 2-1). A non-jurisdictional electric transmission line and substation also would be constructed in association with the Downeast LNG Project. The following subsections describe the facilities, land requirements, construction, operations, and maintenance of the proposed LNG terminal and sendout pipeline.

2.1 LNG TERMINAL FACILITIES

2.1.1 Proposed LNG Terminal Facilities

The LNG terminal facilities would consist of a vessel unloading facility (one vessel berth and unloading platform), two LNG storage tanks, vaporization and vapor handling system, vent system, hazard detection and response system, hazard control system, metering, and support buildings and piping structures.

A preliminary site configuration and plot plan with trestle layout for LNG vessel offloading is shown in figure 2-3. The marine terminal for the unloading of LNG vessels consists of the following:

- a 3,862-foot-long, 37-foot-wide pier with a single berth that would accommodate LNG vessels with cargo capacities ranging from 70,000 to 165,000 m^3;
- four manifolded, articulated 16-inch-diameter stainless steel unloading arms, three for LNG delivery and one for vapor return line to the LNG ship; and
- one 36-inch-diameter single walled stainless steel insulated transfer pipeline.

The import terminal site would accommodate the LNG storage facilities, administrative buildings, access roads, and parking areas. The storage terminal consists of the following facilities:

- two insulated LNG storage tanks, each with a nominal usable storage capacity of 160,000 m^3;

[2] The most recent alignment sheets were filed with the FERC on March 11, 2010 and can be found on eLibrary (http://www.ferc.gov/docs-filing/elibrary.asp) by referencing FERC Docket Nos. CP07-52-000, CP07-53-000, CP07-54-000, and CP07-55-000.

- two fully submerged low pressure transfer pumps to transfer the LNG from the storage tanks to the LNG sendout pumps;
- boil-off gas (BOG) recovery system consisting of three BOG compressors, two vapor blowers, and direct contact re-condenser to re-liquefy the BOG;
- four submerged combustion vaporizers (SCV) to re-vaporize LNG to natural gas;
- electrical power distribution, including power substations and transformers;
- ancillary terminal facilities, including control room, maintenance shop, warehouse, office, security, and safety systems;
- measurement controls and natural gas metering facilities; and
- a comprehensive hazard monitoring system incorporating flammable gas detectors, high and low temperature detectors, smoke detectors, and local emergency shutdown controls.

2.1.2 LNG Terminal Facilities Land Requirements

Construction and operation of the proposed LNG terminal would require about 47 acres of the 80-acre parcel. Of the 47 acres required for construction and operation of the LNG terminal, approximately 9 acres of forested and scrub-shrub wetlands would be permanently altered by clearing, grading, and filling. The remaining 33 acres of the terminal site would remain undisturbed to maintain the site's natural vegetation perimeter as well as a setback from the access roads and shoreline. Construction and operation of Downeast's pier trestle and unloading platform would be constructed on 3.6 acres of submerged lands in Passamaquoddy Bay, based on the surface area of the pier, which are owned by the State of Maine. However, only 0.1 acre of submerged land (subtidal and intertidal wetlands) would be directly disturbed by the pilings. Table 2.1.2-1 summarizes the land requirements for the proposed LNG terminal. Access to the LNG terminal would be by way of U.S. Route 1.

Several temporary facilities would also be required to support the construction effort. These include offices, sanitary facilities, warehouses, construction laydown areas, construction utilities, access roads, security infrastructure, and fencing. Off-site staging areas would be used for some fabrication, employee parking, and material/equipment storage.

Table 2.1.2-1

Summary of Land Requirements for the Proposed LNG Terminal Facilities

Facility/Use	Land Affected During Construction (acres)	Land Affected During Operation (acres)
LNG Terminal		
Terminal land based facilities a/	47.0 a/	47.0
Pier trestle and unloading platform b/	3.6	3.6
Total	**50.6**	**50.6**

a/ Includes sendout pipeline pig launching facility inside the terminal property. Does not include acreage for three off-site temporary pipeline and terminal laydown areas. These are included in section 2.3.2.

b/ Only 0.1 acre of submerged land would be directly disturbed by the pilings.

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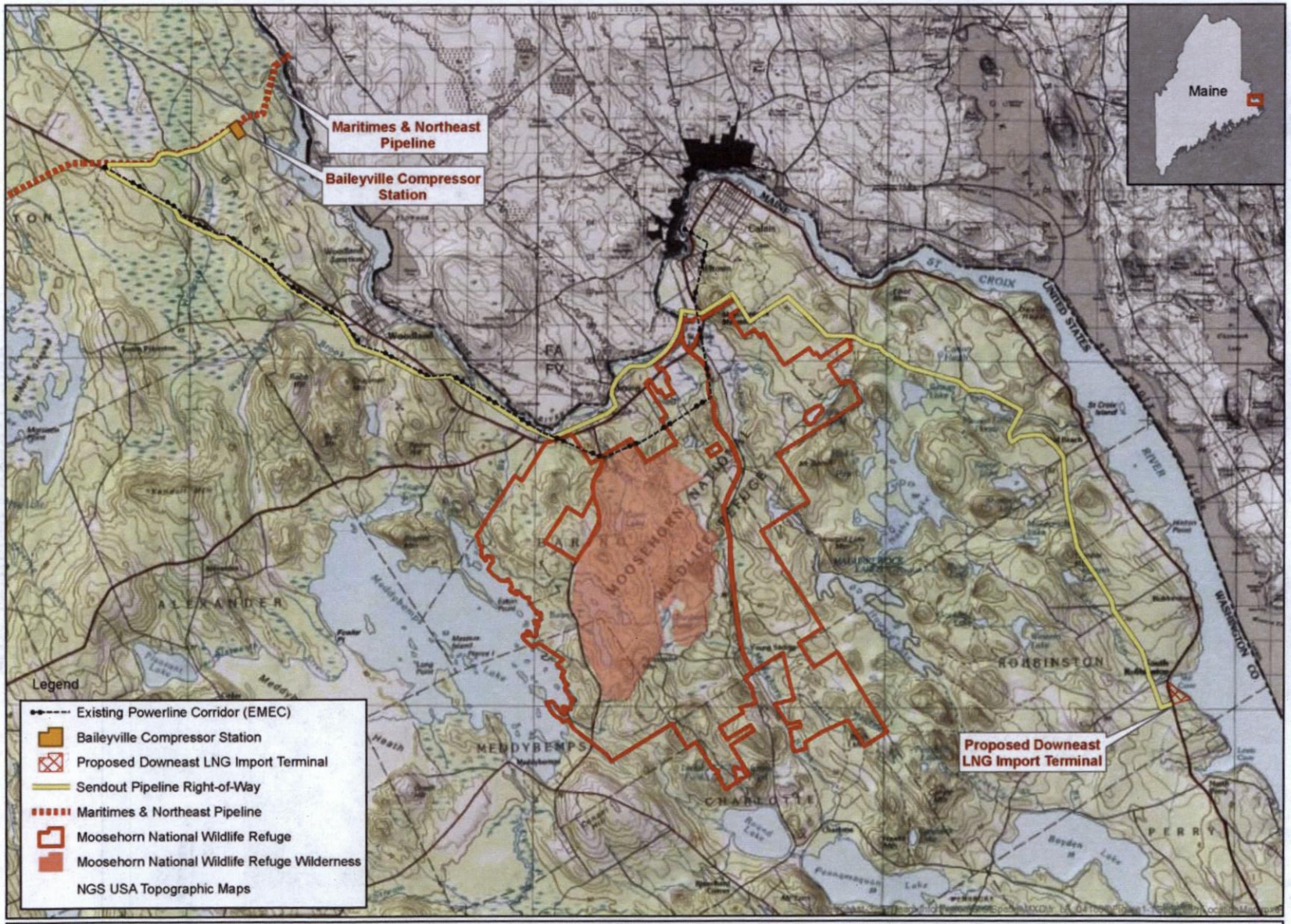

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Figure 2-1
Downeast LNG Project
General Project Location Map

0 0.5 1 2 3 4 Miles

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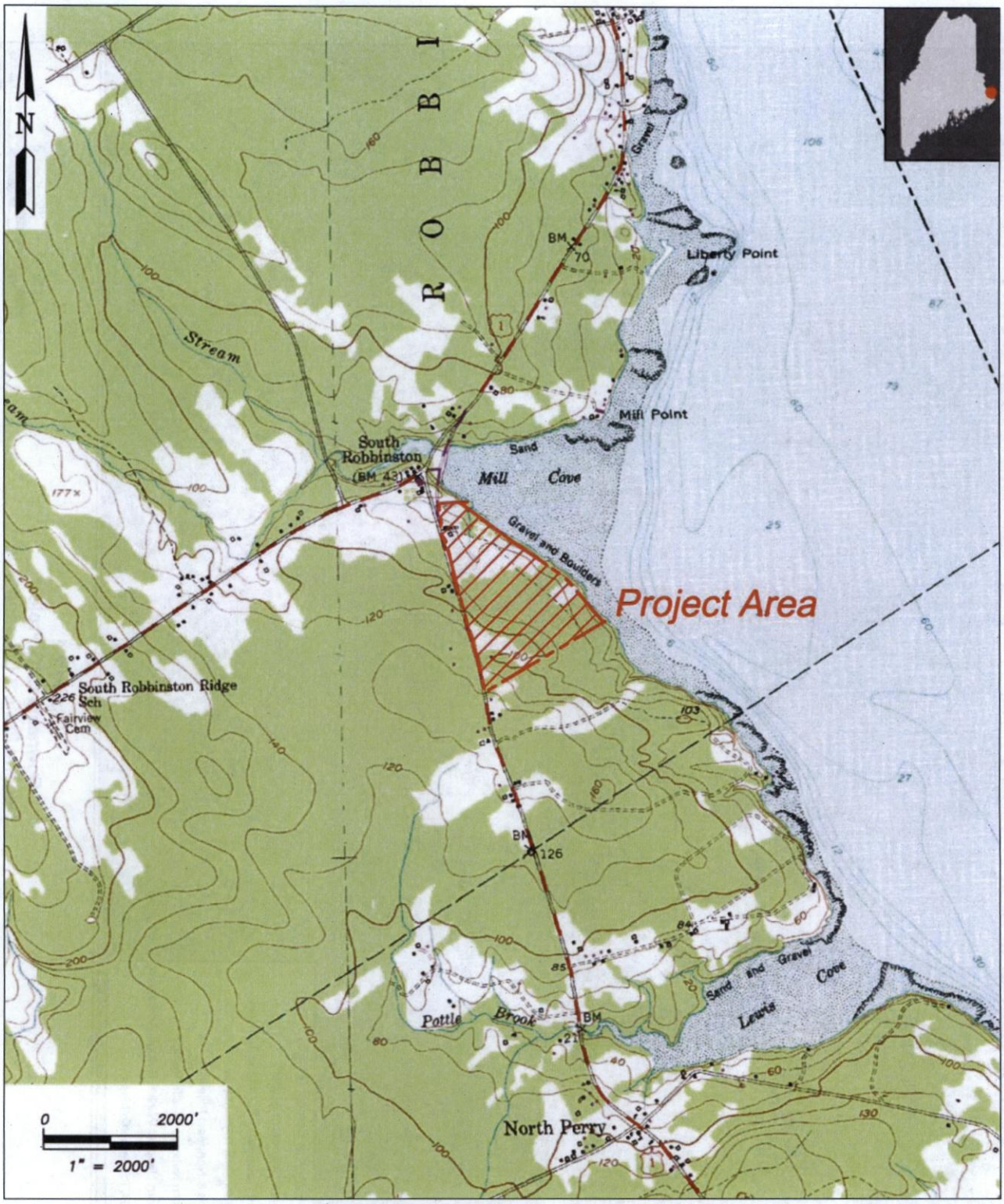

Figure 2-2
Downeast LNG Project
LNG Terminal Location Map

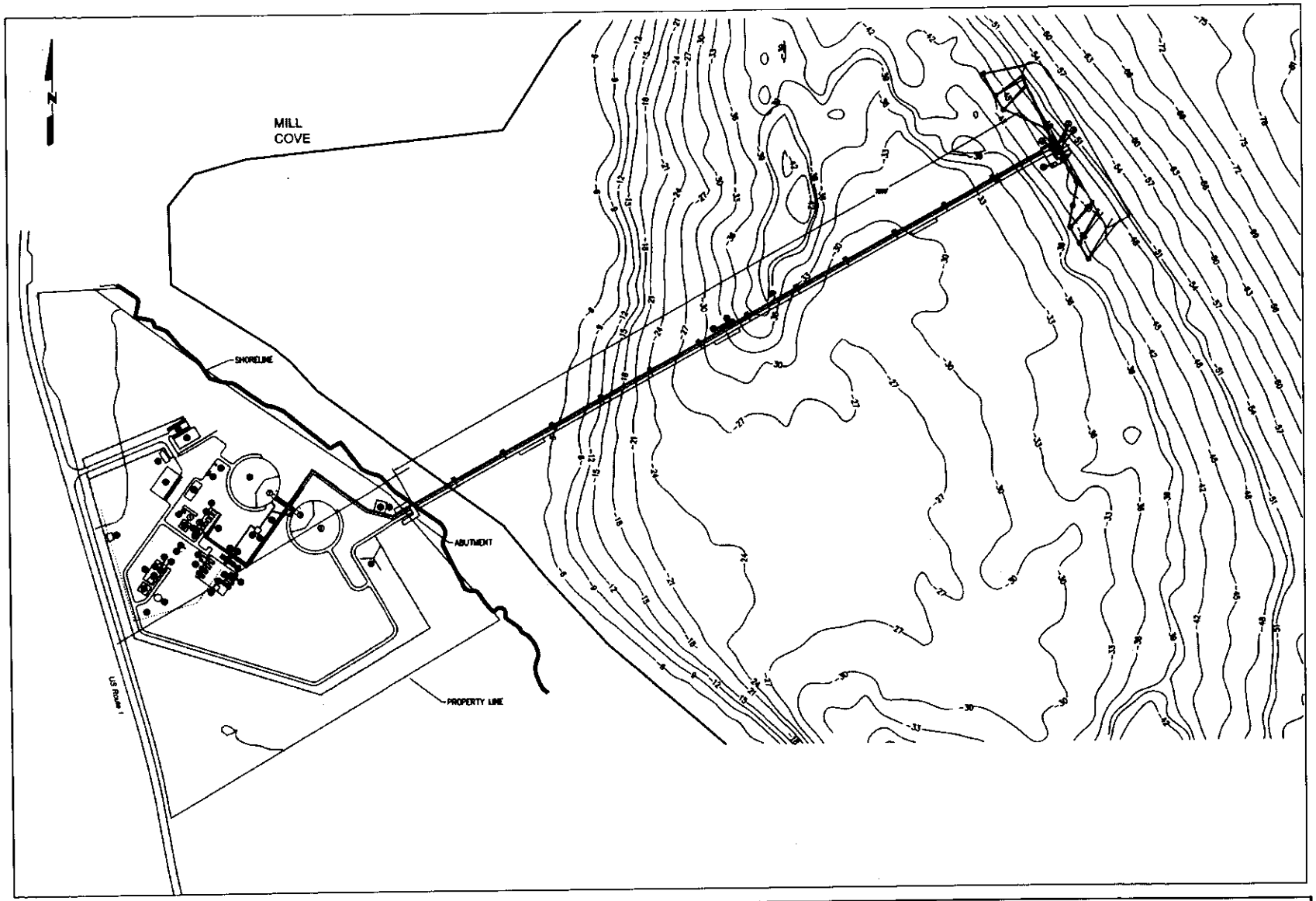

Figure 2-3
Downeast LNG Project
LNG Terminal Plot Plan

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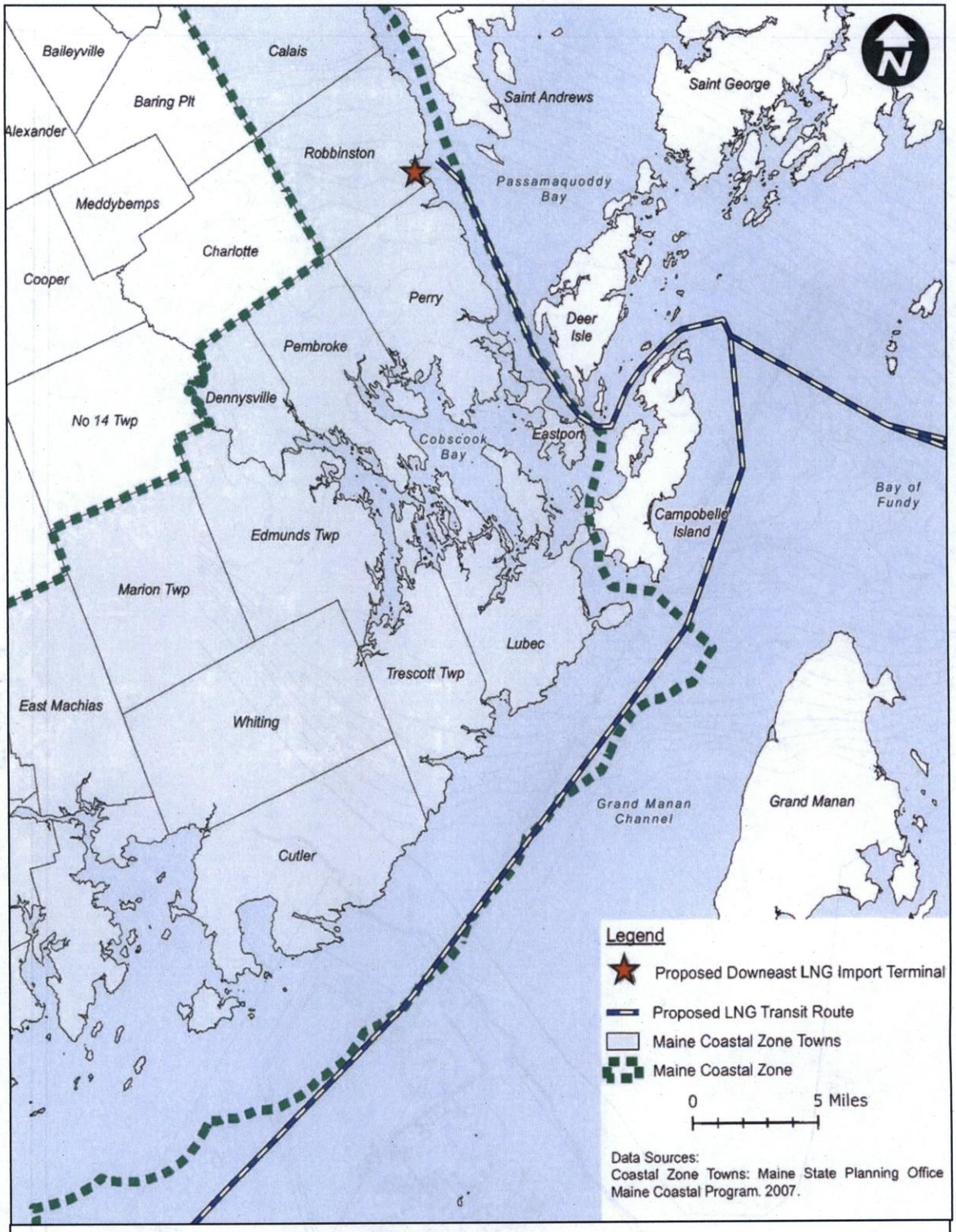

Figure 2-4
Downeast LNG Project
Waterway for LNG Marine Traffic

The primary laydown area would be within the disturbed area for the LNG terminal. As the construction progresses on the site, open areas available for construction laydown may become more limited and off-site areas would be used for the overflow if needed. The three off-site areas that would be used as overflow sites are previously disturbed by logging, construction laydown, acreage clearance, or open burning. Although additional acreage is available, the Downeast LNG Project would use only previously disturbed areas as potential construction laydown sites to avoid clearing. All affected landowners have agreed to the use of their land by the Downeast LNG Project and land lease negotiations have been completed.

2.1.3 LNG Terminal Facilities Construction Procedures

Downeast would construct its LNG facilities in accordance with the FERC's *Upland Erosion Control, Revegetation and Maintenance Plan* (Plan), *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures) and M&NE's *Soil Erosion and Sediment Control Guidelines* (excluding appendices) used to construct the Phase II Pipeline Project in northeastern Maine. The FERC's Plan and Procedures are available for viewing on the FERC Internet website at www.ferc.gov. The M&NE Guidelines are provided in appendix H of the EIS. Because Downeast has adopted the FERC Plan and Procedures, and the M&NE *Soil Erosion and Sediment Control Guidelines*, these documents will be hereafter referred to as Downeast's Plan, Procedures, and *Soil Erosion and Sediment Control Guidelines*. Prior to construction, Downeast would prepare an Environmental Control Plan that would include its Plan and Procedures, and *Soil Erosion and Sediment Control Guidelines* as well as other applicable federal, state, and local requirements.

To prepare the terminal site for construction, areas of the onshore facilities that would be disturbed by construction activities would be stabilized with temporary erosion controls, which would be maintained until construction is complete.

The terminal site has sufficient space to allow all work to be done on-site but would require additional clearing which would reduce the buffer area around the site perimeter. In order to keep as much of the on-site vegetation as possible for use as a buffer (visual, noise, etc.), off-site areas that have been previously disturbed would be used for at least some of the fabrication and material/equipment storage for the site construction.

The near-surface competent bedrock would preclude the need for deep foundations or extensive excavations. The cut/fill balance is expected to remain on-site. The only fill that may be required to be imported is structural stone for some of the foundations and possibly the on-site roads.

Some of the larger materials needed for the LNG terminal would be delivered to the project site and constructed from working marine barges traveling from the Port of Bangor. All other required materials would be transported to the site via truck from Eastport, Maine.

Following completion of the onshore construction activities, the site would be permanently stabilized and restored through a combination of graveling, covering, seeding and landscaping to

prevent erosion in accordance with Downeast's Plan, Procedures, and *Soil Erosion and Sediment Control Guidelines*, as well as any other federal (e.g., COE) or state mandates (e.g., Maine Department of Environmental Protection [DEP]).

2.1.3.1 Berthing, Vessel Unloading, and Transfer Facilities

The LNG pier trestle construction would be accomplished using a combination of "over the top" construction using land-based equipment and off-shore marine-based equipment. The "over the top" method uses a temporary (movable) construction steel frame to support the crane in lieu of the permanent concrete beams and deck system. This construction method eliminates the use of barge-mounted equipment, which results in a substantial reduction of impacts on the seabed from anchoring and propeller wash. As the pier construction progresses into deeper water, the construction methodology would switch to marine-based equipment using a floating or jackup barge to install the remaining portion of the trestle and unloading platform. This construction method would minimize the use of barge-mounted equipment, resulting in a substantial reduction of impacts on the seabed from anchoring and from propeller wash.

Large diameter steel pipe piles would support the trestle and loading platform. Downeast would vibrate these piles to drive them through any surficial soils on the seabed to the top of the underlying rock where they would be seated into competent bedrock. The piles would be anchored into the bedrock using drilled rock sockets using rotary auger methods. Downeast would only require impact driving to embed or "seat" the piles into the top of the bedrock, likely only a few feet, to seal the bottom of the piles into the rock so that rock sockets can be installed. Although the area of the pier itself would be 3.6 acres, the impact of the piles on submerged land would be 0.1 acre.

Downeast would construct the LNG mooring and breasting dolphins using floating or jackup marine-based equipment. The dolphins would either be multiple steel pipe piles supporting a large concrete cap, or a very large single steel-pipe type dolphin (monopile). These piles would be similarly driven through any surficial soils, if any, at the seabed until the top of rock is encountered, where it would then be seated and affixed to the rock using drilled rock sockets. A precast concrete form would be used to contain the cast-in-place concrete used for the remainder of the pile cap. Finally, Downeast would mount the fenders, mooring hooks and other topside equipment (railing, ladders, lights, etc.).

Once the loading platform and breasting and mooring dolphins are in-place, Downeast would erect the fabricated steel truss walkways by marine equipment to interconnect the structures for personnel access and operations.

Downeast would also incorporate the following into the design of the unloading platform:

- a pier jetty control room providing control and monitoring capabilities remotely from the Main Control Room during vessel unloading operations;
- a facility firefighting system extended to the unloading berth;

- a gangway to allow access to/from the LNG vessel for customs and immigration officials, pilots, operations personnel (including unloading supervisor), and crew members;
- gangways between the unloading platforms and berthing dolphins for use by line handlers during the berthing and unberthing of LNG vessels; and
- an LNG spill trough beneath the unloading platform and LNG transfer pipe to route any LNG spills to the terminal's LNG spill containment system. This would be designed in accordance with the requirements of National Fire Protection Association (NFPA) 59A Section 5.2.

The unloading platform and associated infrastructure include provisions to park a trailer at the pier head and to maintain a turnaround area for a small crane/truck or emergency vehicles. The trailer would be used to transport materials and equipment to/from the pier head for routine and corrective maintenance. Downeast would leave sufficient space for turnaround of a crane/truck if the trailer is left parked. Marine construction would be expected to take approximately 16 months.

2.1.3.2 LNG Storage and Vaporization Facilities

Downeast would construct the two 160,000 m^3 full containment LNG storage tanks on a ground reinforced concrete slab foundation. The ground preparation for the installation of the LNG storage tank foundation would take approximately seven months. Once the ground is prepared, installation of the foundation would take approximately four months and the the LNG storage tank would take an additional 20 months to complete.

Construction of the LNG storage tank and foundation would include the following key activities:

- prepare and level the area upon which the LNG storage tank and foundation would be located;
- form and pour the concrete foundation. The tank base heating elements would be installed within the poured concrete;
- construct the outer tank carbon steel liner, install the outer tank carbon steel bottom liner on the foundation, erect the outer tank carbon steel roof liner on the outer tank bottom and erect the inner tank suspended deck and connect to the steel roof;
- raise the outer tank steel roof and suspended deck using an air lift procedure and weld to the top compression bar;
- install the tank bottom insulation;
- install the secondary tank and inner tank bottoms;
- erect the inner tank shell;
- construct the outer tank concrete walls;
- install the outer tank concrete roof;
- install and tension concrete wall pre-stress tendons;

- install tank internal accessories, such as pump columns, bottom and top fill pipework, instrument wells, purge and cool-down pipework;
- install tank external accessories, such as tank instrumentation, electrical equipment, pipework, roof platforms and access stairways;
- hydrotest the inner tank and, once complete, air dry the tank;
- final installation of the tank internal and annual space instrumentation;
- install tank insulation (once tank is completely dry);
- complete visual inspections and conduct final tank clean;
- install in-tank LNG pumps; and
- purge tank with nitrogen to a positive pressure and prepare for cool-down.

Downeast would hydrostatically test the storage tanks in accordance with American Petrolium Institute (API) Standard 620, Appendix Q.8. API Standard 620 deals with the design and construction of large, welded, field-erected low-pressure carbon steel aboveground storage tanks (including flat-bottom tanks) with a single vertical axis of revolution, and Appendix Q.8 deals with low-pressure storage tanks for liquefied hydrocarbon gases at temperatures not lower than -270 degrees Fahrenheit (°F) (Techstreet 2008). Downeast would fill the inner tank with approximately 28 million gallons of water. At the maximum level calculated, the water would be maintained for at least 48 hours for inspection. Downeast states that although a combination of sources may be used (water from the on-site deep well, water trucked in from a municipal or industrial supply, or Passamaquoddy Bay water), the principle source of test water would likely be from Passamaquoddy Bay. The tank would be filled and emptied as quickly as possible. After testing, the tank would be cleaned with fresh water and dried. Downeast would sample and analyze the water prior to discharge in accordance with Maine DEP requirements. If no chemicals or biocides are used in the hydrostatic test water, Maine DEP has indicated that a total suspended solids analysis would be the only analysis required.

2.1.4 LNG Terminal Operation and Maintenance Procedures

Procedures for the operation and maintenance of the import terminal would be developed to comply with the requirements of:

- 49 CFR 193, Subpart F – Operations and NFPA 59A Chapter 14 – Operating, Maintenance and Personnel Training;
- 49 CFR 193, Subpart G – Maintenance and NFPA 59A Chapter 14 – Operating, Maintenance and Personnel Training; and
- 49 CFR 193, Subpart J – Security and NFPA 59A Annex C – Security.

Downeast would train all permanent terminal operations and maintenance personnel to be qualified to operate the LNG import terminal in accordance with the requirements of 49 CFR 193, Subpart H – Personnel Qualifications and Training, and also NFPA 59A Chapter 14 – Operating, Maintenance and Personnel Training.

Operation of the Downeast LNG Project would require several utility and auxiliary systems, such as electrical power distribution, potable and service water, sanitary sewer and water treatment, storm sewer and disposal, and waste/oily water collection and treatment.

Downeast would operate the import terminal on a permanent 24 hour basis. LNG vessels would deliver LNG to a single unloading berth on the terminal's pier (see description of LNG vessels in section 2.2). The berthing terminal would be where the water depth is approximately 50 feet mean low low water (MLLW). The arrival/mooring/unloading/departure sequence would be completed in less than 24 hours. The frequency of unloading events would vary from an average of once every 10 days during summer operation to once every 5 to 7 days during winter operation.

Upon arrival at the terminal, the ship would berth using a site-specific vessel approach system and secured with a mooring system equipped with a line monitoring system to continuously monitor tension of all mooring lines. The vessels would use onboard pumps to transfer the LNG at approximately -260°F through the unloading arms and insulated pipeline to the LNG storage tank. The marine terminal facility unloading system is designed to unload at a rate of 14,000 m^3 per hour.

LNG vessels would use water during unloading as ballast and to cool the engines generating power for the off-loading pumps and other onboard systems (e.g. hoteling). Although ballast water intake by the LNG vessel would occur during offloading of the LNG, no release of ballast water would occur within Passamaquoddy Bay. Any limited discharge of ballast water that should occur would be conducted in accordance with the Coast Guard's mandatory ballast water management program (33 CFR 151). The water used for hoteling would consist of engine cooling water that would be discharged back to Passamaquoddy Bay. A 165,000-m^3 LNG vessel would require a maximum of 55.5 million gallons of water over a 21-hour period to support engine cooling while at the pier (a maximum average rate of 540 gallons per second). The cooling water discharge rate and location would vary by LNG vessel, but typically would be perpendicular to the hull (not directed downwards) and closer to the surface than bottom, such that bottom scour would not be a concern. The temperature of this water would be elevated by 5 to 10°F in comparison to the receiving waters of Passamaquoddy Bay. However, Downeast's Cornell Mixing Zone Expert System modeling indicates that the discharge plume associated with engine cooling would be relatively minor and dissapate to a 33.8°F or less temperature change from ambient conditions at approximately 49 to 98 feet on a vertical plane from the point of discharge under ambient current speeds of 1.6 feet per second and 0.16 feet per second, respectively.

During unloading, the newly added LNG would displace the vapor in the LNG storage tanks. This vapor would be returned to the vessel to maintain the pressure in the vessel's tanks. Additional BOG would be generated due to the heat added by the vessel's transfer pumps and the heat leaked into the tank and piping systems. Any BOG not returned to the vessel would be compressed by the BOG compressors and condensed in the BOG condenser.

The SCVs would be used to re-vaporize the LNG to natural gas. In each SCV, natural gas would be fired in a burner, or series of burners, submerged in a water bath. The SCV units produce their own water during normal operation. Specifically, the SCV units would produce a total of up to 109 gallons per minute (gpm) of water on a continuous volumetric design basis when the terminal is operating at peak sendout. This equates to a 24-hour discharge of between 122,400 and 156,960 gallons. This SCV generated water would be used in a number of ways, including firewater make-up, service water makeup, and other purposes involving resource recovery use. Downeast proposes to sell excess SCV water for offsite use to an independent party yet to be identified. Downeast states that it is in discussions with several such parties and is confident that a buyer for this water will be contracted. To ensure impacts are minimized in the event that the SCV water cannot be sold, we have recommended that Downeast file a final plan for the discharge of excess SCV water for our review and approval, prior to construction of the LNG terminal facilities. The plan should include discharge locations, rates, mitigation measures, and copies of applicable permit applications.

For the very first use of vaporizers (i.e., prior to SCV system start-up), approximately 20,200 gallons of water would be required to initialize the system. Water from the on-site wells, from commercial distributors, or a combination of both would provide the initial water volume for start-up of the SCVs. One supply well has been installed on-site and tested with a stable yield of 7.5 gpm. Existing supply wells on properties adjacent to the import terminal have yields in excess of 20 gpm. For major maintenance work requiring the water from an SCV unit to be drained, water from the in-service vaporizers would be used to fill empty vaporizer water baths.

When not in vessel unloading mode, the in-tank column-mounted LNG pumps would circulate LNG through a small diameter circulation line to the pier and back through the unloading line and to the sendout area in order to keep these piping systems cold. In sendout/vaporization mode, LNG pressure is increased to pipeline send-out pressure by High Pressure LNG pumps, before being vaporized into natural gas.

LNG would be pumped out of the LNG storage tank via in-tank, column mounted low pressure LNG sendout pumps. The LNG pressure is increased to pipeline sendout pressure by high pressure LNG pumps, before being vaporized into natural gas. Natural gas sendout would be routed by a gas pipeline distribution system to the M&NE pipeline system at the Baileyville Compressor Station for delivery to end users. Operation of the sendout pipeline is described in greater detail in section 2.3.4.

2.2 LNG VESSELS AND VESSEL TRANSITS

2.2.1 LNG Vessels

LNG vessels calling on the terminal would consist of vessels ranging in size from 70,000 to 165,000 m^3, with the potential for future vessels ranging up to 220,000 m^3. Vessels with a 145,000 m^3 storage capacity have a length of approximately 950 feet, breadth of 162 feet, and a draft of 41 feet. Typical LNG vessels are double-hulled and have containment systems consisting of the cargo tank, the secondary barrier, and insulation. LNG vessel construction is

highly regulated and consists of a combination of conventional vessel design and equipment, with specialized materials and systems designed to safely contain liquids stored at temperatures of -260°F.

2.2.2 Waterway to LNG Terminal

The proposed terminal would receive LNG from up to 60 LNG vessels per year from liquefaction plants throughout the world (e.g., Trinidad, Nigeria, Qatar, Algeria, Oman, Abu Dhabi, and Libya). Local pilots would control LNG ships during the LNG marine transit to and from the terminal. The pilots would decide whether the current and wind conditions allow safe entry to the harbor.

The Coast Guard assesses the suitability of the Head Harbor, Western Passage, and Passamaquoddy Bay Channels for LNG vessel traffic and must issue an LOR for the operation of the proposed facility. In a letter to the FERC dated July 5, 2007, the Coast Guard identified additional information needed to complete and submit a Waterway Suitability Report (WSR). On January 6, 2009, the Coast Guard issued an LOR and made an assessment in its WSR that the Head Harbour Passage, Western Passage, and Passamaquoddy Bay Channels are suitable for the type and frequency of LNG vessels proposed for the Downeast LNG Project with implementation of the risk mitigation measures listed in section 4.6 of the WSR. In accordance with the WSR recommendations, the attending pilots would decide, in consultation with, and the concurrence of, the Coast Guard Captain of the Ports, whether the weather, current, visibility, and wind conditions allow safe entry to the harbor. Based on recommendations in the WSR, three to four assist tugs would escort LNG ships (depending on carrier size) to provide assistance in the unlikely event of a mechanical failure to the LNG ship or during adverse weather conditions, with one tug tethered at all times during the transit to the terminal. The WSR also recommends that authorized Coast Guard vessels escort the LNG carriers during transit. In addition, the WSR recommends that a standby tug be moored outboard of the berthed LNG vessel during its stay at the terminal.

Upon entering the Gulf of Maine, the ships could potentially take two routes to the Pilot Station at Quoddy Head. One route is east of Grand Manan Island and follows the Vessel Traffic Scheme (VTS) as shown on nautical charts. The distance from the entrance of the Gulf of Maine to the pilot station along this route is 82 nautical miles. The second route, the Grand Manan Channel Route, is west of Grand Manan Island. There is no designated shipping lane along the western route, therefore it is left up to the Captain to choose the route based on visibility, wind, tide cycle, and other such constraints. The western route from the Gulf of Maine entrance to the pilot station is 42 nautical miles. The waterway for LNG marine traffic is shown on figure 2-4. The Coast Guard's WSR does not specifically authorize or approve one of the proposed routes.

From the pilot station near Quoddy Head, the LNG vessels would enter the harbor via the Head Harbor Passage, Western Passage, and Passamaquoddy Bay. The LNG vessels would enter the Head Harbor Passage approximately 1.5 miles from Quoddy Head at the northern end of Campobello Island. From the entry point, the LNG vessels would travel approximately

16.6 nautical miles along 13 different legs to the LNG terminal. The longest leg of the passage is in Passamaquoddy Bay and follows the United States and Canadian border.

The existing depth of the channel from Quoddy Head to the terminal varies from a minimum of 69 feet near Mill Cove to a maximum depth of 470 feet near Quoddy Head. Channel widths range between 2,600 and 13,700 feet. Water depth at the berthing terminal is approximately 45 to 50 feet MLLW. The width of the channel near Mill Cove is approximately 6,080 feet which exceeds industry guidelines for turning an LNG vessel. Therefore, terminal operation would not require the dredging of a turning basin.

LNG vessels typically travel at speeds up to 19.5 knots. However, a vessel transiting to the Downeast LNG terminal would not exceed 10 knots, beginning from Grand Manan Island to the LNG terminal facility, as is reasonable for the safe operation of the vessel and its crew. The speed restriction is consistent with the NOAA Fisheries final rulemaking in 50 CFR 224 that was implemented on December 8, 2008. This ruling requires vessels greater than 65 feet in overall length to reduce speeds to 10 knots or less when traveling through North Atlantic right whale habitats. These restrictions would be in effect in the Great South Channel area of the Atlantic Ocean from April 1 to July 31; near Race Point from March 1 to April 30; and Cape Cod Bay from January 1 to May 15.

2.3 SENDOUT PIPELINE

2.3.1 Proposed Facilities

The pipeline facilities would consist of a 29.8-mile-long, 30-inch-diameter natural gas sendout pipeline, three mainline valves (MLV), a pig launcher and pig receiver[3], and natural gas metering facilities. The proposed pipeline route is depicted in figure 2-1 and EIS appendix E. Upon leaving the import terminal, the pipeline heads westward and proceeds north-northwest for 11.6 miles to just south of Calais. This segment follows approximately the right-of-way of the old U.S. Route 1, which is now inactive. From south of Calais, the route turns west for 0.75 mile and then runs north for 0.5 mile to Magurrewock Mountain. The route then proceeds on the south side of Magurrewock Mountain and crosses U.S. Route 1. The sendout pipeline would be tunneled longitudinally under the St. Croix River using a staged horizontal directional drill (HDD). The alignment would parallel the Maine Central Railroad corridor along the St. Croix River for 0.5 mile, at which point the pipeline bears south away from the railroad corridor, turns southwest, and parallels U.S. Route 1 to another portion of the existing Eastern Maine Electric Cooperative (EMEC) electrical transmission corridor. The pipeline then follows the existing EMEC electrical transmission corridor until meeting the existing M&NE right-of-way which it paralells until it's terminus at M&NE's existing Baileyville Compressor Station.

[3] A pipeline "pig" is a device used to clean or inspect the pipeline. A pig launcher/receiver is an aboveground facility where pigs are inserted or retrieved from the pipeline.

2.3.2 Sendout Pipeline Land Requirements

Downeast's construction of the proposed pipeline and related facilities would disturb about 267 acres of land, including the construction right-of-way for the 30-inch-diameter sendout pipeline, additional temporary workspaces, pipeline and terminal laydown areas, pigging facilities, access roads, and MLVs.

2.3.2.1 Sendout Pipeline Right-of-Way and Temporary Extra Workspace Requirements

The sendout pipeline construction right-of-way would generally be 75 feet wide, with 50 feet of permanent right-of-way and an additional 25 feet of construction right-of-way/temporary workspace. Downeast would require site-specific locations where wider or narrower construction right-of-way depending on proposed construction techniques and environmental sensitivities. Generally, the construction working side of the right-of-way would be 45 feet wide and the side used for spoil storage would be 30 feet wide. Downeast would narrow its construction right-of-way to between 55 to 65 feet-wide in limited site-specific locations, such as along residential areas, existing roadways, wetlands, and within 100 feet of streambanks. Table 2.3.2.1-1 summarizes the land requirements for the proposed pipeline facilities. Additional temporary workspace of varying dimensions, adjacent to the construction right-of-way, would be required at 141 locations, primarily at road crossings, waterbodies, and wetlands.

TABLE 2.3.2.1-1

Summary of Land Requirements for the Proposed Pipeline Facilities

Facility	Land Affected During Construction (acres)	Land Affected During Operation (acres)
Pipeline		
Pipeline Right-of-Way	206.7 [a/] [b/]	131.1 [b/]
Additional Temporary Workspaces	11.5	0.0
HDD Additional Temporary Extra Workspaces	7.2	0.0
Terminal Construction and Pipeline Off-Site Laydown and Storage Areas [b/]	27.5	0.0
Access Roads	10.1	10.0
Pipe Storage Area	3.4	0.0
Subtotal	**266.4**	**141.1**
Aboveground Facilities		
Valve Station	0.3 [d/]	0.4 [e/]
Pigging Receiver [c/]	0.5	0.3
Subtotal	**0.8**	**0.7**
Total [f/]	**267.2**	**141.8**

[a/] Includes nominal 75-foot-wide construction right-of-way for the sendout pipeline.

[b/] This table excludes areas where HDD is being proposed because these areas would not be disturbed by construction or operation of the pipeline.

[c/] Acreage for the pig launching facility is included in the land requirements for the terminal in table 2.1.2-1.

[d/] The total area disturbed during the valve station construction would be 0.5 acre; however, 0.2 acre overlaps the pipeline right-of-way and is included in the pipeline right-of-way acreage.

[e/] This is the acreage outside the permanent pipeline right-of-way.

[f/] Rounding may result in slight differences in some calculations.

Approximately 12 miles of the route for the sendout pipeline would be immediately adjacent to existing rights-of-way (listed in table 2.3.2.1-2). Downeast is coordinating with EMEC on the use of their transmission line right-of-way for a portion of the sendout pipeline right-of-way. If feasible, where the pipeline would be directly adjacent to the existing right-of-way, the new pipeline would be offset about 5 to 10 feet from the outside edge of the existing utility right-of-way. The 50-foot-wide permanent pipeline right-of-way, as well as a portion of the construction right-of-way, would partially overlap the existing electric transmission line right-of way.

EMEC would construct a new electric transmission line parallel to the sendout pipeline from milepost (MP) 0.2 to MP 11.6. The new transmission line would bring electric power from EMEC's existing switchyard in Milltown to a new electric substation across from the Downeast LNG terminal.

Table 2.3.2.1-2

Where the Downeast Sendout Pipeline Would Parallel Existing Rights-of-Way

Mileposts	Segment Length (miles)	Existing Easement	Direction from Existing Right-of-Way
17.7-27.2	9.5	Existing EMEC Powerline	Adjacent to the south side of the electric transmission line
27.3-29.8	2.5	Existing M&NE Pipeline	Adjacent to the south side of the pipeline

2.3.2.2 Aboveground Facilities

The sendout pipeline aboveground facilities that Downeast would construct include three MLVs and pigging and gas metering facilities. Table 2.3.2.1-1 lists the land requirements for these facilities along the sendout pipeline. The pig launching facility would be within the terminal site and require approximately 0.25 acre for both construction and operation. It is included in the 47 acres of land associated with the terminal construction and operation. The MLV at MP 17.17 would affect 0.3 acre of land outside the pipeline construction right-of-way during construction and 0.4 acre of land outside the pipeline permanent right-of-way during operation. The fenced valve station footprint would be 0.5 acre (which includes 0.2 acre of temporary pipeline right-of-way and 0.1 acre of permanent right-of-way). The pig receiving and gas metering facilities would be within the Baileyville Compressor Station property boundary at MP 29.8 and would require 0.5 acre for construction and 0.3 acre during operation.

2.3.2.3 Access Roads and Contractor Yard

Downeast would use its construction right-of-way for construction access for most of the pipeline route. Downeast would use four temporary access roads related to its proposed pipeline facilities (see table 2.3.2.1-1). Only the access road at MP 15.4 would be newly created and require clearing for a new road base. The remaining three construction access roads are existing skidder roads that were previously used for timbering activities; however, they would require upgrades prior to construction of the sendout pipeline. The width of the skidder roads are generally 15 to 25 feet, with numerous road segments exceeding 25 feet in width. The roads are

compacted earth with a gravel surface and are raised above existing grade for positive drainage control. Downeast's would replace and supplement the gravel surface that has degraded over time. Small, localized sections of the skidder roads would need to be widened, but the total area for all of the access roads that requires widening would be 1 to 2 acres. Downeast would require a total of about 10 acres for constructing and upgrading the access roads. After compeletion of pipeline construction, Downeast would leave the road improvements in place.

Downeast has proposed three pipeline and terminal laydown areas, which would affect approximately 8 acres during the construction of the terminal and sendout pipeline (table 2.3.2.1-1). All three areas are previously disturbed by logging, construction laydown, clearing, or open burning. Following construction, Downeast would return these areas would to their pre-construction conditions.

2.3.3 Pipeline Construction Procedures

Downeast would construct its pipeline in compliance with applicable federal regulations and guidelines (e.g., DOT), as well as state and local permit-specific conditions (e.g., Maine State Department of Transportation, Robbinston Town Road Commissioner review, etc.). Typical construction drawings for the pipeline right-of-way, road crossings, wetland protection areas, waterbody crossings, etc. are included in section 2 of the draft EIS. Downeast would refine its plans during detailed pipeline engineering. Federal requirements and guidelines that apply to the pipeline project component include, but are not limited to:

- its Plan;
- its Procedures;
- its *Soil Erosion and Sediment Control Guidelines* (excluding appendices) (see EIS appendix H);
- 49 CFR 192 – Transportation of Natural Gas and Other Gas by pipeline: Minimum Federal Safety Standards; and
- 18 CFR 380 – Guidelines to be Followed by Natural Gas pipeline Companies in the Planning, Clearing and Maintenance of right-of-ways and the Construction of Aboveground Facilities and Siting and Maintenance Requirements.

2.3.3.1 General Pipeline Construction

Standard pipeline construction proceeds in a manner of an outdoor assembly line composed of specific activities that make up the linear construction sequence. These operations collectively include survey and staking of the right-of-way, clearing and grading, trenching, pipe stringing and bending, welding and coating, lowering-in and backfilling, hydrostatic testing, and cleanup. In addition to standard pipeline construction, Downeast would use special construction techniques where warranted by site-specific conditions. These special techniques would be used when constructing across waterbodies, wetlands, Moosehorn NWR, and roads (see section 2.3.3.2 below).

Staking and Flagging

Downeast would map and flag all areas to be affected by pipeline construction in advance of actual construction activity. Important resource protection areas, such as stream crossings or wetlands, would be specifically marked and flagged as well as posted with signage. Prior to actual field work by the pipeline crews, the Environmental Inspector(s) (EIs) would guide the crew management personnel on a site-by-site review of the mapped and protected areas. The EIs would review construction restrictions and management methods designed to protect the specified areas with the pipeline crews to ensure understanding.

Clearing and Grading

Where necessary and unavoidable, Downeast would clear and rough-grade the right-of-way to specified widths Downeast would dispose of vegetative or other waste in accordance with applicable permit conditions. Erosion controls would be installed immediately after initial clearing and disturbing of an area's surface soils.

Trenching

Downeast would determine the trench excavation widths and depths prior to the start of pipeline construction. Typically, excavation would be limited to allow for 3 feet of cover as required by 49 CFR 192. Generally, the trench would be about 6 feet deep (for a minimum of 3 feet of cover over the pipe) and between 10 to 25 feet wide. Downeast would excavate the pipeline ditch with either a rotary trencher or track-mounted backhoe.

Downeast would conduct topsoil segregation in accordance with its Plan, agency requirements, or landowner specifications to minimize the mixing of topsoil with subsoil.

Pipestringing, Bending, and Welding

Pipeline crews would "string" the pipe sections along the right-of-way. Side-booms or other suitable equipment would off-load the pipe sections from trucks and place them in the stringing area. The pipe sections would then be lined up end to end to allow for welding and bending into continuous lengths. Pipe welding would occur in accordance with API Standard No. 1104 (most current revision). Downeast would conduct quality assurance/quality control in accordance with 49 CFR 192.

Lowering-in/Backfill

Downeast would lower coated and inspected pipe lengths into prepared trenches and cover with a soil material padding that acts as a buffer between the pipeline and the backfill. The remainder of the trench would be backfilled with suitable soil material. Ideally, the material that was excavated for the trench would be used as backfill. Where the material is not suitable as backfill, such as large rock, imported material would be used. The trench may be over-backfilled to allow for additional settlement over time. After installation of the pipe, Downeast would internally clean it of loose impediments that may have been left over from the installation process by using compressed air-driven manifolds.

Hydrostatic Testing

After cleaning and prior to service, Downeast would test the pipeline would in accordance with 49 CFR 192. The test consists of placing the pipeline under hydrostatic pressure to verify its structural integrity for its design pressure load. If a leak or break in the pipeline were to occur during testing, Downeast would repair and retest that section of pipe until the DOT specifications are met. Approximately 6.1 million gallons of water would be required for hydrostatic testing of the entire 29.8-mile, 30-inch-diameter sendout pipeline. Downeast has stated it would test the sendout pipeline in more than one segment, allowing for reuse of some of the water and lowering the quantity needed. The length of the test segments would dictate the water volume needed. Downeast has identified the Baileyville Utility District as the source of hydrostatic test water through a direct connection to the fire hydrant system. Downeast would discharge the hydrostatic test water to an unnamed creek at MP 17.5 or to the Baileyville Utility District sewer system at a rate of 1,400 to 2,800 gpm. The Maine DEP must permit the discharge of hydrostatic test water used to test the integrity of oil and gas facilities in Maine. In addition, hydrostatic test waters that fall under the jurisdiction of the Maine DEP and that would be discharged into waters of the state would require a permit under the Maine Pollutant Discharge Elimination System (Maine PDES), as regulated by the Clean Water Act. Downeast must also obtain the appropriate Section 401 and 404 Water Quality Certifications prior to discharge of hydrostatic test water into surface waterbodies.

