

TABLE OF CONTENTS

Sparrows Point LNG Project Final Environmental Impact Statement

TABLE OF CONTENTS	i
LIST OF APPENDICES	vii
LIST OF TABLES	viii
LIST OF FIGURES	xi
ACRONYMS AND ABBREVIATIONS.....	xiii
EXECUTIVE SUMMARY	ES-1
INTRODUCTION	ES-1
PROJECT BACKGROUND	ES-1
PROPOSED ACTION	ES-2
PUBLIC OUTREACH AND COMMENTS	ES-2
ENVIRONMENTAL IMPACTS AND MITIGATION.....	ES-3
ALTERNATIVES CONSIDERED	ES-8
CONCLUSIONS	ES-9
1.0 INTRODUCTION	1-1
1.1 PURPOSE AND SCOPE OF THIS STATEMENT	1-2
1.2 PROJECT PURPOSE AND NEED.....	1-3
1.3 PERMITS, APPROVALS, AND REGULATORY REQUIREMENTS.....	1-4
1.3.1 FERC Regulatory Authority.....	1-4
1.3.2 Coast Guard Regulatory Authority	1-4
1.3.3 Major Acts That This Document Addresses	1-5
1.4 STAKEHOLDER INVOLVEMENT PROCESS	1-10
1.5 PUBLIC REVIEW AND COMMENT.....	1-13
1.5.1 Public Scoping Process	1-13
1.5.2 FERC Public Comment Process for the DEIS	1-15
1.6 NONJURISDICTIONAL FACILITIES	1-16
2.0 DESCRIPTION OF PROPOSED ACTION	2-1
2.1 PROPOSED PROJECT FACILITIES	2-1
2.1.1 LNG Terminal.....	2-1
2.1.1.1 Ship Unloading Facility.....	2-4
2.1.1.2 LNG Storage Tanks	2-4
2.1.1.3 Vaporization Systems	2-7
2.1.1.4 Vapor Handling System.....	2-7
2.1.1.5 Nitrogen Use.....	2-8
2.1.2 LNG Ships.....	2-8
2.1.2.1 LNG Shipping and Ship Design	2-8
2.1.2.2 LNG Ship Ballasting and Ship Boiler Cooling Water Intake and Discharge	2-9
2.1.3 Pipeline and Associated Facilities.....	2-9
2.1.3.1 Pipeline Facilities	2-9
2.1.3.2 Aboveground Facilities.....	2-10
2.2 LAND REQUIREMENTS	2-13

2.2.1	LNG Terminal	2-13
2.2.2	Pipeline and Associated Facilities	2-13
2.2.2.1	Pipeline Right-of-Way and Additional Temporary Workspace	2-14
2.2.2.2	Access Roads and Pipeyards	2-14
2.2.2.3	Aboveground Facilities.....	2-19
2.3	CONSTRUCTION PROCEDURES.....	2-19
2.3.1	LNG Terminal	2-19
2.3.1.1	Ship Docking and Unloading Facilities.....	2-19
2.3.1.2	LNG Storage and Process Facilities	2-20
2.3.1.3	Dredging and Dredged Material Disposal	2-22
2.3.2	Pipeline Facilities	2-27
2.3.2.1	General Construction Techniques.....	2-27
2.3.2.2	Specialized Construction Techniques.....	2-31
2.4	CONSTRUCTION SCHEDULE.....	2-36
2.5	ENVIRONMENTAL COMPLIANCE, INSPECTION, AND MITIGATION MONITORING.....	2-37
2.6	OPERATION AND MAINTENANCE PROCEDURES	2-37
2.6.1	LNG Terminal	2-37
2.6.2	Pipeline Facilities	2-39
2.7	SAFETY CONTROLS	2-39
2.7.1	LNG Terminal	2-39
2.7.1.1	Spill Containment System	2-40
2.7.1.2	Fire and Hazard Detection System	2-40
2.7.1.3	Fire and Hazard Control System.....	2-40
2.7.1.4	Emergency Shutdown System	2-40
2.7.1.5	LNG Transfer Monitors and Vessel Inspections	2-41
2.7.1.6	Security Zones	2-41
2.7.2	Pipeline Facilities	2-42
2.7.2.1	Corrosion Protection and Corrosion Monitoring	2-42
2.7.2.2	Emergency Response Procedures	2-42
2.8	FUTURE PLANS AND ABANDONMENT	2-42
3.0	ALTERNATIVES.....	3-1
3.1	ALTERNATIVE ENERGY SOURCES.....	3-3
3.1.1	Other Non-Renewable Fuels	3-3
3.1.2	Renewable Energy Sources	3-3
3.1.3	Conclusions Regarding Alternative Energy Sources	3-4
3.2	LNG TERMINAL ALTERNATIVES.....	3-4
3.2.1	LNG Terminals Serving Other Target Markets	3-5
3.2.2	LNG Terminals Serving Target Markets	3-7
3.2.3	LNG Terminal Onshore Site Alternatives	3-9
3.2.4	Offshore Terminal Alternatives	3-22
3.2.5	Regasification Alternatives	3-27
3.2.6	Conclusions of All LNG Terminal Alternatives	3-29
3.2.7	Dredging Method and Dredged Material Disposal Alternatives	3-29
3.2.7.1	Dredging Method Alternatives	3-29
3.2.7.2	Comparison of Dredged Material Disposal Alternatives.....	3-31
3.2.8	Conclusion of Preferred Dredged Material Disposal/Placement Method	3-33
3.3	MID-ATLANTIC EXPRESS PIPELINE ALTERNATIVES	3-33
3.3.1	Pipeline System Alternatives	3-33
3.3.2	Major Route Alternatives	3-34