Cleanup and Restoration

Following backfill, Downeast would final-grade and restore all work areas to pre-construction contours, as closely as possible, and collect all construction debris along the right-of-way. Downeast would install permanent erosion control structures, such as slope breakers, during final grading, in accordance with its Plan, Procedures, and *Soil Erosion and Sediment Control Guidelines*. Downeast would restore the work areas within one week after the trench has been backfilled and graded. In addition, restoration of wetlands would be conducted in accordance with any COE permit conditions. Downeast would restore or repair any private property damage from construction, such as fences, field roads, and driveways, as necessary.

Downeast would revegetate disturbed areas using native seed mixtures in accordance with recommendations of the local office of the Natural Resources Conservation Service or as requested by the landowner. Downeast would monitor all construction work areas for the success of revegetation and restoration. Downeast would conduct inspections after: (1) initial placement of regrading, stabilization, and reseeding; (2) at the beginning and latter parts of the first full growing season; and (3) during the second growing season. Restoration and revegetation success evaluations would be based on predetermined criteria established with the various agencies and expressed as conditions in relevant permits and approvals.

2.3.3.2 Special Construction Techniques

Special construction techniques would be used when work is required in and around waterbodies, wetlands, roads and utilities, agricultural land and residences, and in areas where rock blasting may be required.

Wetlands and Waterbodies

Downeast's surveys indicate that 39.1 acres of wetlands would be affected by construction of the proposed project. Permanent or operational impacts would affect 23.3 acres of wetlands[4]. This acreage may be reduced during final routing design to avoid or minimize the extent of wetland crossings. To minimize impacts on wetlands, Downeast would follow its Plan, Procedures, and *Soil Erosion and Sediment Control Guidelines* and minimize the amount of time that constructing in wetland areas. Areas with wetland soils that are inundated or saturated to the surface would be excavated from wooden swamp mats to minimize the disturbance of wetland soils. In wetlands that have firm substrates or are unsaturated, Downeast would segregate the top 12 inches of wetland soil over the trenchline by piling it in a ridge adjacent to the pipeline trench. Leaving gaps in the spoil piles at appropriate intervals would ensure circulation and drainage of water. Downeast would assemble the pipeline in upland staging areas that are outside of the right-of-way.

In accordance with Downeast's Procedures, it would locate wetland construction staging areas least 50 feet or more from the wetland edge. If the setbacks are not possible due to construction limitations, Downeast would request a variance from its Procedures and *Soil Erosion and Sediment Control Guidelines.*

Typically, the additional temporary work area for wetland crossings would be 25 feet wide by 200 feet long. However, work areas would only rely on the minimal size required for staging and accessing stockpiled soils and equipment. Larger workspaces may be required for large wetland crossings. Downeast would maintain vegetative buffers between the work areas and the wetland during construction.

Downeast would protect water quality while working in wetlands and other waterbodies by:

- keeping construction materials, fuels, etc., 100 feet or more from of any stream or wetland system, except under limited, highly controlled circumstances;
- refueling construction equipment in upland areas 100 feet or more from any stream or wetland system, except under limited, highly controlled circumstances; and
- washing construction equipment outside of any wetland or waterbody.

The proposed LNG terminal would impact one waterbody and the sendout pipeline would cross 22 waterbodies. Downeast would cross streams and rivers as quickly as possible to minimize structural or water quality impacts. Table 2.3.3.2-1 indicates Downeast's proposed pipeline

[4] These acreage impacts include the Downeast LNG terminal, sendout pipeline, access roads, and aboveground facilities.

installation method for each of the waterbody crossings. The construction methods and associated information listed are subject to change based on specific field conditions, easement agreements, and permit conditions. Downeast would cross most streams using conventional backhoe-type equipment and dry, open-trench methodology. The dam-and-pump method is a dry-crossing technique that uses pumps to isolate water from the construction work area. This method is Downeast's preferred waterbody crossing technique. Downeast would cross 9 of the 22 waterbodies using the HDD crossing method. The HDD method involves boring a pilot hole beneath the waterbody to the opposite bank and then enlarging the hole with one or more passes of a reamer until the hole is the necessary diameter. A prefabricated pipe segment is then pulled through the hole to complete the crossing. A successful HDD generally results in no impact on the waterbody being crossed. For this reason, HDD is a preferred crossing method for major waterbodies, especially those that are sensitive or where there are sensitive environmental issues. HDD is not technically feasible in some types of geologic environments such as glacial till, and it requires larger staging areas than other stream crossing methods.

Table 2.3.3.2-1

Waterbodies Crossed by the Pipeline Route

Town	MP	Waterbody	State Water Quality Classification [a]	Waterbody Width/Crossing Length (linear ft) [b]	Crossing Method	Stream Type	Fishery Type [c]
Robbinston	0.8	Eastern Stream	B	25 / 25	Dam and Pump	Perennial	Cold-water
Robbinston	2.0	Unnamed stream	B	4 / 4	Dam and Pump	Intermittent	Warm-water
Robbinston	4.3	Unnamed stream (outlet of Keene Lake)	B	9 /1,165	HDD	Perennial	Cold-water
Calais	6.7	Flowed Land Ponds	B	12 / 141	HDD	Perennial	Cold-water
Calais	7.7	Unnamed stream (inlet to Flowed Land Ponds)	A	7 / 7	Dam and Pump	Perennial	Cold-water
Calais	8.6	Tributary of Beaver Brook (upstream of Flowed Land Ponds)	A	10 / 2,629	HDD	Perennial	Cold-water
Calais	12.3	Unnamed stream	A	3 / 3	Dam and Pump	Intermittent	Warm-water
Calais	14.1-14.2	Magurrewock Stream Outlet	A	528 / 792	HDD	Perennial	Cold-water
Calais/ Baring	14.2-15.3	St. Croix River	C	3,000 / 5,829	HDD	Major river	Cold-water
Baring	15.6	Unnamed stream	A	3 / 3	Dam and Pump	Intermittent	Warm-water
Baring	15.6	Unnamed stream	A	3/3	Dam and Pump	Intermittent	Warm-water
Baring	16.9	Conic Stream	A	3 / 3	Dam and Pump	Perennial	Warm-water
Baring	17.2	Unnamed stream	A	3 / 3	Dam and Pump	Intermittent	Warm-water
Baring	17.6	Unnamed stream, (tributary of St. Croix River)	A	3 / 3	Dam and Pump	Perennial	Warm-water

Table 2.3.3.2-1

Waterbodies Crossed by the Pipeline Route

Town	MP	Waterbody	State Water Quality Classification [a/]	Waterbody Width/Crossing Length (linear ft) [b/]	Crossing Method	Stream Type	Fishery Type [c/]
Baring	17.8	Unnamed stream, (tributary of St. Croix River)	A	8 / 1,227	HDD	Perennial	Warm-water
Baileyville	18.1	Unnamed stream, (tributary of St. Croix River)	A	4 / 1,227	HDD	Perennial	Cold-water
Baileyville	18.4	Stony Brook	A	18 / 18	Dam and Pump	Perennial	Cold-water
Baileyville	21.3	Wapsaconhagen Brook	A	37 / 37	Dam and Pump	Perennial	Cold-water
Baileyville	22.5	Unnamed stream (tributary of Wapsaconhagen Brook)	A	4 / 4	Dam and Pump	Perennial	Warm-water
Baileyville	25.2	Anderson Brook	A	15 / 2,622	HDD	Perennial	Cold-water
Baileyville	25.8 (3 crossings	Unnamed stream	A	4 / 4, 4 / 4, 4 / 4	Dam and Pump	Intermittent	Cold-water
Baileyville	28.9	Headwater tributary to Anderson Brook	A	8 / 1,000	HDD	Intermittent	Cold-water

[a/] State Designation - Based on Title 38 MRSA §465
A - 2nd highest classification. Must be of such quality that they are suitable for the designated uses of drinking water after disinfection; fishing; agriculture; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation, except as prohibited under Title 12, section 403; navigation; and as habitat for fish and other aquatic life. The habitat must be characterized as natural.
B - 3rd highest classification. Must be of such quality that they are suitable for the designated uses of drinking water supply after treatment; fishing; agriculture; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation, except as prohibited under Title 12, section 403; navigation; and as habitat for fish and other aquatic life. The habitat must be characterized as unimpaired.
C – 4th highest classification. Must be of such quality that they are suitable for the designated uses of drinking water supply after treatment; fishing; agriculture; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation, except as prohibited under Title 12, section 403; navigation; and as a habitat for fish and other aquatic life.

[b/] Waterbody width determined from Downeast's field measurements and aerial photograph interpretation.

[c/] Fishery types were assigned based on habitat functionality observed during field assessment of proposed Pipeline crossings. Fishery habitat suitability assigned to waterbodies not sampled in the field were based on aerial photograph interpretation and Maine DIFW fish stocking records.

HDD = horizontal directional drill

To cross minor streams of less than 10 feet that contain coldwater or significant warmwater fisheries, a temporary dam and flume pipe would be installed prior to trenching to divert stream flow over the construction area and allow for dry trenching of the stream crossing. Downeast would store trench spoils behind silt and sedimentation control structures. Pipe strings would be fabricated on one bank and moved into the trench by pulling pipe sections across the stream bottom to the opposite bank, floated across the stream, or carried into place. Downeast's Procedures and *Soil Erosion and Sediment Control Guidelines* would be used to adopt procedures for different waterbody crossings that may be encountered.

Where necessary, Downeast would install temporary construction equipment crossings across waterbodies taking into account highest expected flows during construction. Construction equipment crossings would be carefully installed after clearing to minimize streambed disturbance and downstream siltation. Where culverts are used, Downeast would minimize scouring through engineered devices. Construction equipment would be limited to one pass and not permitted to drive through the waterbody after establishing crossings. Downeast would remove the construction equipment crossings once pipeline installation and construction restoration are completed.

To facilitate pipeline construction across waterbodies, Downeast would need construction staging areas adjacent to the waterbody to assemble and fabricate the length of pipe necessary to complete the crossing. These staging areas are in addition to the standard construction right-of-way and Downeast would locate them at least 50 feet from the stream bank where technically feasible.

Rock Blasting and Rugged Topography

Downeast would use one of the following techniques to remove rock encountered during construction based on rock hardness, fracture susceptibility, and expected volume of the material: conventional backhoe excavation, dozer ripping and backhoe excavation, use of a backhoe hammer and backhoe excavation, or blasting and backhoe excavation. Blasting would be performed by licensed professionals according to strict guidelines designed to control energy release.

Downeast's sendout pipeline would not cross any areas of steep side slopes requiring special construction techniques; however, construction along moderate side slopes would be necessary. Permanent trench breakers (e.g., sandbags) would be installed in trenches over and around the pipe in areas with potential slope erosion.

2.3.3.3 Aboveground Facilities

Downeast would install three MLVs and two pigging facilities for the sendout pipeline. The LNG terminal site would contain the MLV and pig launching facility at the start of the sendout pipeline. The MLV at MP 17.17 would affect 0.3 acre of forested land outside the construction right-of-way and 0.4 acre outside the permanent right-of-way during operation. The pig receiving and gas metering facility would be at MP 29.8 in Baileyville and would affect 0.5 acre of developed land outside of the pipeline construction right-of-way and 0.3 acre of developed land outside the permanent right-of-way during operation.

2.3.4 Pipeline Operation and Maintenance Procedures

Downeast would inspect all aboveground equipment, permanent erosion controls, and revegetation during pipeline and right-of-way patrols. In addition, Downeast would address any conditions that could prohibit the safe operation of the pipeline with respect to right-of-way maintenance (fallen trees, excess vegetation, trespasser obstructions or damage, etc.). Any soil erosion or excess sedimentation along the pipeline right-of-way would be reported to appropriate

environmental management personnel. Downeast would identify corrective measures concurrently with the inspection and implement these measures, as needed, in a timely manner.

Maintenance would include periodic seasonal mowing of the permanent right-of-way, and vegetation control around aboveground facilities. Downeast would maintain vegetation in the 50-foot-wide permanent right-of-way on an approximate 3 to 5 year basis in uplands. Vegetation control would be limited in wetland and riparian areas to the selective clearing of trees and shrubs greater than 15 feet in height within 15 feet of the pipeline. In addition, Downeast would maintain a 10-foot-wide corridor centered on the pipeline in an herbaceous state on an annual basis. Permanent rights-of-way associated with the pipeline system would be maintained in accordance with Downeast's Plan, Procedures, and *Soil Erosion and Sediment Control Guidelines*, as well as any additional requirements (e.g., COE, local towns, Maine DEP, etc.). The use of herbicides is not proposed for vegetation maintenance.

As stated previously, Downeast would conduct regularly scheduled pipeline surveys as part of the pipeline system maintenance activities and safety programs.

2.4 CONSTRUCTION SCHEDULE

Downeast anticipates that construction of the Downeast LNG Project would take about 35 months, starting with terminal site work and foundation preparation for the LNG storage tanks. Once the tank foundations are in place, work would begin on tank construction, terminal buildings, and the marine terminal. The LNG storage tank construction would take approximately 30 months from the start of site work. Construction of the other terminal facilities would take about 18 months with marine construction taking approximately 16 months. Downeast would construct the sendout pipeline construction in 9 to 12 months.

The construction contractors would observe and comply with all applicable federal, state and local laws, ordinances, and regulations that apply to the conduct of the work. A list of environmental permits and approvals that have been received to date, as well as those that are anticipated by the project is found in table 1.3-1 of the draft EIS.

2.5 ENVIRONMENTAL COMPLIANCE INSPECTION AND MITIGATION MONITORING

Downeast would implement environmental compliance and monitoring requirements from its Plan, Procedures, and *Soil Erosion and Sediment Control Guidelines* during construction of the LNG terminal and sendout pipeline. Downeast would also incorporate compliance and monitoring requirements from federal, state, and local permits obtained for its project.

In accordance with its Plan and Procedures, Downeast would conduct environmental training for construction and contractor personnel before construction and periodically during construction. Downeast would employ at least one EI for construction of the LNG terminal, and at least one EI for construction of the sendout pipeline and MLVs. The EIs would ensure construction activities comply with the conditions of the FERC Certificate, and all other applicable federal, state, and

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local permits. The EIs would would report to the Lead Downeast Inspector, but have independent status and stop-work authority in the event of a noncompliance issue that requires corrective action.

In addition, the FERC would conduct independent inspections of the project throughout construction and restoration, to ensure compliance with the Commission's environmental conditions.

2.6 FUTURE PLANS AND ABANDONMENT

Downeast does not foresee abandonment of the proposed facilities prior to the expiration of its design life (25-plus years). If abandonment were to occur, Downeast has committed to the Town of Robbinston to restore the property parcel to a non-industrial condition by the removal of terminal components and land restoration actions. This commitment would be evidenced by a reclamation bond or similar financial guarantee and has been stipulated in the executed Downeast-Town of Robbinston Agreement. Downeast would also have to file an application with the FERC to abandon the LNG facility and sendout pipeline. A determination would then be made as to the best method of abandonment (e.g., removal or abandon in-place of the pipeline) along with the restoration of the right-of-way, in consideration of landowner preferences.

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3.0 EXISTING ENVIRONMENTAL CONDITIONS

3.1 WATERWAY FOR LNG MARINE TRAFFIC

3.1.1 Marine Environment

The marine environment surrounding Grand Manan Island, in the Bay of Fundy, is characterized by tides generally ranging from 19 to 22 feet. This range increases progressively traveling northeast into the Bay of Fundy. Typical marine fauna include whales, seals, seabirds, shorebirds, gulls, and sea ducks. Some commercial marine species include a variety of finfish, lobsters, clams, scallops, sharks and rays.

The tidal action characteristic of the Bay of Fundy and its associated passages also helps to create a typical northeast maritime climate. Most islands are wooded and possess ledge rock-outcrops. Dominant tree species include red spruce, white spruce, balsam fir, larch, paper birch, and red maple. Northern cedar bogs are common.

Several areas in New England waters offer foraging and nursery habitat for marine mammals. For whales, the primary use of habitats as feeding grounds in the Gulf of Maine and Bay of Fundy typically occurs in spring and summer. Seasonal use areas for North Atlantic right whales include a summer to early fall nursery and feeding area in Gulf of Maine/Georges Bank in the Bay of Fundy, as well as a late summer to fall feeding areas in the Roseway Basin south of Nova Scotia, among others. The Gulf of Maine and Stellwagen basin are used by juvenile humpback whales and other whale species for feeding. Weinrich et al. (2000), suggest that Jeffreys Ledge, a 33-mile glacial deposit which stretches from the coast of Rockport, Massachusetts, to just southeast of Cape Elizabeth, Maine, is very important nursery habitat for mother-calf pairs of the right whale. The shallowness of Jeffreys Ledge, surrounded by deeper ocean waters, creates an upwelling, making it a very productive foraging habitat for marine mammals and fishes.

3.1.2 Western Passage/Passamaquoddy Bay

The bayside area adjacent to the terminal is characterized by partially exposed to semi-protected marine conditions. Owing to its protected location, the site is largely free from oceanic wind/wave influences. The majority of the intertidal zone is a mosaic of gravelly sand of varying grade sizes, fucoid-dominated ledge, and fairly homogenous pebbly gravel pavement that support sparse rooted vegetation. With protection from winds originating from directions west of true north-south, and because strong winds from the northeast to southeast have only a moderate fetch with which to build waves, intertidal conditions are moderate to low energy. This is indicated by the presence of knotted wrack, the dominant algae and only rooted marine vegetation noted on site, which is most often affiliated with bay-like environs (Woodlot 2006c).

Phytoplankton form the base of the pelagic marine food web by directly and indirectly supporting communities of zooplankton, nekton (i.e., free swimming organisms), and microbes (i.e., protists and bacteria). Phytoplankton is composed of photosynthetic plants whose occurrence is generally limited to areas in which light can penetrate (Thurman and Weber 1984).

Phytoplankton abundance is usually lowest in the winter and peaks during the spring bloom (mid-March to mid-April) (NOAA 1993). A seasonal presence of more than 675 species of phytoplankton has been documented in coastal waters of the northeastern United States (Marshall and Cohn 1982).

Primary production within the northeastern waters is built upon phytoplankton communities. Comparing equal units of producers in the Cobscook Bay, Campbell (2004) has shown that phytoplankton is the least productive of the several producer groups. Comparatively, benthic diatoms are the most productive element of the Cobscook Bay Region. It can be inferred that the primary productivity of upper Passamoquoddy Bay is similar to that found in Cobscook Bay with some exceptions. Because the area of the bay surrounding the Downeast LNG Project area has less energy due to its sheltered location adjacent to Mill Cove and because it would be less affected from direct ocean wave energy, the productivity is likely less.

Subtidal vegetation is primarily comprised of a variety of kelp species (Mann 1973, Sebens 1986). This macroalgae is an important food source for sea urchins and herbivorous gastropods. Kelp also serves as important habitat for fish and invertebrates. Most of these macroalgae species are associated with hard structures or substrates that are limited in the Downeast LNG Project area; hence the sparse rooted marine vegetation community.

Vegetation within intertidal areas of Passamoquoddy Bay is comprised of a variety of brown algae such as Ascophyllum spp. and Fuscus spp. Other species of commercially important macroalgae found in protected tide pools or areas with high tidal and wave action such as sea lettuce, Irish moss, and kelp are not found within intertidal areas at the Downeast LNG Project area (Woodlot 2006c).

As a habitat of special significance, eelgrass is always a matter of concern involving disturbances to the bottom. According to Seth Barker, Geographic Information System (GIS) coordinator for the Maine DMR responsible for identifying and mapping of eelgrass along the entire coast of Maine, although eelgrass has been seen in the upper portions of the St. Croix River estuary, none has been seen along the low water edge at Mill Cove; this is likely due to the large tidal amplitude and strong currents affecting the area, making the site unsuitable for the species.

According to Short and Short (2003), "In northern Maine, with the highest tidal ranges in the world (more than 8 meters), eelgrass occurs mostly in protected bays and harbors, as well as tidal rivers." However, field surveys and aerial photo interpretation confirm the lack of eelgrass in Mill Cove. Thorough examination of 2006 low tide aerial photography of the site, dive surveys (Woodlot 2006c), and review of the Maine DMR eelgrass database via Maine GIS showed that eelgrass does not occur at this location (Barker 2003).

3.1.3 Vessel Traffic

There are no known areas of "Heavy Marine Traffic" along the intended route of the Downeast LNG Project. The Coast Guard NVIC 05-05 defines "Heavy Marine Traffic" areas to include areas of the waterway that are congested with commercial, military and/or recreational vessels

(marine events and seasonal activities such as regattas, fisheries, etc.). Large commercial vessel activity that occurs in Western Passage includes bulk vessels calling on the Port of Bayside, New Brunswick, which receives about 75 vessels per year. Bulk vessels calling on the Port of Eastport, Estes Head Pier on the southwest side of Eastport, Maine, transit through Head Harbor Passage and Friars Roads. The Port of Estes receives 50 or more vessels per year.

Other vessels that transit though waters associated with the action area include seasonal cruise vessels transiting through Western Passage enroute to St. Andrews, New Brunswick. Both the Ports of Bayside and Eastport are trying to attract commercial cruise vessels, which may increase the amount of vessel traffic that are received by these ports.

3.1.4 Vessel Strikes off the East Coast

According to Jensen and Silber (2003), Nelson et al. (2007), and Waring et al. (2010), there have been 198 documented occurrences of vessel collisions with marine mammals in the Western Atlantic Ocean (including the U.S. East Coast, U.S. Gulf Coast, and Eastern Canada), most of which occurred off the U.S. East Coast. Table 3.1.4-1 lists the vessel strikes by mammal species or species group. Of strikes reported from the Western Atlantic Ocean, 82 percent occurred along the U.S. East Coast. Fin, humpback, and right whale collisions comprised 75 percent of these documented vessel strikes.

Nelson et al. (2007) examined mortality and serious injury reports involving baleen whale stocks along the U.S. eastern seaboard between 2001 and 2005. According to this study, 11.5 percent of events involved vessel strikes, of which 64 percent resulted in mortality. Entanglement with fishing gear accounted for 32 percent of events, of which 20 percent resulted in mortality. Waring et al. (2010) reviewed the records of dead, injured, and/or entangled humpbacks (found either stranded or at sea) for the period 2004 through 2008, as reported for stock assessment reports for U.S. Atlantic and Gulf of Mexico marine mammal stocks. Numbers associated with injury or mortality due to ship strikes were used to account for incidents between 2005 and 2008.

Data obtained by Downeast from the Ocean Biogeography Information System and the North Atlantic Right Whale Consortium found that various marine mammal species are known to aggregate along portions of the proposed marine transit route (see EIS Appendix E, figures 20 through 30). As a result, LNG vessels transiting the route have the potential to encounter and impact marine mammals.

Table 3.1.4-1

Analysis of Whale Mortality and Serious Injury Reports Associated with Vessel Strikes from the Period 1905 – 2008 /a/ & b/

Species	Eastern Canada	U.S. East Coast	U.S. Gulf Coast	Total Individuals
Baleen	0	1	0	1
Blue	0	1	0	1
Fin	7 /b	46 /b	1	54
Humpback	1	40 /b	1	42
Minke	1	17	1	19
Minke/small sei	0	1	0	1
North Atlantic Right	11	39 /b	2	52
Sei	0	6 /b	0	6
Sperm	1	3	2	6
Unknown	7	8	1	16
Total Individuals	**28**	**162**	**8**	**198**
Total Percent by Region	**14%**	**82%**	**4%**	

a/ Whale mortality and serious injury reports (1905 through 2005) from Jensen and Silber, 2003, and Nelson et al., 2007. Only data associated with vessel strikes are reported in this table.
b/ Numbers updated from 2005 through 2008 Waring et al., 2010, stock assessment reports. Only data associated with vessel strikes are reported in this table.

3.2 LNG TERMINAL AND PIPELINE

3.2.1 Terrestrial Areas

3.2.1.1 Import Terminal

The import terminal site is within the Laurentian Mixed Forest Province (Bailey 1995). This province lies at the transition of the boreal forest and the broadleaf deciduous forest zones. The province consists of mixed stands of coniferous species (pine) and deciduous species (yellow birch, sugar maple, and American beech); the rest is a macromosaic of pure deciduous forest in favorable habitats with good soils and pure coniferous forest in less favorable habitats with poor soils.

Maine has been divided up into 15 biophysical regions, which are based on climate variables, topography, and soil characteristics, correlated with vegetation characteristics (McMahon 1990). The import terminal site lies within the Eastern Lowlands Biophysical Region which includes the extensive lowlands west of the St. Croix River. The Eastern Lowlands consist of a variety of peatland ecosystem types, scattered perched wetland communities, and upland forests. The area has a long history of intensive commercial forestry.

The Downeast import terminal onshore facilities would be on approximately 80 acres between US Route 1 and Passamaquoddy Bay; the pier would extend into the Passamaquoddy Bay. The northern portion of the site was a homestead and farmland up until the 1960s. Some of the

former agricultural fields remain relatively open, although they are reverting to wooded uplands and forested/scrub-shrub wetlands. Scattered household trash areas, remnant fencing, and apple trees are further evidence of the former homestead. The remainder of the site consists of wooded uplands and forested/scrub-shrub wetlands. Both the uplands and wetlands have been historically harvested, with the most recent harvesting occurring in the mid-1990's (Joseph Krug, retired forester, personal communication, 2005). Harvesting over much of the site was intensive, and numerous skidder trails are evident. There are also several large slash piles, particularly on the southern side of the site, associated with a former log landing. Wooded uplands on the import terminal site vary in species composition and age across the site.

Based upon the Natural Landscapes of Maine classification system (Gawler and Cutko 2004), the community in the northwest part of the site can be characterized as an Aspen–Birch Woodland/Forest Complex. The uplands are generally characterized by species such as apple and choke cherry. Uplands to the northeast support a canopy dominated by deciduous species, whereas to the southeast coniferous species are more characteristic. Paper birch dominates the canopy to the northeast with lesser amounts of red maple, choke cherry, big-toothed aspen, and balsam fir also present. The shrub layer includes species such as beaked hazelnut, choke cherry, alternate-leaved dogwood, red spruce, and yellow birch. Bunchberry, wild sarsaparilla, common speedwell, lowbush blueberry, mayflower, hawkweed, and interrupted fern occur within the herbaceous layer.

The southeastern part of the site is dominated by red spruce and white spruce. The shrub layer includes balsam fir, red spruce, paper birch, yellow birch, and green alder, with the birches and alder occurring at the top of the bank above the coastal wetland edge. The herbaceous layer is generally sparse, but includes wild sarsaparilla, twinflower, bunchberry, Canada mayflower, and spruce and balsam fir seedlings. These uplands are in various stages of regeneration with the more mature woods occurring within approximately 250 feet of the coastal shoreline, and the younger woods in the center and eastern portions of the site. Based upon the Natural Landscapes of Maine classification system (Gawler and Cutko 2004), this community can be characterized as a Spruce-Fir Forest.

Two wetland areas are on the site. The first wetland is a palustrine forested/scrub-shrub (PFO/PSS) community that bisects the project area from an outlet to Passamaquoddy Bay, near the northeastern project boundary south and southeast across the site. The second wetland area is a PFO, needle-leaved evergreen, seasonally flooded/saturated wetland community in the southwestern corner of the site and extending south beyond the project boundaries. Those portions of the wetlands that were not recently harvested are characterized by a well established canopy, relatively sparse shrub layer and a sparse to absent herbaceous layer.

In general, a bryophyte layer composed of peat moss covers much of the ground in these relatively undisturbed areas. The harvested portions of the wetlands are characterized by either dense shrub regeneration, or relatively open areas with a well developed herbaceous layer. The northeastern portion of the first wetland was in agricultural use up until the 1960s. Speckled alder, choke cherry, meadowsweet, and Virginia rose dominate the dense scrub-shrub. The wet

meadow is characterized by herbaceous species such as foxtail, panicled bulrush, awl-fruited sedge, tussock sedge, soft rush, flat-topped white aster, bristly aster, Canada goldenrod, and woodland horsetail. Tree species in this community include yellow birch, red maple, balsam fir, northern white cedar, larch, red spruce, and quaking aspen. Saplings identified include northern white cedar, balsam fir, and larch.

3.2.1.2 Pipeline

Mature Upland Forest

Spruce-fir

The most prevalent community along the proposed sendout pipeline right-of-way is a low-elevation spruce-fir forest type, which can be further described as a Spruce-Fir-Broom-Moss community (Gawler and Cutko 2006). These forests are characteristically dominated by red spruce and balsam fir, and associate species vary depending on the local community. Northern white cedar often occurs in wetter sites, such as in rocky drainages. Other tree associates include red maple, gray birch, paper birch, yellow birch, quaking aspen, big-tooth aspen, and American beech. Eastern white pine and eastern hemlock occur occasionally, and white spruce tends to replace red spruce from MP 1 to the import terminal site.

Spruce-fir forests tend to contain large swaths with closed canopy where understory is sparse and patchy, and often contains only regenerating dominants. These swaths are often devoid of herbaceous layers. In less dense stands, shrub associates include striped maple, mountain maple, beaked hazelnut, mountain holly, low-bush blueberry, and red raspberry in openings. Speckled alder, meadowsweet, and winterberry occur in damp sites in forest gaps.

Due to low sunlight penetration, the upland herbaceous layer tends to be sparse to absent. When understory vegetation does occur, it often includes species such as mosses, canopy-species seedlings, wild sarsaparilla, Canada mayflower, bunchberry, wintergreen, starflower, wood fern, and bracken fern. In poorly drained sites, cinnamon fern or interrupted fern occur densely on the forest floor.

Spruce-Northern Hardwoods

Spruce-northern hardwood stands occur as infrequent patches along the sendout pipeline route and are dominated by red spruce, sugar maple, red maple, American beech, and birch. Sub-dominate species include balsam fir and white pine. The sapling/shrub layer in this community is fairly well developed and composed of thick stands of striped maple and canopy species saplings. Other shrub associates include mountain maple, hobblebush, beaked hazelnut, and mountain holly. Speckled alder, meadowsweet, and winterberry occur in wetter sites. The herbaceous layer is typically comprised of wood fern, tree seedlings, wild sarsaparilla, bristly sarsaparilla, bunchberry, and common wood-sorrel.

White Pine-Mixed Hardwoods

White pine-mixed hardwood forests are along the northwestern portion of the sendout pipeline route. This transition forest type includes white pine, balsam fir, red and sugar maple, white ash, birch, American beech, black cherry, and eastern hemlock. Common understory shrubs include tree saplings, low-bush blueberry, striped maple, and beaked hazelnut. Canada mayflower tends to dominate the herbaceous layer along with starflower, bunchberry, and tree seedlings.

Upland Early-Successional Forest

Aspen-Birch Woodland/Forest Complex

Early successional forests occur throughout the sendout pipeline route wherever woodlands are actively managed for timber. Structure and botanical composition of these forests largely depend on their age. Initially, these sites are dominated by birch, aspen, and red maple. As succession progresses, these pioneering species are eventually replaced by the spruce-fir forests characteristic of the region. Associate species include American mountain ash, cherries, and goldenrod.

Upland Maintained Openings

Maintained openings include mowed fields and residential areas. The plant communities are typically comprised of introduced species such as timothy, clovers, and fescues. Exceptions include fields maintained for wildlife management, such as those within the Moosehorn National Wildlife Refuge (Moosehorn NWR), where botanical compositions include more naturally occurring species.

Approximately 12 miles (41 percent) of the sendout pipeline would be installed in or adjacent to other existing utility or road rights-of-way between MP 17.7 and MP 29.8. These areas are similar to the upland maintained openings described in this BA.

Wetlands

Wetlands include a variety of transitional areas where land-based and water-based ecosystems overlap, and the communities are comprised of those species that are tolerant of flooded or saturated conditions.

Palustrine Forested Wetland

PFO wetland cover-types possess a mature tree canopy; the understory components vary accordingly. The most frequent PFO wetland is the spruce-fir-cinnamon fern community, which often occurs along rocky drainages on gentle slopes or in flat areas with pit-and-mound topography. Characteristically, red spruce, balsam fir, and northern white cedar dominate the tree layer, and prominent patches of cinnamon fern are abundant in the herbaceous layer. Other tree species include tamarack and green ash.

The shrub/sapling density varies from sparse to dense, and shrubs include mountain holly, alder, and red maple. Along with cinnamon fern, the herb layer is diverse with sensitive fern,

woodland horsetail, pointed broom sedge, three-seeded sedge, drooping sedge, grass-leaved goldenrod, and rattlesnake mannagrass.

Palustrine Scrub-Shrub Wetland

PSS wetlands are dominated by woody vegetation less than 20 feet tall (Tiner 1994). Along the sendout pipeline route, PSS wetlands are often among large mixed graminoid-shrub complexes, particularly in transitional zones. PSS wetlands within the proposed right-of-way are frequently flooded or saturated near the surface, and often associated with palustrine emergent (PEM) wetlands. Common herbaceous species include bluejoint, rattlesnake mannagrass, wool-grass, black bulrush, soft rush, and Canada St. Johnswort.

Alder thickets are the most common PSS wetland along the pipeline route and are characterized by impassable stands of speckled alder mixed with dogwood willow, meadowsweet, sweetgale, arrowwood, and rhodora. Associated tree species can include red maple and larch, and it is common to find these PSS thickets adjoining a spruce-fir-cinnamon fern community.

Sheep laurel dwarf shrub bogs can be found along the proposed pipeline right-of-way interspersed with graminoid communities. These communities are comprised of dense ericaceous shrubs, most often sheep laurel and rhodora, and individual spruce or larch trees occur intermittently. The ground is dominated by peat mosses.

Palustrine Emergent Wetland

PEM wetlands are dominated by non-woody hydrophytic vegetation and usually have either surface water or saturated soils present year-round. PEM wetlands along the pipeline route include marsh, wet meadow, and beaver flowages.

Cattail marshes vary in size from a few hundred square feet to several acres and are usually found in impounded or semi-permanently flooded basins or depressions. Cattail stands tend to be dense and do not permit the occurrence of many other associated species. However, other occasional species can include sweetgale, meadowsweet, winterberry, pickerelweed, black bulrush, and wool-grass.

Wet meadows often occur in association with PSS wetlands in the form described for mixed graminoid–shrub complex. Wet meadows typically flood in spring and soils tend to remain saturated throughout the growing season. Along the sendout pipeline route, wet meadows are characterized by rich and diverse sedge communities. Species include pointed broom sedge, drooping sedge, hop sedge, long sedge, tussock sedge, soft rush, bluejoint, black bulrush, and grass-leaved goldenrod.

Vernal Pools

A vernal pool, defined by Maine's Natural Resource Protection Act (NRPA), is a natural, temporary to semi-permanent body of water occurring in a shallow depression that typically fills during the spring or fall and may dry during the summer; it has no permanent inlet, and lacks

viable populations of predatory fish. Potential vernal pools were identified during Downeast's field surveys in 2006 and 2007 for the sendout pipeline alignment. Downeast performed a field verification of vernal pools and significant vernal pools (SVPs) in spring of 2007 for vernal pools identified in 2006, and in spring of 2008 for vernal pools identified in 2007. These surveys resulted in the identification of nine SVPs based on criteria listed in Maine DEP Rules Chapter 335 Section 9. An additional 22 non-significant vernal pools were also identified. More information about vernal pools is found in section 4.4 of the EIS.

3.2.2 Aquatic Areas

Surface water resources within the Downeast LNG Project area were initially identified using U.S. Geological Survey (USGS) 7.5 minute-series topographic maps. Downeast field verified surface water resources during wetland surveys where landowners had granted permission to access properties along the sendout pipeline corridor (about 85 percent). The Maine Water Classification Program (38 Maine Revise Statutes Annotated [MRSA] 465, 467, and 468) was used to determine the water quality classification of surface waters. Fishery types for the various surface waterbodies were obtained from fisheries biologists at Maine DIFW and through stream classifications conducted during wetland surveys.

Downeast classified streams using Maine DEP jurisdictional stream definition as defined in the NRPA Wetlands and Waterbodies Protection Rules – Chapter 310 (38 MRSA 480-B-9). A Maine DEP jurisdictional stream is defined as a "channel between defined banks." A channel is created by the action of surface water and has two or more of the following characteristics:

- It is depicted as a solid or broken blue line on the most recent edition of the U.S. Geological Survey 7.5 minute-series topographic map or, if that is not available, a 15-minute series topographical map.
- It contains or is known to contain flowing water continuously for a period of at least 6 months of the year in most recent years. The channel bed is primarily composed of mineral material such as sand and gravel, parent material or bedrock that has been deposited or scoured by the water.
- The channel contains aquatic animals such as fish, aquatic insects or mollusks in the water or, if no surface water is present, within the stream bed.
- The channel contains aquatic vegetation and is essentially devoid of upland vegetation (38 MRSA 480-B-9).

Riparian corridors throughout the Downeast LNG Project area are largely forested, with canopy openings resulting from commercial logging, agricultural land uses, and utility and road crossings.

3.2.2.1 LNG Terminal Surface Waters

Downeast would construct the onshore portion of its import terminal within the Coastal Washington and Hancock drainage (previously Eastern Coastal Rivers) as designated by using 1:24,000 scale contours and delineated by USGS staff in Augusta, Maine, in 1989. Within this

drainage, the Downeast import terminal is within the St. Croix River at Robbinston Watershed (HUC Code 0105000010809) (MEGIS 2004).

Surface water resources at the Downeast import terminal include a small Maine DEP jurisdictional stream flowing through a PFO/ PSS wetland from a culvert under U.S. Route 1 northeast, to its outlet at the edge of Passamaquoddy Bay. The stream is between five to seven feet wide with well-defined banks. The scoured substrate varies from exposed ledge to rock-cobble to silt-sand. A drainage swale to Passamaquoddy Bay at the southeastern end of the wetland shows evidence of scouring, but it does not display any of the additional characteristics necessary to meet the definition of a Maine DEP jurisdictional stream. This PFO/PSS wetland also includes a second drainage to Passamaquoddy Bay near the southeastern boundary of the Downeast property. This drainage is essentially devoid of vegetation, but does show evidence of scouring from periodically flowing water. Although scouring was evident, this drainage does not display other stream characteristics.

3.2.2.2 Sendout Pipeline Surface Waters

The sendout pipeline right-of-way would be within the Coastal Washington and Hancock drainage area and the St. Croix River drainage area. Within these drainages, the sendout pipeline would be within the St. Croix River at Robbinston Watershed (HUC Code 10500010809), the St. Croix River at Grand Falls Watershed (HUC Code 10500010702), the Mohannes Stream (Canada) Watershed (HUC Code 10500010803), the Pocomoonshine Lake Watershed (HUC Code 10500020401), the Wapsaconhagan Brook Watershed (HUC Code 10500010802), the St. Croix River at Woodland Watershed (HUC Code 10500010801), the St. Croix River at Devil's Head Watershed (HUC Code 10500010806), the Magurrewock Stream Watershed (HUC Code 10500010804), and the Cobscook Bay Watershed (HUC Code 10500020307) (MGIS 2004).

Riparian corridors throughout the Downeast region of Maine are largely forested with canopy openings resulting primarily from commercial forest practices. Although much of the sendout pipeline right-of-way would be along existing roadways and utility corridors, waterbody crossings do include streams with potential fish habitat.

The Downeast sendout pipeline would cross 22 waterbodies. Of the waterbodies crossed by the proposed sendout pipeline, a total of 13 waterbodies are classified as coldwater fisheries and 9 waterbodies are classified as a warmwater fishery. Table 2.3.3.2-1 illustrates the distribution of stream crossings by town and milepost. With the exception of the St. Croix River, all streams in the sendout pipeline area are A and B water quality classes, signifying the second and third highest water quality conditions based on the Maine Water Classification Program (Title 38 M.R.S.A. Sections 465, 467, and 468). The A and B classes include provisions for the protection of fish and aquatic life. The streams vary in substrate type, substrate particle size, channel width, flow regime, and depth. The dominant stream habitat units in the project area are run, glide, and low-gradient riffle, portions of which contain habitat characteristics of warm- and cold-water fisheries. Temperatures ranged within several degrees of 68°F. Depths are generally less than 10 feet and stream bottoms are a combination of woody debris and mineral deposits ranging in

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size from fine to cobble. Canopy closures over the streams ranged from zero to 100 percent and the average canopy closure was 52 percent.

Downeast coordinated with the Maine ASC and Maine DIFW to develop protocols for stream habitat evaluations. Downeast completed surveys of streams the sendout pipeline would cross between July and September of 2006, on lands where access was granted by the landowner. On lands where access was not granted by the respective landowner, Downeast evaluated stream crossings through aerial photograph interpretation.

At each stream crossing sampled, discrete habitat units were delineated on the basis of one or more physical characteristics that separated them from adjacent habitat types. Once a habitat unit was defined, appropriate attribute data were measured and recorded for the unit.

Based on the parameters measured, the streams intersecting the sendout pipeline were found to provide habitat conditions for both cold- and warm-water fishery species. Warmer streams are likely to provide habitat for species such as brown bullhead, sunfish, and minnow species. Cold-water streams are likely to provide habitat for species such as brook trout, brown trout, and whitefish species. Low-gradient riffles with substrates dominated by cobble and/or gravel (0.2 inch to less than 3 inches), some of which are tributaries of the St. Croix River, are likely to support brook trout. In general, the majority of low-gradient riffles are west of Conic Stream (MP 17.4) to Wapsaconhagan Brook (MP 22.1), including Stoney Brook. Additionally, three unnamed streams at MP 1.9, 4.2, and 16.1 were observed to have habitat units with fish spawning habitat along with temperatures ranging from 66.74°F to 70.88°F (attachment B).

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4.0 STATUS OF SPECIES AND CRITICAL HABITAT AND PROJECT EFFECTS

This section describes the federally listed threatened and endangered species that may occur in the Downeast LNG Project area and potential effects from construction and operation of the Project.

4.1 ATLANTIC SALMON (ENDANGERED)

4.1.1 Status of Atlantic Salmon in the Project Area

Species Description

The Atlantic salmon (*Salmo salar*) is an anadromous fish that spends its first two to three years in freshwater. It then migrates to the ocean to spend typically two years before returning to its natal freshwater river to spawn. There are three recognized groups of Atlantic salmon: North American, European, and Baltic. The North American Atlantic salmon historically ranged from northern Quebec to Newfoundland and southwest to Long Island Sound (NOAA Fisheries and FWS 2005). Historically, nearly every coastal river in the United States north of the Hudson River supported Atlantic salmon.

Life History

According to Bigelow and Schroeder (1953, 2002) and Baum (1997), mature Atlantic salmon enter and spawn in freshwater rivers in the Gulf of Maine in mid-October and early November. Most of the adult salmon return to sea shortly after spawning, although many do not survive the physically draining journey up-river and spawning. Young salmon, or parr, remain in freshwater for two to up to six years before transitioning to the sea where they remain as smolts for as few as two to three years (Baum 1997). In Maine, most parr remain in the rivers for two years. In the Penobscot River in Maine and the St. John River, New Brunswick, parr remain in freshwater for two summers and two winters. The time at which parr move downstream toward the sea varies from late spring to fall, but in Gulf of Maine streams this usually occurs in June and July (Baum 1997). Maine Atlantic salmon spend varying lengths of time at sea, ranging from one to several years, before navigating back along their original migration route to spawn in their birth river. Consequently, the most sensitive periods for the Atlantic salmon are late spring through early summer during smolt season and early fall when adults are returning to spawn.

Habitat

NOAA Fisheries and the FWS listed the Gulf of Maine DPS of Atlantic salmon as endangered in 2000. The Gulf of Maine DPS includes all naturally reproducing remnant populations of Atlantic salmon from the Androscoggin River northward along the Maine coast to the Dennys River (74 FR 29344). This DPS includes both early- and late-run Atlantic salmon (Baum 1997). The river specific hatchery reared fish are also included as part of the DPS. However, these hatchery fish would not count toward a delisting until they have spawned naturally in the wild. The core of the remnant populations is in the Dennys, East Machias, Machias, Pleasant, Narraguagus, Ducktrap, and Sheepscot Rivers; Kenduskeag Stream; and Cove Brook. The Gulf

of Maine DPS was expanded in 2009 to include populations existing in the Androscoggin, Kennebec, and Penobscot River basins (74 FR 29344).

Habitat conditions and salmon abundance are largely understood for the larger rivers, but less is known about the smaller rivers (Meister 1962, Baum 1997). For the most part, riverine habitat can be characterized as free-flowing, medium gradient, cool-water courses with gravel substrates for spawning. Currently, the identified watersheds within the DPS are sparsely populated with salmon.

Population Dynamics

Naturally reproducing Atlantic salmon populations of the Gulf of Maine DPS are at extremely low levels. The results of several population studies in Gulf of Maine DPS streams demonstrate that: 1) spawning Atlantic salmon abundance is less than 10 percent of the number required to maximize juvenile production; 2) juvenile abundance indices are lower than historical counts; and 3) freshwater smolt production is less than a third of estimated capacity. In these streams, fry were stocked to fill available habitat, and parr abundance increased as a result. Despite these conservation efforts, the number of smolts leaving the river did not increase at the same rate (65 FR 69459).

In general, densities of young-of-the-year salmon and parr remain low relative to potential carrying capacity. These depressed juvenile abundances are a direct result of low adult returns in recent years. A total parr population estimate is not available for the entire Gulf of Maine DPS. The Maine ASC and NOAA Fisheries have conducted a watershed-wide parr population study on the Narraguagus River. Service biologists also conducted an outmigration study for the Narraguagus River (Kocik et al. 1998a). Large parr numbers ranged from 11,700 to 27,000. The corresponding outmigrating smolt numbers ranged from 2,800 to 3,600, well below what was an estimated production capacity (i.e., 18,000). The Maine ASC and Service biologists derived a preliminary estimate of 3,607 for the number of emigrant smolts in 1999, which would indicate spawning production in 1996-1997. The average overwinter survival for 1999 was 14.3 percent, which is significantly lower than that in 1997 at 24.4 percent. In summary, studies conducted on juvenile salmon in the Narraguagus River concluded that high overwinter mortality of 1+ and older parr, combined with high mortality of out-migrating parr, are impediments to the recovery of this species (65 FR 69459).

Threats

Declines in returns of Maine adult salmon became evident by 1985, by which time this species had been extirpated in southern New England (NOAA Fisheries and FWS 2004). Critically low adult returns make this species particularly susceptible to threats. Anthropogenic impacts are implicated as the major cause of significant declines in Atlantic salmon populations.

Historic landuse practices likely had a significant impact on salmon populations and habitat. Although many of these practices are not implemented today, the extent that historic disturbances continue to affect freshwater habitat remains a consideration. For example,

physical alterations to instream channel geometry increases substrate embeddedness or creates wide reaches where deep narrow channels once occurred. Streams that have been widened may exhibit more rapid heating and cooling conditions. Additionally, implementation of historic log drives necessitated channelization and boulder removal. These two factors alone have seriously compromised salmon habitat suitability.

Current threats to the salmon have been identified by NOAA Fisheries and the FWS (2004). Water withdrawal for agriculture purposes has been identified as the most immediate threat to habitat in the Pleasant, Narraguagus, and Machias River watersheds due to the incidence of commercial blueberry operations. Several water quality issues have been identified that may have effects on salmon. Point source and non-point source pollution continue to affect water quality in salmon-bearing rivers. However, the Maine Technical Advisory Committee, Water Quality Committee concluded that the most significant water quality threats are acidification (NOAA Fisheries and FWS 2005) due to acid rain and endocrine disruption from pesticides. Sedimentation from various sources may be affecting habitat quality in rivers by causing substrate embeddedness, diminished habitat complexity, and stream channel alteration.

Elevated water temperatures may be a significant threat in salmon rearing habitat, especially in combination with other compromising factors. Optimal temperatures for salmon in different life stages is well understood; if temperatures exceed 75°F during juvenile development, adequate size for overwintering may not be attained. Elevated water temperatures in rivers have been documented in recent years (NOAA Fisheries and FWS 2004). Factors that may create elevated temperature conditions include industrial cooling water discharges, low flows, removal of shading, and climate change.

The Downeast Region of Maine is currently undergoing significant land use pattern changes. Among these are increased development, population growth, and land conversion, which can result in a number of significant impacts on salmon habitat. Primarily, land clearing and housing developments are often followed by a need to add roads and other buildings to a region. Increased impervious surface often increases sedimentation, erosion, and pollution in streams, all of which lower water quality and degrade habitat for salmon.

Commercial and recreational fishing have had historical roles in the decline of salmon. Today, fishery management practices are regulated in the United States and Canada. Commercial harvesting of salmon in Greenland marine waters is permitted, but it is regulated through international agreements. NOAA Fisheries and the FWS (2004) recognize the St. Pierre and Miquelon fishery off the coast of Newfoundland as a continuing potential threat to Atlantic Salmon.

Fish pathogens may be a significant factor in salmon population recovery, particularly in rivers influenced by pen facilities or hatcheries. Two salmonid diseases have only recently occurred in the range of existing salmon populations: infectious salmon anemia and salmon swimbladder sarcoma.

Predation and Competition

Atlantic salmon recovery is hampered by predation and competition. Important predators include marine mammals (especially seals) and avian predators (cormorants and mergansers, in particular). There are several other species of fish that are predators and competitors of Atlantic salmon.

The effects that aquaculture facilities and hatcheries have on Atlantic salmon are not fully understood. There may be issues associated with those salmon used for aquaculture and produced in hatcheries that are surrounded with wild Atlantic salmon, such as interactions, disease, and competition.

Status, Protection, and Management

NOAA Fisheries and the FWS listed the Gulf of Maine DPS of Atlantic salmon as endangered in 2000 (65 FR 69459). In September 2008, the Services determined that naturally spawned and conservation hatchery populations of Atlantic salmon within the range of the Gulf of Maine DPS, including those that were already listed in November 2000, constitute a new Gulf of Maine DPS and hence a ''species'' for listing as endangered under the ESA. A NOAA Fisheries Status Review was published in July 2006 (Fay et al. 2006). This reports an estimated extinction risk of 19 to 75 percent within the next 100 years for the Gulf of Maine DPS even when current levels of hatchery supplementation are considered. In June 2009, the Gulf of Maine DPS was further deliniated to include all freshwater bodies in the watersheds from the Androscoggin River northward along the Maine coast to the Dennys River (74 FR 29344). Information presented in Fay et al. (2006) determined that the best available science suggests that the St. Croix River groups with other Canadian rivers and Atlantic salmon within the St. Croix River system are genetically more similar to Canadian salmon populations. Additionally, the Atlantic salmon Inner Bay of Fundy population is listed by Canada as endangered.

The State of Maine prepared a Conservation Plan for Atlantic salmon and is a key partner in the recovery efforts for the species. The Maine Conservation Plan contains a number of actions and measures to reduce potential impacts on Atlantic salmon from recreational fishing, agriculture, aquaculture, and forestry. The federal Recovery Plan was developed in close cooperation with Maine, and many of its elements are based on the Maine Conservation Plan. In addition to efforts to reduce threats to this species, river-specific Atlantic salmon are being stocked. The final rule to list the DPS as endangered acknowledged the considerable efforts being put forth by the State of Maine and public and private sector partners to protect Atlantic salmon, but pointed out that despite these efforts, the DPS is in danger of extinction (Final Recovery Plan for the Gulf of Maine DPS of Atlantic Salmon [70 FR 75473]).

Remnant native populations of Atlantic salmon in the United States now persist only in Maine (Fay et al. 2006). These populations are functioning but at significantly reduced abundance levels. Although it is unlikely that any Atlantic salmon populations in the United States currently exist in a genetically pure native form, it is generally accepted that the DPS individuals are descendants of original stock. These Atlantic salmon represent the remnant genetic stock of

indigenous salmon from a region that included rivers from the Housatonic River in Connecticut to the headwaters of the Aroostook River in Maine. According to the latest Annual Report of the U.S. Atlantic Salmon Assessment Committee (2010), all stocks are at very low levels; only the Penobscot River population has been near 10 percent of its conservation spawning escapement and only because of an intensive smolt stocking program.

Riverine habitat occupied by the Gulf of Maine DPS is the southern extent of the Atlantic salmon range (Saunders 1981; Baum 1997). The loss of the Gulf of Maine DPS would move the range of Atlantic salmon further north and beyond the U.S. border. The Services acknowledge that salmon hatchery processes could potentially have influenced the genetic integrity of the Gulf of Maine DPS. However, the persistence of native stocks has been documented (Kendall 1935, Baum 1997), and hatchery fish have not necessarily caused hybridization with the remnant populations.

The State of Maine Seven Rivers Atlantic Salmon Commission Stocking Program has the responsibility for all Atlantic salmon stocking in Maine waters. The Maine ASC does this in cooperation with two FWS salmon hatcheries. These hatcheries receive Atlantic salmon collected by the Maine ASC from wild populations in Dennys, East Machias, Machias, Narraguagus, Penobscot, and Sheepscot Rivers and hold or raise them for use as broodstock. The current salmon stocking program in Maine uses river-specific fish. Each river receives progeny of fish previously collected from the same river; except restoration efforts in the Saco, Union, and St. Croix Rivers, which are based on Penobscot River origin fish.

Critical Habitat

On June 19, 2009, the entire occupied range of the Gulf of Maine DPS was listed as critical habitat in 45 specific areas occupied by Atlantic salmon, comprising approximately 12,160.86 miles of perennial river, stream, and estuary habitat and 308.5 square miles of lake habitat (74 FR 29300 and 29341). These areas comprise three salmon habitat recovery units, including the Penobscot Bay, Merrymeeting Bay, and Downeast coastal areas.

Species Occurrence in the Downeast LNG Project Area

LNG Waterway for Marine Traffic and LNG Terminal

Eastern Maine is described as the only state where remnant native populations of Atlantic salmon still persist; all other populations native to western North Atlantic (i.e., New England and Canadian waters) have been extirpated (Kocik and Sheehan 2006). In its comments on the initial BA, the FWS indicated that endangered Atlantic salmon could occur near the Downeast LNG Project area at Mill Cove during their migrations to and from rivers that are within the Gulf of Maine DPS (FWS 2009). The FWS also indicated that endangered Atlantic salmon could also occur in marine waters along the coast that might be used as a transit route by LNG carriers accessing the proposed terminal in Mill Cove. Therefore, the action area that is applicable to Atlantic salmon includes the offloading pier in Mill Cove and waters of Passamaquoddy Bay.

According to the Maine ASC, 15 salmon returned to the St. Croix River in 2003, 14 in 2004, and 42 in 2005 (however, in 2005, 35 individuals were determined to be aquaculture "escapees" leaving only 7 as either wild or hatchery-origin fish) (Dube 2006).

According to the Atlantic Salmon Federation, the Digdeguash River, a tributary of the St. Croix River, has a documented population of salmon (Maine ASF 2007). The Services currently do not designate the St. Croix River and its tributaries as part of the Gulf of Maine DPS or as critical habitat for the Gulf of Maine DPS. Critical habitat for the Gulf of Maine DPS for Atlantic Salmon is only identified as far east as Lubuc, Maine and the western portions of Cobscook Bay (NOAA Fisheries 2009).

Sendout Pipeline

Downeast conducted detailed stream evaluations during August 2006 based on survey protocols established by the Maine ASC and informal consultation with the FWS, Maine DMR, Maine DIFW and Maine ASC. Based upon this information, there are no potential Atlantic salmon spawning areas that would be crossed by the sendout pipeline. Ideal physiocochemical parameters for Atlantic salmon are limited to narrow temperature and dissolved oxygen ranges along with specialized substrate conditions for spawning. There were few locations where potential spawning beds were identified (beyond the proposed pipeline corridor), which greatly limits any habitat potential for Atlantic salmon.

Atlantic salmon migratory habitat was identified within the action area in the St. Croix River and Magurrewock Stream (Maine DMR 2008). Maine DMR anticipates few individuals to be present during the migration period in these locations. In September 2008, NOAA Fisheries proposed new critical habitat for Atlantic salmon in waters in or near Princeton and Baileyville, Maine.

4.1.2 Effects on Atlantic Salmon

Waterway for LNG Marine Traffic

Adult Atlantic salmon are common in Passamaquoddy Bay from May through November, and juveniles are common from April through June. Data are scarce concerning the biology of Atlantic salmon as they enter the marine habitat or the factors that influence their migration as post-smolts. Dube (2006) of the Maine ASC reports that between 2003 and 2005, a total of 71 returning salmon were sampled from the St. Croix River; however, in 2005, only 7 of the 42 returning individuals were determined to be wild-caught or hatchery reared, while the remaining 35 individuals were aquaculture "escapees." This relatively low number of documented returning non-hatchery reared salmon to the St. Croix River indicates that, while this species does occur in the waterbodies associated with the waterway for LNG marine traffic, its presence would likely be low. Additionally, mortality is thought to be high in post-smolts during the out migration, especially during the early stages, but data are lacking (Hansen et al, 2003; Lacroix et al, 2004). Migratory salmon present in the waterway may be temporarily displaced to adjacent waters by disturbance caused by LNG vessels; however, this displacement is expected to be

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short-term and localized. We received a letter from NOAA Fisheries, dated November 16, 2006, that concurred with this assessment.

The risk of an accidental or intentional release of LNG during transit of the LNG ships is extremely low and can be managed with appropriate safety and security measures (Sandia National Laboratories 2004). Because of the marine transit safety and security measures, the probability of an LNG vessel spill from collisions, allisions, and/or terrorist attacks would be unlikely. However, if released, unignited LNG would vaporize rapidly upon contact with the relatively warm air and water. Because LNG is not soluble in water and the LNG would completely vaporize shortly after being spilled, there would be no liquid left that could mix and/or contaminate the water. Therefore, potential surface water impacts associated with an accidental release of LNG are not considered significant due to the low probability of a spill.

Direct contact with spilled LNG would be fatal due to the cryogenic temperature of LNG. Exposure to lower water temperatures near an LNG spill could cause adverse effects on salmon, ranging from cold shock to lethal exposure. An LNG spill on water would create a thermocline in the waterbody surrounding the immediate spill area that would likely be detected and avoided by any salmon in the affected area. There is a potential of limited significant impacts if a spill should occur; however, with implementation of the safety and security measures recommended by the Coast Guard to ensure suitability of the waterway, the likelihood of such an event would be extremely remote. Atlantic salmon adults may occur within the waterway for LNG marine traffic, but are unlikely to be adversely affected by the LNG vessel transits to the Downeast LNG Project.

LNG Terminal

Potential impacts on salmon near the terminal site include construction related lighting, noise, increased sedimentation and turbidity associated with pile driving and hydrostatic testing of storage tanks, destruction of benthic habitats, as well as operational impacts including entrainment/impingement of juvenile salmon during LNG vessel ballast water uptake or engine cooling.

The proposed LNG terminal site is near the migratory corridor for adult salmon and juvenile salmon smolts moving to and from the St. Croix River. Within the region, Atlantic salmon use Passamaquoddy Bay and, the St. Croix, Dennys, and Pennamaquen Rivers as migratory corridors. Within the Dennys River, this species spawns and rears its young. We received scoping comments expressing concern for migrating smolts near the LNG terminal. However, in a communication to the FERC on November 16, 2006, the FWS and NOAA Fisheries indicated that, while transient individuals may occur, Atlantic salmon are not likely to occur near the proposed LNG terminal. Therefore, no adverse effects on Atlantic salmon are anticipated from construction or operation of the terminal.

Sendout Pipeline

There is known, but unmapped, salmon habitat downstream of Downeast's proposed crossing of the Wapsaconhagen Brook at MP 21.3. According to the Maine ASC, this location is a considerable distance from the point of crossing and is not of high quality (Norm Dube, pers. comm., August 26, 2008). Downeast would cross Wapsaconhagen Brook using a dam-and-pump technique which would require in-stream excavation of a trench. This type of dry, open-cut construction produces less sedimentation and turbidity than traditional wet open-cut methods. These dry, open-cut crossings are often completed in less than 24 hours. In-stream activities associated with placing the dams would be expected to temporarily displace fish, both upstream and downstream, from the dams. In-stream activities associated with both dry and wet crossing methods could physically damage fish or fish eggs and other aquatic organisms, including prey and forage species. Vegetation removal at stream crossings could also result in increased water temperature, decreased presence of large, woody debris and the associated reduction of in-stream habitat, and increased stream bank failure adjacent to the waterbodies.

Critical habitat for the Downeast Coastal Salmon Habitat Recovery Unit of Atlantic salmon was revised on June 19, 2009 to include watersheds in Princeton and Baileyville, Maine. The waters that would be crossed by the sendout pipeline have not been identified as critical habitat for the Atlantic salmon. Atlantic salmon migratory habitat was identified within the action area in the St. Croix River and Magurrewock Stream (Maine DMR 2008); however, the Maine DMR anticipates few individuals to be present during the migration period in these locations. To minimize any potential impacts on downstream habitats associated with stream crossings, Downeast has proposed to cross coldwater fisheries between July 16th and September 30th. Downeast would also implement its pipeline erosion control plan and allow the right-of-way to fully revegetate following construction.

The FERC typically requires that a riparian buffer at least 25 feet wide be allowed to permanently revegetate with native plant species across the right-of-way after construction is completed. As specified in the project's *Soil Erosion and Sediment Control Guidelines*, Downeast would extend the maintenance setback from 25 feet to 100 feet at all perennial Class A, AA, coldwater, and coldwater/warmwater waterbodies, unless the Maine DEP approves a variance based on site-specific conditions. Trees and shrubs greater than 15 feet in height that are within 15 feet of the pipeline would be selectively cut to facilitate periodic pipeline surveys and prevent damage by deep rooted vegetation.

There is also the potential for spills or leaks of fuels or hazardous materials from storage containers, equipment working in or near streams, and fuel transfers, which could be detrimental to salmonids if they reach a waterbody. Exposure to chemicals could result directly in death or alter behavior, physiological processes, or by affect food sources. To minimize the potential for and impacts of any spills near surface waters, Downeast would implement a state approved Stormwater Pollution Prevention Plan (SWPPP) that includes spill prevention and response procedures. Downeast does not propose to use any herbicides for right-of-way maintenance.

Determination of Effects to Atlantic Salmon

The Downeast LNG Project has the potential to adversely affect Atlantic salmon; however, Downeast has agreed to implement a variety of mitigation measures that would avoid or minimize impacts on this species. These mitigative measures include timing construction to avoid times of year when migrating salmon smolts or adult salmon could be present; employing construction methods in stream crossings that minimize damages on the aquatic habitat; and preserving and restoring riparian buffers. Implementation of these measures would be sufficient to prevent adverse impacts on Atlantic salmon. Therefore, we believe construction and operation of the Downeast LNG Project ***is not likely to adversely affect*** Atlantic salmon.

The Downeast LNG Project would not impact designated Atlantic salmon critical habitat. Therefore, construction and operation of the Downeast LNG Project would have ***no effect*** on designated Atlantic salmon critical habitat. The Gulf of Maine DPS of Atlantic salmon, as currently described in 65 FR 69459, would not be crossed by the Downeast LNG Project.

4.2 ATLANTIC STURGEON (THREATENED – GULF OF MAINE DPS)

4.2.1 Status of Atlantic Sturgeon in Project Area

Species Description

The Atlantic sturgeon has a long, sharply "v"-shaped snout, the presence of bony scutes between the anal fin base and the lateral scute row, and the presence of pale intestines. It is black-blue above and pale below, and can grow to 14 feet (NOAA Fisheries 2011; Page and Burr 1991).

Coastal features or shorelines where migratory Atlantic sturgeon commonly aggregate include the Bay of Fundy, Massachusetts Bay, Rhode Island, New Jersey, Delaware, Delaware Bay, Chesapeake Bay, and North Carolina. Historically, Atlantic sturgeon were present in 38 rivers in the United States from St. Croix, Maine to the Saint Johns River, Florida, of which 35 rivers have been confirmed to have had a historical spawning population. Atlantic sturgeon are currently present in 35 rivers, and spawning occurs in at least 20 of these rivers (Atlantic Sturgeon Status Review Team 2007).

Life History

The Atlantic sturgeon is a long-lived, late maturing, estuarine dependent, anadromous species. It spawns in freshwater but spends most of its adult life in the marine environment. Females may live to over 60 years, while males are thought to live about 30 years. Spawning adults migrate upriver from April to May in mid-Atlantic waters and May to July in Canadian waters. This species is highly migratory; mark-recapture studies have documented movements of sturgeon from the Hudson and Delaware Rivers to as far north as coastal Maine and south to North Carolina (Shepherd 2006). Atlantic sturgeon spawning is thought to occur in large rivers where flow rates are between 1.5 to 2.5 feet per second and depths of 36 to 89 feet. Sturgeon eggs adhere to hard bottom substrates (e.g., cobble), and hatch 4 to 6 days later. Newly hatched larval fish begin migrating downstream to rearing habitats after 8 to 12 days; as they develop into juveniles, they continue moving downstream into brackish waters, and eventually become

residents in estuarine waters for months or years. Subadults move to coastal waters after reaching lengths of 30 to 36 inches. Despite its extensive migrations, the adult sturgeon returns to its natal stream for spawning. Males return first and remain in the natal stream for the entire spawning period, whereas females leave the spawning grounds soon after eggs are laid (Atlantic Sturgeon Status Review Team 2007). Spawning intervals are irregular; males are thought to spawn every 1 to 5 years, and females every 2 to 5 years.

Habitat

The Atlantic sturgeon spawns in freshwater, but spends most of its adult life in near-shore coastal waters. Spawning occurs in large flowing rivers between the salt front and the fall line (located below waterfalls) over hard substrates. Juveniles move into brackish waters and remain there until reaching subadult size; subadults then migrate into coastal waters. Once the sturgeon leaves its natal stream, it generally becomes highly migratory (Atlantic Sturgeon Status Review Team 2007).

Population Dynamics

Comprehensive information on current or historic abundance of Atlantic sturgeon is lacking for most river systems. A substantial Atlantic sturgeon fishery existed into the late 1800s, with landings as high as 3,500 metric tons. Stock abundance of Atlantic sturgeon steadily declined throughout the 20th century, largely due to overfishing and habitat degradation/destruction (Shepherd 2006). Population estimates of spawning adults are available for only two subpopulations of Atlantic sturgeon, including the Hudson (about 870 adults per year) and Altamaha Rivers.

Threats

The growing demand for caviar in the 1870s is largely responsible for the intense pressures on this fishery, ultimately causing its collapse by 1901. The Atlantic sturgeon fishery was closed by the Atlantic States Marine Fishery Commission in 1998, when a coastwide fishing moratorium was imposed for 20-40 years.

Atlantic sturgeon depend on a wide range of estuarine and freshwater habitats for spawning, early life stage survival, and survival and growth of juveniles, making it susceptible to impacts at each life stage. Pollution, habitat degradation (e.g., dewatering of streams, changes in physiochemical properties of streams, and physical alteration of in-stream habitats), fishing exploitation in spawning habitats, and as bycatch in marine fisheries all represent critical threats to this species. Additionally, individuals are susceptible to vessel strikes (Atlantic Sturgeon Status Review Team 2007).

Status, Protection, and Management

In response to a petition in 1998 to list Atlantic sturgeon under the ESA, the Services published a determination that listing the species was not warranted at that time (63 FR 50187). However, NOAA Fisheries retained this species on its candidate species list in order to continue to monitor its status (63 FR 50211) and later transferred it to its newly established species of concern list

(69 FR 19975). In 2005, NOAA Fisheries initiated a new status review to make a determination on whether listing the Atlantic sturgeon or DPSs of this species is warranted. Based on the status review report (Atlantic Sturgeon Status Review Team 2007), and other information available since completion of the status review, NOAA has determined that the species is comprised of five DPSs that qualify as species under the ESA: Gulf of Maine; New York Bight; Chesapeake Bay; Carolina; and South Atlantic (75 FR 61872). On January 31, 2012, NOAA Fisheries issued a final determination that lists the Atlantic sturgeon as threatened for the Gulf of Maine DPS (77 FR 5880). The remaining four DPSs have been listed as endangered.

Critical Habitat

Critical habitat has not yet been designated for this species.

Species Occurrence in Project Area

The geomorphology of most small coastal rivers in Maine is not sufficient to support Atlantic sturgeon spawning populations, except for the Penobscot and the estuarial complex of the Kennebec, Androscoggin, and Sheepscot Rivers. During the summer months, the salt wedge intrudes almost to the site of impassable falls in the St. Croix River (river mile 9.94), Machias River (river mile 6.21), and the Saco River (river mile 6.21). Although surveys have not been conducted to document Atlantic sturgeon presence, subadults may use the estuaries of these smaller coastal drainages during the summer months.

The historic and current status of the St. Croix Atlantic sturgeon population is largely unknown. A small population of large sturgeon may be spawning annually below the hydropower dam on the St. Croix River (Atlantic Sturgeon Status Review Team 2007).

The Gulf of Maine population of Atlantic sturgeon historically supported at least four spawning subpopulations; however, today it is suspected that only two extant subpopulations exist in the Penobscot and Kennebec Rivers. Of these two extant subpopulations, the Kennebec was considered a subpopulation of significant value to the Gulf of Maine population, as this subpopulation was historically large. Historically, the Kennebec supported about 15,000 spawning adults. It was speculated that the Penobscot subpopulation was extirpated until a fisherman captured an adult Atlantic sturgeon in 2005, and a gill net survey directed toward Atlantic sturgeon captured seven in 2006 (Atlantic Sturgeon Status Review Team 2007).

Few Atlantic sturgeon have been captured in the Piscataqua River. Since 1990, the New Hampshire Fish and Game has not observed or received reports of Atlantic sturgeon of any age-class being captured in the Great Bay Estuary and its tributaries. This species is thought to be extirpated from the area.

4.2.2 Effects on Atlantic Sturgeon

Waterway for LNG Marine Traffic

The Atlantic sturgeon may be present in the St. Croix River; however, data about this population are lacking. Atlantic sturgeon present in the waterway may be temporarily displaced to adjacent

waters by disturbance caused by LNG vessels; however, this displacement is expected to be short-term and localized.

The risk of an accidental or intentional release of LNG during transit of the LNG ships is extremely low and can be managed with appropriate safety and security measures (Sandia National Laboratories, 2004). Because of the marine transit safety and security measures, the probability of an LNG vessel spill from collisions, allisions and/or terrorist attacks would be unlikely. However, if released, unignited LNG would vaporize rapidly upon contact with the relatively warm air and water. Because LNG is not soluble in water and the LNG would completely vaporize shortly after being spilled, there would be no liquid left that could mix and/or contaminate the water. Therefore, potential surface water impacts associated with and accidental release of LNG are not considered significant due to the low probability of a spill.

Direct contact with spilled LNG would be fatal due to the cryogenic temperature of LNG. Exposure to lower water temperatures near an LNG spill could cause adverse effects to Atlantic sturgeon, ranging from cold shock to lethal exposure. An LNG spill on water would create a thermocline in the waterbody surrounding the immediate spill area that would likely be detected and avoided by any sturgeon in the affected area. There is a potential of limited significant impacts if a spill should occur; however, with implementation of the safety and security measures recommended by the Coast Guard to ensure suitability of the waterway, the likelihood of such an event would be extremely remote. Atlantic sturgeon adults may occur within the waterway for LNG marine traffic, but are unlikely to be adversely affected by LNG vessel transits to the proposed project.

LNG Terminal

The Atlantic Sturgeon Status Review Team (2007) notes that a small spawning population of large Atlantic sturgeon may be present in the St. Croix River below the hydroelectric dam; however, it also notes that spawning habitats are largely lacking because the salt water wedge intrudes nearly to the impassable falls at river mile 9.94. Few spawning adults are anticipated to be present in the St. Croix River; however, subadults may use Passamaquoddy Bay in summer months. Potential impacts on Atlantic sturgeon near the terminal include lighting, noise, increased sedimentation and turbidity associated with pile driving and hydrostatic testing of storage tanks, and accidental releases and spills, as well as operational impacts including entrainment/impingement during LNG vessel ballast water uptake or engine cooling.

Turbidity

Construction of the LNG terminal would involve the installation of the pier and berthing facilities within Mill Cove. Specifically, pier construction could contribute to water quality degradation through increased turbidity. During rock socket drilling activities, drill cuttings would be produced and released into the water column. The resuspension of sediments during pier installation activities, including propeller wash from construction vessels and the release of drill cuttings could cause increased turbidity resulting in reduced light penetration and hence reduction in primary productivity. Turbidity can also cause an increase in biological oxygen

demand resulting in decreased dissolved oxygen concentrations available to fish in and around the affected area. Low dissolved oxygen concentrations can also negatively affect organisms that are an important prey base. Indirect adverse impacts on phytoplankton production could result from increased turbidity associated with disturbance of the sea floor. Turbidity would reduce visibility thus affecting the ability of sight feeders to locate prey. Fishes such as the Atlantic sturgeon may also experience gill clogging effects caused by excessively turbid water making contact with gill surfaces.

The effects associated with construction in Mill Cove are anticipated to be short-term and minor. Given the tidal amplitude and strong currents affecting the area, construction activities are not likely to produce thick layers of sediment in any one location of the project area, and the water turnover also would aid in dispersing any suspended drill cuttings. The installation of the pier would also be conducted using a conventional "over-the-top" method of construction whereby the pier trestle is constructed from the shore seaward. This method of installation would limit the use of barge-mounted equipment reducing the amount of impacts on the seabed from anchoring, as well as reduce the area of habitat disturbance and loss from propeller wash. Downeast has stated it would use best management practices (BMPs) to minimize/localize turbidity. In addition, as the pier support structures would be bolted to the bedrock underlying the softer seafloor surface, foundations would not have to be poured or filled, resulting in a relatively small footprint of the seafloor. Total permanent habitat loss due to piling structures would be approximately 0.11 acre.

Noise

Noise generated from tugboats, operation of barge mounted equipment, and pile driving (vibratory and impact hammering) during LNG terminal construction could affect Atlantic sturgeon present during construction activities. Sounds of short duration that are produced intermittently or at regular intervals, such as sounds from pile driving, are classified as "pulsed." Sounds produced for extended periods, such as sounds from generators, are classified as "continuous." Although continuous noise sources (tugboats, operation of diesel powered construction equipment) have the potential to elicit certain behavioral effects on marine species, impact pile driving has the greatest potential to cause harassment or injury through generation of intense underwater sound pressure waves. Large diameter steel pipe piles are anticipated to be used to support the trestle and loading platform. These piles would be vibrated through any surficial soils on the seabed to the top of the underlying rock, where they would be seated into competent bedrock using an impact hammer. Driving hollow steel piles with impact hammers produce intense, sharp spikes of sound that can easily reach levels that injure fish. Conversely, vibratory hammers produce sounds of lower intensity, with a rapid repetition rate.

In discussing the impacts of sound on aquatic resources it is important to note the difference in sound intensity in air versus water. Sound intensity in air uses a standard of 20 micropascals (μPa), while sound intensity measured in water uses a standard level of 1 μPa. Sound sources are typically presented as sound pressure levels at a distance of 1 meter from an idealized point source, i.e., decibels (dB) re 1 micro-Pascal (μPa) at 1 meter.

The intensity of the sound pressure levels produced during pile driving depends on a variety of factors including, but not limited to, the type and size of the pile, the firmness of the substrate into which the pile is being driven, the depth of water, the type and size of the pile-driving hammer, and the geometry and boundaries of the surrounding underwater environment. In water, the frequency component of pile driving varies with principal energy found in the 200 to 400 Hz range. Impact pile driving source levels well in excess of 200 dB (re: 1 μPa) at 1 meter have been documented from similar construction projects.

The degree to which marine species are exposed to and affected by sound waves is dependent upon variables such as the peak sound pressure level and frequency as well as the species and size (e.g., small fish appear to be more susceptible to injury by intense sound waves than are larger fish of the same species). Short-term exposure to peak sound pressure levels above 190 dB (re:1 μPa) is thought to physically harm fish (Hastings 2002).

Although the effects of pile driving are poorly studied and there appears to be substantial variation in a species' response to sound, intense sound pressure waves can change fish behavior or injure/kill fish through rupturing swim bladders or causing internal hemorrhaging (NMFS 2005; Hastings and Popper 2005). We would not expect noise impacts on sturgeon within the project area at the time of construction to be materially different than those impacts on other fish species. The presence of predators can also influence how marine species might be affected by pile driving (e.g., fish stunned by pile-driving activities may be more susceptible to predators). If drilling and/or vibropiling were to occur during anadromous fish migrations, the avoidance of the nearshore areas could restrict migrating fish to deepwater areas that are less suitable for some species, which could increase the susceptibility of some smaller species to predation.

Underwater noise during construction activities would be temporary, and long-term noise impacts are not expected to be significant. However, adverse impacts during impact pile driving can be mitigated. Minimizing the number of pile segments to be driven with an impact hammer would reduce the noise impact from pile installation. A "noise-alert" procedure would be used to cause mobile marine species sensitive to the acoustics generated by the pile driving to vacate and avoid the immediate area before pile driving procedures are continued. Additional potential mitigation measures include time of year restrictions, bubble curtain systems, caissons, or the engagement of a NMFS-approved marine spotter to ensure no sensitive species are within the designated NMFS Acoustic Safety Zone during construction activity.

Downeast has stated it would continue to consult with NOAA Fisheries and other relevant federal and state agencies to discuss appropriate mitigation measures. To date Downeast has not proposed any specific mitigation measures to minimize acoustic impacts on marine species. However, we have recommended in our EIS that Downeast should continue to consult with NOAA Fisheries and other relevant federal and state agencies to determine appropriate mitigation strategies to employ during construction of the LNG terminal facility to minimize acoustic harassment or harm to marine species (fish, sea turtles, pinnipeds, and other marine mammals). These mitigation measures would address Atlantic Sturgeon.

Lighting

Reduced light penetration and reduced visibility due to increased turbidity during construction of the LNG terminal are discussed above under "Turbidity." During operation, the presence of the pier structure could affect marine organisms due to shading and the presence of artificial lighting. However, the pier is relatively narrow and would be constructed at a sufficient height above the water resulting in only minor shading effects. Safety lighting of the pier is under the jurisdiction of the Coast Guard. Downeast would work with the Coast Guard in coordination with Maine DMR and NOAA Fisheries to establish a lighting plan that would both meet Coast Guard safety standards and minimize the impacts associated with artificial lighting on marine organisms to the extent practicable. In addition, while the pier may serve as a detractor to some species due to either shading or lighting, the pier pilings themselves would provide new attachment surfaces for various marine prey species for the sturgeon. In the Eastport region, piers are known for their biological richness.

Timing of Construction Activities

To further mitigate for construction related impacts, Downeast is currently consulting with the appropriate agencies regarding the timing of construction activities to avoid particularly sensitive periods. Timing may include seasonal considerations to avoid sensitive periods such as during spawning and migration, including for Atlantic sturgeon if identified as needed by agencies, and peak fishery activity. Timing may also include avoiding equipment relocation activity during specific periods of the diurnal tide to avoid excessive disturbance to the bottom and reduce sediment resuspension by construction vessels. Additional mitigation options include specific measures for impact containment, such as the use of silt retention devices to restrict silt plumes. We have recommended in our EIS that Downeast continue to consult with NOAA Fisheries, Maine DMR, and other appropriate agencies to determine any recommended seasonal or construction timing restrictions to minimize impacts on marine species and habitats during LNG terminal construction activities, including all proposed in-water work, pile driving, and water withdrawals and discharges.

Impingement and Entrainment

During construction of the LNG terminal, Downeast would conduct hydrostatic testing of the LNG storage tanks using approximately 28 million gallons of water, obtained principally from Passamaquoddy Bay. Entrainment and impingement of fish and other aquatic organisms such as zooplankton and ichthyoplankton could occur during water withdrawals. Impact on Atlantic sturgeon would be minimal because few individuals are expected to occur in the Project vicinity and those indivuals would be primarily juvenile, subadults, or adults and because of their size impingement or entrainment would be unlikely. Downeast would minimize the potential for entrainment and impingement of sturgeon by regulating the intake rate and by the use of screens on intake hoses. Downeast is currently proposing the use of a #200 mesh filter during intake of hydrostatic test waters. Downeast has also stated it would coordinate with federal and state agency personnel regarding the scheduling of testing to minimize potential conflicts with seasonal/life-cycle periods of important aquatic resources. We recommended that Downeast file

the results of its agency consultations and detail any proposed timing restrictions, prior to construction of the LNG terminal. All water used for testing would be discharged back to the Bay.

During operation, water would be taken on by LNG vessels while at the pier as ballast and to cool the engines generating power for the off-loading pumps and other onboard systems. The majority of water used for onboard systems would be for engine cooling water. A 165,000-m^3 LNG vessel would require a maximum of about 55.5 million gallons of water over a 21-hour period to support engine cooling while at the pier (a maximum average intake rate of 540 gallons per second). Entrainment and impingement of fish and other aquatic organisms, including Atlantic sturgeon, could occur during this water intake. However, because of the size of the juvenile, subadult, and adults that may be in the project area and few individuals are expected to occur in the Project vicinity, we believe entrainment would be unlikely.

Accidental Releases and Spills

During construction, the potential for spills and accidental releases of material such as diesel fuel, lubricants, and hydraulic fluid could affect fishes and other aquatic life through acute or chronic toxicity; and result in sub-lethal effects which could affect reproduction, growth, and recruitment. To minimize the likelihood of accidental spills and releases, Downeast has adopted the measures specified in our Procedures regarding spill prevention and containment near waterbodies. In addition, we recommended in our EIS (section 4.3.2.2), that Downeast develop a project-specific Marine SPCC Plan to prevent, respond to, and mitigate any potential spills of oil, gas, lubricants, or other hazardous materials during construction and operation of the marine terminal. Given the adoption of the measures in our Procedures and the recommendation to develop a Marine SPCC Plan, we conclude the risk of accidental spills or the introduction of other hazardous materials to the marine environment and their effects on aquatic life would be effectively minimized.

During operation, all commercial vessels calling on the Project must comply with the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78). MARPOL is the international treaty regulating disposal of wastes generated by normal operation of vessels. In the United States, MARPOL is implemented by the Act to Prevent Pollution from Ships, under the lead of the Coast Guard. Discharge and disposal of garbage and other solid debris from vessels is prohibited by the Bureau of Safety and Environmental Enforcement (BSEE) (30 CFR 250.300) and the Coast Guard (MARPOL Annex V, Public Law 100-220 [Statute 1458]). Fuel on LNG vessels is protected by their double hull construction. Additionally, each LNG vessel would maintain a *Shipboard Oil Pollution Emergency Plan* (SOPEP) as required by international convention and in compliance with MARPOL 73/78 Consolidated Edition 2002 Annex 1 Regulation 26, which requires every oil tanker of 150 tons gross and above, and every vessel of 400 tons gross and above to carry an approved SOPEP.

Non-recreational vessels 79 feet or greater in length must also comply with the EPA's Vessel General Permit (VGP). On December 18, 2008, the EPA issued a final VGP to reduce releases of 26 types of discharges from vessels operating in U.S. waters. The new permit incorporates the Coast Guard's mandatory ballast water management and exchange standards, and provides technology-based and water-quality-based effluent limits for other types of discharges, including deck runoff, ballast water, and gray water. It also establishes specific corrective actions, inspections and monitoring, recordkeeping, and reporting requirements.

Compliance with these applicable regulations would effectively minimize potential impacts on aquatic habitats associated with the discharge of graywater, blackwater, ballast water, or potential accidental releases from LNG vessels at the berth. As discussed in our EIS (section 4.3.2.2), we recommended that Downeast develop a project-specific Marine SPCC Plan to prevent, respond to, and mitigate any potential spills of oil, gas, lubricants, or other hazardous materials during construction and operation of the marine terminal. Downeast would have spill containment basins in the process, vaporizer, and LNG transfer areas to collect and contain any LNG spills.

There is a very low probability that an area of the pipelines associated with the LNG transfer system would fail, or that LNG vessel spill from collisions, allisions, or terrorist attacks would release LNG into the marine environment. However, if an unignited LNG spill were to occur at the terminal, given that LNG is lighter than water, the LNG would float on the water until it had vaporized, possibly reaching shore. If the LNG were to contact any aquatic species, it could be injured (e.g., tissue damage from freeze burns and lung and/or internal organ damage from ingestion or inhalation) or killed. Further, because the colder water would be denser than the ambient water, it would sink to the bottom and could affect the benthos in the area of the incident. Mobile species would be expected to move from the area until water temperatures return to normal. However, non-mobile species could be subjected to the cold water temperatures (the further from the spill, the less water temperatures would be affected). If an associated fire were to occur with the release of LNG, impacts on species would be limited to those individuals on or near the water surface in the vicinity of the fire. Radiant heat within Zone 2 may impact some species on the water's surface. Because of the marine transit safety and security measures, the probability of a LNG vessel spill from collisions, allisions, and terrorist attacks would be highly unlikely.

Although transient Atlantic sturgeon may be present near the LNG terminal, specific data about its abundance in and use of the St. Croix River are lacking. Downeast would implement protective measures that adequately mitigate for impacts to this species, if present, near the terminal. Because few individuals are expected to occur near the LNG terminal, adverse impacts to the Atlantic sturgeon are not anticipated.

Sendout Pipeline

Atlantic sturgeon may be present in the St. Croix River, which Downeast has proposed to cross using HDD methods. If this method is successfully implemented, we would not anticipate any

adverse impacts on Atlantic sturgeon from pipeline construction. Additionally, Downeast has proposed to cross coldwater fisheries between July 16th and September 30th, a time when migratory sturgeon are thought to be absent. Downeast does not propose to use any herbicides for right-of-way maintenance.

Determination of Effects

The proposed project has the potential to adversely affect Atlantic sturgeon; however, Downeast has agreed to implement a variety of mitigation measures that would avoid or minimize impacts to this species. These mitigative measures include timing construction to avoid times of year when migrating sturgeon are likely to be present and by implementing construction methods that preserve habitat (e.g., use of HDD). Construction and operation of the proposed project ***may affect, but is not likely to adversely affect,*** Atlantic sturgeon.

4.3 SHORTNOSE STURGEON (ENDANGERED)

4.3.1 Status of Shortnose Sturgeon in Project Area

Species Description

As a member of the sturgeon family, the shortnose sturgeon (*Acipenser brevirostrum*) is among the most primitive bony fishes, inhabiting riverine and estuarine environments. The short-nose sturgeon shares the same general external morphology of other sturgeon, characterized by a body surface that lacks scales but contains five rows of bony plates or "scutes." The shortnose sturgeon has a long, pointy tail, short shovel-shaped snout, large fleshy barbells projecting from the chin and mouth to detect food, and a mouth located on the underside of the head for bottom feeding. It is the smallest of three sturgeon species that inhabit northeastern waters, growing to a length of 48 inches and a weight of 15 pounds. Its coloring is olive-yellow to gray or bluish on the back, and white to dark yellow on the belly.

Shortnose sturgeon are benthic feeders, typically feeding on the bottom or off of plant surfaces. Juveniles eat available benthic crustaceans and insects. Adults in freshwater eat mollusks, crustaceans, and insect larvae, depending on availability; in estuaries, polychaete worms, crustaceans, and mollusks are the primary foods.

The shortnose sturgeon is found on the Atlantic Coast of North America where its range extends from the Saint John River, New Brunswick, to the St. Johns River, Florida, and in Maine populations inhabit the Sheepscot, Kennebec, Androscoggin, and Penobscot Rivers and Merrymeeting Bay (NOAA Fisheries 1998b). The federal recovery plan for the species identifies 19 DPSs, of which the Penobscot and Kennebec System DPSs occur in Maine (NOAA Fisheries 1998b). Ongoing studies show that at least some population of shortnose sturgeon in Maine undergo coastal migrations between river systems (Zydlewski et al. unpublished), and NOAA Fisheries (2012a) suggests that although undocumented, the shortnose sturgeon may also occur in the same rivers as the Gulf of Maine DPS of the Atlantic sturgeon.

Life History

Shortnose sturgeon are typically long lived, and exhibit delayed sexual maturity and high reproductive capacity. The maximum known age for females is 67 years, however males seldom exceed 30 years. The sex ratio among young adults is 1:1 but changes to a predominance of females (4:1) for larger fish (i.e., for length longer than 90 cm).

Reproduction and growth characteristics vary with latitude due to the effect of differing temperature regimes, with northern populations typically exhibiting slower growth and later maturity. In the north, females typically reach maturity at 12-18 years of age and males at 10 to 11 years of age. The first spawning may occur 1-16 years after maturity, and continues annually at intervals of a few to several years.

Spawning occurs in the spring at or above the head of the tide. Eggs, which are laid in freshwater, hatch in approximately 13 days and drift downstream and remain there for 3 to 10 years. Shortnose sturgeon then move to the freshwater/saltwater interface. Adults may occur in freshwater or tidal areas of rivers during summer and winter, where they concentrate in areas of decreased flow thought to be associated with conditions suitable for their prey.

Habitat

Shortnose sturgeon inhabit rivers, estuaries, and the sea. This species is anadromous, living mainly in the slower moving riverine waters or nearshore marine waters, and migrating periodically into faster moving fresh water areas to spawn. However, unlike other anadromous species in the region, shortnose sturgeon do not appear to make long distance offshore migrations. Sturgeon are usually most abundant in estuaries, and are generally found within a few miles of land when at sea.

Shortnose sturgeon prefer deep pools with soft substrates and vegetated bottoms, but individuals may vary in preference for various water depths and substrate types (Seibel 1991). Generally, shortnose sturgeons spawn in sand to boulder sized substrate with low-medium water flow (0.2 to 1.8 m/sec). Larvae and juveniles have been reported from deep river channels above the salt wedge (Richmond and Kynard 1995).

Population Dynamics

Shortnose sturgeon declined dramatically in Maine rivers by the 1900s and were nearly extirpated from the Penobscot River, with only one adult found in 1997 (Maine DIFW 2003). However, the population in the estuarine complex of the Kennebec, Androscoggin, and Sheepscot Rivers in the Kennebec River System is the largest population in the United States north of the Hudson River, numbering approximately 7,000 adults. No population estimate exists for the Penobscot River System.

Threats

Primary threats to the shortnose sturgeon are pollution and overharvesting for commercial fisheries, including bycatch in the shad fishery. High fish loss resulted from pollution of large

tidal rivers during the 19th and early 20th centuries. During this time, shortnose sturgeon commonly were taken in a commercial fishery for the closely related, and commercially valuable, Atlantic sturgeon. Concurrently, the species was in high demand for caviar, which lasted until the 1950s. Habitat alterations from discharges, dredging or disposal of material into rivers, or related development activities involving estuarine/riverine mudflats and marshes, continue to be threats.

Status, Protection, Management

The shortnose sturgeon was listed as endangered throughout its range on March 11, 1967 under the Endangered Species Preservation Act of 1966 (a predecessor to the ESA of 1973). A recovery plan was drafted in 1998 (NOAA Fisheries 1998b) outlining actions that need to be taken in order to recover the species. This species is also listed as a species of concern in Canada.

The shortnose sturgeon has been the subject of considerable research by the Maine DMR, including mark-recapture population studies and radio tracking studies to determine movement patterns and habitat use. Recent local, state, and federal conservation efforts have focused on Merrymeeting Bay, and the Penobscot, Kennebec, St. George, Medomak, Damariscotta, Union, and Narraguagus Rivers.

Critical Habitat

No critical habitat has been designated for the shortnose sturgeon.

Species Occurrence in Project Area

The shortnose sturgeon is not documented in the St. Croix River system or coastal waters near Passamaquoddy Bay. The closest documented population is in the Penobscot River over 100 miles south of the Project area. However, ongoing studies show that at least some population of shortnose sturgeon in Maine undergo coastal migrations between river systems, and one individual was detected in 2010 in the Narraguagus River, about 60 miles south of the Project area (Zydlewski et al. unpublished). NOAA Fisheries (2012) also suggests that although undocumented, the shortnose sturgeon may occur in the same rivers as the Gulf of Maine DPS of the Atlantic sturgeon. The historic and current status of the St. Croix Atlantic sturgeon population is largely unknown, but a small population of large sturgeon may be spawning annually below the hydropower dam on the St. Croix River (Atlantic Sturgeon Status Review Team 2007, see also discussion of Atlantic sturgeon above).

4.3.2 Effects on Shortnose Sturgeon

Although undocumented, if the shortnose sturgeon does occur in the Project area potential effects on this species would be the same as described above for the Atlantic sturgeon.

Determination of Effects

The proposed project has the potential to adversely affect shortnose sturgeon; however, Downeast has agreed to implement a variety of mitigation measures that would avoid or

minimize impacts to this species. These mitigative measures include timing construction to avoid times of year when migrating sturgeon could be present and by implementing construction methods that preserve habitat (e.g., use of HDD). Construction and operation of the proposed project ***may affect, but is not likely to adversely affect***, shortnose sturgeon.

4.4 LEATHERBACK SEA TURTLES (ENDANGERED)

4.4.1 Status of Leatherback Sea Turtles in Project Area

Species Description

The leatherback sea turtle (*Dermochelys coracea*) is the largest living turtle. The adult leatherback is often 4 to 8 feet long and weighs 500 to 2,000 pounds. The carapace shell is composed of a mosaic of small bones covered by firm, rubbery skin raised into seven prominent ridges. The skin is scaleless and predominantly black with varying degrees of pale spotting. Either side of the upper mandible bears a tooth-like cusp; the lower jaw is hooked anteriorly. Hatchlings are also mostly black with mottled undersides and have a seven-ridged carapace.

The leatherback's pointed, tooth-like cusps and sharp edged jaws are perfectly adapted for a diet of soft-bodied pelagic prey. Jellyfish are the main staple of its diet, and secondary prey include sea urchins, squid, crustaceans, tunicates, fish, blue-green algae, and floating seaweed. Posteriorly-pointed spines located in the mouth and throat help retain the turtle's gelatinous prey during feeding.

The leatherback turtle is distributed worldwide in tropical and temperate waters of the Atlantic, Pacific, and Indian Oceans. Adult leatherbacks are capable of tolerating a wide range of water temperatures; small numbers of individuals occur as far north as British Columbia, Newfoundland, and the British Isles, and as far south as Australia, Cape of Good Hope, and Argentina. In the United States, leatherbacks have been sighted along the U.S. Atlantic coast as far north as the Gulf of Maine and south to Puerto Rico, the U.S. Virgin Islands, and into the Gulf of Mexico.

Nesting grounds are located around the world; the largest assemblages are on the northern South American and west African coasts. Significant sites in the U.S. are much smaller nesting colonies and are in the U.S. Caribbean, primarily Puerto Rico and the U.S. Virgin Islands, and southeast Florida. Nesting north of Florida is rare (Eckert 1995).

Life History

It is estimated that leatherbacks reach sexual maturity between 6 and 10 years of age. The estimated average lifespan for leatherbacks is about 45 years. Leatherbacks have been observed mating in the waters adjacent to nesting beaches, but there is also strong evidence that mating occurs before or during the nesting migration (Eckert 1995).

In the United States, leatherbacks nest on sandy tropical beaches in the Caribbean and southern Florida. Nesting generally occurs at night, roughly from March to July. Females lay approximately 100 eggs at each of 5 to 7 nests (up to 11 nests have been documented) within a

single nesting season. After nesting, female leatherbacks migrate from tropical waters to more temperate latitudes where there are high densities of jellyfish prey in the summer. Most leatherbacks exhibit remigration intervals of two to three years.

On average, the eggs incubate for approximately two months (55 to 75 days). Sex of hatchlings is dependent on incubation temperature. Leatherback hatchlings emerge from the nest in early evening and apparently orient toward the ocean using the brightness of the horizon (Eckert 1995). On average, hatchlings are 2 to 3 inches in length, with fore flippers as long as their bodies, and weigh 1.4 to 1.8 ounces.

Atlantic Canada supports one of the largest seasonal foraging populations of leatherbacks in the Atlantic. Leatherbacks tagged with satellite transmitters at sea off the coast of Nova Scotia were tracked to waters adjacent to nesting beaches along the northeast coast of South and Central America (James et al. 2005).

Habitat

The leatherback sea turtle is the most pelagic of the sea turtles, but also forages in coastal waters. Thermoregulatory adaptations allow this sea turtle to maintain a core body temperature higher than that of the surrounding water, thereby allowing it to tolerate colder waters.

Juvenile leatherback dispersal and developmental habitats are poorly understood. Based on reported sightings (Eckert 2002), researchers found that leatherback turtles smaller than 39 inches were observed in waters 79°F or warmer, while adults were found in waters off Newfoundland (Goff and Lien 1988) where water temperatures ranged from 32 to 59°F. Leatherback females nest on sandy beaches backed with vegetation. The preferred beaches are proximal to deep water and often associated with rough seas.

Population Dynamics

Because adult female leatherbacks frequently change nesting beaches, numbers and trends are especially difficult to estimate. Recent estimates of global nesting populations indicate 26,000 to 43,000 nesting females annually, which is a significant decline from 115,000 estimated in 1980. This is largely related to the dramatic decline in nesting leatherbacks in the Pacific over the last two decades. The Mexico population, once considered to be the largest leatherback nesting population (65 percent of worldwide population), is now less than one percent of its estimated size in 1980. The largest populations now occur in French Guiana and Colombia (estimated several thousand nests annually).

In the United States, small nesting populations occur on the Florida east coast (35 nesting females/year), Sandy Point, U.S. Virgin Islands (50 to 100 nesting females/year), and Puerto Rico (30 to 90 nesting females/year). In the Atlantic, observed declines in nesting populations are not as severe as in the Pacific Ocean (estimated decline is 80 percent), and some population trends are increasing or stable. Nesting trends on U.S. beaches have been increasing in recent years; however, these populations are very small.

Threats

Leatherback turtles face threats on both the nesting and feeding grounds. Dramatic declines worldwide have been largely attributed to long-term harvest and incidental capture in fishing gear. Harvest of eggs and adults occurs on nesting beaches, and harvest of juveniles and adults occurs on feeding grounds. Incidental capture primarily occurs in gillnets, but this also happens in trawls, traps and pots, longlines, and dredges.

Nesting habitat loss and degradation from coastal development is another factor threatening leatherbacks globally. Secondary threats include disorientation of emerging hatchlings by beachfront lighting; excessive nest predation by native and non-native predators; degradation of foraging habitat; marine pollution and debris; and watercraft strikes.

Status, Protection, and Management

On June 2, 1970, NOAA Fisheries and the FWS listed the leatherback sea turtle as an endangered species throughout its range. The Services have joint jurisdiction for leatherbacks, with NOAA Fisheries having the lead in the marine environment and the FWS having the lead on the nesting beaches. Both federal agencies, and a number of state agencies, have promulgated regulations to eliminate or reduce threats on sea turtles.

Due to the long migratory movements of sea turtles between nesting beaches and foraging areas, long-term international cooperation is required for recovery and stability of nesting populations. In the United States and the Caribbean, nest and beach habitat protection efforts have been in progress for most of the significant nesting areas since adoption of the Recovery Plan for Leatherback Turtles (NOAA Fisheries and FWS 1992). In addition, research is ongoing to continue to develop technologies to minimize leatherback mortality associated with the longline fishery. Many coastal counties and communities have developed lighting ordinances to abate hatchling disorientation upon nest emergence. Important U.S. nesting beaches have been acquired for long-term protection.

NOAA Fisheries implements measures to reduce sea turtle interactions in fisheries by regulations and permits under the ESA and Magnuson-Stevens Fishery Management and Conservation Act. In the Atlantic, NOAA Fisheries has required measures (e.g., gear modifications, changes to fishing practices, and time/area closures) to reduce sea turtle bycatch in pelagic longline, mid-Atlantic gillnet, Chesapeake Bay pound net, and southeast shrimp and flounder trawl fisheries. In 1992, NOAA Fisheries finalized regulations to require turtle excluder devices (TEDs) in shrimp trawl fisheries to reduce turtle interactions with trawl gear (50 CFR 223.206, 50 CFR 223.207). NOAA Fisheries has modified these regulations as TED technology has evolved; for example, larger TEDs are now required to exclude larger turtles. NOAA Fisheries has provided extensive TED training throughout the world.