3.3.2.1	Dundalk West Alternative	3-35
3.3.2.2	Western Corridor Alternative	3-38
3.3.2.3	State Route 136 Alternative.....	3-41
3.3.2.4	US I-95 & Greenfield Alternative	3-43
3.3.3	Route Variations.....	3-46
4.0	ENVIRONMENTAL ANALYSIS	4-1
4.1	GEOLOGICAL RESOURCES.....	4-1
4.1.1	Physiographic and Geologic Setting	4-1
4.1.1.1	LNG Terminal	4-1
4.1.1.2	Pipeline Facilities	4-8
4.1.2	Other Natural Hazards.....	4-11
4.1.2.1	Flooding.....	4-11
4.1.2.2	Acid Runoff Production.....	4-12
4.1.2.3	Localized Scour and Shoreline Erosion.....	4-12
4.1.3	Paleontological Resources.....	4-13
4.2	SOILS	4-14
4.2.1	LNG Terminal Site.....	4-14
4.2.1.1	Construction and Operation.....	4-17
4.2.2	Waterway for LNG Marine Traffic	4-18
4.2.3	Pipeline Route	4-19
4.2.3.1	Prime Farmland Soils	4-22
4.2.3.2	Potential Changes to Drainage.....	4-22
4.2.3.3	Hydric Soils	4-23
4.2.3.4	Compaction Potential and Mixing	4-23
4.2.3.5	Erosion.....	4-24
4.2.3.6	Stony Rocky Soils and Shallow-to-Bedrock Soils	4-24
4.2.3.7	Revegetation Potential	4-25
4.2.3.8	Soil Contamination	4-25
4.3	WATER RESOURCES	4-28
4.3.1	Groundwater.....	4-28
4.3.1.1	Regional Groundwater Quality and Quantity	4-28
4.3.1.2	Impacts along the Waterway for LNG Marine Traffic	4-33
4.3.2	Surface Water.....	4-33
4.3.2.1	Watershed Description	4-33
4.3.2.2	Waterbody Classifications	4-35
4.3.2.3	Sensitive Waterbodies	4-36
4.3.2.4	Sediment	4-38
4.3.2.5	Surface Water Resources Impacts and Mitigation.....	4-56
4.3.2.6	Impacts from Operations along the Waterway for LNG Marine Traffic	4-73
4.4	WETLANDS	4-75
4.4.1	Regulatory Permits.....	4-75
4.4.2	Wetland Types Impacted by the Proposed Project.....	4-76
4.4.2.1	Wetlands Located at the Proposed LNG Terminal Site and Along the Proposed Pipeline Route.....	4-79
4.4.2.2	Waterway for LNG Marine Traffic	4-82
4.4.3	Potential Impacts of the Mid-Atlantic Express Pipeline to Wetlands	4-84
4.4.4	Wetlands Construction and Maintenance Procedures and the Aquatic Resources Mitigation Plan.....	4-84
4.5	VEGETATION.....	4-86