In 2003, NOAA Fisheries developed the Strategy for Sea Turtle Conservation and Recovery in Relation to Atlantic and Gulf of Mexico Fisheries (Strategy). The Strategy is used to evaluate

and address turtle bycatch across jurisdictional boundaries for commercial and recreational fisheries in the Atlantic Ocean and Gulf of Mexico.

Because of their long-range migratory movements between nesting beaches and foraging areas, leatherbacks are subject to varied conservation efforts across several countries. International cooperation is absolutely essential for recovery and stability of nesting and migrant populations. Leatherback turtles are protected by several international treaties and agreements as well as national laws:

1) Convention on International Trade in Endangered Species of Wild Flora and Fauna (i.e., international trade is prohibited);
2) Convention on Migratory Species, including the Memorandum of Understanding (MOU) on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia and the MOU Concerning Conservation Measures for Marine Turtles of the Atlantic Coast of Africa;
3) Specially Protected Areas and Wildlife (SPAW) Protocol of the Cartagena Convention; and
4) Inter-American Convention for the Protection and Conservation of Sea Turtles, an international treaty dedicated exclusively to marine turtles.

Critical Habitat

In September 1978, the FWS designated the nesting beach on Sandy Point, St. Croix, as critical habitat (50 CFR 17.95); in March 1979, NOAA Fisheries determined the surrounding waters as critical habitat (50 CFR 226.207). No critical habitat for leatherback sea turtles would be impacted by construction or operation of the Downeast LNG Project.

Species Occurrence in the Downeast LNG Project Area

The distribution of the leatherback sea turtle includes the Gulf of Maine, along the coast of Maine and northward to Nova Scotia and the Labrador coast during the summer and late summer months (Stellwagen Bank 2006, Maine DIFW 2003b). Leatherbacks are commonly observed in the Gulf of Maine, and are considered to be the sea turtle most frequently encountered in these waters (Maine DIFW 2003b). The turtles move southward again as winter approaches, heading toward nesting and breeding grounds. Leatherbacks are generally a pelagic species, occurring within deeper waters greater than 200 feet, often west of the Gulf Stream, unless nesting (Maine DIFW 2003b). The leatherback has some potential to occur in waters surrounding the import terminal site. Although the turtle may or may not occur within Passamaquoddy Bay, it is likely to be present in areas that would be transited by LNG vessels serving the import terminal.

4.4.2 Effects on Leatherback Sea Turtles

Waterway for LNG Marine Traffic

Leatherback sea turtles are most likely to be present along the waterway for LNG marine traffic during the summer months, when the greatest potential impacts are acoustic harassment and

vessel strikes. Engine noise produced by LNG vessels would result in temporary increases in underwater noise levels near the transiting vessels. However, because sea turtles are mobile, we anticipate that turtles would avoid areas with high noise levels during operation of the Downeast LNG Project.

Sea turtles are difficult to spot from transiting vessels and are especially prone to propeller strikes. Downeast has indicated that it would provide environmental training to vessel crews to identify threatened and endangered species. During inclement weather and periods of low visibility, LNG vessels would reduce speeds to the extent possible while allowing for safe operation of the vessel and crew. If a vessel strike was observed, the vessel would notify the Coast Guard. In addition, the mitigation measures that Downeast would implement to protect North Atlantic right whales would also minimize potential impacts on sea turtles. Downeast's implementation of a reduced vessel speed to 10 knots during night and periods of reduced visibility would act to reduce both the noise emitted from the vessel as well as the potential for turtle-vessel encounters.

Sea turtles are also vulnerable to ingestion of marine debris and contaminated prey and exposure to contaminants from accidental spills and other vessel discharge. Discharge and disposal of garbage and other solid debris from vessels is prohibited under 30 CFR 250.300 and the Coast Guard (MARPOL). In addition, each LNG vessel would maintain a SOPEP. With these mitigation measures in place, normal operations in the waterway for LNG marine traffic is not likely to adversely affect leatherback sea turtles.

An LNG spill or fire could significantly affect leatherback sea turtles present at the ocean surface at the time of the spill; however, the likelihood of an accidental or intentional release of LNG during transit of the LNG vessels is extremely remote. Primary impacts would be thermal stress associated with coming into contact with the cryogenic liquid (before the LNG vaporizes) or the fire associated with a pool fire or ignited vapors. Extreme temperature changes, which would likely be fatal for leatherback sea turtles, would only occur in the immediate vicinity of the spill and then dissipate, allowing nearby turtles to avoid the area. To minimize this risk, the containment system for each vessel would be equipped with cargo monitoring and control and safety systems. These systems would automatically monitor key cargo parameters while the vessel is at sea and during the remote-control phase of cargo operations at the marine terminal. The systems include provisions for pressure monitoring and control, temperature monitoring of the cargo tanks and surrounding ballast tanks, emergency shutdown of cargo pumps and closing of critical valves, monitoring of tank cargo levels, and gas and fire detection. In addition, the Coast Guard would identify the necessary procedures to ensure the safe and secure transit of LNG vessels from open waters to the Downeast LNG Project.

LNG Terminal

Leatherback sea turtles may occur in the Western Passage and therefore may transit in the vicinity of the LNG terminal. Although they are unlikely to spend a large amount of time foraging or resting at the terminal berth itself, leatherback sea turtles may be susceptible to

impacts associated with construction and operational activities should they happen to be in the area at the time. Construction related effects include acoustic harassment and temporary water quality impacts such as increased turbidity and suspended sediments in the water column. Operational effects include water quality impacts related to stormwater runoff and accidental spills.

During construction of the LNG terminal facility, sea turtles would be susceptible to acoustic harassment. Downeast would be required to "ramp up" acute noise-producing activities, allowing sea turtles time to leave the project area before maximum noise levels are produced. Downeast would also be required to employ at least one full-time EI during construction. This individual would be experienced with offshore and onshore construction and would have experience with marine mammal and sea turtle mitigation measures. Prior to commencing construction activities, the EI would search the work area for the presence of sea turtles; if a sea turtle were sighted, work would be delayed until the EI provided procedures to the work crew to avoid harassment of the animal. Given the rarity of sea turtle sightings within the immediate vicinity of the LNG terminal, it is unlikely that acoustic harassment caused by construction and operation of the LNG terminal would adversely affect leatherback sea turtles.

Construction and operation of the terminal would temporarily impact water quality in various ways, including increased turbidity during pier construction, discharge of water used for hydrostatic testing of the storage tanks, stormwater runoff, and accidental spills. Any water quality impacts associated with pier construction would be temporary. If chemicals or biocides are used in the hydrostatic testing process, the chemical composition of hydrostatic test waters would be tested and water would be treated or neutralized prior to discharge into Passamaquoddy Bay. During construction, individual crew members would be responsible for ensuring that debris is not discharged into the marine environment. Additionally, training of construction crews would include proper waste disposal and spill prevention, containment, and response procedures. Therefore, construction activities are not likely to result in long-term reductions in water quality that would displace leatherback sea turtles from using the area.

Prior to operation, Downeast would prepare a SWPPP to comply with Maine DEP and EPA requirements concerning stormwater runoff due to the impervious surfaces at the LNG facility. Stormwater discharges would be directed to Maine PDES permitted discharge points. We have also recommended in the draft EIS that Downeast prepare a Marine Spill Prevention, Countermeasure, and Containment Plan (SPCC Plan) to address prevention and response procedures in the event of an accidental spill of oil, gas, lubricants, or other hazardous materials. Additionally, Downeast would design its LNG terminal to account for an accidental spill of LNG during operation of the facility, and prevent the LNG from entering Passamaquoddy Bay. The LNG facilities would include safety and hazard detection systems, LNG containment and process sumps, and associated LNG spill collection system. By implementing these measures, we do not anticipate leatherback sea turtles to be affected by reductions in water quality.

Sendout Pipeline

The leatherback sea turtle does not occur near the proposed sendout pipeline.

Determination of Effects

The proposed Downeast LNG Project has the potential to adversely affect leatherback sea turtles, either by acoustic harassment or vessel strikes. Due to the measures Downeast would implement to mitigate these impacts, particularly those associated with right whale detection and monitoring (which also apply to leatherback sea turtles), we believe the Downeast LNG Project ***may affect but is not likely to adversely affect*** leatherback sea turtles. Federally designated critical habitat does not occur within the proposed Downeast LNG Project area, and thus the proposed action would have ***no effect*** on leatherback sea turtle critical habitat.

4.5 CETACEANS

4.5.1 Description and Status of Cetaceans in the Project Area

4.5.1.1 North Atlantic Right Whale (Endangered)

Species Description

Right whales (*Eubalaena glacialis*) are more robust in size and have a very large girth relative to their length, compared to other mysticetes, especially the rorqual whales (i.e., blue, minke, sei, fin, and humpback whales). The maximum length of an adult is 56 feet with an average weight of 60 tons but it can weigh up to 100 tons. Like other whale species, sexual dimorphism does exist in this species as female right whales are larger than males. The overall coloration of right whales is dark and predominately black, with possibly some white patches on the ventral side. Its flippers are quite broad and spatulate, the fluke is notched, and there is no dorsal fin. The large head makes up about one quarter of the body length. The rostrum is narrow and arching, and is enfolded by the bowed lower lips. Along the rostrum, lower lip, and around the eyes, callosities (wart-like growths) form. These growths often harbor crustaceans called whale lice. Callosities change little after a whale's first year of life, and are therefore used for identification purposes of the individual. Baleen plates of the right whale are large in relation to other baleen species, and may measure up to 10 feet long with a maximum length of 16 feet. There are approximately 250 to 300 plates per side.

Life History

Males and females reach sexual maturity around 10 years of age, when males are at an average length of 48 feet and females at 50 feet. Breeding most likely occurs in the winter, and gestation is about 12 months. A single calf is born with a birth length of about 15 to 20 feet. An updated analysis of calving intervals through the 1997/1998 season suggests that the mean calving interval increased since 1992 from 3.67 years to more than 5 years, a significant trend (Waring et al. 2010). Low calf production heightens concerns for the survival of this population. Females are most frequently sighted during years in which they are lactating and have a calf in tow, but

tend to be seen significantly less often than other segments of the population (Singer and Ludwig, 2005).

A population average of only about 11.2 births per year has been recorded (1982 to 1992), although those numbers dropped in subsequent years to 6, 7, and 8 for 1993, 1994, and 1995 respectively, and only 1 calf was reported for the 2000/2001 season. Recent years have seen an increase in reported calf production, peaking at 39 reported calves in 2009 with only a single calf mortality (NOAA Fisheries 2010, Waring et al. 2010). Additionally, age structure may play an important role in the survival of this population. The number of claves that reach juvenile age is less than expected, which may reflect population dynamics or high juvenile mortality (Waring et al. 2006).

The limited data available on the hearing sensitivity of the northern right whales indicate that they produce moans of less than 400 Hz in frequency (Watkins and Schevill, 1972; Thompson et al. 1979; Spero 1981). Apparently, while summering in the Bay of Fundy, right whales use low frequency sounds as contact calls (Spero 1981).

Right whales can travel long distances and exhibit extensive movements (which may include searching for available food sources). However, they are extremely slow swimmers, swimming at an average of 2 knots and rarely exceeding 5 knots. Based on photographically identified individuals and sighting histories, it has been reported that one-third of all females with calves use the feeding and nursery grounds in the Bay of Fundy (Waring et al. 2006). Based on telemetry, some whales make lengthy and somewhat distant excursions (Waring et al. 2006).

The feeding of northern right whales is associated with copepods including the genera *Calanus* spp. and *Pseudocalanus* spp. (Waring et al. 2006). *Calanus finmarchicus* copepodite stage 5, a favorite prey item of the right whale, is abundant in the deep basins of the lower Bay of Fundy critical habitat and northern right whale feeding ground (Hanson 2001, Baumgartner et al. 2003, Pelczarski 2003, Singer and Ludwig 2005). *Calanus* spp. dominates the biomass in the Gulf of Maine region during late spring and early summer, and a non-linear association between the right whale and *Calanus* spp. has been suggested (NOAA Fisheries 2005). Whales generally feed at depth in the Bay of Fundy, and have been observed feeding at the surface in other feeding areas such as Cape Cod Bay (PCCS 2008).

Habitat

The location of some age classes of whales and females without calves during the winter is virtually unknown. Satellite tagged right whales from the Bay of Fundy were tracked within Jeffreys Ledge, Roseway Basin, and the Great South Channel. Whales were observed more often going to areas with cold bottom water and low surface salinity, such as Jeffreys Ledge and the Roseway Basin, in a non-random fashion, as opposed to deep basins (Baumgartner and Mate 2003). Juveniles tend to be sighted inshore more frequently than other age classes.

Five to six major use areas of the North Atlantic right whale or seasonal high-use areas have been identified: a winter calving area along eastern Florida and Georgia (southeastern calving

and wintering grounds); a late-winter feeding and nursery area in Cape Cod Bay, Massachusetts; a spring feeding area in the Great South Channel east of Cape Cod; a summer-to-early-fall nursery and feeding area in the Gulf of Maine/Georges Bank, Bay of Fundy just north of the United States-Canada border; and a late-summer-to-fall feeding area in the Roseway Basin south of Nova Scotia (Scotian Shelf area) (MMC 1996, Waring et al. 2006).

Population Dynamics

The western North Atlantic population of right whale is considered to be the most critically endangered species of cetacean in the world. As a result of serious hunting efforts (with a known total take of 7,000 whales by 1910), the northern right whale was considered seriously depleted in much of the region by the early 1920s (Stevick et al. 2003). Despite initial protection of the northern right whale starting in 1935, commercial hunting continued until the species was protected in the North Atlantic by the International Whaling Commission in 1955 (Stevick et al. 2003, Pelczarski 2003, Waring et al. 2006). Minimal recovery has occurred in the population occupying the eastern coast of the United States and Canada (Pelczarski 2003, Waring et al. 2006).

The western North Atlantic population size was estimated to be at least 361 individuals in 2005 (Waring et al. 2010) based on a census of individual whales identified using photo-identification techniques. The small population size and low annual reproductive rate of right whales suggest that human sources of mortality may have a greater effect relative to population growth rates than for other whales.

Threats

Vessel collisions and fishing gear entanglements are the most common human-caused mortality in North Atlantic right whales. Since 1970, more than 73 North Atlantic right whale deaths have been confirmed. Nearly 50 percent of these deaths were attributed to ship collisions (n=29) or entanglements (n=7), and 71 percent of these deaths occurred since 1990[5] (NOAA Fisheries 2008z). More recent evidence suggests that right whale mortality is increasing. For the period 2004-2008, average human-caused mortality was 2.8 individuals per year[6], where vessel strikes averaged 2.0 deaths per year and entanglement with fishing gear averaged 0.8 deaths per year (Waring et al. 2010). Other threats include acoustic harassment.

Vessel Collisions

In areas that are likely to be transited by LNG vessels associated with the Downeast LNG Project (e.g., the Bay of Fundy, Gulf of Maine, and Scotian Shelf), there were 25 reported North Atlantic right whale strikes between 1972 and 2008. Of these incidences, 18 resulted in death or

[5] Note that whale deaths caused by vessel strike, entanglement, or other means is likely under-represented in published data (e.g., because carcasses may sink instead of float; lack of reporting; etc.). Also, the observed increase in whale deaths since 1990 is likely influenced by increased awareness about reporting and increased survey efforts.

[6] Average mortality is reported for the entire population, rather than only those occurrences near the proposed Downeast LNG Project.

presumed death of the whale (Glass et al. 2008, Jensen and Silber 2003, Nelson et al. 2007, Waring et al. 2008, and Waring et al. 2010). The speed at which large vessels transit is a contributing factor in whale injuries and mortality. In a study of ship strikes with whales, Laist et al. (2001) concluded that vessel speeds greater than 14 knots often resulted in whale mortality or serious injury, while strikes that occurred at 10 knots or less rarely caused death. Given the low abundance of North Atlantic right whales relative to other species, the frequency of occurrence of ship strikes to right whales suggests that the threat of ship strikes is proportionally greater to this species (Jensen and Silber 2003). Table 4.4.1.1-1 summarizes right whale vessel strikes in the Bay of Fundy and adjacent areas.

Table 4.4.1.1-1

Identified Ship Strikes of North Atlantic Right Whales in the Bay of Fundy and Adjacent Areas

Date	Sex	Age	Location where struck or found	Mortality/Injury
1972 a/	-	-	97 km East of Boston, Massachusetts	Mortality
04/15/1976	M	Calf	Massachusetts	Mortality
11/05/1976	-	-	Maine	Mortality
05/25/1980	M	-	Great South Channel, Massachusetts	Injury
08/05/1984	-	-	Browns Bank, Canada	Mortality
08/07/1986	F	1 year	Massachusetts	Mortality
08/14/1986	F	-	Bay of Fundy, Canada	Presumed Mortality
07/09/1987	M	Juvenile	Nova Scotia, Canada	Mortality
08/28/1987	-	-	Browns Bank, Canada	Injury
09/05/1992	F	Adult	Bay of Fundy, Canada	Mortality
08/04/1994	-	-	Gulf of Maine	Unknown
08/13/1995	F	Adult	Gulf of Maine	Unknown
09/16/1995	M	4 years	Bay of Fundy, Canada	Injury
10/19/1995	M	-	Bay of Fundy, Canada	Mortality
03/09/1996	M	-	Massachusetts	Mortality
03/25/1996	M	-	Wellfleet, Massachusetts	Mortality, Stranded
08/19/1997	F	-	Bay of Fundy, Canada	Mortality
04/20/1999	F	-	Near Wellfleet, Massachusetts	Mortality
07/08/2000	M	-	Bay of Fundy, Canada	Unknown
09/27/2000	F	-	Bay of Fundy, Canada	Injury
10/02/2003	F	Adult	Digby, Nova Scotia	Mortality
04/28/2005	F	Adult	Monomoy Island, Massachusetts	Mortality
07/24/2006	F	9 years	Campobello Island, New Brunswick	Mortality
08/24/2006	F	-	Roseway Basin, Nova Scotia	Mortality
09/03/2006	F	-	Nova Scotia, Canada	Mortality

Sources: Glass et al. 2008, Jensen and Silber 2003, Nelson et al. 2007, Waring et al. 2008, Waring et al. 2010.
a/ Presumed North Atlantic right whale

The Bay of Fundy is an important transit route with traffic lanes for vessels passing to and from Canadian and U.S. ports, resulting in significant vessel traffic across the Canadian Grand Manan Basin Whale Sanctuary. These ports, including St. John and Bayside in New Brunswick;

Hantsport in Nova Scotia; and Eastport, Maine, service more than 800 vessels annually (IMO 2002). Over two-thirds of the known population of North Atlantic right whales is found in the Bay of Fundy area during summer and fall months (June through November) (IMO 2002). A change in the mandatory shipping lanes in the Bay of Fundy was proposed and adopted by Canada's Maritime Safety Committee in 2002 (IMO 2002; 2007). This measure was designed to relocate vessel traffic using the Traffic Separation Schemes (TSS) from an area with a high density of right whales to an area with a lower density (3.9 miles to the east), thus reducing the relative probability of a vessel strike by approximately 80 percent. On June 1, 2008, Transport Canada adopted the "Roseway Basin Area to be Avoided (ATBA), South of Nova Scotia," originally proposed by the International Maritime Organization (IMO) on April 20, 2007 (IMO 2007). The Roseway Basin ATBA would have only a seasonally limited effective period of seven months (June through December) each year when the largest percentage of the right whales is known to be in the area and consequently, when the risk of vessel strikes is greatest. The voluntary implementation by mariners of the ATBA is expected to reduce the relative probability of vessel-whale encounters.

Acoustic Harassment

Marine ocean noise has increased in recent years, due in large part to anthropogenic sources such as shipping, seismic profiling for oil/gas exploration and seismic/geologic hazard exploration, and drilling and pile driving among others. Some of these sounds are loud enough to cause physical injury or elicit behavioral changes in the marine organisms that perceive those sounds, particularly marine mammals. The Marine Mammal Protection Act of 1972 (MMPA) prohibits, with limited exceptions, the take of marine mammals in waters or on lands under U.S. jurisdiction. It also regulates the takes of marine mammals on the high seas by vessels or persons under U.S. jurisdiction. A "take" is defined as "harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill" any marine mammal. The MMPA defines "harassment" as any act of pursuit, torment, or annoyance which either has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment, generally assumed to occur at 180 decibel [dB] re 1 micro-Pascal [μPA] for cetaceans and 190 dB re 1 μPA for pinnipeds), or has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment, generally assumed to occur at 160 dB re 1 μPA for pulsed noise, or 120 dB re 1 μPA for continuous noise).

Status, Protection, and Management

In 2008, NOAA Fisheries listed the northern right whale as two separate, endangered species under the ESA: the North Pacific right whale (*E. japonica*) and North Atlantic right whale (*E. glacialis*) (73 FR 12024). As one of the most critically endangered whale species in the world, the North Atlantic right whale population is regarded as a strategic stock, based on the stock's status of endangered under the ESA and on fishery-related mortality in exceedance of the

calculated potential biological removal (PBR) level[7], which has been determined to be zero for this population (MMC 2002, Waring et al. 2006). Relative to its Optimal Sustainable Population (OSP), the estimated size of this stock is extremely low (Waring et al. 2006). Minimal recovery has occurred in the North Atlantic right whale population, thus with the combination of the impacts and threats listed above, the population may be pushed to extinction.

Given the very small size of the population and very low birth rate of this species, NOAA Fisheries has determined that ship-related mortality and injury are significant obstacles to the species' recovery (NOAA Fisheries 2005). In collaboration with other agencies, NOAA Fisheries has taken measures to reduce the potential for ship collisions with large whales, particularly the North Atlantic right whale. These measures are largely based on avoidance (e.g., limiting vessel approach to whales, altering vessel transitways, prohibiting entry into critical habitats when whales are abundant), minimization methods (e.g., Mandatory Ship Reporting Systems [MSRS], reducing vessel speed where whales aggregate), and increasing mariner and boater awareness about whales and best management practices.

On February 13, 1997, NOAA Fisheries published a regulation (62 FR 6729) that prohibits approaching within 500 yards of any right whale, whether by vessel, aircraft, or other means. The same year, NOAA Fisheries either participated in or supported an extensive program of aircraft surveys for right whales off the coast of New England as part of the Right Whale Sighting Network[8].

NOAA Fisheries and the Coast Guard developed and implemented the MSRS to reduce the number of vessel strikes on large whales (66 FR 58066, Final Rule), which were endorsed by the IMO. These systems, one off the northeastern coast, the other off the southeastern coast, have been in effect since 1999 and describe geographical boundaries and times of year when vessel reporting requirements are to be used. The northeast U.S. system (WHALESNORTH) is required year-round and affects waters of Cape Cod Bay, Massachusetts Bay, and the Great South Channel east and southeast of Massachusetts. When a vessel greater than 300 gross tons enters key right whale habitat, it is required to report to a shore-based station. In return, the vessel receives a message about right whales, their vulnerability to ship strikes, precautionary measures the vessel can take to avoid a collision with whales, and locations of recent sightings (NOAA Fisheries 2008y).

Between 1999 and 2001, NOAA Fisheries developed its Ship Strike Reduction Strategy, which consists of five elements for reducing the threat of ship strikes. Most of these elements are non-regulatory and are structured to increase mariner and boater awareness; however, the last element establishes new operational measures for commercial and recreational mariners. These measures include establishing a restricted vessel speed, avoiding areas where whales aggregate, and avoiding specific habitats.

[7] The PBR is defined as the maximum number of animals that may be removed from a marine mammal stock, not including natural mortalities, while allowing that stock to reach or maintain its OSP.
[8] More information is available online at http://rwhalesightings.nefsc.noaa.gov/.

On June 26, 2006, NOAA Fisheries announced its proposed rule to restrict vessel speed to 10 knots or less. The final ruling was issued in October 2008 (73 FR 60173) and implemented on December 8, 2008. Speed restrictions apply to all vessels subject to the jurisdiction of the United States greater than or equal to 65 ft. in overall length. This final ruling establishes seasonal management areas (SMA) along the eastern seaboard when speed restrictions apply, including Cape Cod Bay (January 1 to May 15), off Race Point at the northern end of Cape Cod (March 1 to April 30), and Great South Channel of New England (April 1 to July 31), among other areas listed for the mid-Atlantic and southern Atlantic states. Additionally, the rule implemented temporary dynamic management areas (DMAs) that allow NOAA Fisheries to implement seasonal management measures that are substantially smaller in size and of shorter duration than the SMAs. These DMAs allow mariners the option of either reducing vessel speeds to 10 knots or less, or routing around the area.

On July 1, 2007, NOAA Fisheries and the Coast Guard implemented a shift in the Traffic Separation Scheme servicing Boston to reduce the threat of vessel collisions with right whales and other whale species. The realignment is expected to result in a 58 percent reduction in the risk of vessel strikes to right whales and an 81 percent risk reduction in vessel strikes of other large whale species occurring in the area. The U.S. government submitted a proposal to the IMO to modify the shipping lanes in April 2006, which was approved in December 2006 (NOAA Fisheries 2008x).

Critical Habitat

Three areas in the U.S. Atlantic waters were designated in 1994 as critical habitat for the North Atlantic right whale. These are coastal Florida and Georgia, Massachusetts Bay and Cape Cod Bay, and the Great South Channel off of Massachusetts (NOAA Fisheries 2005). These critical habitats are essential feeding, breeding, and nursery areas for right whales. Although peak whale seasons are from January to April in Cape Cod Bay and from April to June in the Great South Channel, whales are present within these areas nearly year-round with increasing frequency.

In addition to designated critical habitat, other areas in Atlantic waters are recognized as significant to the survival and recovery of the North Atlantic right whale. The Gulf of Maine and Bay of Fundy areas are important feeding grounds (NAMMCO 2006; Pelczarski, 2003) and are also used as a nursery for calves and in some cases may be used as mating grounds (Hain 1992; Waring et al. 2006). Two North Atlantic right whale conservation areas have been established by the Canadian government along the east coast in Canadian waters; the Grand Manan Basin in the mouth of the Bay of Fundy (between New Brunswick and Nova Scotia) and the Roseway Basin off the southern coast of Nova Scotia (Canadian Whale Institute 2008). In Canadian waters, especially in the Grand Manan Basin Whale Sanctuary, it has been estimated that more than two-thirds of all North Atlantic right whales are found in this area during the summer and fall (June-November) each year.

Species Occurrence in the Downeast LNG Project Area

North Atlantic right whales are known to occur within the waters of the Gulf of Maine and the Bay of Fundy, including sightings in Head Harbor. Sightings of right whales based on season are provided in appendix F, figures 25 through 29 of the draft EIS. The VTS route alternative (transiting east of Grand Manan Island) would cross a portion of right whale feeding grounds in the Grand Manan Basin Whale Sanctuary. Because the water depth at the LNG terminal is approximately 45 to 50 feet MLLW, and prey is available near the terminal, it is possible that a North Atlantic right whale could be present in the immediate vicinity of the terminal. However, because of the rarity of documented sightings of North Atlantic right whales near the terminal, the presence of this species in the immediate area of the terminal is not expected. However, this species could be encountered throughout the LNG transit route(s).

4.5.1.2 Sei Whale (Endangered)

Species Description

Sei whales (*Balaenoptera borealis*) are very similar in appearance to the fin whale, but smaller in overall body size. Adult male sei whales average 46 feet in length, and weigh approximately 14 tons. Females are slightly larger in size, averaging 49 feet in length and weighing approximately 17 tons. The sei whale has a long and slender body shape, with a more uniformly dark coloration with a light ventral side. The rostrum is a V-shape that narrows to a blunted point and holds up to 400 baleen plates on each side. This species has 32 to 60 throat grooves that are shorter than some of the other listed whales. Its flippers are slender and pointed, and its fluke is large and notched.

No studies have been published on the vocal behavior of sei whales and no studies have directly measured the sound sensitivity of sei whales (Croll et al. 1999).

Life History

Sei whales are considered the fastest swimming baleen whale with speeds up to at least 20 knots. They are shallow divers that seldom have a visible fluke when diving, with the average dive lasting between 15 and 30 minutes. Sei whales rarely congregate; they are most frequently seen alone or in groups of 2 to 5 whales.

Sei whales are generalists that feed primarily on small fish, squid, amphipods, euphausiids, and copepods (Waring et al. 2010). They tend to skim through schools of prey and can consume a massive quantity of food, as much as 1 ton per day.

Both males and females reach sexual maturity at approximately 10 years of age. Breeding occurs mostly during the winter months. Following a gestation period of 11.5 to 12 months, a single calf is born. The calf at birth is approximately 15 feet, may weigh 1 ton, and nurse for up to 9 months (lactation ranges from between 6 and 9 months). Sei whales may live to be 60 years of age.

Habitat

Sei whales are generally a pelagic species, and concentrations of sei whales tend to be found in deeper waters and in regions off the continental shelf edge. However, this offshore pattern also includes travel into more shallow and inshore waters. The range of the North Atlantic sei whale may actually include two stocks, identified as the Nova Scotia stock and a Labrador Sea stock. The Nova Scotia stock occurs in waters off the Scotian Shelf during the feeding season, and movements extend southward into the Gulf of Maine and the Georges Bank during spring and summer (Waring et al. 2010).

Population Dynamics

The total number of sei whales in the U.S. Atlantic EEZ is unknown. An estimate of 207 (CV=0.62) sei whales was obtained from an aerial survey conducted in August 2006 which covered 6,633.76 miles of trackline in the region from the 6,561.66 foot depth contour on the southern edge of Georges Bank to the upper Bay of Fundy and to the entrance of the Gulf of St. Lawrence. Recent population estimates have confirmed the 2006 survey and estimate the sei whale population at 208 individuals (Waring et al. 2010).

Threats

Data of human-caused mortality and serious injury are limited. No incidents of adverse fishery-related interactions were reported with sei whales between 1999 and 2008 (Waring et al. 2006; 2007; 2010). During this same time, however, two ship strikes were reported as mortalities, one in 2001 and one in 2003.

Status, Protection, and Management

The Nova Scotia stock of sei whales is federally listed as endangered under the ESA and is considered a depleted stock under the MMPA. Currently, there are too few data available on this species to determine the status of the population as it relates to OSP, but human-caused mortality and serious injury appear to be minimal. A Recovery Plan for sei whales has been developed, and was approved in December 2011. The purpose of the Recovery Plan is to provide a research strategy to obtain data necessary to estimate population abundance, trends, and structure and to identify factors that may be limiting sei whale recovery (NOAA Fisheries 2011).

Critical Habitat

No critical habitat has been designated for the sei whale.

Species Occurrence in Downeast LNG Project Area

Because there are confirmed sightings of sei whales along the Georges Bank and within the Gulf of Maine, whales may be encountered by LNG vessels when on route to the Downeast import terminal. Sei whale sightings have been reported in areas proximal to the transit route (see draft EIS appendix F, figure 30). Because the water depth at the LNG terminal is approximately 45 to 50 feet MLLW, and its prey is available near the terminal, it is conceivable that a sei whale could occur in the immediate vicinity of the terminal. However, because of the rarity of documented

sightings of sei whales near the terminal, the presence of this species in the immediate area of the terminal is not expected. Therefore, this species could be encountered throughout the LNG transit route(s) but is not expected to occur near the terminal itself.

4.5.1.3 Blue Whale (Endangered)

Species Description

The blue whale (*Balaenoptera musculus*) is one of the rorqual whales, a family that includes the humpback, fin, sei, and minke whales. The western Atlantic stock of blue whale is considered the standard blue whale, as there are three additional blue whale subspecies recognized throughout the world's oceans. Blue whales are mottled bluish-grey and appear dappled or uniformly light blue when viewed through the water surface. The blue whale is the largest extant mammal and is thought to be the largest mammal that has ever inhabited the earth. Adult blue whales average about 85 feet in length, but can reach lengths of 90 to 100 feet. The average weight of an adult blue whale is about 100 tons, with a range of 80 to 150 tons. Female whales tend to be larger and weigh more than males of the same age.

The body of a blue whale is long, somewhat tapered, and streamlined with the head making up less than one-fourth of its total body length. The upper part of its head, or rostrum, is broad, flat, and U-shaped, with a single ridge that extends from the front of the splashguard around the blowholes to the tip of the snout. Its body is smooth, with the exception of a few barnacles that occasionally attach themselves to the edge of the fluke, the tips of the flippers, and to the dorsal fin. The whales have approximately 270 to 395 baleen plates per side, and the plates measure about 3 feet in length.

Life History

Blue whales feed within about 330 feet of the ocean surface, and thus are considered shallow feeders. The blue whale is thought to feed almost exclusively on euphausiids or krill (small, shrimp-like creatures). During the peak of the summer feeding season the blue whale can consume 4 tons or more each day, equaling up to 40 million krill per day.

Blue whales reach sexual maturity around 10 years of age, or when males average about 74 feet and females are about 79 feet. The whales breed in the fall and winter, and give birth approximately 12 months later to a single calf at intervals of two to three years. Calves are 23 to 27 feet long at birth and can weigh 3 tons. During the nursing period, calves can consume up to 100 gallons of the fat-rich mother's milk each day, resulting in gains up to 200 pounds and 1.5 inches in length per day. A calf nurses for approximately 7 to 8 months and is weaned when it reaches approximately 52 feet in length and weighs about 23 tons.

Blue whales tend to travel alone or in pairs, although they may be found in small groups. Occasionally they are seen in larger groups, and concentrations of 50 to 60 have been observed. Blue whales are known to be fast swimmers, with swim speed bursts of up to 20 knots. The life span of the blue whale may extend past 80 years.

Habitat

Blue whales are found in all oceans of the world. This species migrates to waters ranging from temperate to tropical during winter months to mate and give birth. It can feed throughout its range, including polar, temperate, and tropical waters. The stock identified as the western Atlantic blue whales occurs in the western North Atlantic, with a distribution that extends from the arctic waters southward throughout waters of the mid-latitude (Waring et al. 2010). The blue whale is considered to be pelagic, but may be seen along the ice edge while migrating.

Blue whales are present along the north shore of the Gulf of St. Lawrence and eastern Nova Scotia during the spring, summer, and fall (Reeves et al. 2005; Waring et al. 2010). The north shore of the Gulf of St. Lawrence has been the most intensely studied area for blue whales, and includes the majority of recent sightings (Reeves et al. 2005). In the winter, this stock is found off the coast of southern Newfoundland (Waring et al. 2010). Although the distribution of the blue whale is reported to be somewhat north of the Gulf of Maine, it is considered to be an occasional visitor along the U.S. Atlantic coast as far south as Florida with the extent of its southern range unknown (Waring et al. 2010). Movements and distribution in other areas of the North Atlantic Ocean are poorly understood. Also, there have been rare documented sightings in the Bay of Fundy. Therefore, transient individuals are possible in waters of the Gulf of Maine and the Bay of Fundy, where this species may venture as opportunistic feeders.

Population Dynamics

Very little is known about the current size of the blue whale population, and there is no current abundance estimate available. Pre-whaling population estimates of blue whales were over 350,000. It is estimated that up to 99 percent of blue whales were killed during whaling efforts, and recovery has been extremely slow. The only post-whaling population estimate was thought to be about 12,000 worldwide, but the data are not recent and are deemed unusable for abundance documentation (Waring et al. 2010). The population estimate for blue whales occupying the Northern Hemisphere is considered to be less than 3,500, and approximately 8,000 in the Southern Hemisphere. However, from 1979 to 2009, 440 individuals in the Gulf of St. Lawrence area were catalogued by R. Sears (as reported in Waring et al. 2010). Only in the last few years have there been indications that their numbers may be increasing.

Threats

Because of their massive size and swiftness, blue whales were safe from early whalers who could not pursue them from open boats and traditional hand harpoons. But in the mid-1800s the whaling industry was revolutionized by the use of steam and diesel powered factory ships and catcher boats, as well as the Norwegian invention of the exploding harpoon gun. A single 90-foot blue whale could yield up to 120 barrels of oil, and the blue whales were killed by the thousands in the early 20th century. The whaling industry peaked in 1931 when over 29,000 blue whales were killed in one season. After that time, blue whales became so scarce that the whalers turned their focus to other species.

Today, the primary threat to blue whales is mortality and serious injury caused by ship strikes. In the western North Atlantic, at least nine percent of the whales in the Gulf of St. Lawrence have injuries or scars attributed to contact with ships. This area has a relatively high risk of vessel strikes because the St. Lawrence Seaway has heavy ship traffic during the time of year when blue whales are relatively abundant (NOAA Fisheries [no date]). However, only one documented mortality as a result of a vessel strike, from 1998, is known from the western North Atlantic stock, where a blue whale was brought into Rhode Island waters on the bow of a tanker (Jensen and Silber 2003; Waring et al. 2010). The extent of human-caused mortalities or serious injury is virtually unknown.

Status, Protection, and Management

Within the United States the blue whale is listed as endangered throughout its range under the ESA and is listed as depleted throughout its range under the MMPA. Following significant depletion by past commercial whaling practices, the International Whaling Commission (IWC) banned all hunting of blue whales in 1966 and gave them worldwide protection. The blue whale was listed as endangered in 1978, and a Recovery Plan was developed and implemented in 1998 (NOAA Fisheries 1998). Blue whales are still rare in important former habitats, especially in the northern and northeastern North Atlantic (Waring et al. 2010).

Critical Habitat

No critical habitat has been designated for the blue whale.

Species Occurrence in the Downeast LNG Project Area

The blue whale is considered as an occasional visitor in waters of the EEZ and is most frequently observed in waters off eastern Canada, with the majority of recent records from the Gulf of St. Lawrence (Waring et al. 2010). Based on information provided above, transient individuals would be considered possible in waters of the Gulf of Maine and the Bay of Fundy where blue whales may venture as opportunistic feeders. Therefore, blue whales may occur in the offshore waters that LNG vessels would transit. However, no blue whales are expected at the proposed terminal site.

4.5.1.4 Fin Whale (Endangered)

Species Description

Fin whales (*Balaenoptera physalus*), sometimes referred to as finback whales, represent one of the most common cetacean species in the western North Atlantic Ocean, particularly in the region north from Cape Hatteras throughout the Gulf of Maine and into the Bay of Fundy (Waring et al. 2010).

The fin whale has a large sleek body, with a distinct ridge that runs along the back from the dorsal fin to the broad triangular fluke. Its rostrum is V-shaped and flat, and it has 55 to 100 ventral throat grooves. The fin whale has a unique asymmetrical lower jaw coloration pattern, where the right side of the jaw is white but the left side is dark. The average length of an adult

male is about 70 feet and it may weigh 45 tons. An adult female is slightly longer than the male, averaging about 73 feet, and also weighs an average of 45 tons.

The fin whale is one of the most studied whales in terms of underwater sounds. A variety of low-frequency sounds within the 10 to 200 Hz band are produced by fin whales (Watkins 1981; Watkins et al. 1987; Edds 1988; Thompson et al. 1992). Long, patterned sequences of short duration (0.5 to 2 seconds) infrasonic pulses in the 18 to 35 Hz range are the most typical signals produced (Patterson and Hamilton, 1964), and source levels are estimated to be as high as 190 dB (Patterson and Hamilton, 1964; Watkins et al. 1987; Thompson et al. 1992; McDonald et al. 1995).

Whales in social groups tend to produce short sequences of rapid pulses in the 20-70 Hz band (McDonald et al. 1995) with each pulse lasting approximately 1 second and containing approximately 20 cycles (Tyack 1999). A series of pulses in a regular repetitious pattern tends to be associated with fin whales during the breeding season, in which bouts of pulsing may last for longer than 1 day (Tyack 1999). Some authors believe there are geographic differences in the frequency, duration, and repetition of the pulses (Thompson et al. 1992).

Life History

Males and females reach sexual maturity between 6 and 10 years of age. Whales breed in the winter months, and following an 11 to 12 month gestation, produce a single calf. Calves are approximately 21 feet in length at birth, and may weigh 3,600 pounds. Calves nurse for approximately 6 months. Fin whale females may give birth every 2-plus years. Fin whales may live to be over 100 years old.

Fin whales can be seen in groups of 6 to 10 individuals, or in pairs, or even alone. The fin whale is considered a fast swimmer, with swim burst speeds up to 20 mph. When a fin whale dives, the fluke is rarely shown, and a dive may last for 5 to 15 minutes. The maximum depth that finbacks can dive to is thought to be about 1,000 feet.

The fin whale feeds on small schooling fish and invertebrates. Fin whales have incorporated a feeding technique that includes swimming on their side, gulping large schools of fishes to be captured and large quantities of water to be filtered through the whale's baleen. Fin whales primarily feed during the summer months.

Habitat

Finbacks are common in the North Atlantic, including the U.S. Atlantic EEZ. The waters off New England represent a major feeding ground for fin whales, and evidence indicates that female whales show site fidelity for feeding areas. Additionally, fin whales in the Gulf of Maine have demonstrated maternally directed site fidelity, by showing patterns of seasonal occurrence and annual returns (Waring et al. 2010). Based on neonate stranding information, it has been suggested that calving grounds for some fin whales may be in the U.S. mid-Atlantic region from October to January; but breeding, calving, and wintering habits and movements are generally unknown.

Population Dynamics

The best abundance estimate available for the fin whale (western North Atlantic stock) is 3,985 (CV= 0.24); however, this is a conservative estimate given the incomplete coverage of the known habitat of the stock and the uncertainties regarding population structure and whale movements between surveyed and unsurveyed areas (Waring et al. 2010). There may be local, year-round populations with little migratory movements, and/or sub-populations that may make distinct annual migrations to the open ocean, indicating a substantial deep-ocean component to fin whale distribution. Evidence of large-scale migrations (based on an acoustic analysis from the Navy's Sound Survalence System program of year-round fin whale vocalizations) was not identified (Waring et al. 2010).

Threats

Human-caused mortality was lower for fin whales than for other large whale species, such as humpback whales. However, there are documented reports of fishery-related and ship strike mortalities. From data reviewed for 1999 to 2008, there were five mortalities due to fishery interactions with substantial evidence to support the cause of death; these data provide a minimum estimate of the frequency of entanglements for this species (Waring et al. 2006; 2010). However, between 1996 and 2001 there were 10 entanglements reported for finback whales with significant evidence to demonstrate and confirm the primary cause of death as being fishery-related (NOAA Fisheries 2001). Additionally, there were five other cases of fishery interactions that lacked sufficient evidence or details to determine the degree of injury from entanglement and whether entanglement did in fact cause mortality (Waring et al. 2006). During this same time period, fifteen mortalities in which the primary cause of death was due to vessel collision were confirmed and two collisions were not confirmed as fatal (NOAA Fisheries 2001; Waring et al. 2006). From 2002 through 2008, an additional six strikes were reported that resulted in mortalities (Waring et al. 2010). These encounters do not necessarily indicate the total level or degree of human-induced mortality and serious injury to fin whales. Fin whales were commercially harvested in some oceans until 1976.

Status, Protection, and Management

The fin whale is federally listed under the ESA as an endangered species, and is considered depleted under the MMPA (MMC 1996). The total fishery-related mortality and serious injury was higher than the allowable 10 percent of the calculated PBR for this species, and therefore is considered to be significant (Waring et al. 2010). Due to these data, the fin whale is a strategic stock, and a revised Recovery Plan has been been published (NOAA Fisheries 2006).

Critical Habitat

No critical habitat has been designated for the fin whale.

Species Occurrence in Downeast LNG Project Area

Although the fin whale tends to be relatively pelagic, it is known to use deep coastal waters. Therefore, fin whales have the potential of occurring in waters traversed by LNG vessels. Fin

whale sightings have been reported in areas proximal to the transit route (see draft EIS appendix F, figure 21). Because the water depth at the LNG terminal is approximately 45 to 50 feet MLLW, and its prey is available near the terminal, it is conceivable that a fin whale could occur in the immediate vicinity of the terminal. However, because of the rarity of documented sightings of fin whales near the terminal, the presence of this species in the immediate area of the terminal is not expected. Therefore, this species could be encountered throughout the LNG transit route(s) but is not expected to occur near the terminal itself.

4.5.1.5 Humpback Whale (Endangered)

Species Description

Humpback whales (*Megaptera novaeangliae*) are found throughout the oceans of the northern hemisphere. Their body is stocky, with a generally black coloration and possibly some white on the ventral side and throat. Humpbacks possess a flat broad head and a rostrum and lower lip that have fleshy nodules. There are approximately 400 baleen plates per right and left sides of the mouth, and the whales have 12 to 36 ventral throat grooves. Humpbacks have elongated flippers that can measure up to one third of the body length. The dorsal fin is relatively small with distinguished, individual shapes which can be used for identification. This species also displays sexual dimorphism. An adult male averages 46 feet in length and may weigh 25 tons. An average adult female reaches the length of about 50 feet and may weigh 35 tons.

Life History

Humpbacks tend to be quite gregarious and social, and usually congregate in groups. Humpbacks are very acrobatic and engage in behaviors such as breaching, spy-hopping, and lob-tailing. An additional distinguishing characteristic of the humpback is their complexity of vocalizations and songs.

Humpback whales produce at least three kinds of sounds: 1) complex songs with components ranging from at least 20Hz to 4 kHz with estimated source levels from 144 to 174 dB which are mostly sung by males on the breeding grounds (Payne 1970; Winn et al. 1970; Richardson et al. 1995); 2) social sounds in the breeding areas that extend from 50Hz to more than 10 kHz with most energy below 3kHz (Tyack and Whitehead 1983; Richardson et al. 1995), and 3) feeding area vocalizations that are less frequent, but tend to be 20Hz to 2 kHz with estimated sources levels in excess of 175 dB re 1 μPa (Thompson et al. 1986; Richardson et al. 1995). These various vocalizations have a range from about 5 to 12 miles.

Males and females reach sexually maturity between four and seven years of age, and breed in the winter. Following an 11.5 month gestation period, the cow gives birth to a single calf. At birth the calf is approximately 16 feet in length, and may weigh as much as 2 tons. The lactation period of the cow lasts between 6 and 10 months, and the calf grows quickly during this nursing period. The estimated life span of the humpback is thought to be about 50 years.

Humpbacks generally prey on euphausids and small schooling fish such as herring, sand lance, and other small fishes (Wynne and Schwartz 1999, Cupka and Murphy 2005; Waring et al. 2010). The cold, nutrient-rich waters of the Gulf of Maine provide abundant prey items, and the

abundance and species of prey is correlated with the movements of the whales. Humpbacks frequently use a feeding technique known as bubble-netting, which is encircling and stunning their prey for capture. There appears to be competition with commercial fisheries for common prey species (herring and mackerel), resulting in a strong correlation between depleted prey populations and decreased abundance of humpbacks in specific areas (Waring et al. 2010).

Habitat

The humpback is a species that is pelagic as well as coastal, and although it tends to feed and breed over shallow banks, during migration the humpback may traverse the deep, open ocean. Nearshore or coastal areas (i.e., shallow banks and shelf waters) are intensively used for feeding (Reeves et al. 2005; Cupka and Murphy 2005). Feeding grounds occupied in the spring, summer, and fall have been identified as the Gulf of Maine and the Bay of Fundy, northward to Iceland (Waring et al. 2010; Cupka and Murphy 2005).

For all sub-populations of humpback whales, the breeding and calving grounds occupied during winter months is primarily the West Indies, with the majority of the whale congregation found in the waters of the Dominican Republic (Waring et al. 2010). There has been an increase in the number of humpbacks occupying waters off the U.S. mid-Atlantic coast during winter, most prominently in January to March. These sightings may suggest distributional changes, an increase in whale abundance, or simply an increase in awareness and sighting of the whales (Waring et al. 2010; Cupka and Murphy 2005). These areas may in fact be recognized as increasingly important habitat for juvenile humpbacks (Waring et al. 2010).

Population Dynamics

Six sub-populations, or stocks, of humpback whales have been identified within their designated feeding range. These stocks appear to demonstrate site fidelity to feeding grounds. This showing of strong site fidelity includes calves returning to the same feeding ground as their mother (Waring et al. 2010, Cupka and Murphy 2005).

Abundance estimates for the Gulf of Maine humpback whale sub-population has proved to be challenging due to the overlap in range of some of the stocks. The best abundance estimate for the Gulf of Maine stock is 847 (CV = 0.55), with a minimum estimation of 359 animals (Waring et al. 2010). This estimate may actually be below its OSP level (Cupka and Murphy 2005; Waring et al. 2010). It has been suggested that the Gulf of Maine stock is actually increasing, estimated annual population growth rate of 3.1 percent (Waring et al. 2010).

Threats

Humpback populations are sensitive to a variety of anthropogenic stressors, including disturbance and/or displacement due to noise (associated with shipping, mining, and underwater explosions in relation to marine construction and exploration), habitat destruction, competition with fisheries for prey species, and pollutants from various marine and coastal sources. The greatest cause of humpback whale mortality is caused by ship collisions and fishing gear entanglement (Wynne and Schwartz, 1999; Cupka and Murphy, 2005; NAMMCO 2006; Waring et al. 2010).

Fishery-related mortality and serious injury reports indicate that gillnets and gear were the most common source of entanglements leading to serious injury and mortality in the Gulf of Maine between 1975 and 1990. In a 5 year period, the Gulf of Maine stock suffered 14 fishery-related incidents, of which 5 resulted in the death of the animal, and 9 were recorded as serious injury attainable from fishery interactions (Waring et al. 2006). For the years 2004-2008, the estimated human-caused mortality and serious injury to the Gulf of Maine population from incidental fishery interactions was 3.0 per year (Waring et al. 2010). Between 1990 and 2000, there were 52 known humpback whale mortalities in the waters of the U.S. mid-Atlantic states.

Occurrences of ship strikes are greater than occurrences of entanglement for humpbacks. Records from the NOAA Fisheries for 1999 through 2003 indicate 15 cases of verified vessel collisions that caused mortality or serious injury. Of the 15 known mortalities, 6 were the direct result of the ship strike (3 animals identified from the Gulf of Maine stock), but 8 could not be determined if the strike was primary or caused serious injury leading to the eventual death of the animal (Waring et al. 2006). From 2004 to 2008, 8 humback whale mortalities have been attributed to ship strike (Waring et al. 2010)

An increase in humpback whale strandings has been reported, especially along the U.S. mid-Atlantic coast. Based on the investigation of individuals stranded, in particular along the Virginia and North Carolina coasts, most animals were sexually immature individuals and many recently separated from their mothers (Waring et al. 2006).

Status, Protection, and Management

The humpback whale is federally listed as endangered under the ESA. The Gulf of Maine stock, identified as part of the overall U.S. Atlantic stock, has been listed by the MMPA as a strategic stock. The strategic classification of this stock was determined based on the average human-caused mortality and serious injury exceeding its calculated PBR level, as well as its listing as an endangered species (Cupka and Murphy, 2005; Waring et al. 2010). Human-caused mortalities exceed the maximum allowable number of animal removal from the stock, prohibiting it from reaching or maintaining a sustainable population (Cupka and Murphy, 2005).

A Recovery Plan was developed in 1991 and is currently in affect for the western North Atlantic humpback whale (Waring et al. 2010). Additionally, collaborative efforts of numerous groups and agencies have been directed toward utilizing protective measures to reduce the incidence of ship strikes and collision-induced injury and mortality, as well as impacts related to fisheries (Cupka and Murphy, 2005; NAMMCO 2006).

Critical Habitat

No critical habitat has been designated for the humpback whale.

Species Occurrence in the Downeast LNG Project Area

Humpback whales are typically observed offshore in the northern Gulf of Maine, and also occur in the Bay of Fundy (Waring et al. 2010). This would indicate a potential occurrence proximal

to vessel travel lanes. Humpback whale sightings have been reported in areas proximal to the transit route (see draft EIS appendix F, figure 23). Humpback whales are not predicted to occur in Passamaquoddy Bay. Because the water depth at the LNG terminal is approximately 45 to 50 feet MLLW, and its prey is available near the terminal, it is conceivable that a humpback whale could occur in the immediate vicinity of the terminal. However, because of the rarity of documented sightings of humpback whales near the terminal, the presence of this species in the immediate area of the terminal is not expected. Therefore, this species could be encountered throughout the LNG transit route(s) but is not expected to occur near the terminal itself.

4.5.1.6 Sperm Whale (Endangered)

Species Description

The sperm whale (*Physeter macrocephalus*) is the largest of the odontocete, or toothed, whales. The head of the sperm whale is large, blunt and squared off, with a small and inferior jaw. The head makes up to one third the total body length and more than one third of its mass. The lower jaw contains approximately 50 conical teeth that are 3 to 8 inches in length. The upper jaw contains a series of sockets into which the lower teeth fit. A single blowhole is located forward on the left side of the head, which projects its breath forward rather than straight up, as is the case with other whales. The sperm whale is usually a dark, brownish gray, and the body appears wrinkled, except for the head. The ventral side of the body may be a lighter gray and may have white patches. The skin around its mouth is white, particularly near the corners.

Adult males reach lengths of 49 to 59 feet and weigh approximately 40 tons. Adult females are much smaller, averaging about 36 feet in length, and weigh up to 22 tons. The sperm whale has a single smooth dorsal fin, followed by a series of knuckles along the spine. Its flippers are small and slightly tapered, while its flukes are broad, measuring as much as 16 feet from tip to tip.

Life History

Sperm whales are considered to be the deepest and longest diving cetacean, possibly descending to depths of 10,000 feet for up to 90 minutes. Average dives occur at depths of 980 to 1,970 feet and last 20 to 50 minutes. There is little or no solar light at such great depths; some organisms produce biochemical light (bioluminescence) which may aid the sperm whale in navigations and prey capture. Sperm whales also use their highly developed echolocation ability to locate food and to navigate, making nearly constant clicking sounds or patterns called codas that pulse through the water. There is also a theory that sperm whales may stun their prey with a burst of sound.

Sperm whales are considered to be squid-specialists, as their main source of food is medium-sized deep water squid. They prefer giant squid, but they also eat smaller squid and fish. A sperm whale can consume about 1 ton of food (e.g., squid) each day (NatureServe 2011).

Males reach sexual maturity at approximately 33 to 39 feet and 10 years or more of age but do not appear to actively breed until their late 20s. Females reach sexual maturity around 9 years of age and 29 feet. Females and their young travel in permanent units, or family groups, whereas

the much larger males rove between breeding and feeding grounds as well as among groups of females when breeding. Large males join female family groups typically consisting of 10 to 20 animals during the mating season, and within these groups there appears to be communal care for the young (NOAA Fisheries 2012b, NatureServe 2011). The gestation period for a sperm whale is 14 to 16 months, followed by the birth of a single calf at intervals of 3 to 15 years. Newborn calves weigh approximately 1 ton and are 11 to 16 feet long. Calves may nurse up to two years (NOAA Fisheries 2012b, NatureServe 2011).

Studies have reported a stable social structure for sperm whales. Low reproductive rates and social structure are two important factors that give distinction to specific social groupings, e.g., nursery schools and bachelor schools to name only two (Waring et al. 2006).

Habitat

Sperm whales are considered to be deep, open-ocean inhabitants, with their distribution occurring over the continental slope, on the continental shelf edge, and into mid-ocean regions (Waring et al. 2007). However, movements have been documented in nearshore areas.

Studies have reported site fidelity among sperm whales, as well as a stable social structure (Waring et al. 2007). The males, alone or in groups, are found in higher latitudes although they occasionally migrate toward lower latitudes (NOAA 2006c). Only the largest mature males appear to enter the breeding grounds close to the equator. Females, calves, and juveniles remain in the warmer tropical and sub-tropical waters of the Pacific, Atlantic, and Indian Oceans year round. In waters of the U.S. Atlantic Ocean, whales concentrate northeast of Cape Hatteras in the winter, and move out to the southern portion of Georges Bank and the continental shelf south of New England as spring approaches and through summer (Waring et al. 2007). The continental shelf south of New England is occupied in the fall by concentrations of sperm whales (Waring et al. 2007).

Population Dynamics

The abundance estimate for sperm whales of the North Atlantic stock is 2,607 (CV = 0.57), and for the combined northern and southern U.S. Atlantic stocks is 4,804 (CV = 0.38), although this estimate was not corrected for dive time and may underestimate actual abundance (Waring et al. 2007). The current minimum estimate provided for the combined northern and southern U.S. Atlantic sperm whale stocks is 3,539. Additionally, this estimate was based on a small portion of the known stock range (Waring et al. 2007).

Prior to the onset of whaling, the global population of sperm whales was estimated to be over 1,000,000. The majority of sperm whale hunting occurred during two periods in history when massive numbers of whales were killed; whalers hunted the sperm whale mainly through 1740 to 1880, and modern whaling of sperm whales peaked in 1964 when 29,255 were killed.

Currently, sperm whales are relatively numerous, with the world-wide population estimated at about 360,000 whales. However, selective killing of the larger breeding-age males over many years has disrupted the male-to-female ratio, and as a result the birth rate has seriously declined

in some populations. The average size of sperm whales killed noticeably decreased during the last 40 years of hunting.

Threats

Sperm whales were the primary targets of whalers based out of the northeastern United States in the 18th and 19th centuries. The sperm whale's head houses a large reservoir containing spermaceti, a clear liquid oil that hardens to a wax-like consistency when cold, which was prized by whalers for its use in candles in the 18th century. Whaling has continued until recent decades and some populations have been depleted, although not to the extent that many of the baleen whales have been effected. Ambergris, a substance found in large lumps in the lower intestine of sperm whales was used in the making of perfume, and continues to be valuable in spite of its widespread replacement by synthetics.

Human-caused mortality and serious injury have also been attributed to fishery-related interaction and/or entanglement, as well as ship strikes (Waring et al. 2006; 2007). Between the years 1999 and 2003, two whales with known causes of death were attributed to human-related activities (Waring et al. 2006; 2007).

Status, Protection, and Management

This species is federally listed as endangered under the ESA, and the sperm whale is considered to be a strategic stock based on this listing (Waring et al. 2007). Status of the sperm whale population within the EEZ is unknown. The average mortality due to fishery-related activities is below the 10 percent of the calculated PBR level.

In 1988, the International Whaling Commission banned the hunting of sperm whales. Some sperm whales may still be taken by aboriginal whalers in the Caribbean and in some eastern islands of Indonesia. Japan also hunts some sperm whales under its scientific whaling program.

Critical Habitat

No critical habitat has been designated for the sperm whale.

Species Occurrence in the Downeast LNG Project Area

Sperm whales have been observed regularly in shallow New England waters at depths of 59 feet and less, from late May through June and in October. Because sperm whales have been observed in nearshore areas, as well as documented sightings in the Bay of Fundy and waters of the northern Gulf of Maine (Waring et al. 2007), there is the potential of sperm whales occurring and/or traversing waters near or within the waters adjacent to the proposed transit route of the LNG vessels. Therefore, this species could be encountered throughout the LNG transit route(s) but is not expected to occur near the terminal itself.

4.5.2 Effects on Cetaceans

Waterway for LNG Marine Traffic

Whales have been observed across the mouth of Passamaquoddy Bay from Head Harbor Passage up to Blacks Harbor on the coast of New Brunswick in July and August (Schom 2006). Whale species have also been observed in Friar Roads, Western Passage, and Grand Manan Channel (MacKay 2006). Whales may be affected by vessel collisions, physical and acoustic harassment, and to a lesser extent by the introduction of pollution and artificial lighting. Of the six whale species that could occur in the Project area, critical habitat has been designated for one species, the North Atlantic right whale. However, designated critical habitat is south of the Project area and would not be affected. Potential impacts on whales and proposed mitigation measures are discussed in further detail below.

Vessel Strikes

Jensen and Silber (2003) report that of 292 documented large whale vessel strikes, 48 resulted in injury to the animal, while 198 resulted in whale mortality; these values together account for 84 percent of vessel strikes resulting in injury or death to large whales. Vulnerability to vessel collisions may result from the whale's limited ability to detect or maneuver around on-coming vessels, or because the species is at the surface feeding, resting, mating, and/or nursing. As discussed in section 4.4.1, vessel strikes with whales often resulted in death or serious injury when the vessel speed was 14 knots or greater (Laist et al. 2001).

Fin, humpback, North Atlantic right, sei, sperm, and blue whales have experienced both injury and mortality as the result of vessel strikes. Between 1999 and 2008, 13 fin whales of the western North Atlantic stock were killed by vessel strikes; 14 vessel strikes resulted in humpback whale mortalities; 2 sei whales were struck by transiting vessels; and 1 sperm whale was killed after colliding with a vessel (Waring et al. 2006; 2010; Cole et al. 2006). These occurrences are summarized in table 3.1.4-14 Within the Bay of Fundy alone, nine known vessel strikes with North Atlantic right whales occurred between 1972 and 2006 (see table 4.4.1.1-1).

The proposed Downeast LNG Project would result in increased marine traffic through the Bay of Fundy to the project site in the Western Passage by as many as 60 vessels per year. Currently, nearby commercial ports (Port of Estes Head, Maine; and Port of Bayside in Canada, near Calais, Maine) typically receive 125 vessels each year, including ferries, small- to mid-size cruise ships, and cargo vessels. This project would result in a permanent increase in large vessel traffic (49 percent) and a temporary incremental increase associated with construction vessels over existing vessel activity associated with fishing, commercial transportation, recreational boating, and ferries.

In the Downeast LNG Project area, the primary issue of concern is the protection of the North Atlantic right whale, as the Bay of Fundy and Passamaquoddy Bay represent important habitats for this species. The major apparent threat to the North Atlantic right whale and the most probable factor preventing recovery of this species is human-caused mortality and serious injury

due to vessel strikes and entanglement in fishing gear. The current strategy to minimize impacts on the North Atlantic right whale as well as the general conservative approach to protect other marine mammals builds upon the mitigation measures developed to protect this species.

As described in section 4.4.1, NOAA Fisheries and participating agencies have implemented several measures to ensure the continued survival of the North Atlantic right whale. These measures include maintaining a minimum 500 yard distance from protected whales; mandatory ship reporting of any whale sightings (MSRS) in areas transited by right whales; recommended reduction of vessel speed to 10 knots or less when vessels transit through areas and where whales aggregate; implementing a TSS that avoids critical or high-use whale habitats; and increasing mariner and boater awareness about the potential human-caused impacts and ways to minimize whale-human conflicts through production of educational materials.

Downeast has indicated its commitment to take the necessary precautions to reduce the risk of injury to right whales and other marine mammals and sea turtles. To minimize the risk of ship strike, Downeast would require the LNG vessels to comply with the required speed restriction of 10 knots or less, beginning from Grand Manan Island to the LNG terminal. In times of inclement weather and low visibility (including nighttime), speeds would be kept as low as reasonable for the safe operation of the vessel and its crew. Downeast would incorporate within its Import Terminal Regulations Manual a section devoted to the North Atlantic right whale, its protection, and implementing regulations.

Because LNG vessels associated with the Downeast LNG Project could transit waters designated by the IMO and NOAA Fisheries as natural habitat of the North Atlantic right whale, the LNG vessels would follow the IMO regulations to report any sightings of right whales and to undertake precautionary measures to avoid any contact with the species. Specifically, vessels would remain 500 yards from North Atlantic right whales and 100 yards from all other whales when navigational limits permit. LNG vessels are required by NOAA Fisheries to implement speed restrictions of 10 knots or less in seasonal management areas. Furthermore, if right whales are known to be in the area, LNG vessels would avoid the Canadian designated Grand Manan Basin Whale Sanctuary by transiting along the western side of Grand Manan Island. Downeast LNG vessel crews and terminal construction and operation crews would also receive environmental training that stresses individual responsibility for marine mammal awareness and reporting. All on-board crew members would receive training on marine mammal sighting and reporting, as required by IMO standards. Additionally, the Captains/Pilots of LNG vessels associated with the Downeast LNG Project would be responsible for monitoring communications and for sighting reports of the North Atlantic right whale, including local Notice to Mariners, NAVTEX warnings, NOAA Weather Radio, and any other means. Following a received whale sighting warning, LNG vessels would comply with required IMO regulations and federal regulations, and attempt to avoid contact and reduce the risk of ship strikes on whales. In the event of a vessel strike, the captain would notify the Coast Guard and follow the Coast Guard's procedural guidance for detailed information about the strike.

To further minimize potential vessel strikes, Downeast has identified the following mitigation measures that it would implement during all stages of the Downeast LNG Project, maximizing protection of the listed species by either avoiding adverse impacts, or minimizing the potential for adverse impacts:

- maintaining an LNG vessel transit speed of less than 10 knots, as described above.
- using "forward-watching" whale spotters that would be ahead of the LNG vessel transitway and on the LNG vessel. The spotters would warn of North Atlantic right whale presence, especially in Head Harbor, as well as other observed special species. This practice is used for protected species at the EcoElectrica LNG Import Terminal in Puerto Rico and has reportedly been very successful. The intent of the forward watching whale spotters is to notify an LNG vessel in advance of the vessel entering an area of the presence of a North Atlantic right whale and to defer entry. A similar practice is already in place in the area relative to the Pilots and their advance ship radio communication. The Downeast plan would implement a dedicated team of whale spotters and a vessel that would be resident to the area (e.g., personnel and equipment/vessel located in Eastport-Perry and/or Canada). This team could also be used in coordination with local whale observation recorders to regularly monitor and record whale sightings.
- developing and implementing a project-wide training and education program, wherein all employees of the project and LNG vessel crews are provided detailed information regarding the potential presence of special species and methods and procedures to avoid problematic encounters.
- providing specialized equipment that would enhance the identification and location of protected species, especially the presence of North Atlantic right whales. Investigations are being conducted regarding this type of equipment which may include instrumentation that uses infrared methods for identification.
- funding of enhanced visual observation equipment for placement on whale watching tour vessels that would promote customer observation of encountered whales from a greater distance than might be practiced at present.

These measures that Downeast would employ to minimize impacts on North Atlantic right whales would minimize impacts on all listed cetatean species. Downeast has committed to continue its consultation with the FWS, NOAA Fisheries, and other relevant federal and state agencies to discuss appropriate mitigation measures. Upon completion of ESA consultation and federal and state permitting processes, Downeast would incorporate the final approved construction and mitigation measures into a comprehensive Prevention and Mitigation Manual for use in training of Downeast's construction and operational personnel, which would be filed with FERC.

Acoustic Harassment and Take

Underwater sounds, if they are intense enough, may cause injury (acoustic trauma, hearing loss or discomfort) to the ears of whales, or even death from concussion. In addition, many marine

mammals rely on sound for navigation, communication, and detection of prey (by echolocation). Thus, the generation of project-related noise may affect a mammal's ability to perform some or all of these important functions. Specifically, noise created by LNG vessels in transit may cause temporary changes in marine mammal behavior. In the presence of vessels, whales may exhibit no response; they may exhibit avoidance response; or they may exhibit behaviors that increase their susceptibility to collision, such as startle responses, erratic surface movements, reduced surface time, fewer blows per surfacing, shorter intervals between successive blows, and increased frequency of dives without raised flukes (Whitehead et al. 1990; Cawthorn 1992; Gordon et al. 1992). Of the whale species that could occur in the project area, the fin whale is known to react strongly to low-frequency vessel sounds that are near the frequency of its own vocalizations, between 15 to 100 Hz (EPA 1993). Fin whales have been reported to actively avoid approaching vessels within this sound range, especially those that approached quickly or changed direction or speed abruptly (Edds and Macfarlane 1987; Macfarlane 1981 as reported in Richardson et al. 1995).

Table 4.4.2-1 describes the four types of sound categories based on the characteristics of the noise at the source. These categories are intended to address how mammal ears react to sounds of different types. These are the finest gradations that are now possible, given the current state of the research.

TABLE 4.4.2-1

Types of Sound Categorized Based on the Characteristics of the Noise at the Source

Sound Type	Source Characteristic	Selected Example
Single Pulse	Single sound: short duration, fast rise time	Single explosion, pile strike, or airgun, watergun or sparker pulse, single ping of certain sonars/depth finders
Single Non-Pulse	Single sound: long duration, slow rise time	Single vessel pass, drilling event, aircraft overflight, single ping of certain sonars
Multiple Pulse	Multiple sounds: each short duration, fast rise time	Airguns, some sonar/depth sounder systems, waterguns, sparkers, pile driving, serial explosions
Multiple Non-Pulse	Multiple sounds: Each long duration, slow rise time	Multiple vessel/aircraft passes, certain sonar systems, tomography sources

Directional hearing and source localization are important factors affecting marine animal hearing and that influence the impacts of sound. The ability to localize sound sources is important for two primary reasons including social interaction and the ability to detect prey by echolocation or normal listening. It is also important in order to detect a signal of interest amongst a man-made or other noise (Kryter 1985). Most marine animals can perceive underwater sounds over a broad range of frequencies spanning from about 10 Hz to more than 10,000 Hz (10 kHz). Marine mammals have shown a response to constant low-frequency received sounds with broadband intensities of more than about 120 dB re 1 μPa (Richardson et al. 1995). However, actual thresholds for behavioral responses to sounds in the natural environment depend largely on the level of natural ambient noise, with whales apparently capable of distinguishing sounds in their optimum frequency range that are 10 to 20 dB re 1 μPa above ambient noise at the same frequency (Richardson et al. 1991).

To estimate the effects of underwater sound propagation produced during construction and operation of the proposed project on marine wildlife, Downeast conducted a comprehensive underwater acoustic modeling analysis (Gaboury et al. 2007). Results of this study are discussed in detail in section 4.11.2 of the draft EIS. Vessels and tugs used to transit the waterway for LNG marine traffic would likely generate sound source levels in the range of 120-160 dB re 1 μPA at 1 meter proportionate to vessel size, depth of propeller, speed, engine load and revolutions per minute with broadband source levels driven primarily by propeller cavitations, hydrodynamic flow over the hull and hull appendages, and operation of machinery onboard. Therefore, sounds generated by project vessel transit could potentially elicit a short term avoidance response by marine mammals in the transit area. While Level A acoustic harassment is possible, marine mammals are unlikely to remain close enough to the transiting vessel or associated tugs to be affected in that manner; it is widely assumed that most marine mammals would flee the immediate area adjacent to a vessel. However, Level B acoustic harassment caused by transiting vessels and tugs is expected to affect marine mammals present in the waterway for LNG marine traffic. Mitigation measures listed in the discussion of vessel strikes would help to reduce the affect of acoustic harassment of marine mammals.

Physical Harassment

To date, the overall impacts on marine mammals associated with exposure to toxins are not well understood; however, accidental spills and releases of oils, lubricants, or other pollutants could harm those species that come into contact with the released product. For example, biomagnifications of environmental toxins (e.g., ingestion of phytoplankton toxins like saxitoxin) have been known to pose threats to humpback and sperm whales. To minimize the potential for accidental spills and/or releases, as well as the associated impacts on marine mammals, Downeast would adopt marine spill prevention and control measures to expedite containment and clean-up in the event of a spill; additionally, each LNG vessel is required to comply with the EPA's VGP and maintain a SOPEP. As such, marine mammals are not expected to be adversely affected by accidental spills.

Certain types of anthropogenic debris and refuse have also been documented to cause harm to marine species, such as plastic bags swallowed by feeding whales. Discharge and disposal of garbage and other solid debris from vessels is prohibited by the BSEE (30 CFR 250.300) and the Coast Guard (MARPOL Annex V, Public Law 100-220 [Statute 1458]).

Lights on LNG vessels and support vessels would be necessary to ensure safe operation at all times, and could attract potential whale prey species to the area. Light shining into the water would be focused in the area around the vessels, except for navigational purposes. Lighting is not expected to significantly alter the behaviors of marine mammals in the waterway for LNG marine traffic.

Habitats used by marine mammals are susceptible to impacts from an LNG spill over water, although adverse impacts are anticipated to be minimal to minor and very localized. There is a low probability of a spill due to the precautionary and mitigation measures that would be

implemented throughout the various phases of operation. However, if a nominal breach did occur, minimal adverse impacts of short duration would be expected on the marine mammal habitat in the transit route area, resulting in possible indirect effects on these species. The most significant indirect impact could be the localized loss of prey base (copepods, fishes, and invertebrates) present in the impact area, causing feeding habitats to be lost within the immediate area for variable durations. In the event that a marine mammal surfaced during an ignited LNG spill, or if it came into contact with waters cooled to dangerous temperatures from the spill of cryogenically cooled LNG, an injury or mortality would be expected. An unignited LNG spill on water would create a thermocline in the waterbody surrounding the immediate spill area that would likely be detected and avoided by marine mammals in the affected area. There is a potential of limited significant impacts if a spill should occur; however, with implementation of the safety and security measures recommended by the Coast Guard to ensure suitability of the waterway, the likelihood of such an event would be extremely remote.

In summary, LNG vessels transiting the proposed waterway for LNG marine traffic have the potential to affect each federally-listed whale species, either through vessel strike or physical or acoustic harassment. Downeast LNG has agreed to implement the mitigation measures of the North Atlantic Right Whale Ship Strike Reduction Strategy, which among other measures would restrict LNG vessels to transit speeds that reduce the potential for whale-vessel strikes. Underwater noise generated by LNG vessels and support and construction vessels transiting the area would result in an overall increased exposure to anthropogenic noise. Because the project would be in an area with ongoing shipping activity, exposure to noise is expected to be somewhat consistent with existing conditions. Downeast notes that the noise of marine vessels in the transit area is not uncommon; motorized vessel traffic and recreational boating have occurred in this area throughout the last 100 years. Underwater noise produced by vessels that transit the waterway for LNG marine traffic is not likely to have an adverse impact on federally listed whales.

LNG Terminal

Whale species with the potential to occur in the immediate vicinity of the terminal include North Atlantic right, sei, fin, and humpback; however, documented sightings of these species are low near the LNG terminal site. Construction of the LNG terminal would increase the potential for whale-vessel strikes, acoustic harassment, and physical harassment; however, such impacts would be short-term.

Vessel strikes

During construction of the pier, there would be multiple vessels, tugs, barges, and lay vessels present in the Downeast terminal area. These vessels would be required to operate in accordance with NOAA Fisheries regulations and requirements described above.

Acoustic Harassment and Take

Underwater sounds expected during the construction and operation of the Downeast LNG Project can be classified into three categories. Sounds of short duration that are produced intermittently or at regular intervals (e.g., pile driving noise) are classified as "pulsed." Sounds produced for an extended period, such as sounds from LNG vessels during offloading, are classified as "continuous." Sounds from moving sources, such as vessels, can be continuous, but for an animal at a given location, these sounds are "transient" (i.e., increasing in level as the vessel approaches and then diminishing as it moves away). In general, baleen whales tend to react to lower received levels of continuous sound than a pulsed sound at the same level. When sounds are pulsed or transient, masking effects are expected to be less severe than when they are continuous. Effects of pulsed and continuous sounds associated with construction are described below. Effects of transient sound are described above.

Acoustic harassment from this type of industrial noise has been shown to affect dolphin behavior and communication, which may ultimately affect health and reproductive success, although long-term implications of exposure to pulsed sound are not known (David 2006, Schlundt 2000). Behavioral reactions of baleen whales to pulsed sounds vary depending on the sound source level, type of whale exposed to the sounds, and the whale's activity when the sounds are heard. Baleen whales near the LNG terminal would be expected to exhibit some temporary displacement from strong pulsed sounds. Exposure limits set forth by NOAA Fisheries (2000) state that baleen whales should not be exposed to received levels of pulsive sounds over 180 dB re 1 μPa. Adverse acoustic impacts during impact pile driving, while unavoidable, would be mitigated through Downeast's engagement of a NOAA Fisheries approved mammal and marine spotter to ensure no listed species are within the designated NOAA Fisheries Acoustic Safety Zone during this activity.

During construction of the LNG terminal pier, there would be multiple vessels, tugs, barges, and lay vessels present in the Downeast terminal area that would produce continuous in-air and underwater noise. The barges, which should be the largest vessel used during construction, would not produce engine noise because they would be towed by tugs, though the machines (cranes, compressors, winches, and stringers), construction activities (welding, vibropile driving, and sand blasting), and living activities (lights and cooking) on the barge, would require generators that can result in elevated, continuous in-air noise levels. However, sounds generated by construction activity occurring above water, including impact noise, are subject to a large transmission loss when moving across the water-air interface from the in-air source to the underwater receiver due to the impedance mismatch between these two mediums. The tugs themselves would also increase the amount of continuous underwater noise when they are towing the barges and positioning anchors. The intensity of noise tends to increase as the load that the tug pulls increases (Richardson et al. 1995).

Vessel noises caused by the turning of the screws, engine noises, and noises of operating machinery on board, generally fall in the frequency (pitch) range of 5 to 2,000 Hz, with highest intensities below 100 Hz (Scrimger and Heitmeyer 1991). Construction activities have been

recorded in the past to create broadband sounds; the strongest was below 10 Hz and reaching frequencies as high as 500 Hz (Richardson et al., 1995). Vessels the size of tugs and their onboard machinery usually generate sound intensities of 160 dB re 1 μPa at 1 m or less. The noises from these construction activities are above harassment levels as established by the MMPA and would impact whales in the vicinity (NOAA Fisheries 2005d). While the intensity of these sounds is well below the intensity associated with injury to the ears of cetaceans, it is sufficient to cause temporary behavior modification. Most marine mammals habituate rapidly to low-level underwater sounds and are able to distinguish the sounds they generate for communication from those of human activities (Richardson et al. 1995). In addition, recent studies have documented a change in the distribution of whales in areas with increased vessel activities (Jelinski et al. 2002; Erbe 2002).

Downeast proposes to use drilled rock socket pile installation to eliminate the need for blasting, therefore reducing noise impacts on local fauna. Downeast's analysis of acoustic impacts describes noise that ranges from 120 dB to 170 dB re 1 μPa for this type of continuous sound emission. Impact pile driving, if necessary to seat the pilings, would result in pulsed sound source levels in excess of 200 dB re 1 μPa at 1 meter. It should be noted that impact pile driving would be limited to a small window in time during pier and trestle construction, and only during the final stage of seating the pilings into bedrock. Adverse acoustic impacts during impact pile driving while unavoidable, are brief and can be mitigated through Downeast's engagement of a NOAA Fisheries-approved marine mammal spotter to ensure no listed species are within the designated NOAA Fisheries Acoustic Safety Zone during this activity. Only transient individuals of North Atlantic right, fin, sei, or humpback whales are expected to occur near the LNG terminal site; therefore, we believe it is unlikely that these species would be adversely affected by vessel strikes, acoustic take, and harassment or physical harassment near the terminal.

Downeast would continue to consult with the FWS, NOAA Fisheries, and other relevant federal and state agencies to discuss appropriate mitigation measures. Upon completion of ESA consultation, and federal and state permitting processes, Downeast would incorporate the final approved construction and mitigation measures into a comprehensive Prevention and Mitigation Manual for use in training of Downeast's construction and operational personnel.

Sendout Pipeline

Construction and operation of the sendout pipeline would be limited to onshore portions of the action area and therefore would have ***no effect*** on whales.

Determination of Effects

The proposed Downeast LNG Project has the potential to adversely affect each of the six whale species identified within the project area, either by acoustic harassment and/or vessel strikes. Downeast LNG has agreed to implement the following measures to avoid or minimize the potential for adverse effect on these whale species:

- Measures of the Right Whales Ship Strike Reduction Strategy, which includes LNG vessel transit speed reduction of less than 10 knots and minimum distance requirements.
- The use of "forward-watching" whale spotters that would be ahead of the LNG vessel transitway and on the LNG vessel. The spotters would warn of northern right whale presence, especially in Head Harbor, as well as other observed special species.
- Development and implementation of a project-wide training and education program, wherein all employees of the project and LNG vessel crews are provided detailed information regarding the potential presence of special species and methods and procedures to avoid problematic encounters.
- Providing specialized equipment that would enhance the identification and location of protected species, especially the presence of North Atlantic right whales. Investigations are being conducted regarding this type of equipment which may include instrumentation that uses infrared methods for identification.
- Funding of enhanced visual observation equipment for placement on whale watching tour vessels that would promote customer observation of encountered whales from a greater distance than might be practiced at present.
- Downeast LNG has committed to continue its consultation with the FWS, NOAA Fisheries, and other relevant federal and state agencies to discuss appropriate mitigation measures, and to incorporate the final approved construction and mitigation measures into a comprehensive Prevention and Mitigation Manual for use in training of Downeast LNG's construction and operational personnel.

With implementation of these measures, we believe the Downeast LNG Project ***is not likely to adversely affect*** the six whale species that may occur in the project area; i.e., the North Atlantic right, sei, blue, fin, humpback, and sperm whales.

Of the six whale species that could occur in the Project area, critical habitat has been designated for one species, the North Atlantic right whale. However, designated critical habitat for the North Atlantic right whale occurs south of the Project area and would not be impacted by the project. Therefore, construction and operation of the Downeast LNG Project would have ***no effect*** on designated critical habitat for North Atlantic right whale.

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5.0 CUMULATIVE IMPACTS AND FINDINGS OF EFFECT

5.1 CUMULATIVE EFFECTS

Activities that occur in the LNG waterway for marine traffic, near the LNG terminal, or adjacent to the proposed sendout pipeline right-of-way have the potential to affect the overall context within which effects of the Downeast LNG Project are considered. Cumulative effects are defined as the "impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions" (40 CFR 1508.7). For the purposes of this analysis, it is important to note that under the ESA, cumulative effects include effects of future state or private activities, not involving federal activities, which are reasonably certain to occur within the action area of the federal action subject to consultation. Future federal actions that are unrelated to the proposed action are not considered in this section because they would require separate consultation pursuant to Section 7 of the ESA.

In the context of the Downeast LNG Project, such ongoing and reasonably foreseeable activities in the marine environment include state-regulated fishing activities and recreational and commercial vessel transit, vessel collisions, ingestion of debris, and exposure to pollution and/or reduced water quality, all of which could result in incidental take. Human-induced mortality or harassment resulting from the combination of these activities may affect populations of ESA-listed species, preventing or slowing species recovery. Commercial fishing, which has the potential to take protected species such as Atlantic salmon and Atlantic sturgeon is expected to continue in the future. Commercial fisheries are also responsible for serious injury and mortality to large whales. However it is unknown how future fishing activities would differ in the extent to which they may affect listed species. Two programs have been implemented that provide information on takes of protected species in state fisheries. The Atlantic Coastal Cooperative Statistics Program and the The Strategy for Sea Turtle Conservation and Recovery in Relation to Atlantic and Gulf of Mexico Fisheries systematically collect fishing effort data for use in monitoring effects to the fisheries.

As noted above, private and commercial vessel activities in the action area may adversely affect listed species in a number of ways, including entanglement, vessel strike, or harassment. Vessel activity is likely to increase over existing levels in the Bay of Fundy over the short term due to construction-related vessel traffic and over the long term due to large vessel traffic associated with LNG terminal operations. This would result in an increased potential for vessel strikes with whales or sea turtles. Increasing vessel traffic in the action area also raises concerns about the potential effects of noise pollution on marine mammals and sea turtles which may result in auditory trauma, temporary or permanent loss of hearing sensitivity, habitat exclusion, habituation, and disruption of other normal behavior patterns such as feeding, migration, and communication. Construction-related impacts, however, would be localized and short term, occurring only in the immediate vicinity of the terminal and pipeline facilities and only during construction, and therefore would be insignificant. Passage of LNG vessels along the waterway to the Downeast terminal while in operation would have longer-term effects.

The Calais LNG Project Company submitted an application before the FERC on December 18, 2009 to construct and operate an LNG import terminal and sendout pipeline; it would be approximately 6 miles north of the Downeast terminal in the town of Calais, Maine. If both Downeast and the Calais projects become operational, impacts associated with construction and operation of these facilities would be expected to increase. LNG vessel traffic could increase

from 60 vessels per year to 164 vessels per year. The exposure to noise and risk of potential vessel strikes also commensurately increases with increased vessel traffic.

It is important to note that NOAA Fisheries has implemented several strategies to reduce the impacts on whales and sea turtles caused by fisheries entanglement and vessel strikes. To reduce the incidental capture of sea turtles in commercial fisheries, NOAA Fisheries has enacted regulations to restrict certain U.S. commercial fishing gears (gillnets, longlines, pound nets, and trawls) that have known, significant bycatch of sea turtles[9]. As described in section 4.4.1 of this BA, NOAA Fisheries and other international organizations have designated critical habitats for the North Atlantic right whale, removed vessel traffic from key whale habitats (traffic separation schemes near the port of Boston and near Grand Manan), and implemented vessel speed restrictions in seasonally managed areas. Together, these regulations act to reduce the occurrence of fishery entanglements and whale-vessel or turtle-vessel interactions.

Sea turtles are susceptible to entanglement by and may ingest marine debris. In general, marine debris generated from oceanic vessel activities is anticipated to continue to pose a threat to sea turtles. However, there are measures required by international convention and in compliance with MARPOL 73/78 to prohibit the disposal of garbage and other debris from vessels. Exposure to pollutants and reductions of water quality may result from stormwater runoff associated with construction of the onshore terminal facilities, ground disturbance associated with construction of the pier, and contaminant spills/leaks from vessels transiting through the action area. Construction of the marine terminal would result in temporary cumulative effects on water quality primarily from turbidity. However, this impact would be localized and short term, occurring only in the immediate vicinity of the terminal facilities, but may be additive to impacts on water quality resulting from runoff from other onshore developments. During operation, the increase in vessel activity in the waterway could have cumulative effects on water quality.

In the terrestrial environment, cumulative impacts may result from clearing, grading, and other construction activities associated with the project, along with other area construction projects, that could result in the removal of vegetation, alteration of wildlife habitat, displacement of wildlife, and other secondary effects such as increased population stress, disruption of predator-prey relationships, forest fragmentation, and establishment of invasive plant species. The construction of utility lines, transmission lines, roads, and residential and industrial sites, in addition to past resource management activities (e.g., timber harvest) in the action area, has already resulted in habitat fragmentation and is expected to remain constant or increase in the foreseeable future.

Cumulative impacts such as noise and disturbance associated with pipeline construction would depend on the timing of construction of other projects in the action area. However, because pipeline construction progresses along the right-of-way, the chance that activities would overlap with ongoing and future projects in the action area, and therefore result in cumulative impacts on terrestrial resources, would be minimal.

5.2 SUMMARY OF EFFECTS DETERMINATIONS

The following findings of effect for federally listed species and their critical habitat are based on information provided in sections 4.1, 4.2. 4.3, and 4.4 of this assessment, including the existing

[9] Regulations implemented by NOAA Fisheries between 2002 and 2008 to protect sea turtles are listed at http://www.nmfs.noaa.gov/pr/species/turtles/regulations.htm.

conditions in the action area and species presence and habitat use obtained from a literature review and federal and state agencies and an analysis of the proposed action including avoidance and minimization measures. Table 5-1 provides our determinations of effect for listed species and their designated critical habitat.

TABLE 5-1

Summary of Effects Determinations for Federally-listed Threatened or Endangered Species Potentially Occurring near the Downeast LNG Project

	Determination of Effects a/		
Common Name	**Species**	**Critical Habitat**	**Justification**
Atlantic Salmon	NLAA	NE	• Low likelihood of occurrence in waterway or near terminal. • Terminal design would include light reduction techniques to avoid unnecessary light. • Downeast would prepare and implement its Plan, Procedures, and *Soil Erosion and Sediment Control Guidelines* and SWPPP plans to minimize water quality impacts. • No Critical Habitat would be crossed or affected by the Project.
Atlantic sturgeon	NLAA	--	• Low anticipated abundance near the waterway and terminal • Lack of suitable spawning habitat
Shortnose sturgeon	NLAA	--	• Low anticipated abundance near the waterway and terminal • Lack of suitable spawning habitat
Leatherback sea turtle	NLAA	NE	• Downeast would provide environmental training to crews to spot and avoid sea turtles in the waterway and would implement Northern Right whale detection and avoidance procedures that would also apply to sea turtles. • LNG vessels and construction vessels would be required to comply with speed restrictions to avoid strikes. • All vessels would keep SOPEP on board in case of spills; LNG vessels would be equipped with cargo monitoring and safety/control systems. • Downeast would employ an EI during construction. • Downeast would train crews in waste disposal; implement an SWPPP for operation of the terminal; and would design the terminal to include safety and hazard detection systems to minimize water quality impacts. • No Critical Habitat in the Project area.
North Atlantic right whale	NLAA	NE	• The proposed project would result in increased noise, lighting, and vessel traffic that may result in adverse impacts on these species, particularly sei, fin, North Atlantic, and humpback whales that may occur near the LNG terminal and nearshore waters of the LNG waterway for marine traffic. • Downeast would implement the mitigation measures of the Right Whales Ship Strike Reduction Strategy, which includes speed reductions and minimum distance requirements; Downeast would comply with IMO regulations to avoid whale strikes. • All construction and operation crews would receive environmental training regarding marine mammal sighting and reporting. • Downeast is consulting with FWS and NOAA Fisheries to develop a comprehensive Prevention and Mitigation Plan. • Downeast would train facility personnel in proper waste disposal requirements. • Downeast would adopt a marine SPPC plan; all vessels would use SOPEPs to minimize water quality impacts from accidental spills. • No Critical Habitat for the North Atlantic right whale occurs in the Project area.
Sei whale	NLAA	---	
Blue whale	NLAA	---	
Fin whale	NLAA	---	
Humpback whale	NLAA	---	
Sperm whale	NLAA	---	

a/ Likely to Adversely Affect (LAA); Not Likely to Adversely Affect (NLAA), No Effect (NE).

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Attachment A
Rare, Threatened, and Endangered Species Surveys

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Rare, Threatened, and Endangered Species And Critical Habitat Survey
Robbinston, Maine

July 2005

Prepared for

Downeast LNG
PO Box 865
Calais, ME 04619

Prepared by

Woodlot Alternatives, Inc.
30 Park Drive
Topsham, ME 04086

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1.0 PROJECT BACKGROUND

Downeast LNG contracted Woodlot Alternatives, Inc. (Woodlot) to conduct an on-site reconnaissance for state and federally listed rare, threatened, and endangered (RTE) species and critical habitats in advance of the construction of a liquid natural gas (LNG) facility. The project site of approximately 80 acres is located adjacent to U.S. Route 1 and Mill Cove at the mouth of the St. Croix River in Robbinston, ME. The parcel was the site of an old farm and pastures until the 1960s. The parcel has since been managed for timber harvesting with the last harvest occurring approximately 10 years ago (Joseph Krug, retired forester, personal communication). The parcel is bisected by numerous skidder trails through regenerating timber stands. Correspondence with Downeast LNG indicates that they are proposing to clear approximately 30 acres in the southern half of the parcel for the installation of a LNG facility and pipeline.

2.0 METHODOLOGY

Determining the likelihood of the presence of RTE species and critical habitat employed gathering information from regulatory agencies, performing a landscape analysis, and conducting a field survey for the presence of ecological conditions with the likelihood to support these species (i.e., existence of proper ecological conditions and proper conductivity to areas that would support populations of RTE species or their habitats). Some specific sampling measures were also conducted during the site visit to target specific RTE species.

2.1 Landscape Analysis

Woodlot performed a landscape analysis by reviewing existing maps, aerial photos, bedrock geology and soil maps, and National Wetlands Inventory (NWI) data to identify areas likely to support RTE species and critical habitats (i.e., wetlands, shoreline outcrops, and intertidal habitat).

2.2 Field Survey

The field survey was conducted July 12 through July 15, 2005. The survey focused on identifying particular natural communities and ecological conditions in which RTE species would likely occur and, when possible, to conduct specific field investigations for target species that could be observed. These targeted searches included observations of individual species, signs of RTE wildlife, and observations of ecological conditions known to perpetuate communities of these species. Species known to occur in similar ecological settings as those found at the project site include Wiegand's sedge (*Carex wiegandii*), blinks (*Montia fontana*), bird's-eye primrose (*Primula laurentiana*), marsh-felwort (*Lomatogonium rotatum*), and bald eagle (*Haliaeetus leucocephalus*).

3.0 RESULTS

3.1 Landscape Analysis

The landscape analysis indicated a moderate likelihood for state and federally listed RTE species to occur at the site. While most of the upland portions of the parcel have been harvested in the past, the wetland mapped by the NWI in the northern portion of the parcel and the shoreline appeared to be relatively undisturbed and intact. A palustrine scrub-shrub wetland is located in the northern portion of the property. Based upon initial analysis of aerial photography, this wetland likely extends to the northern shoreline as well as to the south for 500 to 1,000 feet. Wiegand's sedge occurs in similar wetland habitats throughout northern and eastern Maine. It was determined that the shoreline was likely steep and rocky and could support RTE plant species, including blinks, bird's–eye primrose, and marsh-felwort if proper conditions

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(i.e., seepy ledges) are present. Bald eagles are known to nest in large trees along major rivers in coastal Maine. The aerial photos did not indicate the presence of emergent marshes (i.e., salt marshes) in the project area. The portions of the parcel that have been harvested appeared to be primarily Spruce-Fir-Broom-moss Forest or possibly Maritime Spruce-Fir Forest. These community types are not known to harbor RTE plant or animal species in eastern Maine.

The surficial geology of the project area is composed of unstratified and unconsolidated glacial till. The bedrock is Devonian metasedimentary overlain by glacial till. Soils consist primarily of two types: the Creasey-Abram complex (363XC) and the Lamoine-Creasey-Scantic complex (330XB). The Lamoine-Creasey-Scantic complex is somewhat poorly drained to poorly drained soil composed of glaciomarine deposits and glacial till parent materials. This soil complex is typically associated with terraces, basins, and plains in Maine. Scantic soils are hydric. The Creasey-Abram complex is somewhat excessively drained to excessively drained soil composed of glacial till parent material. This soil complex is associated with ridges and knolls.

Based on the landscape analysis, it was determined that the field survey would focus primarily on the wetland complex and the shoreline. In addition to surveying these areas, a walkthrough of the entire project area would be performed to ensure that small-microhabitats for RTE species were not overlooked.

3.2 Field Survey

The shoreline and previously identified scrub-shrub wetland was surveyed for RTE species. The shoreline is composed of sparsely vegetated, steep outcrops. The rock is soft and brittle with conglomerates of small stones. The tops of the cliffs are densely vegetated with speckled alder (*Alnus incana* ssp. *rugosa*), paper birch (*Betula papyrifera*), balsam fir (*Abies balsamea*), orange hawkweed (*Hieracium aurantiacum*), and fescue grass (*Festuca* sp.). Halophytes such as black grass (*Juncus gerardii*) and American dunegrass (*Leymus mollis*) were sparsely scattered along the base of the outcrops in small coves. Several seepy and shaded areas were found along the shoreline; however, no RTE plant species were found in these areas. Vegetation found on these outcrops was sparse and included narrow false oats (*Trisetum spicatum*), fescue grass, fragile fern (*Cystopteris tenuis*), and rock polypody (*Polypodium virginianum*).

Photograph 1: Shoreline outcrops

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The previously mapped NWI wetland is classified as an Alder Shrub Thicket. Speckled alder is dense throughout the wetland, covering approximately 80% of the wetland. Red maple (*Acer rubrum*) is also common throughout the wetland. The herbaceous stratum is dense with tall meadow-rue (*Thalictrum pubescens*), purple avens (*Geum rivale*), fowl mannagrass (*Glyceria striata*), dwarf raspberry (*Rubus pubescens*), and meadowsweet (*Spiraea alba* var. *latifolia*). A small stream, fed by a culvert from under U.S. Route 1, meanders northerly through the wetland and drains into Mill Cove at the northern edge of the project area.

The wetland transitions to the south into a Northern White Cedar Swamp (ca. 10 to 12 acres larger than the wetland mapped by NWI). This wetland had not been mapped by NWI and had been heavily harvested in the past. The wetland is bisected by numerous skidder trails, which have subsequently become emergent wetlands. Hydrophytic vegetation is abundant in the skidder trails and includes sedges such as *Carex stipata, C. crinita, C. projecta, C. lurida, C. lupulina*, *C. echinata*, *C. canescens,* and *C. flava*. Other hydrophytes include fowl mannagrass, bluejoint (*Calamagrostis canadensis*), sensitive fern (*Onoclea sensibilis*), black-girdled wool-grass (*Scirpus atrocintus*), woodland horsetail (*Equisetum sylvaticum*), dwarf raspberry, Clayton's bedstraw (*Galium tinctorium*), New England Aster (*Symphyotrichum novae-angliae*), crested wood fern (*Dryopteris cristata*), evergreen wood fern (*Dryopteris intermedia*), the hybrid wood fern (*Dryopteris* x *bootii*), and peat moss (*Sphagnum* sp.). The wooded portion of the wetland is dominated by northern white cedar (*Thuja occidentalis*) and balsam fir. Understory plants in the wooded portion consist of three-seeded sedge (*Carex trisperma*), woodland horsetail (*Equisetum sylvaticum*), fowl mannagrass, crested wood fern, and evergreen wood fern. Many saturated depressions are found throughout the wetland. The wetland continues southeasterly in a narrow depression (approximately 200 feet wide on average) to the southern portion of the parcel. Soils throughout the wetland are somewhat poorly drained hydric soils with abundant redoximorphic (i.e., mottling) features within the upper 16 inches of soil. Soil color in the upper 8 inches of soil is 7.5YR 5/1 with a few deletions of 7/10B/1. The B-horizon (8 to 16") is gleyed with a color of 8/5B/1 and with concentrations of 2.5YR 6/3. Upland forest surrounds the wetland on the east, west, southeast, and southwest edges. The approximate location of the wetlands on the site are represented in Figure 1.

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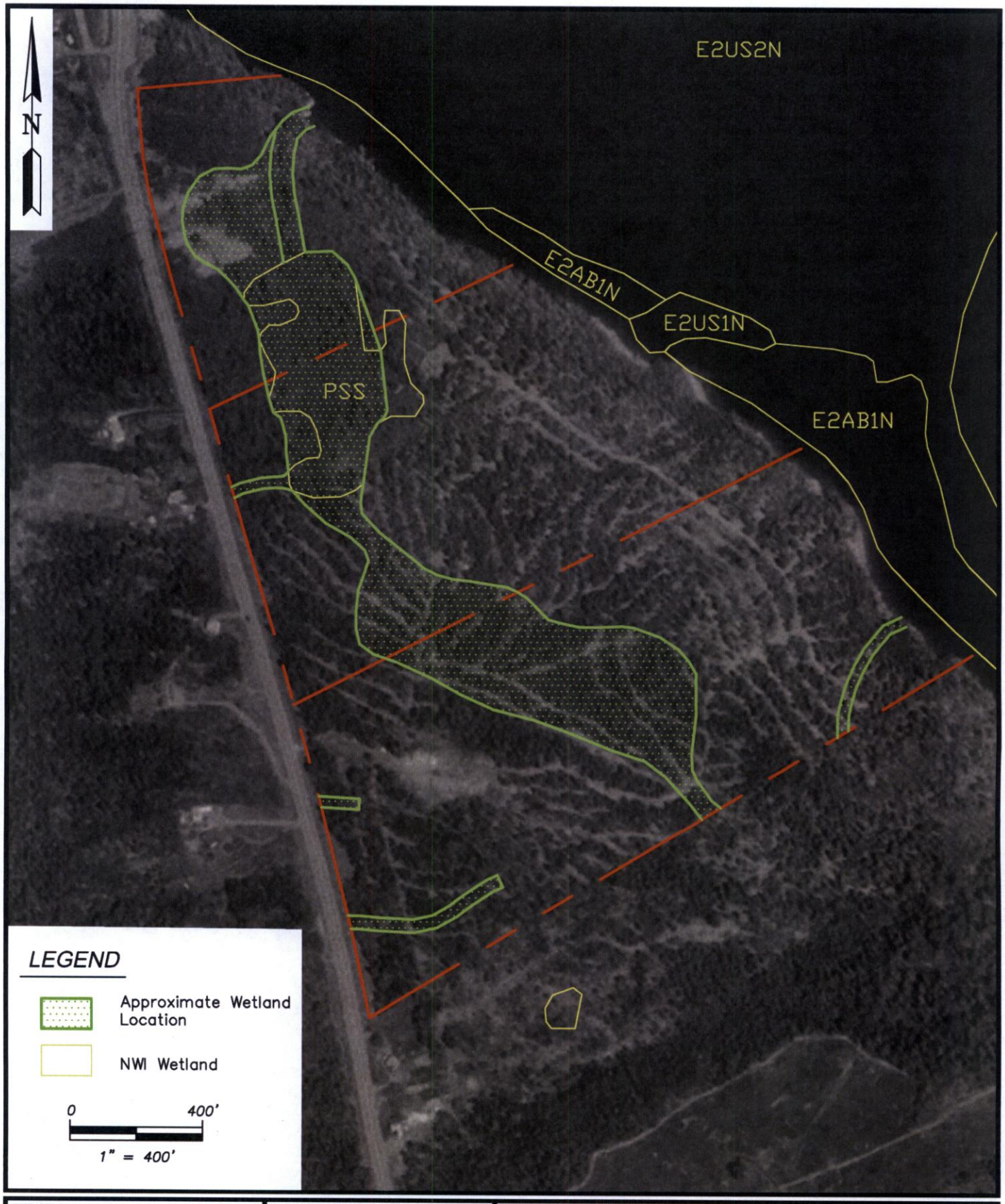

PREPARED BY:

WOODLOT ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS

DATE:	July 2005
SCALE:	1" = 400'
JOB NO.	105111
FILE:	105111-00-wetlands.dwg

Figure 1
Approximate Locations of Wetlands on the DLNG Parcel
South Robbinston, Maine

REV.

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Photograph 2: Upland soil (left) vs. hydric soil (right): note mottling in hydric soil

Two other small wetlands were identified in the southwest portion of the parcel. One wetland consists of a small stream apparently fed by a culvert running under U.S. Rt. 1. The other is a small depression adjacent to the road with abundant amounts of sensitive fern and speckled alder.

Upland habitats had been heavily harvested within the past 15 years. Remnants of Spruce-Fir-Broom-moss and Maritime Spruce-Fir forests were found in the parcel. Tree regeneration in these areas is dense with balsam fir, red spruce (*Picea rubens*), white spruce (*Picea glauca*), quaking aspen (*Populus tremuloides*), and gray birch (*Betula populifolia*). Shrubs include red raspberry (*Rubus idaeus*), meadowsweet, and Virginia rose (*Rosa virginiana*). Herbaceous plants include bunchberry (*Cornus canadensis*), poverty oatgrass (*Danthonia spicata*), velvet-leaf blueberry (*Vaccinium myrtilloides*), and flat-topped white aster (*Doellingeria umbellata*). Tree heights range from 45 to 65 feet with diameters of 12 to 18 inches for the largest trees. Soils ar well-drained, sandy-loams. The upper 10 inches of soil have a color of 2.5YR 6/2 without redoximorphic features. The B-horizon (10 to 18") have a color of 7.5YR 5/4 without redoximorphic features. No RTE species or ecological conditions likely to support RTE species were observed during field observations in these areas.

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Photograph 3: Northern White Cedar Swamp

Photo 4: Clearcut upland Spruce-Fir Forest

Past agricultural use is evident in the northern half of the parcel. Evidence includes apple trees (*Malus* sp.), clearings, an old fencerow, trash middens, two abandoned cars, and old chicken wire fencing. It is estimated that approximately 90% of the project area has been disturbed in the past by forestry and agricultural activities.

4.0 RARE, THREATENED, AND ENDANGERED SPECIES ASSESSMENT

No RTE species were found in the project area. The project area has been heavily disturbed in the past. It is unknown if RTE species once existed prior to the disturbance at the project area. Wiegand's sedge is

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known to occur along old, saturated skidder trails; however, no plants were found and it is unlikely this species occurs at the project site. RTE plant species are often associated with Northern White Cedar Swamps in Maine due to higher pH levels. However, the high degree of disturbance and the lack of indicator plant species suggest that RTE plant species likely do not occur in this wetland complex. Significant wildlife habitat (e.g., deer wintering areas, vernal pools, eelgrass beds, or shore bird nesting habitat such as sand dunes and salt marshes) were not found to occur at the project site. Two wood frogs (*Rana sylvatica*), which are typically associated with vernal pool for breeding, were observed at the project site. However, there was no other evidence to suggest that vernal pools exist at the project site. Bald eagles are associated with large water bodies. They utilize tall trees in close proximity to water for nesting and roosting. Eagle nests were not observed at the project site. It is unlikely that RTE species exist at the project site due to the high degree of disturbance and the lack of field observations.

5.0 SUMMARY

Woodlot has determined that RTE species and critical habitat do not occur on the parcel of land that Downeast LNG has allotted for the establishment of a LNG facility in Robbinston, ME. Wetland habitats were found to be greater in extent than what was previously known from NWI data. The majority of the land has been disturbed through agricultural use and timber harvesting operations.

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Appendix A

Species Observed During Field Visits

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Table 1. Species Observed During Field Visits

Species	Common Name
Vascular Plants	
Abies balsamea	balsam fir
Acer rubrum	red maple
Alnus incana ssp. *rugosa*	speckled alder
Betula alleghaniensis	yellow birch
Betula papyrifera	white birch
Betula populifolia	gray birch
Calamagrostis canadensis	bluejoint
Carex canescens	silvery sedge
Carex crinita	drooping sedge
Carex debilis	white-edged sedge
Carex echinata	star sedge
Carex flava	a sedge
Carex intumescens	a sedge
Carex leptalea	bristle-stalked sedge
Carex lurida	sallow sedge
Carex merritt-fernaldii	Fernald's sedge
Carex projecta	necklace sedge
Carex scoparia var. *scoparia*	pointed broom sedge
Carex stipata	awl-fruited sedge
Carex tenera	a sedge
Carex trisperma	three-seeded sedge
Cornus canadensis	bunchberry
Cystopteris tenuis	slender fragile fern
Danthonia spicata	poverty oatgrass
Doellingeria umbellata	flat-topped white aster
Dryopteris cristata	crested wood fern
Dryopteris intermedia	evergreen wood fern
Dryopteris x *bootii*	a hybrid wood fern
Eleocharis sp. (immature)	A spikerush
Equisetum sylvaticum	woodland horsetail
Festuca sp.	unidentified fescue grass
Fraxinus americana	American ash
Galium tinctorium	Clayton's bedstraw
Geum rivale	purple avens
Glyceria canadensis	rattlesnake mannagrass
Glyceria striata	fowl mannagrass
Hieracium aurantiacum	orange hawkweed
Hieracium caespitosum	yellow king devil
Ilex verticillata	winterberry
Juncus effusus	soft rush
Juncus gerardii	black rush
Juncus greenei	Greene's rush
Juncus tenuis	path rush

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Species	Common Name
Kalmia angustifolia	sheep laurel
Larix laricina	tamarack
Leymus mollis	American dunegrass
Maianthemum canadense	Canada mayflower
Malus sp.	apple
Onoclea sensibilis	sensitive fern
Osmunda claytoniana	interrupted fern
Picea glauca	white spruce
Picea rubens	black spruce
Polypodium virginianum	rock polypody
Populus tremuloides	quaking aspen
Potentilla simplex	old-field cinquefoil
Prunus serotina	black cherry
Prunus virginiana	choke cherry
Ranunculus repens	creeping buttercup
Rosa virginiana	Virginia rose
Rubus idaeus	red raspberry
Rubus pubescens	dwarf raspberry
Salix bebbiana	Bebb's willow
Salix discolor	pussy willow
Scirpus atrocinctus	black-girdled wool-grass
Solidago cf *gigantea*	smooth goldenrod
Spiraea alba var. *latifolia*	meadowsweet
Spiraea tomentosa	steeplebush
Symphyotrichum novae-angliae	New England aster
Symphyotrichum sp (vegetative)	unidentified aster
Thalictrum pubescens	tall meadow-rue
Thuja occidentalis	northern white cedar
Trientalis borealis	starflower
Trisetum spicatum	narrow false oats
Vaccinium myrtilloides	velvet-leaf blueberry
Veronica officinalis	common speedwell
Viburnum nudum	wild raisin
Viburnum trilobum	cranberry bush viburnum
Birds	
Catharus fuscescens	veery
Catharus guttatus	hermit thrush
Corvus brachyrhynchos	American crow
Corvus corax	common raven
Dendroica fusca	Blackburnian warbler
Dendroica pensylvanica	chestnut-sided warbler
Dendroica virens	black throated green warbler
Geothlypis trichas	common yellowthroat
Larus argentatus	herring gull
Mniotilta varia	black-and-white warbler

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Species	Common Name
Phalacrocorax auritus	cormorant
Sitta carolinensis	white-breasted nuthatch
Turdus migratorius	American robin
Zonotrichia albicollis	white-throated sparrow
Amphibians	
Bufo americanus	American toad
Rana sylvatica	wood frog
Mammals	
Alces alces	moose
Odocoileus virginianus	white-tailed deer
Sylvilagus floridanus	eastern cottontail
Tamiasciurus hudsonicus	red squirrel

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Appendix B

Site Soil Survey Map

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Attachment B
Summary of Stream Habitat Analyses along the Sendout Pipeline

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Attachment B

Summary of Stream Habitat Analyses along the Sendout Pipeline

Stream	MP	Habitat Type	Water Temp (°C)	% Substrate Covered by Rooted Vegetation	% Substrate Covered by Attached Vegetation	% Canopy Cover	Woody Debris Present (Y/N)	Spawning Patch Present (Y/N)	% Large Boulder (>24 in)	% Small Boulder (12-24 in)	% Cobble (3-12 in)	% Gravel (0.2-3 in)	% Sand (<0.2 in)	% Fines	Average Depth (in)	Average Width (feet)
Unnamed Stream	1.9	Run	19.3	10	20	85	Y	Y			5	20	45	30	3	4.7
Unnamed Stream (Outlet of Keene Lake)	4.2	Glide	21.6	20	0	5	Y	Y				20	50	30	15	8.9
Unnamed Stream	5.2	Low gradient riffle	22.9	0	0	97	Y	N		5	25	70			8	5.5
Beaver Brook (upstream of Flowed Lands Pond)	7.7	Ponded area	20.7	30	0	40	Y	N			2		8	90	4	7.0
Beaver Brook (upstream of Flowed Lands Pond)	7.7	Low gradient riffle	20.8	10	60	50	Y	N	15	25	35	15	10		13	8.0
Unnamed Stream	15.4	Run	15.6	50	25	60	Y	N				5	15	80	2	2.0
Unnamed Stream	16.1	Run	21.3	20	20	40	Y	N			2	8	80	10	9	3.2
Unnamed Stream	16.1	High gradient riffle	21.4	10	65	80	Y	N	15	30	40	8	7		8	2.8
Unnamed Stream	17.0	Run	17.9	10	40	100	Y	N		5	35	35	20	5	6	5.2
Unnamed Stream	17.0	Glide	17.9	75	20	50	Y	N				20	50	30	6	5.8
Unnamed Stream	17.0	Run	18.3	20	40	100	Y	Y	2	20	20	40	10	8	6	5.0
Conic Stream	17.4	Ponded area	21.8	30	0	5	N	N			5		20	75	33	90.0
Unnamed Stream	17.8	Low gradient riffle	18.1	10	75	80	N	N		15	35	30	20		3	8.3
Unnamed Stream	17.8	Deadwater	18.2	90	0	15	Y	N		5	5	10	35	45	2	11.9
Unnamed Stream	18.2	Ponded area	25	75	0	0	N	N						100	22	220.8

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Attachment B

Summary of Stream Habitat Analyses along the Sendout Pipeline

Stream	MP	Habitat Type	Water Temp (°C)	% Substrate Covered by Rooted Vegetation	% Substrate Covered by Attached Vegetation	% Canopy Cover	Woody Debris Present (Y/N)	Spawning Patch Present (Y/N)	% Large Boulder (>24 in)	% Small Boulder (12-24 in)	% Cobble (3-12 in)	% Gravel (0.2-3 in)	% Sand (<0.2 in)	% Fines	Average Depth (in)	Average Width (feet)
Unnamed Stream	18.2	Run	26.2	80	0	0	N	N						100	20	19.3
Unnamed Stream	18.4	Low gradient riffle	18.7	20	50	100	Y	N		15	30	5	25	25	2	3.3
Unnamed Stream	18.9	High gradient riffle	16.5	0	0	85	N	N		5	10	40	40	5	3	1.1
Stony Brook	19.2	Low gradient riffle	20.6	25	50	30	Y	N		5	90	5			5	13.0
Stony Brook	19.2	Low gradient riffle	20.4	20	60	60	Y	N			80	20			4	4.8
Stony Brook	19.2	Run	20.8	40	50	15	Y	N	10	30	40	20			6	23.0
Wapsaconhagen Brook	22.1	Low gradient riffle	23	15	60	5	Y	N	5	50	40	5			8	37.0
Unnamed Stream	23.3	Glide	19.1	0	0	0	N	N			10	5	45	40	7	3.8
Anderson Brook	26.0	Glide	15.3	50	30	66	N	N		15	20		15	50	12	14.8
Anderson Brook	26.0	Deadwater	15.3	40	0	35	Y	N						100	13	27.5
Unnamed Stream	26.6	Run	13.5	20	20	80	Y	N	5	25	20	20	15	15	3	3.3
Anderson Brook	30.1	Run	13.4	10	80	75	N	N					10	90	4	8.5

a/ Surveys were conducted by Stantec Inc (formerly Woodlot Associates) in September 2006. Some streams crossed by the sendout pipeline were not sampled because access was not authorized by the landowner.

Appendix D

FERC Staff's Responses to Maine State Planning Office Safety Advisory Report

TABLE D-1 FERC Staff's Responses to concerns Presented in the Maine State Planning Office Safety Advisory Report for the Downeast LNG Project	
Topic: The Kind and Use of the Facility	
Issue	**Response**
FERC should require the applicant to identify and provide technical justification for the highest wind speed used for the analysis and the design of the marine terminal and onshore structures.	Addressed in Section 4.12.2, Front-End Engineering Design Review. The Downeast LNG terminal would be designed to withstand a sustained wind velocity of 150 mph per the requirements of49 CFR 193.2067 unless approved for lesser wind speeds by the PHMSA Administrator.
FERC should evaluate the use of tankers up to 165,000 cubic meters that may supply the facility as conducted during the ship simulation study at Marine Safety International (MSI), Newport, Rhode Island in July 2006. The evaluation should include analysis of the loads on the mooring system from the effects of passing vessel traffic and high winds.	Downeast states that it would design the mooring system and unloading platform according to U.S. regulations and international industry standards applicable to the import of liquefied petroleum gases, indicating that this design would accommodate carriers with capacities of 70,000 m^3 to 165,000 m^3. In addition, Downeast states that it would use the *International Safety Guide for Oil Tankers and Import Terminals* (ISGOTT) as a key safety document. Breasting dolphins would be designed to resist breasting forces in accordance with *Oil Companies International Marine Forum* (OCIMF) guidelines and mooring dolphins would likewise follow OCIMF publications including *Mooring Equipment Guidelines* and *Prediction of Wind Loads on Large Liquefied Gas Carriers*.
The applicant states that it may seek to expand the project in the future.[1] Although Downeast LNG does not anticipate the need for additional storage tanks, the expansion would involve the additional of high pressure pumps and vaporizers. The applicant further states that certain engineering elements associated with the expansion have been incorporated into the front end engineering design for the facility. FERC should evaluate the impact to safety and security due to any engineering modifications to the facility to accommodate possible future expansion. FERC should examine whether any of these modifications would result in changes to thermal exclusion zones and vapor dispersion zones.	Addressed in Section 4.12.2, Front-End Engineering Design Review, and Section 4.12.4, Siting Requirements – Thermal and Dispersion Exclusion Zones. FERC staff performed their analysis on the facilities described in the current application. The addition of equipment or modifications that would increase storage capacity or sendout rate would require Downeast to file an amendment for review and approval by FERC. At that time, staff would analyze any proposed facilities in the amendment to ensure that they do not diminish the safety and reliability of the facility and that they comply with current regulations with regard to exclusion zones and other siting requirements.
Topic: Existing and Projected Population and Demographic Characteristics of Washington County Area	
Issue	**Response**
FERC needs to clearly identify all impacted areas associated with the project which include areas utilized during the vessel transit (in and out of Head Harbour Passage and Western Passage), unloading of the vessel (or vessels) at the Pier (Passamaquoddy Bay), transfer of LNG from the pier to the storage facility in Robbinston, and transfer of natural gas from the sendout pipeline to the M&NE pipeline interconnection. FERC's identification of impacted areas should include assessment of the potential for secondary hazards from intentional and unintentional events such as building fires, forest fires, and evacuations.	Identification and discussion of environmental impacts associated with the operation of the LNG terminal and the sendout pipeline, including the potential safety impacts from an ignited or unignited LNG spill are addressed in the EIS. The action area for the FERC's EIS follows the definition in 50 CFR 402.02 as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." Specifically, the action area considered includes the vessel transit paths for all vessel traffic associated with the project, including the waterway from the terminal out to the limit of the territorial seas [12 nm]), the terminal pier and surrounding waters. For potential safety impacts, this includes all associated hazard zones, as defined by the Coast Guard and based

[1] Application under sections 3(a) and 7(c) of the Natural Gas Act for the Downeast LNG Import Terminal and Pipeline Project, December 22, 2006. Docket Nos. CP07-52; CP07-53-000; CP07-54-000; and CP07-55-000. Resource Report 13, Engineering and Design Material, page 40, section 13.1.15, Future Plans.

TABLE D-1 FERC Staff's Responses to concerns Presented in the Maine State Planning Office Safety Advisory Report for the Downeast LNG Project	
Issue	**Response**
	upon criteria developed by Sandia National Laboratories (Sandia) in the report entitled Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill over Water (2004 Sandia Report). The onshore action area considered in the EIS includes the LNG terminal facilities and the entire 29-mile-long sendout pipeline route. The impacts assessed in the EIS include the direct, indirect, and cumulative project effects under the following primary topic areas: alternatives; geology; soils and sediments; water use and quality; wetlands; vegetation; wildlife; aquatic resources; threatened, endangered, and special status species; land use, recreation, and visual resources; socioeconomics; transportation and traffic; cultural resources; air quality and noise; reliability and safety; and cumulative impacts. Secondary impacts such as the spread of fires away from initially affected zones are not specifically addressed, but may be addressed during the development of the Emergency Response Plan (ERP) which is required by Section 311 of the Energy Policy Act of 2005, 15 U.S.C § 717b-1(e), and which must be approved by the FERC and accepted by the U.S. Coast Guard. It should also be noted that Section 4.12.6 includes a recommendation that Downeast coordinate the development of the ERP with state/provincial, tribal, county, and local emergency planning groups during which an appropriate response to secondary hazards may be discussed and included.
Impacted areas should not be defined strictly at the boundary of 5KW/m^2 thermal radiation flux criterion. FERC should conduct analysis defining the boundaries meeting the 1.5KW/m^2 thermal radiation flux for thermal radiation hazards evaluated for the vessel transit, LNG transfer, and storage facility. The State is considering extending the emergency alert and notification to at least the 1.5KW/m^2 thermal radiation flux boundary.	For the onshore facility, the 5 kW/m^2 thermal radiation flux is used to evaluate the siting of the LNG facilities in accordance with 49 CFR 193 and the NFPA 59A standard for LNG facilities. The use of 5 kW/m^2 was re-affirmed for use at U.S. regulated facilities by the DOT in 2010. The Coast Guard also uses 5 kW/m^2 when evaluating radiant heat hazards along the waterway. Other regulations and codes, including those by EPA, NFPA, and the Canadian Standards Association (CSA), also specify the use of 5 kW/m^2 when evaluating radiant heat hazards for other hazardous facilities. The 5kW/m^2 radiant heat level would produce second degree burns within approximately 30 seconds, assuming no shielding from the pool fire. These radiant heat levels are discussed in Section 4.12 and in the Coast Guards' Waterway Suitability Report (Appendix B). Other considerations based on lower thermal radiation levels, such as those proposed here by the State, would be more appropriate to be addressed during the development of the ERP. Radiation flux levels and the corresponding Zones of Concern along the vessel transit are assessed in detail in the 2004 Sandia Report, the conclusions of which have been implemented in the Coast Guards' Waterway Suitability Report (attached as Appendix B) and are discussed in Sections 4.7 and 4.12. It should be noted that while Zone 2 corresponds to a 5 KW/m^2 thermal radiation level, Zone 3 extends farther to the vapor cloud dispersion distance to the LFL from a worst case unignited release. In this zone, impacts to people and property could be significant if the vapor cloud reaches an ignition source and burns back to the source.

TABLE D-1 FERC Staff's Responses to concerns Presented in the Maine State Planning Office Safety Advisory Report for the Downeast LNG Project	
Issue	**Response**
FERC should identify existing and planned land uses within the 1.5KW/m^2 thermal radiation flux of impacted areas during vessel transit, vessel berthing and unloading, and transfer of natural gas and LNG to the storage facility, and along the sendout pipeline. Sensitive receptors, including but not limited to schools, hospitals, nursing homes, businesses, and residences, should be identified within this area. In addition, FERC should evaluate whether any affected communities meet the definition of an environmental justice population.	In our draft EIS, the sections on each resource area contained a discussion of the potential impact of an LNG spill, ignited or unignited, occurring along the waterway for LNG marine traffic to assist the Coast Guard in fulfilling its NEPA obligations related to the issuance of the LOR. Since issuance of the draft EIS, the Coast Guard has determined that the LOR is not a federal action and that the agency has no NEPA obligations which need to be addressed by the FERC EIS. As a result, we have removed the discussion on environmental resources that may be present in the Coast Guard's Zones of Concern. The discussion regarding the Zones of Concern considered by the Coast Guard in its determination on the type and frequency of LNG marine traffic associated with this proposed project is described in section 4.12.7. In section 4.7 of the EIS, we describe land uses along the entire 16.6 nautical miles that LNG vessels would travel to the LNG terminal. In addition, we examine existing and planned residences and other structures at the terminal site and along the entire sendout pipeline route. LNG marine traffic would pass by developed areas in Eastport, Maine and St. Andrews, New Brunswick, as well as Moose Island, Deer Island, Campobello Island, and scattered seasonal and permanent residences along the route. The impact to these areas during normal operation is primarily a visual impact. For the onshore facility, the 5 kW/m^2 thermal radiation flux is used in accordance with Federal code 49 CFR 193 and the NFPA 59A standard for LNG facilities. Other considerations based on lower thermal radiation levels, such as those proposed here by the State, may be addressed during the development of the ERP (see response to previous comment). There are no public lands or other designated federal, state, or local recreation areas located on or within 0.25 mile of the LNG terminal site. The nearest residences to the proposed LNG terminal are located along U.S. Route 1 across from the LNG terminal site. During operation, the primary impact on those residences would be visual. Regarding the proposed pipeline, DOT Minimum Federal Safety Standards in 49 CFR 192 defines area classifications, based on population density in the vicinity of the pipeline, and specifies more rigorous safety requirements for populated areas. These are addressed in detail in Section 4.12.10 Pipeline Safety Standards. Most of the land affected by the construction and operation of the sendout pipeline would be forest land (20.7 miles or 69.6 percent). Developed land constitutes only 2.0 miles or 6.6 percent of the route. Downeast has filed site specific construction plans to minimize impacts on nearby residences. Based on Downeast's communications, neither Robbinston nor the surrounding communities are planning residential or commercial/business developments or subdivisions that would be crossed or within 0.25 mile of the sendout pipeline. We specifically address environmental justice in section 4.8.6 of the EIS. We conclude that Pleasant Point Reservation, the Town of Perry, and Alexander, Baring Plantation, and Pembroke Communities could be defined as environmental justice communities. There would be no disproportionate adverse environmental and human health impacts on these communities. Rather, the proposed project would result in a substantial economic benefit to the neighboring environmental justice communities through increased job opportunities, income, and tax revenues.

TABLE D-1 FERC Staff's Responses to concerns Presented in the Maine State Planning Office Safety Advisory Report for the Downeast LNG Project	
Issue	**Response**
Using worst case meteorological conditions, hazard assessments by FERC should include worst case scenarios for the LNG vessel(s), the LNG transfer system, and onshore storage and regasification facilities that could result from intentional acts, human error, earthquakes, and equipment failure. The FERC should assess hazards and risks including but not limited to: (1) an LNG spill or release resulting from a collision with other vessels that transit along the same route beginning at Head Harbour passage and continue to the Western Passage into Passamaquoddy Bay, using minimum and maximum size LNG vessels; and (2) the full range of credible intentional acts affecting an LNG vessel and associated marine structures as identified in consultation with the Maine Department of Public Safety and the Maine Marine Patrol. In addition, the scenarios and impact analyses should include: (1) an on-water rapid phase transition flameless explosion; (2) instantaneous LNG pool fire and the impact of the tides in the area; (3) fire from LNG flammable vapor clouds and the potential of secondary fires such as buildings and forests; (4) potential danger of asphyxiation from LNG vapor clouds; and (5) freezing impacts to humans, natural resources, and equipment in the immediate vicinity of the LNG release.	Section 4.12 discusses the Federal regulations in 49 CFR 193 and NFPA 59A for thermal radiation and vapor dispersion calculations, including required worst case meteorological conditions selected in accordance with 49 CFR 193. Section 4.12 also discusses the worst case design spills for siting based on a risk-based design spill methodology reviewed by DOT PHMSA. For LNG vessel and related impacts, the Coast Guard used the guidance contained in the 2004 and 2008 Sandia Reports, which takes into account credible worst case intentional and unintentional events for carriers with capacities up to 265,000 m^3. The impacts of rapid phase transitions (RPT), asphyxiation, and freezing are discussed in Section 4.12.1, LNG Hazards. Section 4.12 of the EIS addresses the public safety impact along the route for LNG marine traffic, including impacts from both an ignited or unignited LNG marine spill.
FERC should justify the meteorological conditions and the source of the data to support all air dispersion modeling. Conditions used to calculate worst case scenarios should be explained and justified. A sensitivity analysis should also be performed to identify the uncertainty in the calculations. FERC should explain how the frequent fog in the area impacts the air dispersion modeling and the thermal radiation flux boundaries.	Section 4.12 discusses the Federal regulations in 49 CFR 193 and NFPA 59A for thermal radiation and vapor dispersion calculations, including required worst case meteorological conditions selected in accordance with 49 CFR 193. Title 49 CFR Part 193.2059 requires that dispersion conditions are a combination of those which result in longer predicted downwind dispersion distances than other weather conditions at the site at least 90 percent of the time or as an alternative where the model used gives longer distances at lower wind speeds, an Atmospheric Stability (Pasquill Class) F, wind speed = 4.5 miles per hour (2.01 meters/sec). Wind sensitivity analyses were also conducted within this criteria to determine the worst case wind direction and speed. The use of worst case scenarios within the 90% criteria precludes the need for uncertainty calculations. Fog is a function of the relative humidity, which is taken into account in the dispersion and radiant heat modeling. Fog generally occurs when the relative humidity is near 100%, which would increase convective heat transfer and reduce vapor dispersion distances and would decrease radiant heat distances through absorption.

TABLE D-1 FERC Staff's Responses to concerns Presented in the Maine State Planning Office Safety Advisory Report for the Downeast LNG Project	
Issue	**Response**
FERC should explain if the results of the Sandia National Laboratories Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water are applicable to the 165,000 cubic meter tanker size for this project.	This is addressed in Section 4.12. In 2008, the DOE released another study by Sandia National Laboratories, entitled *Breach and Safety Analysis of Spills Over Water from Large Liquefied Natural Gas Carriers, May 2008* (2008 Sandia Report). The 2008 Sandia Report assesses the scale of possible hazards for newer LNG vessels with capacities up to 265,000 m^3. Using the same methodology as the 2004 Sandia Report, it concludes that thermal hazard distances are only 7 - 8 percent greater than current vessels carrying 148,000 m^3 of LNG, due primarily to the slightly greater height of LNG above the waterline. The 2008 Sandia Report also notes that the general design of the larger vessels is similar to current designs and, hence, for near-shore facilities the calculated breach size for intentional scenarios remains the same. Overall, the 2008 Sandia Report maintains the same impact zones as with the smaller vessels that were analyzed in the 2004 Sandia Report. In 2012, DOE released another report based on work of Sandia that examined large scale experimental spills of LNG onto water and evaluated the potential for cascading damage affecting the potential hazard distances in the original 2004 and 2008 Sandia reports. The new data and report concluded that the hazard distances to the public from large LNG pool fires would be smaller than previously reported by 2 to 7 percent. FERC staff also examined the effect of altering the LNGFIRE3 model to incorporate Sandia's recommendations regarding LNG pool fire modeling over water and on data provided by the largest LNG pool fire tests on land (Gaz de France Montoir tests) or water (Phoenix tests).[2] Our conclusions were that LNGFIRE3, as currently prescribed by 49 CFR 193, is appropriate for modeling thermal radiation from LNG pool fires on land and is suitable for use in siting on-shore LNG facilities.
The analysis of the source term associated with a potential perpetrated or accidental release from a LNG tanker should include a range of release rates including full release of all contents to loss of the smallest tank, as well as release rates ranging from five to sixty minutes.	LNG hazards and spills are addressed in sections 4.12, which discusses hazard distances associated with a LNG spill over water. The release scenarios are based on credible accidental and intentional releases of varying hole sizes. The hole sizes were based on the Sandia studies of 2004, 2008, and 2012. The Sandia studies conducted extensive analyses of intentional and accidental events using finite element analysis techniques and it constitutes to date the most conclusive study of the potential damage that can occur to LNG tankers.
Topic: Existing and Proposed Land Use Near the Location	
Issue	**Response**
FERC should examine whether this project will impact homeowner values, businesses, and homeowner insurance cost during construction and operation. FERC should determine if the project is consistent (from vessel transit to the interconnection of the Maritimes and Northeast Pipeline) with the impacted towns' comprehensive land use plans and zoning requirements. FERC should discuss the extent of the legal liability for losses due to LNG spills. There are preliminary permit applications pending before FERC for development of tidal energy electrical generation facilities in the vicinity of the project. See table below. highest potential for efficient tidal power development.	Property values, insurance rates, and zoning are addressed in Section 4.8.2 and 4.7.4 of the EIS. We conclude that construction and operation of the Downeast LNG project would have no significant adverse impacts on property values in the surrounding area, nor increase insurance rates. The effect of a pipeline easement on property values would be negotiated between Downeast and affected landowners during the easement acquisition process. Downeast has also agreed to compensate residential property owners whose property abuts the project boundary, is located immediately across U.S. Route 1 from the terminal site, or is on the north shoreline of Mill Cove and faces the shoreline portion of the terminal site. Property owners would receive a one-time impact fee of $25,000 or would be compensated for the reduced market value of properties that were sold.

[2] "Recommended Parameters for Solid Flame Models for Land Based Liquefied Natural Gas Spills," Issued January 23, 2013 in Docket AD13-4-000 (eLibrary Accession Number: 20130123-4002).

TABLE D-1 FERC Staff's Responses to concerns Presented in the Maine State Planning Office Safety Advisory Report for the Downeast LNG Project	
Issue	**Response**
Assurance that proposed development meets state land use and environmental standards and other related natural resources protection requirements is a primary means by which the State ensures that "state and local safety considerations" as concern existing land uses, as well as features of the natural environment, are adequately addressed. Accordingly, FERC should continue its efforts to work cooperatively with the State to ensure that state land use, environmental and natural resource protection standards and related issues and concerns are duly addressed.	Downeast received a land use permit from the Robbinston Planning Board (Robbinston Comprehensive Plan 1996) on February 16, 2006 under its Shoreland Zoning Ordinance, and a Conditional Land Use Permit. The waterway for LNG marine traffic, although partially located within Maine's coastal zone, is not subject to the Mandatory Shoreland Zoning Act. For the sendout pipeline, Downeast intends to apply for all state permit requirements that comprise the Maine Coastal Zone Management Program (CZMP) in the after issuance of the final EIS. The sendout pipeline would be exempt from the City of Calais Shoreland Zoning Ordinance. A determination that the project is consistent with the Maine CZMP must be received prior to construction of the LNG terminal and pipeline. Major permits, approvals, and consultations required for the Downeast LNG Project are identified in section 1.2 of the EIS. The FERC encourages cooperation between applicants and state and local authorities. We also note that the Maine CZMP enforces various state and local environmental laws, regulations, standards and criteria as the state's coastal policies. FERC would require Downeast to receive a determination of consistency with Maine's CZMP for construction and operation of the proposed facility and associated vessel operations, prior to construction.
A report developed by the Electric Power Research Institute[3] identifies sites in this area among the places in Maine with FERC should assess in the DEIS whether and how the project would affect development of tidal power at the sites for which preliminary FERC permits have been requested and other potential sites, if applicable, due to LNG vessel transit and other pertinent project elements. In addition, FERC should assess whether and how proposed or potential tidal power development in this region may be affected by the safety and security issues presented by the Downeast LNG project, singly or in combination with the proposed Quoddy Bay LNG project.	Project impacts on tidal energy electric generation facilities are examined in section 4.7.3 of the EIS. Based on information provided by the tidal energy companies, the top of the turbine units would be below the maximum depth of any commercial vessel transiting during low tide. Since the LNG vessels would be transiting the Western Passage at slack high tide, the turbines would be considerably below the LNG vessel hull. In addition, LNG spills would have no impact on the turbines due to their depth in the water. Similarly, since the only equipment on the surface is a conduit connecting the turbines to the local electric transmission grid, no impacts for an accidental LNG spill is anticipated.
FERC should determine the impact of operations from the Downeast LNG project coupled with the operations of the proposed Quoddy Bay LNG project on tourism activities (including those of our Canadian neighbors), cruise ships frequenting Eastport, recreational use of the waters, and commercial fishing. Operations with potential impact should include vessel traffic, security requirements, vessel berthing, and oil or LNG spills (minor or major).	In section 4.13 of the EIS, we assess cumulative impacts of the Downeast LNG project when superimposed on or added to other proposals in the region. In October 2008, the Commission dismissed Quoddy Bay's application; therefore, the Quoddy Bay LNG Project was not included in our cumulative impacts discussion. In section 4.7.3 of the EIS, we specifically address project effects on public, recreation, and special land uses. We conclude that the additional vessel traffic with moving safety and security zones could impact commercial and recreational boating during the arrival, unloading, and departure of the LNG vessels. However, as stated in the WSR, an LNG vessel traveling at an estimated speed of 10 knots would only take 18 minutes to pass by any given point.

[3] http://www.epri.com/oceanenergy/attachments/streamenergy/reports/Tidal_003_ME_Site_Survey_Report_REV_1.pdf

TABLE D-1 FERC Staff's Responses to concerns Presented in the Maine State Planning Office Safety Advisory Report for the Downeast LNG Project	
	Given the limited amount of LNG vessel traffic, the implementation of vessel traffic management practices recommended by the Coast Guard in the WSR, the advance notice to United States and Canadian authorities from the LNG vessels transiting the area, and the limited time that nearby marine traffic could be interrupted, impacts to commercial and recreational marine activity would be insignificant. To prevent and minimize impacts associated with accidental spills or releases, LNG vessels would comply with federal regulations related to fuel handling and spills in offshore areas.
Topic: Natural and Physical Aspects of the Location	
Issue	**Response**
FERC should evaluate the effect of the mechanical force of the tidal waters on the pier, moorings, and other marine facilities, with justification that the design is adequate within an acceptable margin of safety.	As discussed in a previous comment, Downeast states that it would design the mooring system and unloading platform according to U.S. regulations and international industry standards applicable to the import of liquefied petroleum gases, including the *International Safety Guide for Oil Tankers and Import Terminals* (ISGOTT), and the *Oil Companies International Marine Forum* (OCIMF) guidelines. Staff agrees that the use of such standards would provide for a safe design that considers the effects of marine phenomena common to many national and international platforms and terminals, including wind, tide, and the hydrodynamic effects of passing ships.
There are many environmentally significant areas, in both Maine and Canada, along the vessel transit route. FERC should identify these locations and state how they will be protected from intentional and unintentional accident scenarios of the LNG tanker vessel. A further concern is how the construction and operation of a LNG import facility will impact both the natural resources of the area and those people whose livelihoods depend upon those natural resources. A significant number of people in the Downeast Maine rely on natural resources-based occupations for their livelihood. The project's economic impact should be examined not only from the perspective of a release from the facility, but also from the perspective of its potential effects on areas that generally provide the resources needed to support natural resources-based occupations that would be lost or diminished due to establishment of security zones around a LNG facility or other project-related effects. These occupations will include fisheries (lobster, scallop, sea urchin, herring, and ground fish), aquaculture, clamming, marine worm digging, wreath making, firewood harvest, blueberry harvest and other unidentified natural resources. FERC should address these considerations in the DEIS.	For every major resource area discussed in the EIS, we provide analysis specific to potential impacts along the LNG vessel transit route. Based on the extensive operational experience of LNG shipping, the structural design of an LNG vessel, and the operational controls imposed by the Coast Guard and the local pilots, we conclude the likelihood of a cargo containment failure and subsequent LNG spill from a vessel casualty (i.e., collision, grounding, or allision) is extremely remote. If the project were to move forward, we recommended that Downeast receive written authorization form the Director of OEP before commencement of service would be granted. Such authorization would only be granted following a determination by the Coast Guard, under its authorities under the Ports and Waterways Safety Act, the Magnuson Act, the Maritime Transportation Security Act of 2002, and the Safety and Accountability For Every Port Act, that appropriate measures to ensure the safety and security of the facility and the waterway have been put into place by Downeast or other appropriate parties. Direct and indirect socioeconomic impacts of the Downeast LNG project are addressed in detail in section 4.8.2 of the EIS. Operation of the Downeast LNG facilities would result in regular LNG marine traffic in the Bay of Fundy, Grand Manan Channel, Western Passage, and Passamaquoddy Bay. Downeast estimates approximately 60 vessels per year. Given the limited amount of LNG vessel traffic, the implementation of vessel traffic management practices by the Coast Guard, the advance notice to United States and Canadian authorities from the LNG vessels transiting the area, and the limited time that nearby marine traffic could be interrupted, impacts to commercial and recreational marine activity would be insignificant. The project area would benefit from the proposed project, as it would provide small increases in population to an area that has declined in population over past decades, improved employment and training opportunities for local residents, increased personal income, and an improved tax base with increases in local revenues.

TABLE D-1 FERC Staff's Responses to concerns Presented in the Maine State Planning Office Safety Advisory Report for the Downeast LNG Project	
Issue	**Response**
	In addition, the Town of Robbinston and Downeast have finalized a "Host Community Benefits Agreement" that outlines a number of commitments being sponsored by Downeast in the event the project is developed, including a community development fund. Under the Host Community Benefits Agreement, Downeast has agreed to compensate owners of any affected business in the town that was in operation as of July 11, 2005, and that is determined by an independent arbitrator to have been adversely impacted solely by the construction and operation of the project. There is very limited fishing in the pier area that would be affected. Downeast has negotiated an agreement with the one potentially affected weir owner to compensate for the losses resulting from the operations of the LNG facilities. During operation, shoreline fishing and clamming from the immediate vicinity of the LNG terminal site may be prohibited based on the safety and security provisions at the facility that could be established by the Coast Guard. Any prohibition of shoreline fishing or clamming in the immediate vicinity of the project's pier abutment with the shore is not anticipated to be a significant adverse impact. Downeast would continue to consult with the Cobscook Bay Fishermen's Association, the Fundy North Fishermen's Association, and other sources to develop a comprehensive compensation plan to address any potential loss of fishing equipment or income as a result of unavoidable impacts by Downeast LNG vessels. We recommended that, prior to operation of the Downeast LNG terminal, Downeast file the final Fishermen Communication, Coordination and Compensation Plan with the Secretary.
Topic: Emergency Response Capabilities Near the Facility	
Issue	**Response**
The State proposes that the applicant cooperate with the Maine Emergency Management Agency to conduct a systematic assessment designed to identify the safety hazards and estimated risk levels, and to evaluate necessary response and mitigation measures. During the FERC licensing process participants in the assessment should include a broad cross- section of local safety, security, and emergency officials and personnel. The assessment should be conducted in a workshop setting facilitated by a consultant having expertise in this topic. The goal of this approach is to build a common understanding of the requirements for response to an emergency. These requirements would include resources, communications, cooperative agreements, and other measures to assure an effective plan. This workshop would also identify the fiscal impact on state and local governments and other entities for services required to protect public safety.	Section 4.12, Emergency Response and Evacuation Planning, recommends Downeast should develop an ERP (including evacuation) and coordinate procedures with the Coast Guard; state/provincial, tribal, county, and local emergency planning groups; fire departments; state and local law enforcement; and appropriate federal agencies. The specific consultations proposed here by the State may be conducted during development of the ERP.

TABLE D-1 FERC Staff's Responses to concerns Presented in the Maine State Planning Office Safety Advisory Report for the Downeast LNG Project	
Issue	**Response**
Any and all additional safety and security infrastructure, equipment and services identified provided by the state and local governments must be funded in full by the applicant. In its project authorization and certificate, if issued, FERC should detail the specific funding requirements and obligations of the applicant and ensure that these requirements and obligations are adequate to ensure that the applicant, not the State or local communities, will fully bear the safety and security related costs of the project. The cost of this workshop would be fully funded by the applicant.	Section 3A(e) of the Natural Gas Act (as amended by the Energy Policy Act of 2005) specifies that the ERP shall include a Cost-Sharing Plan that contains a description of any direct cost reimbursements the applicants agree to provide to any tribal, state, and local agencies with responsibility for security and safety at the LNG terminal and in proximity to LNG vessels that serve the facility. The FERC has recommended that the ERP should include a Cost-Sharing Plan identifying the mechanisms for funding all project specific security/emergency management costs that would be imposed on state and local agencies. In addition to the funding of direct transit-related security/emergency management costs, this comprehensive plan should include funding mechanisms for the capital costs associated with any necessary security/emergency management equipment and personnel base.
FERC will require the assistance of the appropriate federal agency to consult with the Canadian government on safety and security matters. The DEIS should identify this cooperation with the Canadian government as a requirement for the Emergency Plan to be submitted by the developer of the LNG facility.	Development of an ERP is required by Section 311 of the Energy Policy Act of 2005. The ERP would need to be approved by the Commission and accepted by the Coast Guard to enable a comprehensive and coordinated response to an LNG emergency. The ERP would be developed through a transparent, public process that actively involves the multiple stakeholders. If the project were to move forward, we recommended that the ERP include coordination with multiple stakeholders, including provincial entities. Whether Canadian agencies will wish to be involved are issues yet to be determined. However, Downeast LNG must be able to adequately demonstrate that an effective security regime has been established during the Canadian portion of the vessel's planned route prior to a loaded LNG vessel being allowed to transit to the facility.
Topic: Need to Encourage Remote Siting	
Issue	**Response**
FERC should assess in the DEIS whether emergency services are available in the area to respond to a Mass Casualty Incident (MCI). In doing so FERC should define the worst case scenarios and determine if the emergency health services are available. If FERC finds that the present state and local capacity to respond to a MCI is inadequate, FERC should state the emergency services that would be considered adequate, with justification.	The availability of emergency services is addressed in EIS Section 4.12and Appendix B, Coast Guard's WSR. The emergency services necessary to respond to a MCI should be considered in the development of the ERP and Cost-Sharing Plan.

Appendix E

Detailed Sendout Pipeline Route Maps

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Legend

Mile Post

Pipeline Right-of-Way

Figure E-1
Downeast LNG Project
Detailed Sendout Pipeline Route

0 0.25 0.5 1 Miles

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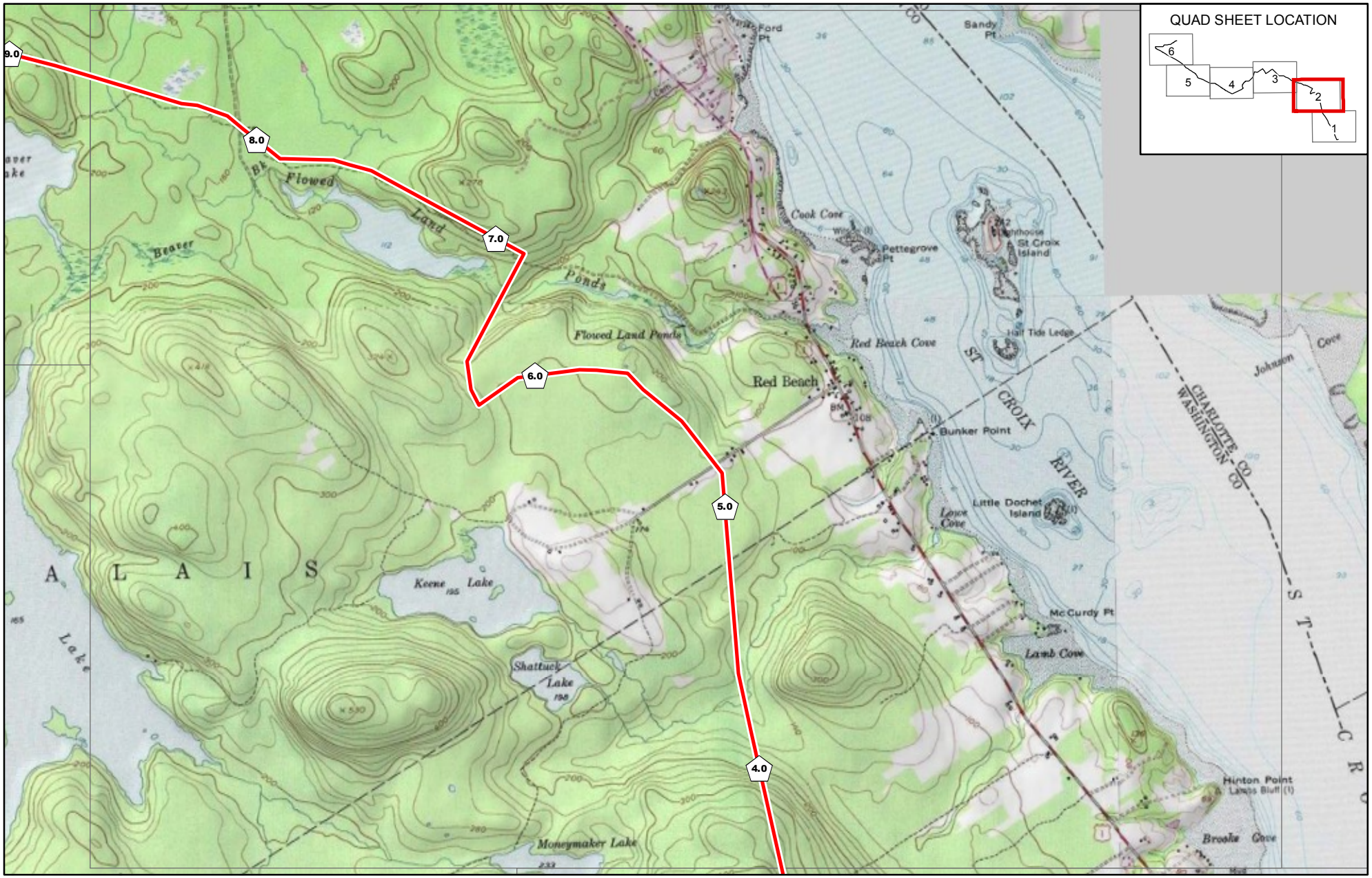

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Mile Post

Pipeline Right-of-Way

Figure E- 2
Downeast LNG Project
Detailed Sendout Pipeline Route

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Pipeline Right-of-Way

Figure E- 3
Downeast LNG Project
Detailed Sendout Pipeline Route

0 0.25 0.5 1 Miles

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Mile Post

Pipeline Right-of-Way

Figure E- 4
Downeast LNG Project
Detailed Sendout Pipeline Route

0 0.25 0.5 1 Miles

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Mile Post

Pipeline Right-of-Way

Figure E- 5
Downeast LNG Project
Detailed Sendout Pipeline Route

0 0.25 0.5 1 Miles

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Mile Post

Pipeline Right-of-Way

Figure E- 6
Downeast LNG Project
Detailed Sendout Pipeline Route

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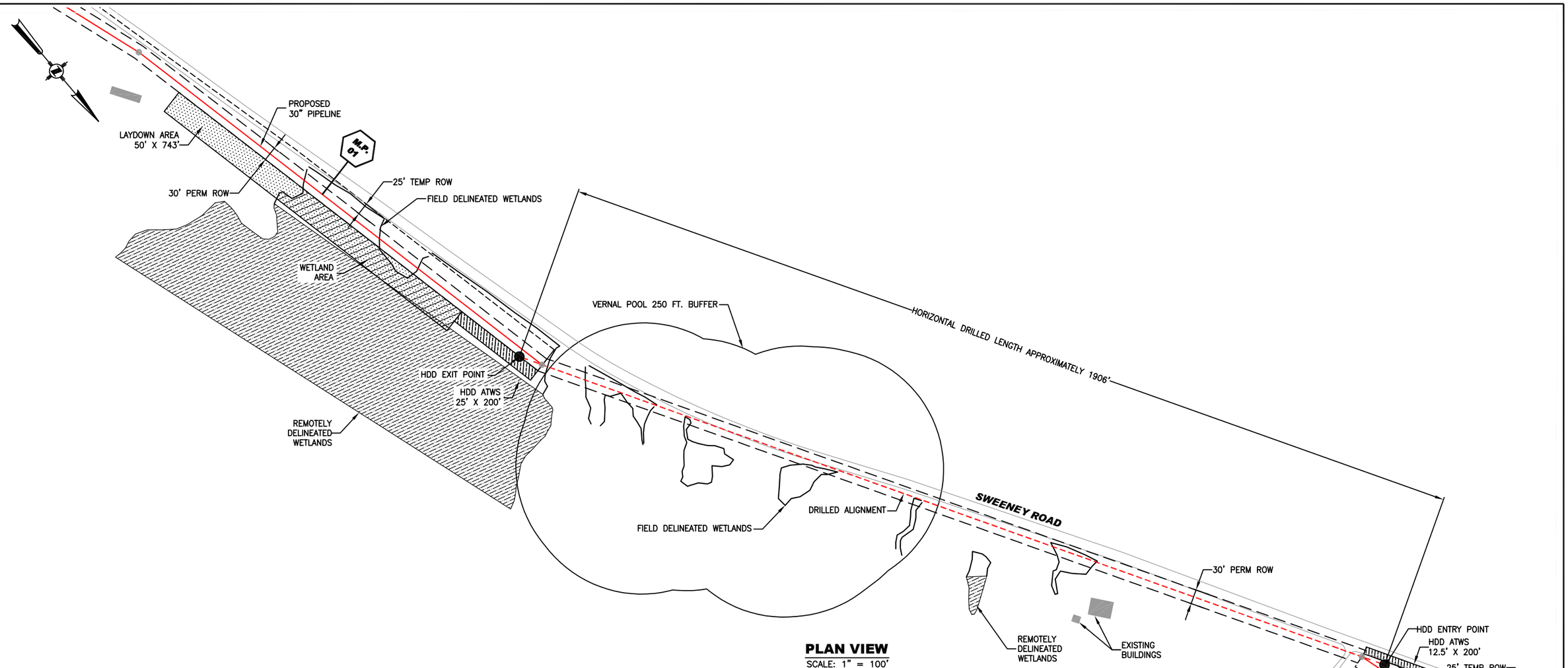

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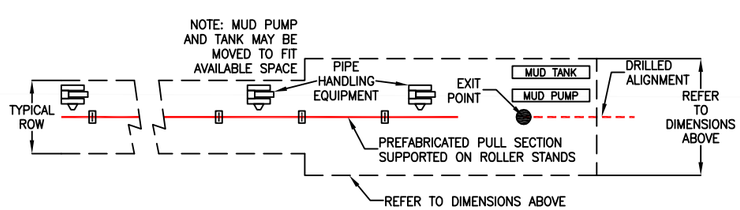

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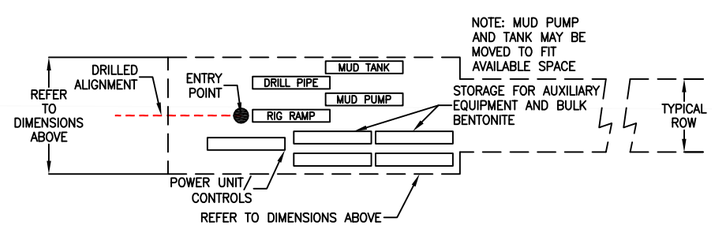

ENTRY POINT APPROXIMATE EQUIPMENT CONFIGURATION
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ENGlobal

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LEGEND

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- ENTRY & EXIT POINT FOR HDD
- PIPELINE CENTERLINE
- HDD CENTERLINE
- PERMANENT ROW
- TEMPORARY ROW
- MARITIMES & NORTHEAST PIPELINE
- TEMPORARY ACCESS ROADS
- STREAM
- FIELD DELINEATED WETLANDS
- REMOTELY DELINEATED WETLANDS
- OPEN WATER FEATURE
- M.P. XX — MILE POST
- ATWS AREA
- HDD ATWS AREA
- PIPE LAYDOWN AREA

NOTES

REVISIONS

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Date:	06-30-09
Sheet No.	1 of 20
Drawn By:	RAW
Chkd. By:	
Appvd. By:	HO

DOWNEAST LNG
NATURAL GAS PIPELINE

PIPELINE HDD EXHIBIT
VERNAL POOL @ M.P. 01.2 HDD BORE
PROPOSED 30" PIPELINE

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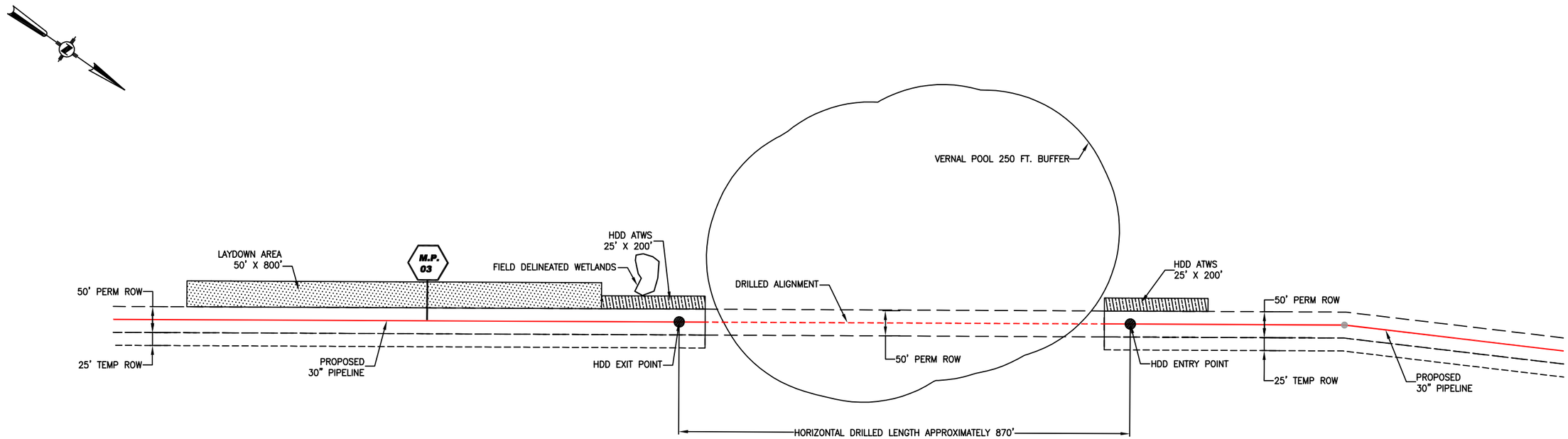

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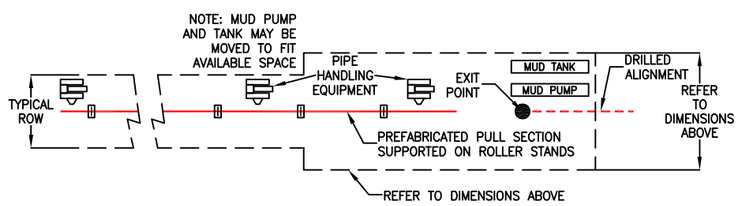

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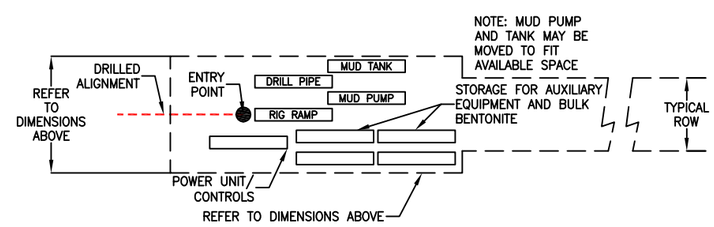

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ENGlobal

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DOWNEAST LNG
NATURAL GAS PIPELINE

PIPELINE HDD EXHIBIT
VERNAL POOL @ M.P. 03.2 HDD BORE
PROPOSED 30" PIPELINE

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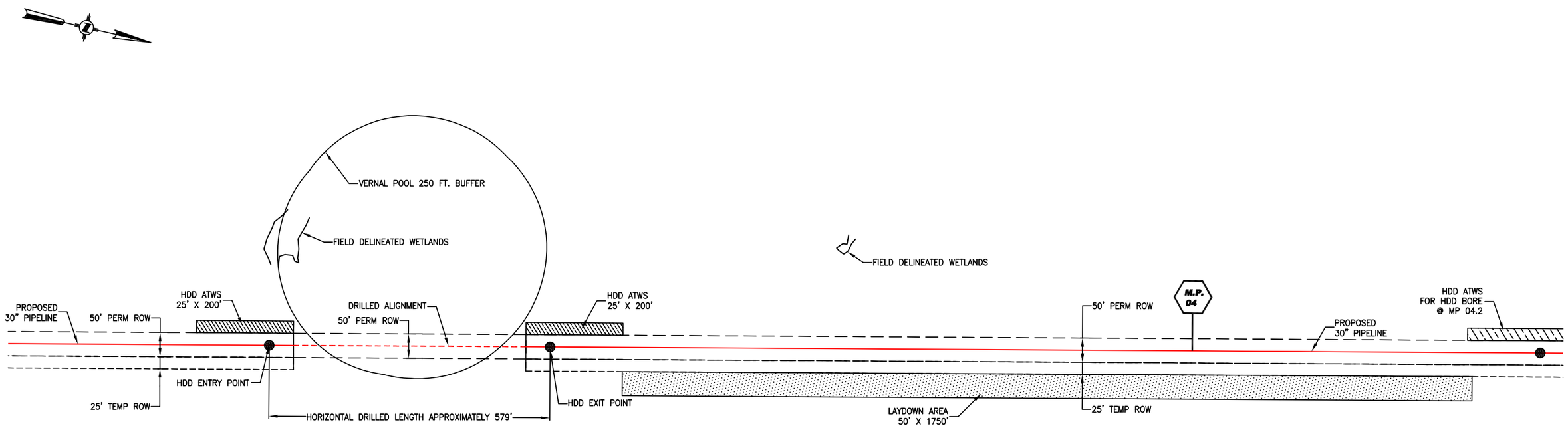

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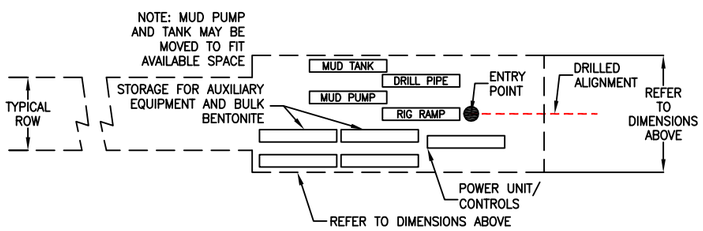

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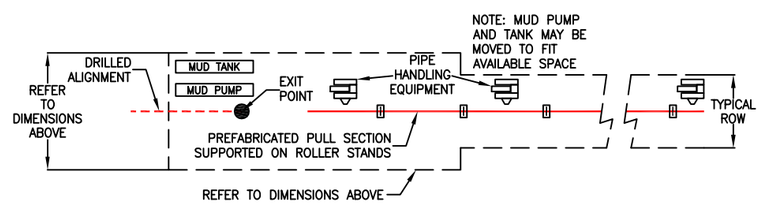

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DOWNEAST LNG
NATURAL GAS PIPELINE

PIPELINE HDD EXHIBIT
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PROPOSED 30" PIPELINE

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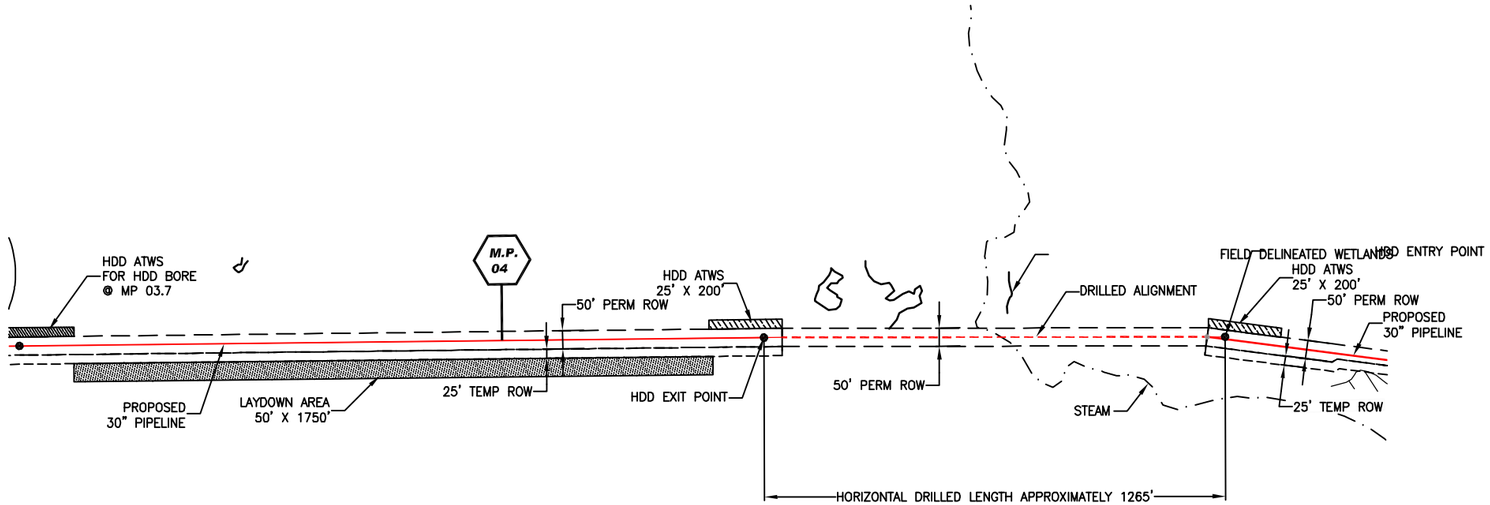

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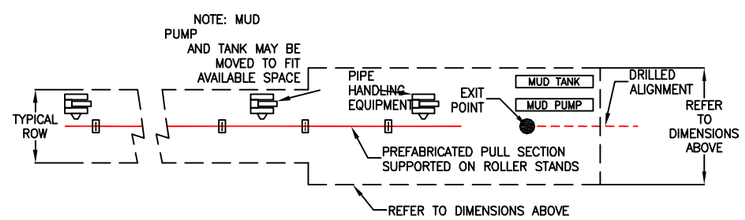

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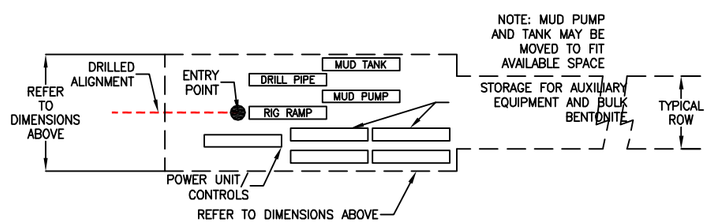

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DOWNEAST LNG
NATURAL GAS PIPELINE

PIPELINE HDD EXHIBIT
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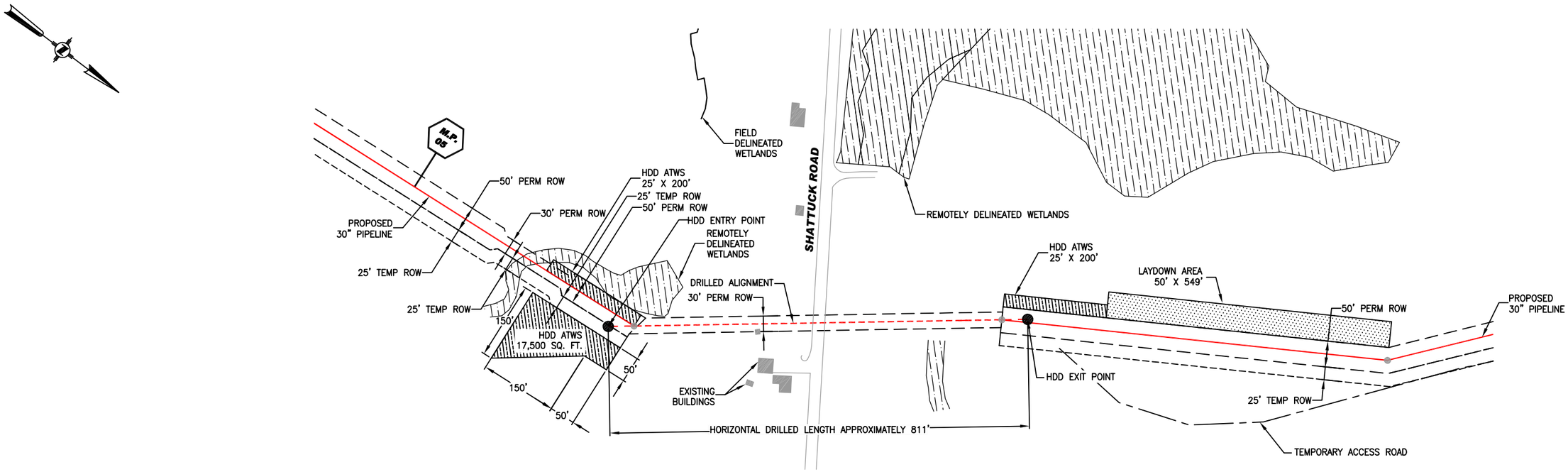

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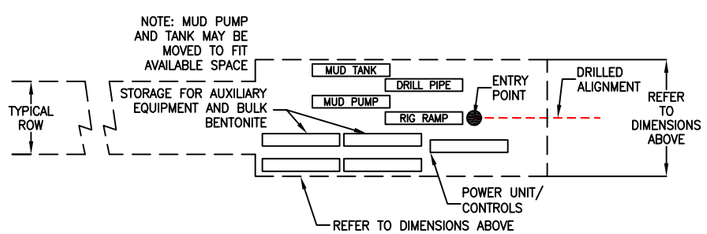

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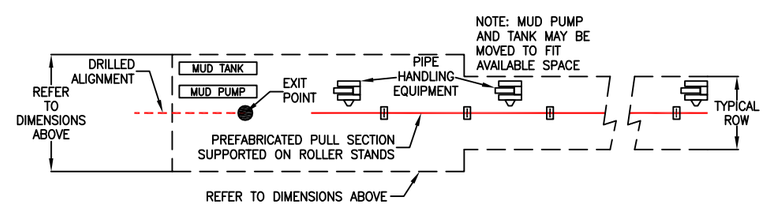

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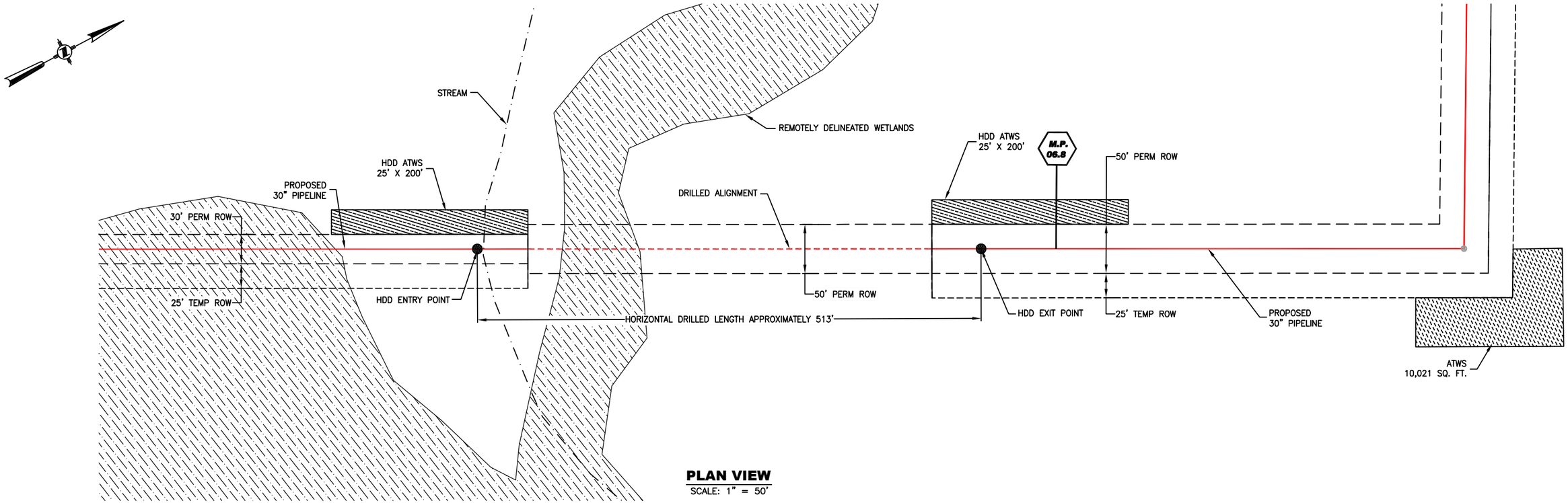
NO.	DESCRIPTION	BY	DATE	APPVD.
A	ISSUED FOR REVIEW	RAW	06/30/09	
B	REVISED BY STANTEC	GAC	01/12/10	

Horizontal Scale:	1" = 100'
Vertical Scale:	
State:	MAINE
Date:	06-30-09
Sheet No.	5 of 20
Drawn By:	RAW
Chkd. By:	
Appvd. By:	HO

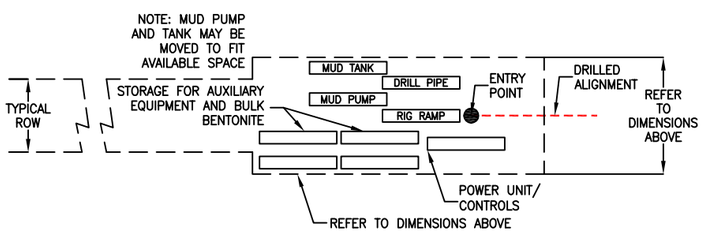
DOWNEAST LNG
NATURAL GAS PIPELINE

PIPELINE HDD EXHIBIT
WETLAND @ M.P. 05.1 HDD BORE
PROPOSED 30" PIPELINE

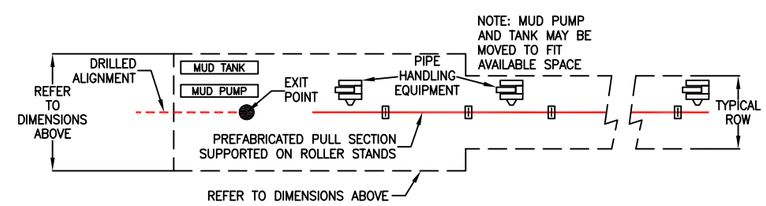
Cost Code | Drawing Number DOW-E-HDD-05.1 | REV. NO. A



PLAN VIEW
SCALE: 1" = 50'



ENTRY POINT APPROXIMATE EQUIPMENT CONFIGURATION
N.T.S.



EXIT POINT APPROXIMATE EQUIPMENT CONFIGURATION
N.T.S.

ENGlobal

0 25 50 100 150 FEET
SCALE: 1"=50'
Project Coordinate System:
NAD83 Maine State Planes,East Zone,US Ft.

LEGEND

- PI
- ENTRY & EXIT POINT FOR HDD
- PIPELINE CENTERLINE
- HDD CENTERLINE
- PERMANENT ROW
- TEMPORARY ROW
- MARITIMES & NORTHEAST PIPELINE
- TEMPORARY ACCESS ROADS
- STREAM
- FIELD DELINEATED WETLANDS
- REMOTELY DELINEATED WETLANDS
- OPEN WATER FEATURE
- M.P. XX — MILE POST
- ATWS AREA
- HDD ATWS AREA
- PIPE LAYDOWN AREA

NOTES

REVISIONS

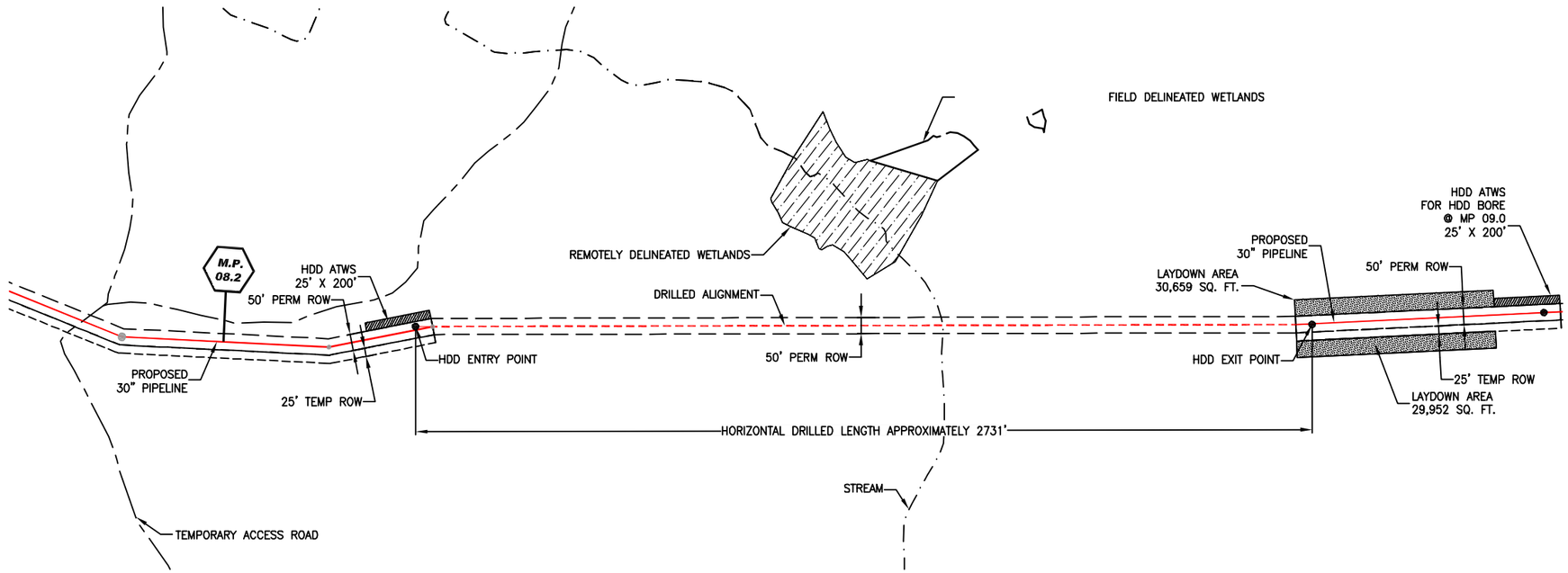
NO.	DESCRIPTION	BY	DATE	APPVD.
A	ISSUED FOR REVIEW	RAW	06/30/09	
B	REVISED BY STANTEC	GAC	01/12/10	

Horizontal Scale:	1" = 50'
Vertical Scale:	
State:	MAINE
Date:	06-30-09
Sheet No.	6 of 20
Drawn By:	RAW
Chkd. By:	
Appvd. By:	HO

DOWNEAST LNG
NATURAL GAS PIPELINE

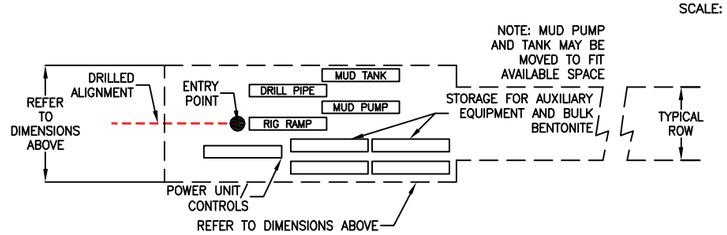
PIPELINE HDD EXHIBIT
REMOTELY DELINEATED WETLAND @ M.P. 06.7 HDD BORE
PROPOSED 30" PIPELINE

Cost Code	Drawing Number	REV. NO.
	DOW-E-HDD-06.7	A



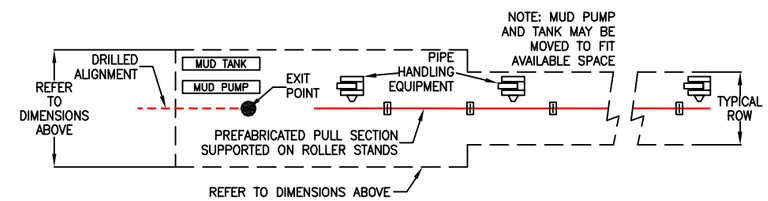
PLAN VIEW

SCALE: 1" = 200'



ENTRY POINT APPROXIMATE EQUIPMENT CONFIGURATION

N.T.S.



EXIT POINT APPROXIMATE EQUIPMENT CONFIGURATION

N.T.S.

ENGlobal DENVER, COLORADO

0 100 200 400 600 FEET

SCALE: 1"=200'

Project Coordinate System:
NAD83 Maine State Planes,East Zone,US Ft.

LEGEND

- PI
- ENTRY & EXIT POINT FOR HDD
- PIPELINE CENTERLINE
- HDD CENTERLINE
- PERMANENT ROW
- TEMPORARY ROW
- MARITIMES & NORTHEAST PIPELINE
- TEMPORARY ACCESS ROADS
- STREAM
- FIELD DELINEATED WETLANDS
- REMOTELY DELINEATED WETLANDS
- OPEN WATER FEATURE
- M.P. XX — MILE POST
- ATWS AREA
- HDD ATWS AREA
- PIPE LAYDOWN AREA

NOTES

REVISIONS

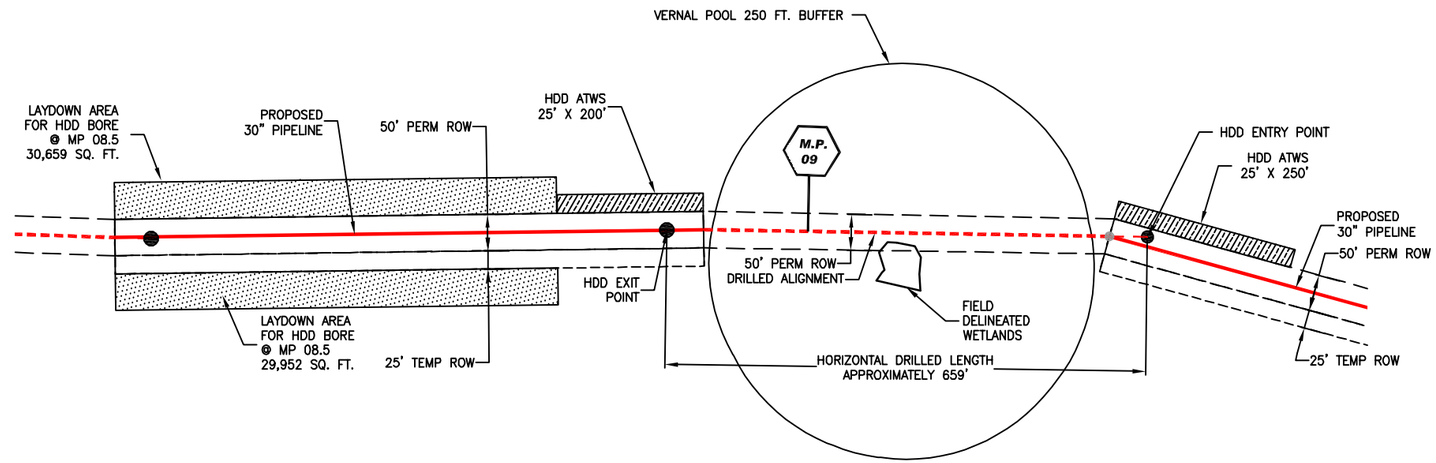
NO.	DESCRIPTION	BY	DATE	APPVD.
A	ISSUED FOR REVIEW	RAW	06/30/09	
B	REVISED BY STANTEC	GAC	01/12/10	

Horizontal Scale:	1" = 200'
Vertical Scale:	
State:	MAINE
Date:	06-30-09
Sheet No.	7 of 20
Drawn By:	RAW
Chkd. By:	
Appvd. By:	HO

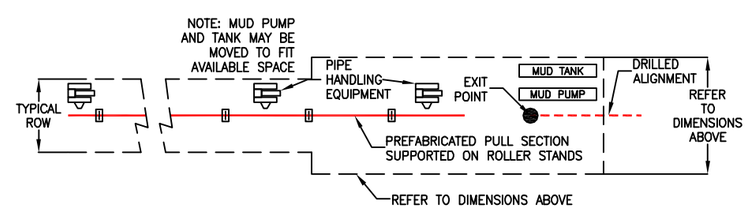
DOWNEAST LNG
NATURAL GAS PIPELINE

PIPELINE HDD EXHIBIT
STREAM @ M.P. 08.5 HDD BORE
PROPOSED 30" PIPELINE

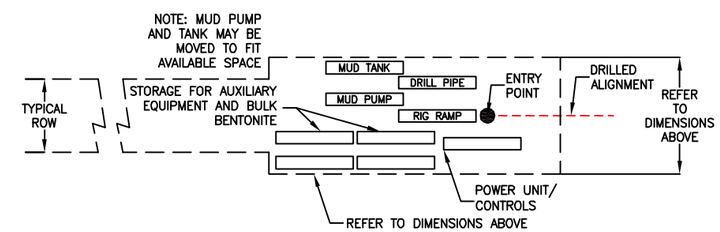
Cost Code	Drawing Number	REV. NO.
	DOW-E-HDD-08.5	A



PLAN VIEW
SCALE: 1" = 100'



EXIT POINT APPROXIMATE EQUIPMENT CONFIGURATION
N.T.S.



ENTRY POINT APPROXIMATE EQUIPMENT CONFIGURATION
N.T.S.

ENGlobal

0 50 100 200 300 FEET
SCALE: 1"=100'
Project Coordinate System:
NAD83 Maine State Planes,East Zone,US Ft.

LEGEND

- PI
- ENTRY & EXIT POINT FOR HDD
- PIPELINE CENTERLINE
- HDD CENTERLINE
- PERMANENT ROW
- TEMPORARY ROW
- MARITIMES & NORTHEAST PIPELINE
- TEMPORARY ACCESS ROADS
- STREAM
- FIELD DELINEATED WETLANDS
- REMOTELY DELINEATED WETLANDS
- OPEN WATER FEATURE
- M.P. XX — MILE POST
- ATWS AREA
- HDD ATWS AREA
- PIPE LAYDOWN AREA

NOTES

REVISIONS

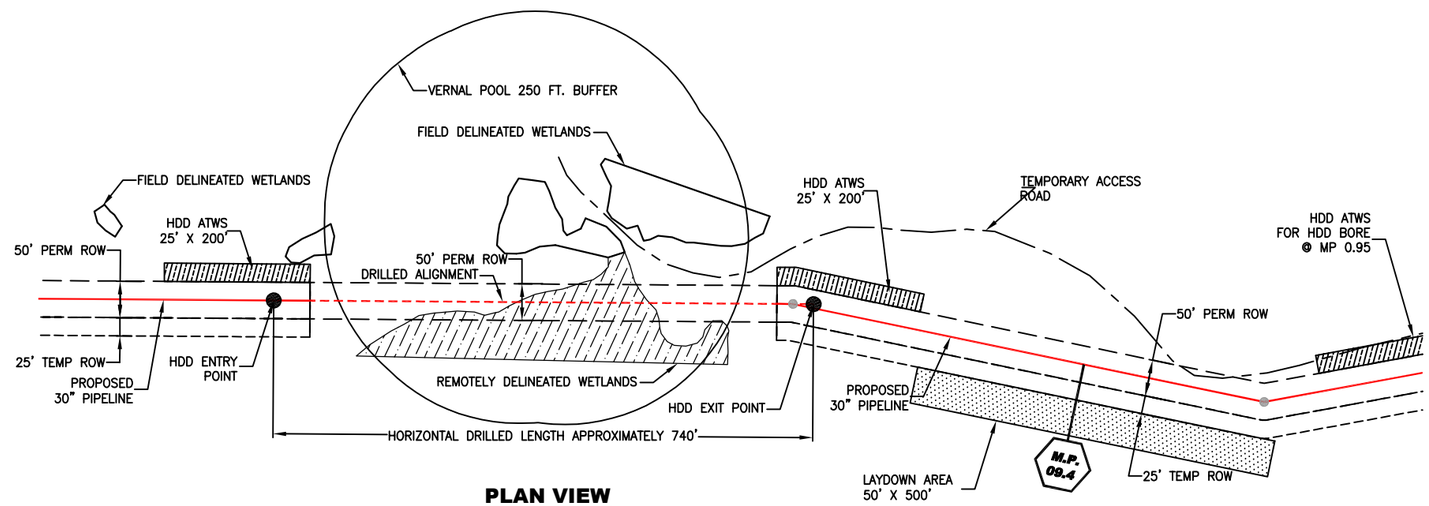
NO.	DESCRIPTION	BY	DATE	APPVD.
A	ISSUED FOR REVIEW	RAW	06/30/09	
B	REVISED BY STANTEC	GAC	01/12/10	

Horizontal Scale:	1" = 100'
Vertical Scale:	
State:	MAINE
Date:	06-30-09
Sheet No.	8 of 20
Drawn By:	RAW
Chkd. By:	
Appvd. By:	HO

DOWNEAST LNG
NATURAL GAS PIPELINE

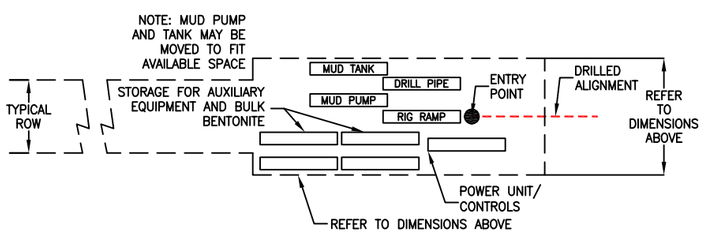
PIPELINE HDD EXHIBIT
VERNAL POOL @ M.P. 09.0 HDD BORE
PROPOSED 30" PIPELINE

Cost Code	Drawing Number	REV. NO.
	DOW-E-HDD-09.0	A



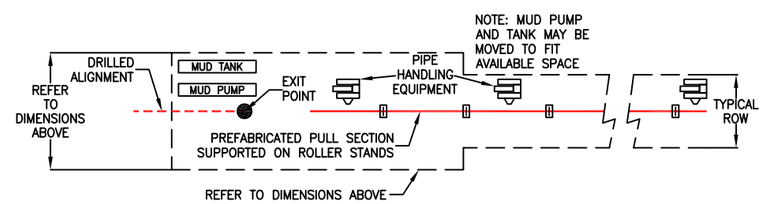
PLAN VIEW

SCALE: 1" = 100'



ENTRY POINT APPROXIMATE EQUIPMENT CONFIGURATION

N.T.S.



EXIT POINT APPROXIMATE EQUIPMENT CONFIGURATION

N.T.S.

ENGlobal DENVER, COLORADO

0 50 100 200 300 FEET

SCALE: 1"=100'

Project Coordinate System:
NAD83 Maine State Planes,East Zone,US Ft.

LEGEND

- PI
- ENTRY & EXIT POINT FOR HDD
- PIPELINE CENTERLINE
- HDD CENTERLINE
- PERMANENT ROW
- TEMPORARY ROW
- MARITIMES & NORTHEAST PIPELINE
- TEMPORARY ACCESS ROADS
- STREAM
- FIELD DELINEATED WETLANDS
- REMOTELY DELINEATED WETLANDS
- OPEN WATER FEATURE
- M.P. XX — MILE POST
- ATWS AREA
- HDD ATWS AREA
- PIPE LAYDOWN AREA

NOTES

REVISIONS

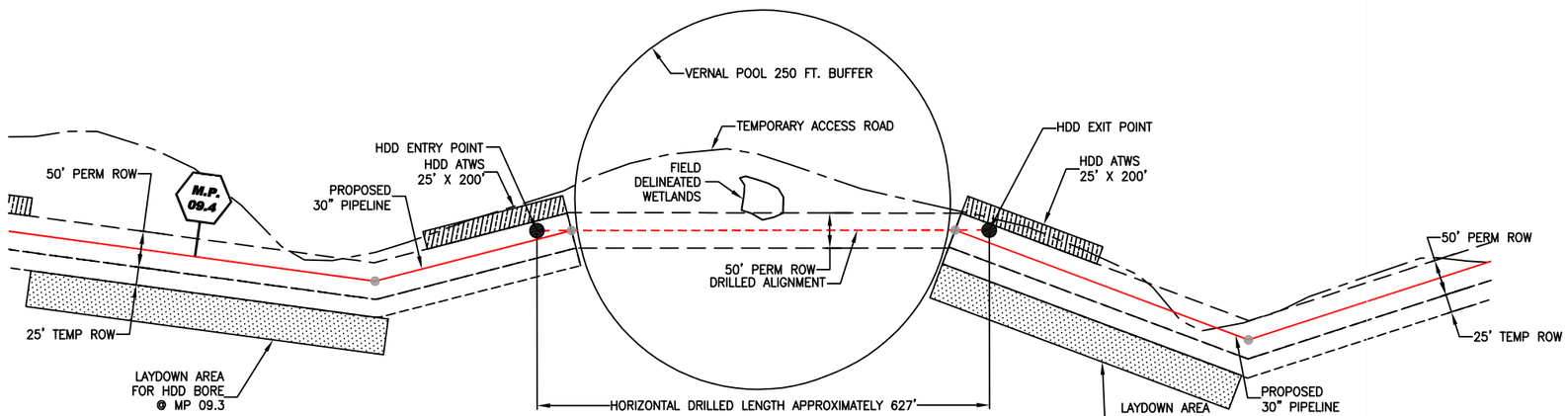
NO.	DESCRIPTION	BY	DATE	APPVD.
A	ISSUED FOR REVIEW	RAW	06/30/09	
B	REVISED BY STANTEC	GAC	01/12/10	

Horizontal Scale:	1" = 100'
Vertical Scale:	
State:	MAINE
Date:	06-30-09
Sheet No.	9 of 20
Drawn By:	RAW
Chkd. By:	
Appvd. By:	HO

DOWNEAST LNG
NATURAL GAS PIPELINE

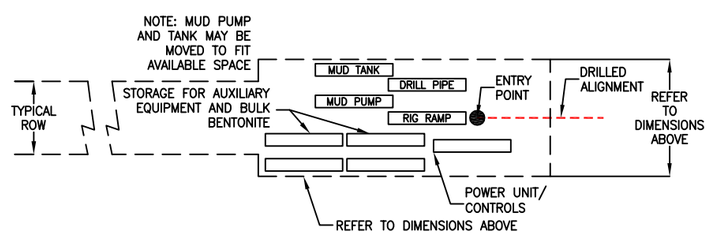
PIPELINE HDD EXHIBIT
VERNAL POOL @ M.P. 09.3 HDD BORE
PROPOSED 30" PIPELINE

Cost Code	Drawing Number	REV. NO.
	DOW-E-HDD-09.3	A



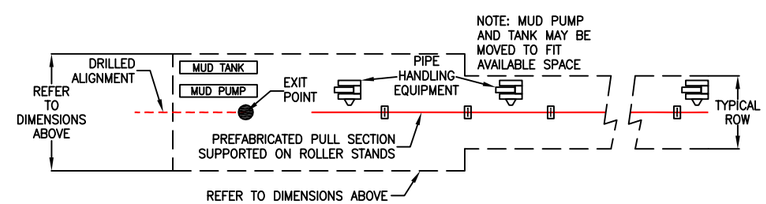
PLAN VIEW

SCALE: 1" = 100'



ENTRY POINT APPROXIMATE EQUIPMENT CONFIGURATION

N.T.S.



EXIT POINT APPROXIMATE EQUIPMENT CONFIGURATION

N.T.S.

ENGlobal
DENVER, COLORADO

0 50 100 200 300 FEET

SCALE: 1"=100'

Project Coordinate System:
NAD83 Maine State Planes,East Zone,US Ft.

LEGEND

- PI
- ENTRY & EXIT POINT FOR HDD
- PIPELINE CENTERLINE
- HDD CENTERLINE
- PERMANENT ROW
- TEMPORARY ROW
- MARITIMES & NORTHEAST PIPELINE
- TEMPORARY ACCESS ROADS
- STREAM
- FIELD DELINEATED WETLANDS
- REMOTELY DELINEATED WETLANDS
- OPEN WATER FEATURE
- M.P. XX — MILE POST
- ATWS AREA
- HDD ATWS AREA
- PIPE LAYDOWN AREA

NOTES

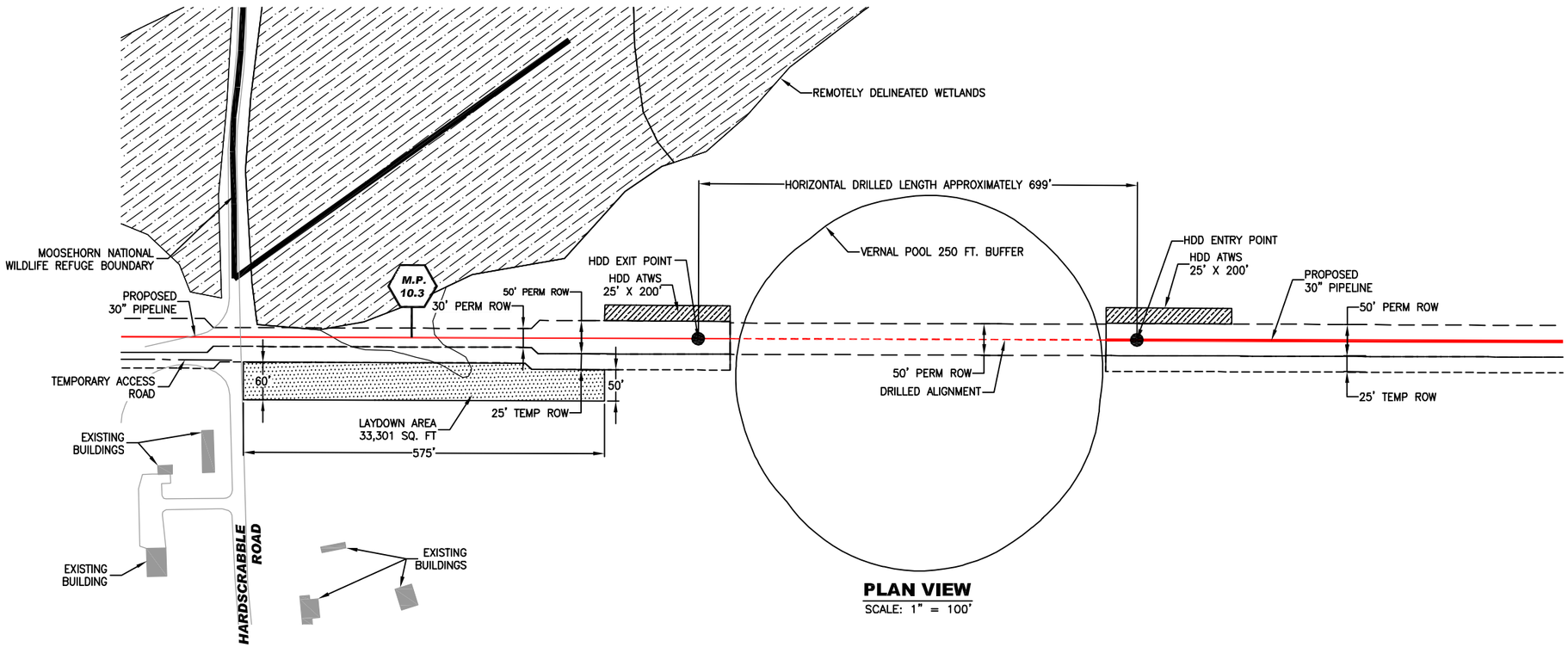
REVISIONS				
NO.	DESCRIPTION	BY	DATE	APPVD.
A	ISSUED FOR REVIEW	RAW	06/30/09	
B	REVISED BY STANTEC	GAC	01/12/10	

Horizontal Scale:	1" = 100'
Vertical Scale:	
State:	MAINE
Date:	06-30-09
Sheet No.	10 of 20
Drawn By:	RAW
Chkd. By:	
Appvd. By:	HO

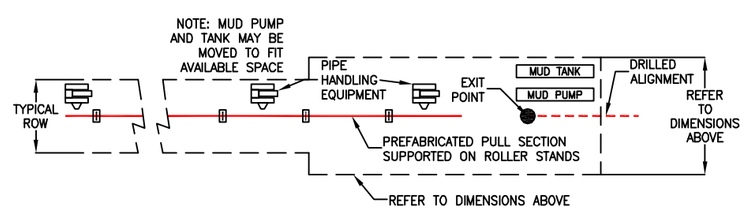
DOWNEAST LNG
NATURAL GAS PIPELINE

PIPELINE HDD EXHIBIT
VERNAL POOL @ M.P. 09.5 HDD BORE
PROPOSED 30" PIPELINE

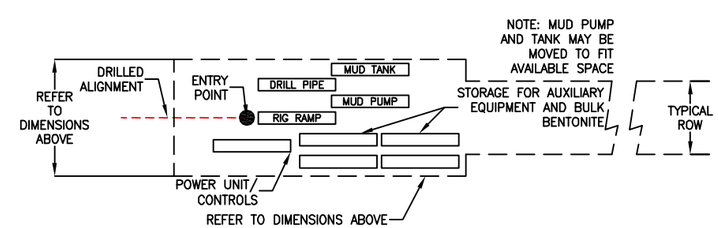
Cost Code	Drawing Number	REV. NO.
	DOW-E-HDD-09.5	A



PLAN VIEW
SCALE: 1" = 100'



EXIT POINT APPROXIMATE EQUIPMENT CONFIGURATION
N.T.S.



ENTRY POINT APPROXIMATE EQUIPMENT CONFIGURATION
N.T.S.

ENGlobal

0 50 100 200 300 FEET
SCALE: 1"=100'
Project Coordinate System:
NAD83 Maine State Planes,East Zone,US Ft.

LEGEND

- PI
- ENTRY & EXIT POINT FOR HDD
- PIPELINE CENTERLINE
- HDD CENTERLINE
- PERMANENT ROW
- TEMPORARY ROW
- MARITIMES & NORTHEAST PIPELINE
- TEMPORARY ACCESS ROADS
- STREAM
- FIELD DELINEATED WETLANDS
- REMOTELY DELINEATED WETLANDS
- OPEN WATER FEATURE
- M.P. XX — MILE POST
- ATWS AREA
- HDD ATWS AREA
- PIPE LAYDOWN AREA

NOTES

REVISIONS

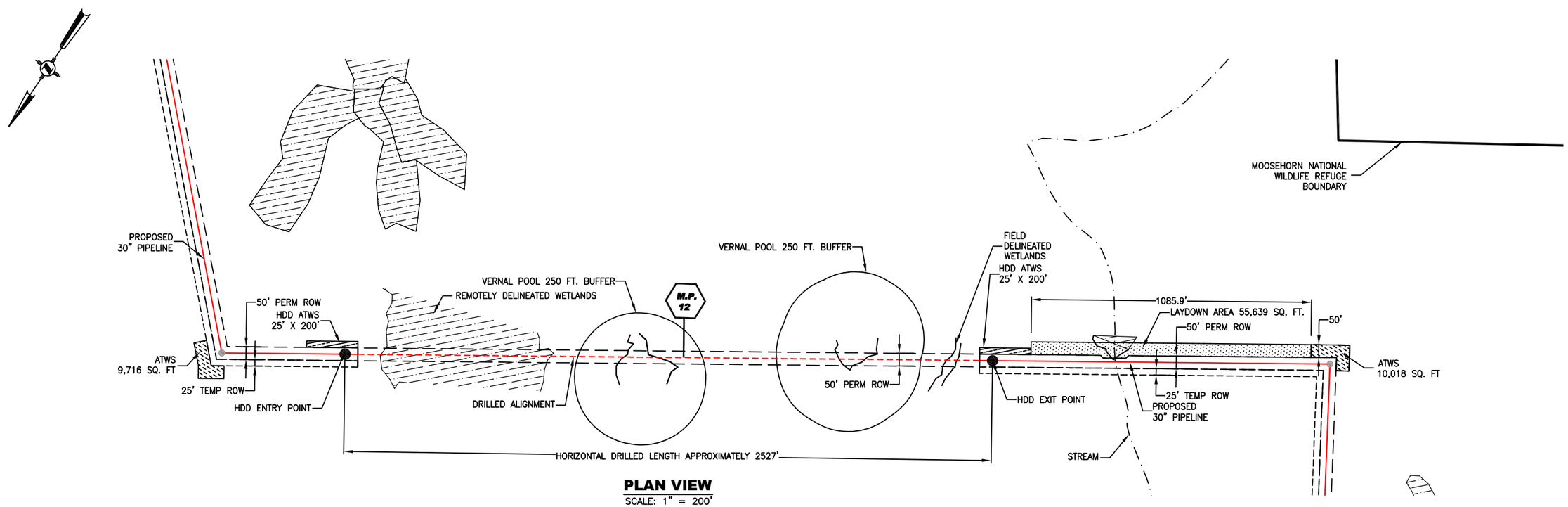
NO.	DESCRIPTION	BY	DATE	APPVD.
A	ISSUED FOR REVIEW	RAW	06/30/09	
B	REVISED BY STANTEC	GAC	01/12/10	

Horizontal Scale:	1" = 100'
Vertical Scale:	
State:	MAINE
Date:	06-30-09
Sheet No.	11 of 20
Drawn By:	RAW
Chkd. By:	
Appvd. By:	HO

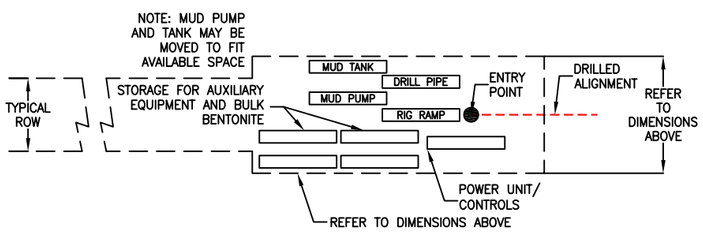
DOWNEAST LNG
NATURAL GAS PIPELINE

PIPELINE HDD EXHIBIT
VERNAL POOL @ M.P. 10.4 HDD BORE
PROPOSED 30" PIPELINE

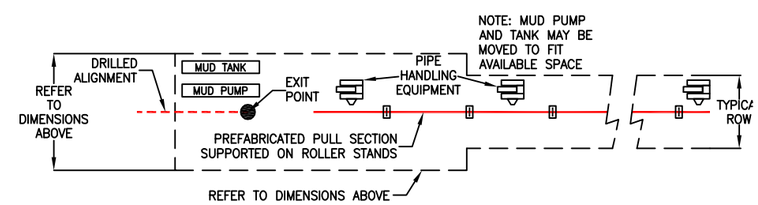
Cost Code	Drawing Number	REV. NO.
	DOW-E-HDD-10.4	A



PLAN VIEW
SCALE: 1" = 200'



ENTRY POINT APPROXIMATE EQUIPMENT CONFIGURATION
N.T.S.



EXIT POINT APPROXIMATE EQUIPMENT CONFIGURATION
N.T.S.

ENGlobal DENVER, COLORADO

0 100 200 400 600 FEET
SCALE: 1"=200'
Project Coordinate System:
NAD83 Maine State Planes,East Zone,US Ft.

LEGEND

- PI
- ENTRY & EXIT POINT FOR HDD
- PIPELINE CENTERLINE
- HDD CENTERLINE
- PERMANENT ROW
- TEMPORARY ROW
- MARITIMES & NORTHEAST PIPELINE
- TEMPORARY ACCESS ROADS
- STREAM
- FIELD DELINEATED WETLANDS
- REMOTELY DELINEATED WETLANDS
- OPEN WATER FEATURE
- M.P. XX — MILE POST
- ATWS AREA
- HDD ATWS AREA
- PIPE LAYDOWN AREA

NOTES

REVISIONS

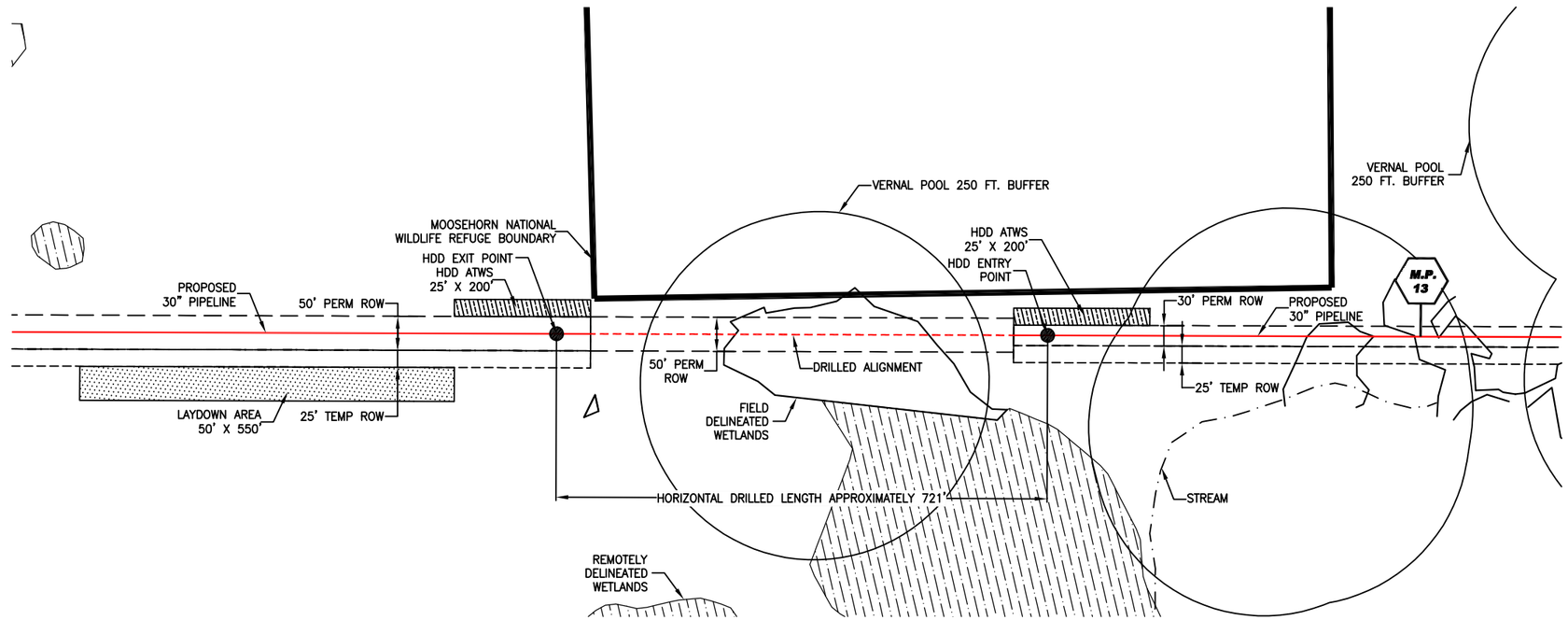
NO.	DESCRIPTION	BY	DATE	APPVD.
A	ISSUED FOR REVIEW	RAW	06/30/09	
B	REVISED BY STANTEC	GAC	01/12/10	

Horizontal Scale:	1" = 200'
Vertical Scale:	
State:	MAINE
Date:	06-30-09
Sheet No.	12 of 20
Drawn By:	RAW
Chkd. By:	
Appvd. By:	HO

DOWNEAST LNG
NATURAL GAS PIPELINE

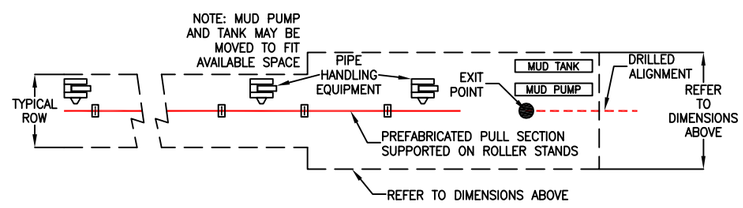
PIPELINE HDD EXHIBIT
VERNAL POOL @ M.P.12.0 HDD BORE
PROPOSED 30" PIPELINE

Cost Code	Drawing Number	REV. NO.
	DOW-E-HDD-12.0	A



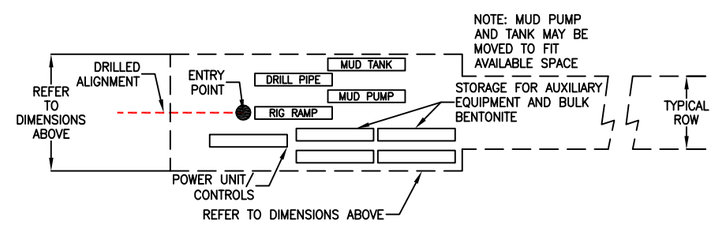
PLAN VIEW

SCALE: 1" = 100'



EXIT POINT APPROXIMATE EQUIPMENT CONFIGURATION

N.T.S.



ENTRY POINT APPROXIMATE EQUIPMENT CONFIGURATION

N.T.S.

ENGlobal

0 50 100 200 300 FEET

SCALE: 1"=100'

Project Coordinate System:
NAD83 Maine State Planes,East Zone,US Ft.

LEGEND

- PI
- ENTRY & EXIT POINT FOR HDD
- PIPELINE CENTERLINE
- HDD CENTERLINE
- PERMANENT ROW
- TEMPORARY ROW
- MARITIMES & NORTHEAST PIPELINE
- TEMPORARY ACCESS ROADS
- STREAM
- FIELD DELINEATED WETLANDS
- REMOTELY DELINEATED WETLANDS
- OPEN WATER FEATURE
- M.P. XX — MILE POST
- ATWS AREA
- HDD ATWS AREA
- PIPE LAYDOWN AREA

NOTES

REVISIONS

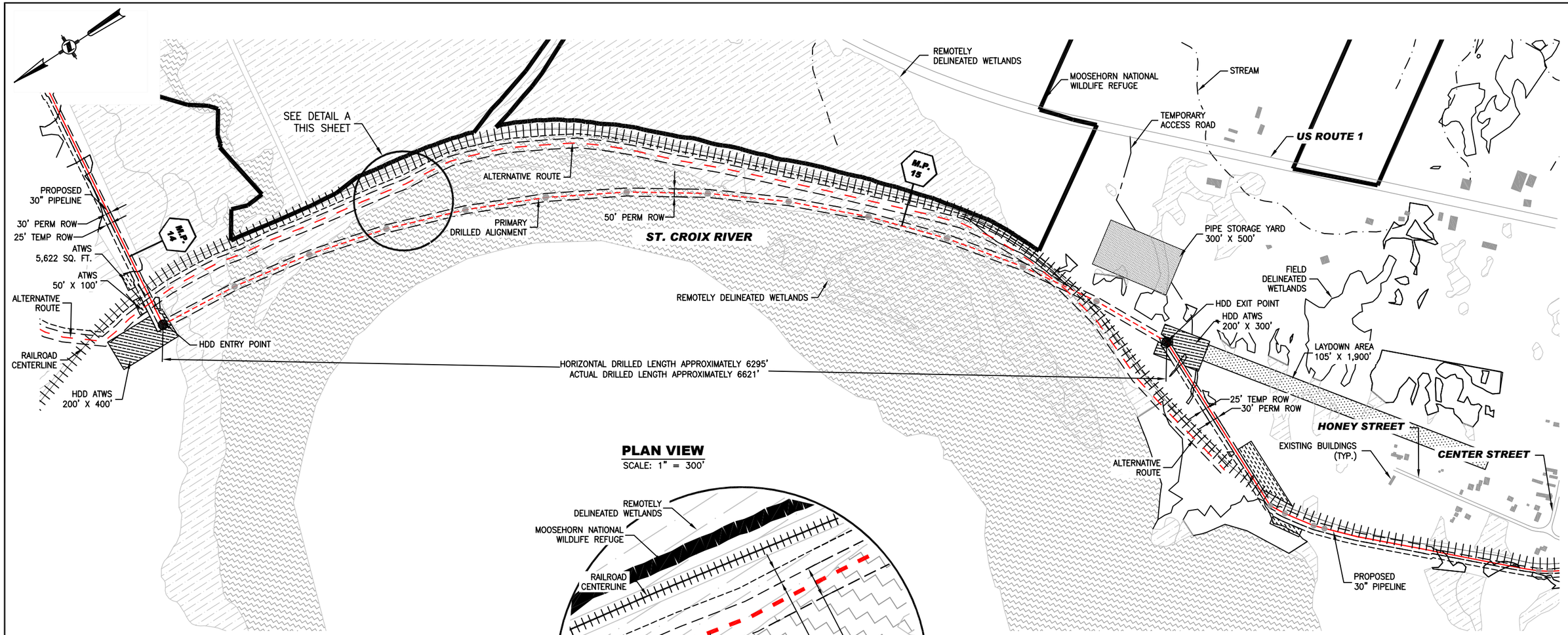
NO.	DESCRIPTION	BY	DATE	APPVD.
A	ISSUED FOR REVIEW	RAW	06/30/09	
B	REVISED BY STANTEC	GAC	01/12/10	

Horizontal Scale:	1" = 100'
Vertical Scale:	
State:	MAINE
Date:	06-30-09
Sheet No.	13 of 20
Drawn By:	RAW
Chkd. By:	
Appvd. By:	HO

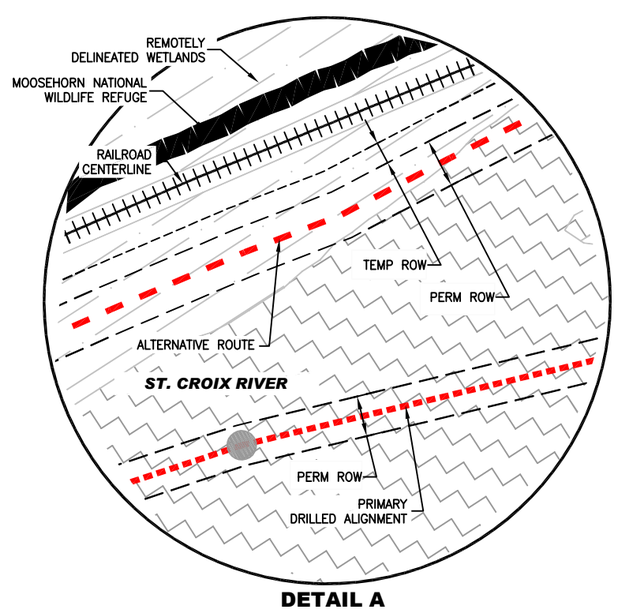
DOWNEAST LNG
NATURAL GAS PIPELINE

PIPELINE HDD EXHIBIT
VERNAL POOL @ M.P. 12.8 HDD BORE
PROPOSED 30" PIPELINE

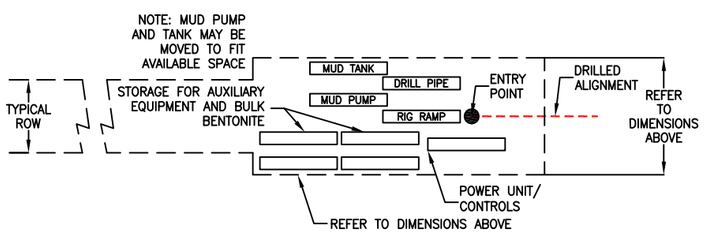
Cost Code | Drawing Number DOW-E-HDD-12.8 | REV. NO. A



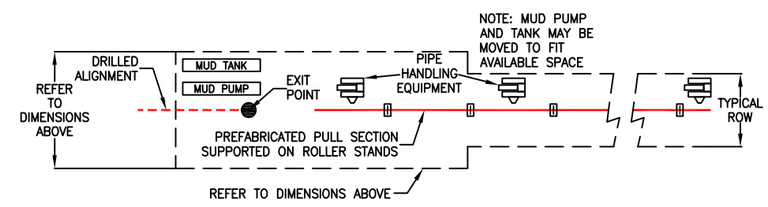
PLAN VIEW
SCALE: 1" = 300'



DETAIL A
N.T.S.



ENTRY POINT APPROXIMATE EQUIPMENT CONFIGURATION
N.T.S.



EXIT POINT APPROXIMATE EQUIPMENT CONFIGURATION
N.T.S.

ENGlobal

0 150 300 600 900 FEET
SCALE: 1"=300'
Project Coordinate System:
NAD83 Maine State Planes,East Zone,US Ft.

LEGEND

- PI
- ENTRY & EXIT POINT FOR HDD
- PIPELINE CENTERLINE
- HDD CENTERLINE
- PERMANENT ROW
- TEMPORARY ROW
- MARITIMES & NORTHEAST PIPELINE
- TEMPORARY ACCESS ROADS
- STREAM
- FIELD DELINEATED WETLANDS
- REMOTELY DELINEATED WETLANDS
- OPEN WATER FEATURE
- M.P. XX — MILE POST
- ATWS AREA
- HDD ATWS AREA
- PIPE LAYDOWN AREA

NOTES

REVISIONS

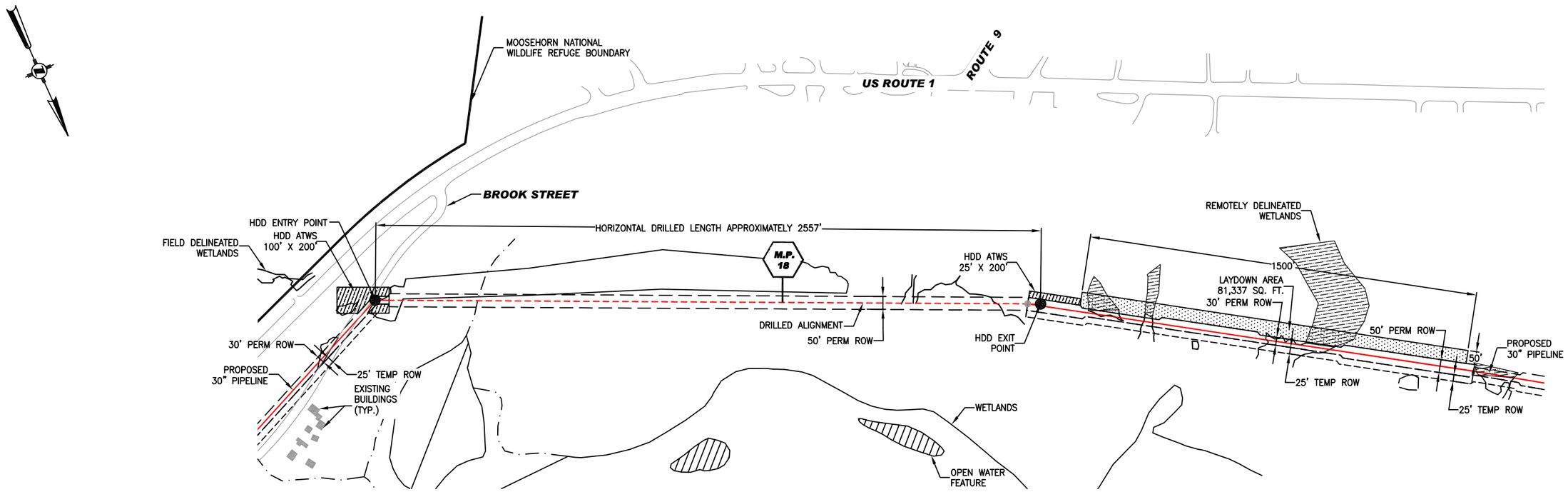
NO.	DESCRIPTION	BY	DATE	APPVD.
A	ISSUED FOR REVIEW	RAW	06/30/09	

Horizontal Scale:	1" = 300'
Vertical Scale:	
State:	MAINE
Date:	06-30-09
Sheet No.	14 of 20
Drawn By:	RAW
Chkd. By:	
Appvd. By:	HO

DOWNEAST LNG
NATURAL GAS PIPELINE

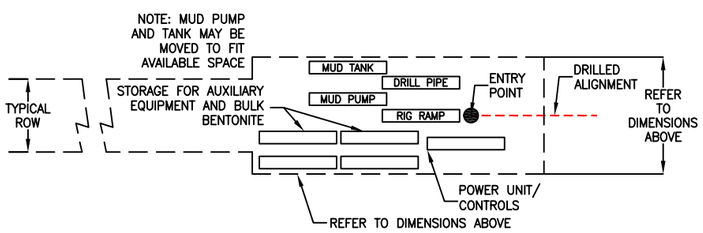
PIPELINE HDD EXHIBIT
ST. CROIX RIVER @ M.P. 15.0 HDD BORE
PROPOSED 30" PIPELINE

Cost Code | Drawing Number DOW-E-HDD-15.0 | REV. NO. A



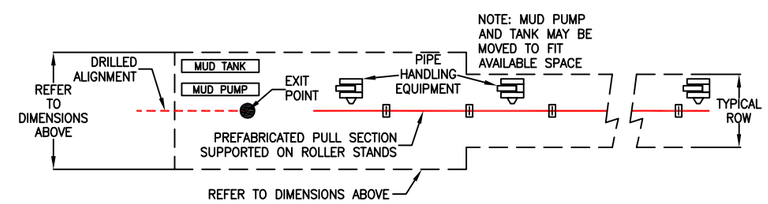
PLAN VIEW

SCALE: 1" = 200'



ENTRY POINT APPROXIMATE EQUIPMENT CONFIGURATION

N.T.S.



EXIT POINT APPROXIMATE EQUIPMENT CONFIGURATION

N.T.S.

ENGlobal DENVER, COLORADO

0 100 200 400 600 FEET

SCALE: 1"=200'

Project Coordinate System:
NAD83 Maine State Planes,East Zone,US Ft.

LEGEND

- PI
- ENTRY & EXIT POINT FOR HDD
- PIPELINE CENTERLINE
- HDD CENTERLINE
- PERMANENT ROW
- TEMPORARY ROW
- MARITIMES & NORTHEAST PIPELINE
- TEMPORARY ACCESS ROADS
- STREAM
- FIELD DELINEATED WETLANDS
- REMOTELY DELINEATED WETLANDS
- OPEN WATER FEATURE
- M.P. XX — MILE POST
- ATWS AREA
- HDD ATWS AREA
- PIPE LAYDOWN AREA

NOTES

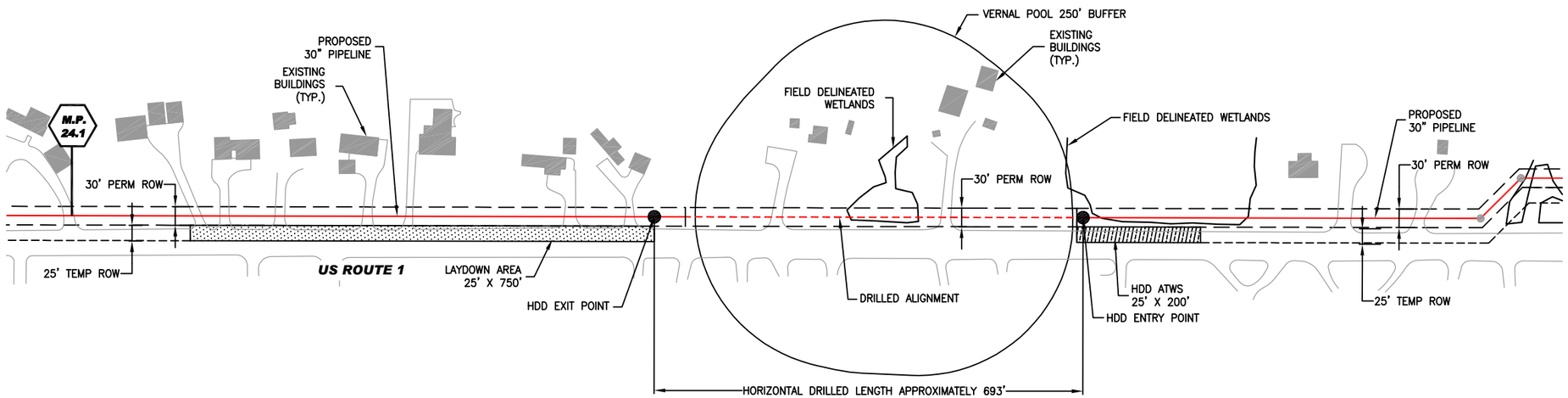
REVISIONS				
NO.	DESCRIPTION	BY	DATE	APPVD.
A	ISSUED FOR REVIEW	RAW	06/30/09	
B	REVISED BY STANTEC	GAC	01/12/10	

Horizontal Scale:	1" = 200'
Vertical Scale:	
State:	MAINE
Date:	06-30-09
Sheet No.	15 of 20
Drawn By:	RAW
Chkd. By:	
Appvd. By:	HO

DOWNEAST LNG
NATURAL GAS PIPELINE

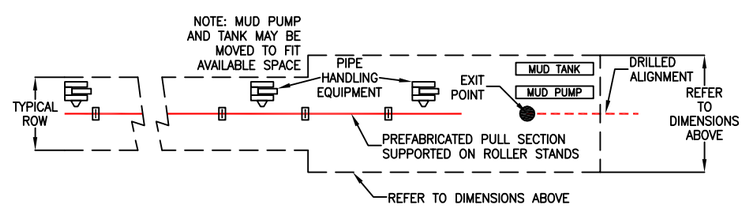
PIPELINE HDD EXHIBIT
WETLAND @ M.P. 18.0 HDD BORE
PROPOSED 30" PIPELINE

Cost Code	Drawing Number	REV. NO.
	DOW-E-HDD-18.0	A



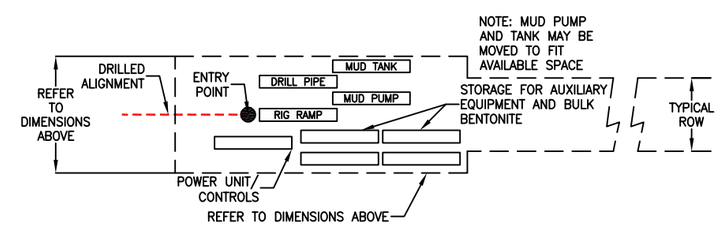
PLAN VIEW

SCALE: 1" = 100'



EXIT POINT APPROXIMATE EQUIPMENT CONFIGURATION

N.T.S.



ENTRY POINT APPROXIMATE EQUIPMENT CONFIGURATION

N.T.S.

ENGlobal

0 50 100 200 300 FEET

SCALE: 1"=100'

Project Coordinate System:
NAD83 Maine State Planes,East Zone,US Ft.

LEGEND

- PI
- ENTRY & EXIT POINT FOR HDD
- PIPELINE CENTERLINE
- HDD CENTERLINE
- PERMANENT ROW
- TEMPORARY ROW
- MARITIMES & NORTHEAST PIPELINE
- TEMPORARY ACCESS ROADS
- STREAM
- FIELD DELINEATED WETLANDS
- REMOTELY DELINEATED WETLANDS
- OPEN WATER FEATURE
- M.P. XX — MILE POST
- ATWS AREA
- HDD ATWS AREA
- PIPE LAYDOWN AREA

NOTES

REVISIONS

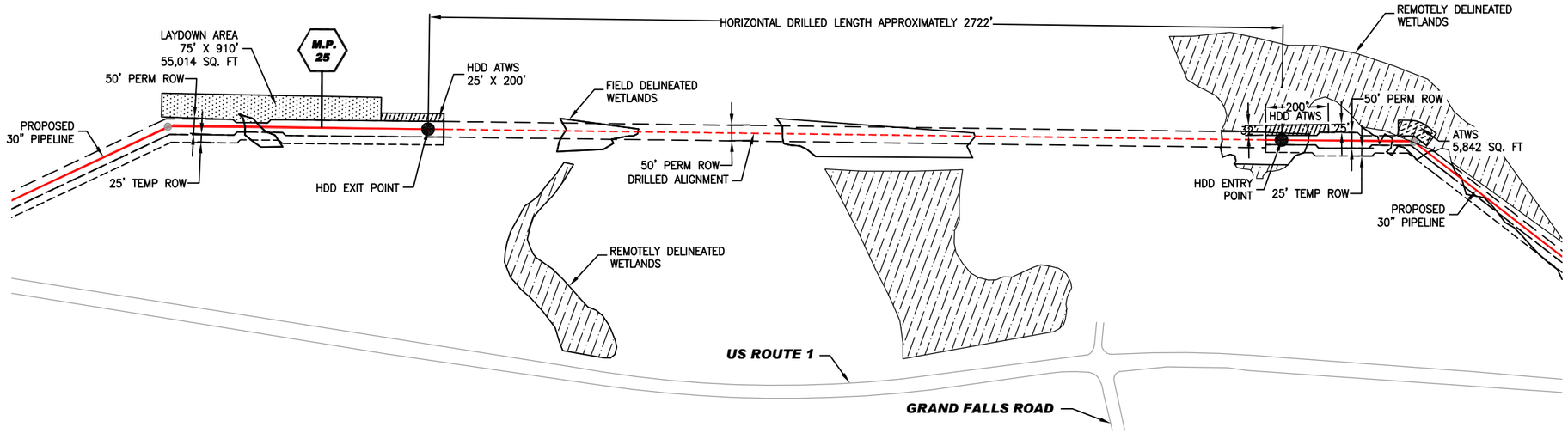
NO.	DESCRIPTION	BY	DATE	APPVD.
A	ISSUED FOR REVIEW	RAW	06/30/09	
B	REVISED BY STANTEC	GAC	01/12/10	

Horizontal Scale:	1" = 100'
Vertical Scale:	
State:	MAINE
Date:	06-30-09
Sheet No.	16 of 20
Drawn By:	RAW
Chkd. By:	
Appvd. By:	HO

DOWNEAST LNG
NATURAL GAS PIPELINE

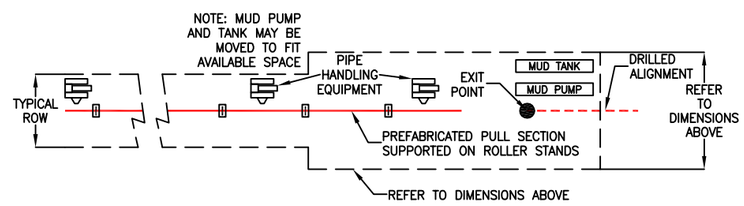
PIPELINE HDD EXHIBIT
VERNAL POOL @ M.P. 24.4 HDD BORE
PROPOSED 30" PIPELINE

Cost Code	Drawing Number	REV. NO.
	DOW-E-HDD-24.4	A



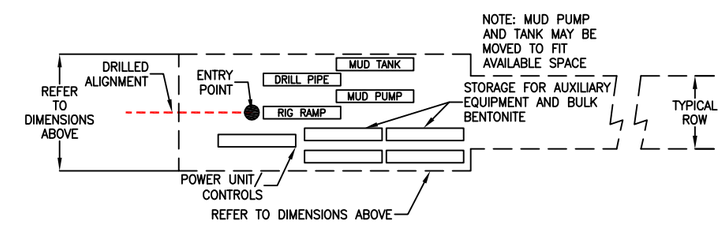
PLAN VIEW

SCALE: 1" = 200'



EXIT POINT APPROXIMATE EQUIPMENT CONFIGURATION

N.T.S.



ENTRY POINT APPROXIMATE EQUIPMENT CONFIGURATION

N.T.S.

ENGlobal

0 100 200 400 600 FEET

SCALE: 1"=200'

Project Coordinate System:
NAD83 Maine State Planes,East Zone,US Ft.

LEGEND

- PI
- ENTRY & EXIT POINT FOR HDD
- PIPELINE CENTERLINE
- HDD CENTERLINE
- PERMANENT ROW
- TEMPORARY ROW
- MARITIMES & NORTHEAST PIPELINE
- TEMPORARY ACCESS ROADS
- STREAM
- FIELD DELINEATED WETLANDS
- REMOTELY DELINEATED WETLANDS
- OPEN WATER FEATURE
- M.P. XX — MILE POST
- ATWS AREA
- HDD ATWS AREA
- PIPE LAYDOWN AREA

NOTES

REVISIONS

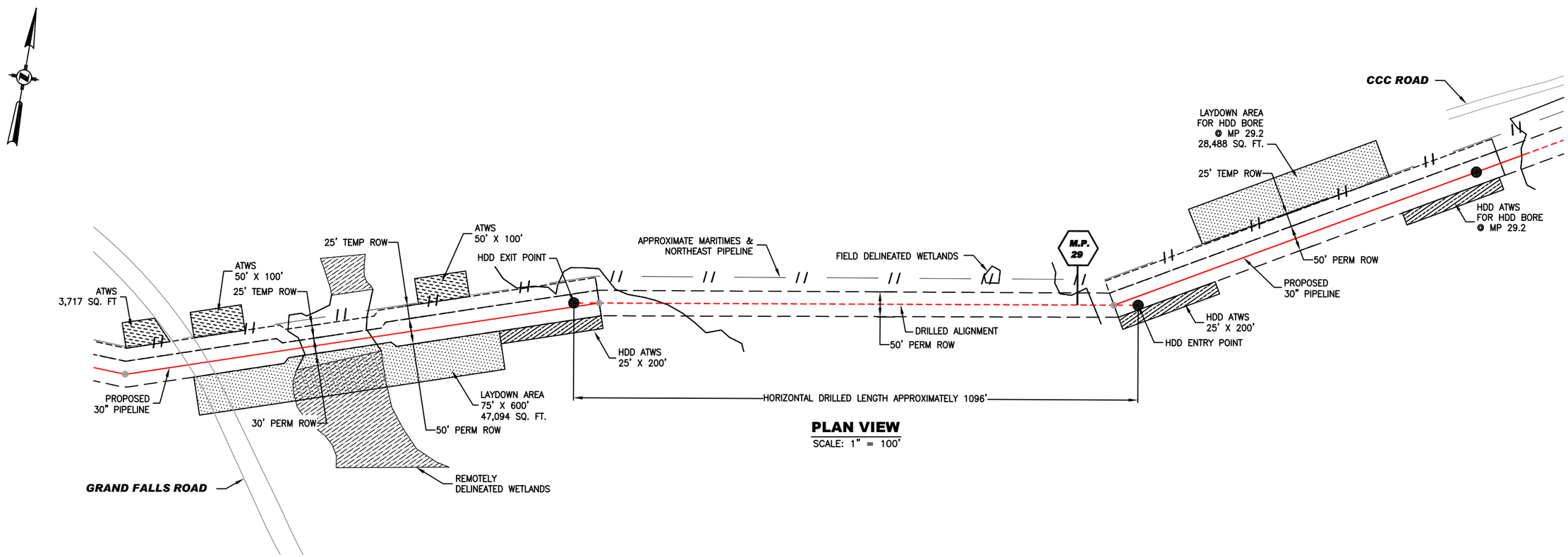
NO.	DESCRIPTION	BY	DATE	APPVD.
A	ISSUED FOR REVIEW	RAW	06/30/09	
B	REVISED BY STANTEC	GAC	01/12/10	

Horizontal Scale:	1" = 200'
Vertical Scale:	
State:	MAINE
Date:	06-30-09
Sheet No.	17 of 20
Drawn By:	RAW
Chkd. By:	
Appvd. By:	HO

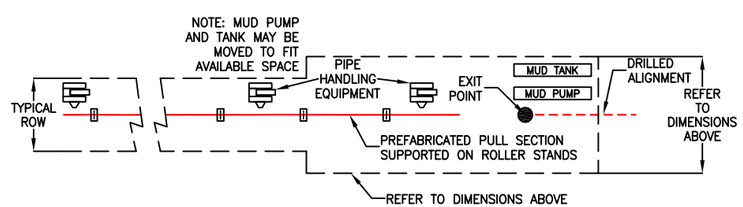
DOWNEAST LNG
NATURAL GAS PIPELINE

PIPELINE HDD EXHIBIT
WETLAND @ M.P. 25.4 HDD BORE
PROPOSED 30" PIPELINE

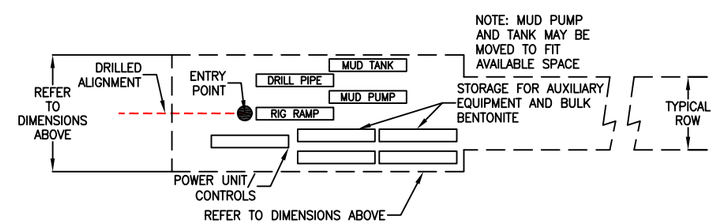
Cost Code	Drawing Number	REV. NO.
	DOW-E-HDD-25.4	A



PLAN VIEW
SCALE: 1" = 100'



EXIT POINT APPROXIMATE EQUIPMENT CONFIGURATION
N.T.S.



ENTRY POINT APPROXIMATE EQUIPMENT CONFIGURATION
N.T.S.

ENGlobal DENVER, COLORADO

0 50 100 200 300 FEET
SCALE: 1"=100'
Project Coordinate System:
NAD83 Maine State Planes,East Zone,US Ft.

LEGEND

- PI
- ENTRY & EXIT POINT FOR HDD
- PIPELINE CENTERLINE
- HDD CENTERLINE
- PERMANENT ROW
- TEMPORARY ROW
- MARITIMES & NORTHEAST PIPELINE
- TEMPORARY ACCESS ROADS
- STREAM
- FIELD DELINEATED WETLANDS
- REMOTELY DELINEATED WETLANDS
- OPEN WATER FEATURE
- M.P. XX — MILE POST
- ATWS AREA
- HDD ATWS AREA
- PIPE LAYDOWN AREA

NOTES

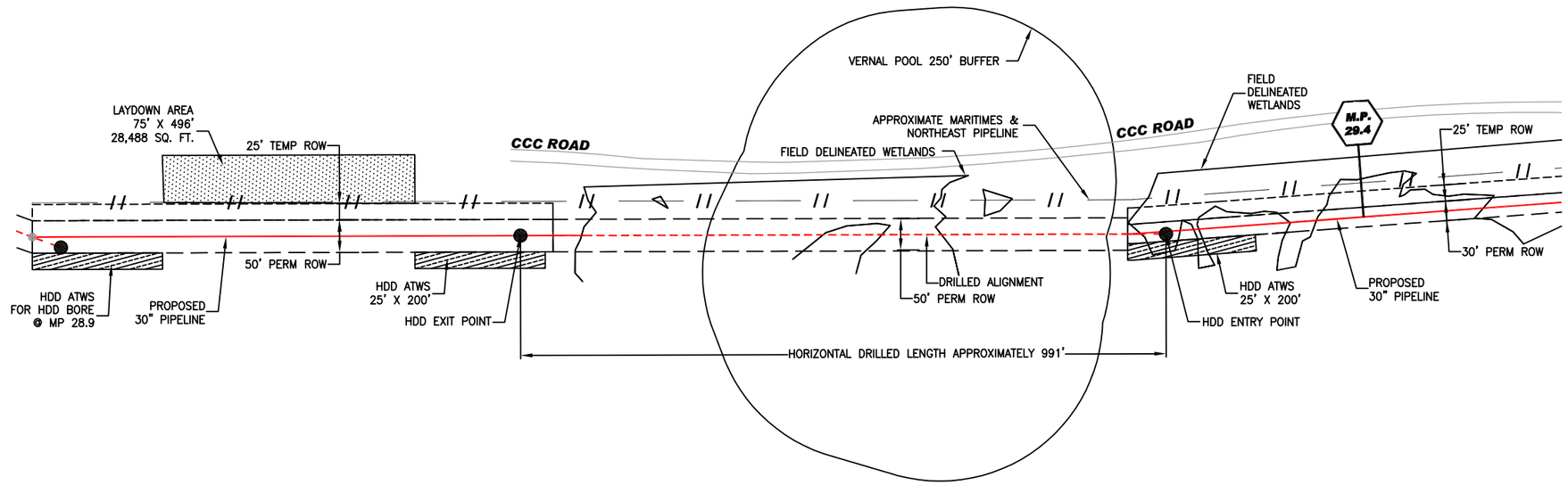
REVISIONS				
NO.	DESCRIPTION	BY	DATE	APPVD.
A	ISSUED FOR REVIEW	RAW	06/30/09	
B	REVISED BY STANTEC	GAC	01/12/10	

Horizontal Scale:	1" = 100'
Vertical Scale:	
State:	MAINE
Date:	06-30-09
Sheet No.	18 of 20
Drawn By:	RAW
Chkd. By:	
Appvd. By:	HO

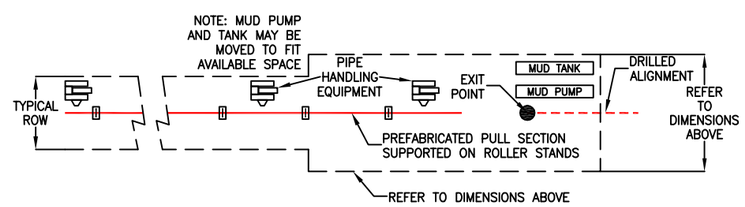
DOWNEAST LNG
NATURAL GAS PIPELINE

PIPELINE HDD EXHIBIT
WETLAND @ M.P. 28.9 HDD BORE
PROPOSED 30" PIPELINE

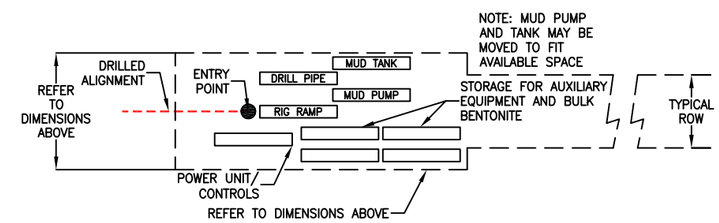
Cost Code	Drawing Number	REV. NO.
	DOW-E-HDD-28.9	A



PLAN VIEW
SCALE: 1" = 100'



EXIT POINT APPROXIMATE EQUIPMENT CONFIGURATION
N.T.S.



ENTRY POINT APPROXIMATE EQUIPMENT CONFIGURATION
N.T.S.

ENGlobal

0 50 100 200 300 FEET
SCALE: 1"=100'
Project Coordinate System:
NAD83 Maine State Planes,East Zone,US Ft.

LEGEND

- PI
- ENTRY & EXIT POINT FOR HDD
- PIPELINE CENTERLINE
- HDD CENTERLINE
- PERMANENT ROW
- TEMPORARY ROW
- MARITIMES & NORTHEAST PIPELINE
- TEMPORARY ACCESS ROADS
- STREAM
- FIELD DELINEATED WETLANDS
- REMOTELY DELINEATED WETLANDS
- OPEN WATER FEATURE
- M.P. XX — MILE POST
- ATWS AREA
- HDD ATWS AREA
- PIPE LAYDOWN AREA

NOTES

REVISIONS

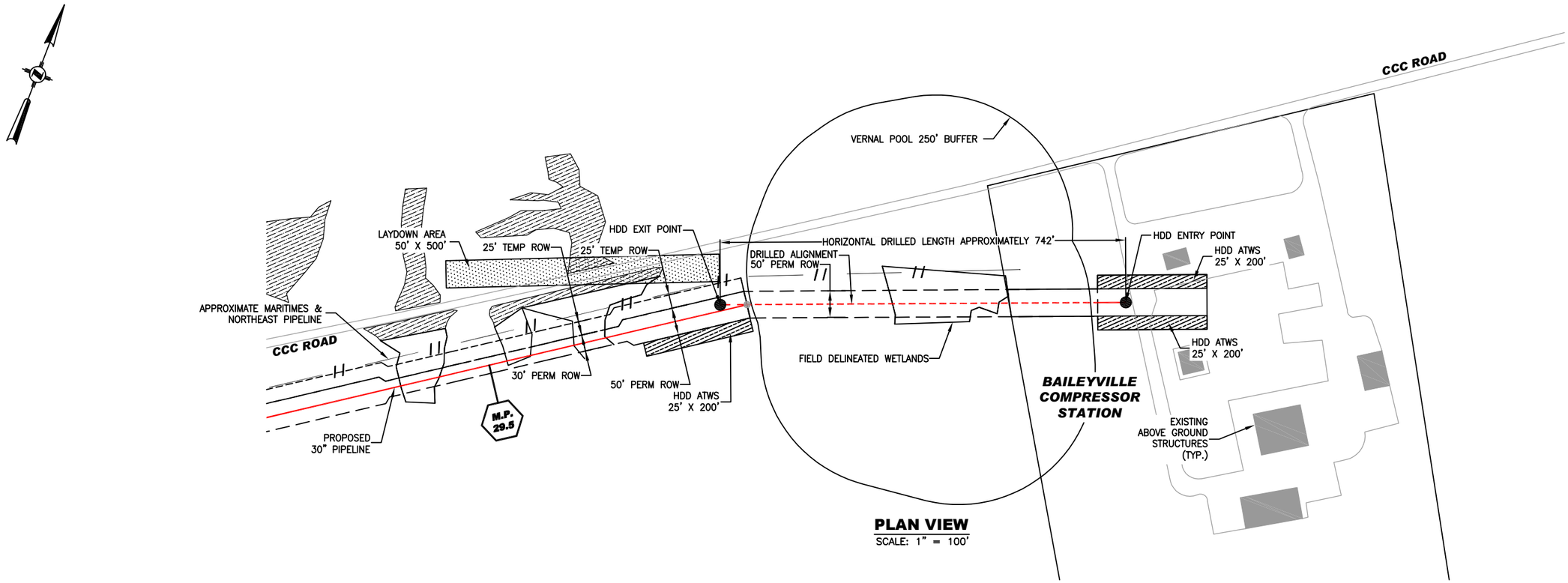
NO.	DESCRIPTION	BY	DATE	APPVD.
A	ISSUED FOR REVIEW	RAW	06/30/09	
B	REVISED BY STANTEC	GAC	01/12/10	

Horizontal Scale:	1" = 100'
Vertical Scale:	
State:	MAINE
Date:	06-30-09
Sheet No.	19 of 20
Drawn By:	RAW
Chkd. By:	
Appvd. By:	HO

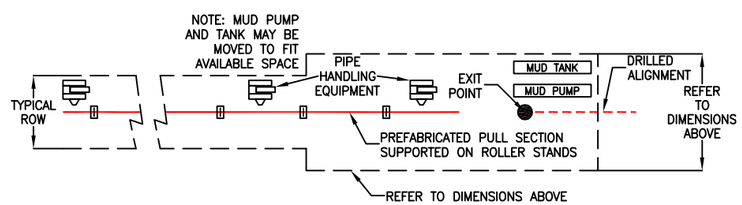
DOWNEAST LNG
NATURAL GAS PIPELINE

PIPELINE HDD EXHIBIT
WETLAND @ M.P. 29.2 HDD BORE
PROPOSED 30" PIPELINE

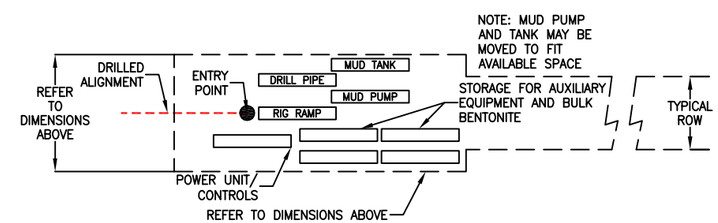
Cost Code	Drawing Number	REV. NO.
	DOW-E-HDD-29.2	A



PLAN VIEW
SCALE: 1" = 100'



EXIT POINT APPROXIMATE EQUIPMENT CONFIGURATION
N.T.S.



ENTRY POINT APPROXIMATE EQUIPMENT CONFIGURATION
N.T.S.

ENGlobal

0 50 100 200 300 FEET
SCALE: 1"=100'
Project Coordinate System:
NAD83 Maine State Planes,East Zone,US Ft.

LEGEND

- PI
- ENTRY & EXIT POINT FOR HDD
- PIPELINE CENTERLINE
- HDD CENTERLINE
- PERMANENT ROW
- TEMPORARY ROW
- MARITIMES & NORTHEAST PIPELINE
- TEMPORARY ACCESS ROADS
- STREAM
- FIELD DELINEATED WETLANDS
- REMOTELY DELINEATED WETLANDS
- OPEN WATER FEATURE
- M.P. XX — MILE POST
- ATWS AREA
- HDD ATWS AREA
- PIPE LAYDOWN AREA

NOTES

REVISIONS

NO.	DESCRIPTION	BY	DATE	APPVD.
A	ISSUED FOR REVIEW	RAW	06/30/09	
B	REVISED BY STANTEC	GAC	01/12/10	

Horizontal Scale:	1" = 100'
Vertical Scale:	
State:	MAINE
Date:	06-30-09
Sheet No.	20 of 20
Drawn By:	RAW
Chkd. By:	
Appvd. By:	HO

DOWNEAST LNG
NATURAL GAS PIPELINE

PIPELINE HDD EXHIBIT
VERNAL POOL @ M.P. 29.7 HDD BORE
PROPOSED 30" PIPELINE

Cost Code | Drawing Number DOW-E-HDD-29.7 | REV. NO. A