4.5.1	Vegetation Resources	4-86
4.5.1.1	Site Specific Impacts	4-89
4.5.1.2	Plant Communities of Special Concern	4-89
4.5.2	Vegetation Management Programs	4-90
4.5.3	Noxious Weeds	4-91
4.5.4	Vegetation Conclusions	4-92
4.6	TERRESTRIAL AND AQUATIC SPECIES.....	4-93
4.6.1	Terrestrial Species	4-93
4.6.1.1	Sensitive Wildlife Areas	4-96
4.6.1.2	Wildlife Resources Impacts and Mitigation	4-98
4.6.1.3	Impacts to Sensitive Wildlife Areas	4-102
4.6.2	Aquatic Species	4-104
4.6.2.1	Affected Environment – Aquatic Species	4-104
4.6.2.2	Impacts and Mitigation - Aquatic Species	4-107
4.6.3	Essential Fish Habitat	4-118
4.6.3.1	EFH Species Accounts	4-120
4.6.3.2	Potential Impacts to EFH-Designated Species, Conservation Measures, and Mitigation Plans	4-122
	4.6.3.3 Conclusions	4-132
4.7	THREATENED, ENDANGERED, AND OTHER SPECIAL STATUS SPECIES	4-134
4.7.1	Federally Listed or Proposed Threatened and Endangered Species	4-134
4.7.1.1	Conclusions and Recommendations – Federally-Listed Species	4-157
4.7.2	State Listed Threatened and Endangered Species and Other Species of Concern	4-158
4.7.3	Threatened and Endangered Species Along the Marine Transit Route	4-171
4.8.	LAND USE, RECREATION, AND VISUAL RESOURCES	4-174
4.8.1	Land Use	4-174
4.8.1.1	Residences and Developments	4-178
4.8.1.2	Recreation and Public Interest Areas	4-187
4.8.1.3	Conservation Easements and Agriculture	4-205
4.8.2	Coastal Regulations	4-208
4.8.2.1	Federal Coastal Zone Management Act	4-208
4.8.2.2	Maryland Critical Areas Act	4-209
4.8.3	Hazardous Waste Sites	4-211
4.8.4	Boating, Fishing, and Hunting	4-214
4.8.4.1	Boating and Fishing	4-214
4.8.4.2	Waterfowl Hunting	4-218
4.8.5	Visual Resources	4-219
4.8.5.1	LNG Terminal and Waterway for LNG Marine Traffic	4-219
4.8.5.2	Pipeline Facilities	4-221
4.9	SOCIOECONOMICS	4-223
4.9.1	Population, Economy, and Employment	4-223
4.9.2	Housing	4-228
4.9.3	Public Services	4-228
4.9.4	Transportation and Vessel Traffic	4-230
4.9.4.1	Vehicle Traffic	4-230
4.9.4.2	Vessel Traffic	4-234
4.9.5	Property Values	4-237
4.9.6	Tax Revenues	4-239
4.9.7	Environmental Justice	4-241
4.10	CULTURAL RESOURCES	4-249

4.10.1	Results of the Cultural Resource Surveys	4-249
4.10.2	Native American and Agency Consultation.....	4-257
4.10.3	Unanticipated Discoveries.....	4-258
4.10.4	Compliance with the NHPA.....	4-258
4.11	AIR QUALITY AND NOISE	4-260
4.11.1	Air Quality	4-260
4.11.1.1	Regional Climate	4-260
4.11.1.2	Existing Air Quality.....	4-260
4.11.1.3	Regulatory Requirements for Air Quality	4-264
4.11.1.4	Air Quality Impacts and Mitigation.....	4-272
4.11.1.5	General Conformity Determination.....	4-280
4.11.1.6	Greenhouse Gas Emissions.....	4-283
4.11.2	Noise	4-285
4.11.2.1	Noise Regulations.....	4-286
4.11.2.2	Existing Noise Levels	4-286
4.11.2.3	Noise Impacts and Mitigation.....	4-287
4.12	RELIABILITY AND SAFETY	4-294
4.12.1	LNG Hazards	4-295
4.12.2	Front-End Engineering Design Review	4-297
4.12.3	Storage and Retention Systems	4-304
4.12.4	Siting Requirements	4-305
4.12.5	LNG Vessel Safety.....	4-313
4.12.5.1	History	4-313
4.12.5.2	LNG Vessel Construction.....	4-314
4.12.5.3	Hazards	4-315
4.12.5.4	LNG Vessel Transit to the AES LNG Terminal.....	4-321
4.12.5.5	Requirements for LNG Operations in Chesapeake Bay and the Patapsco River	4-323
4.12.6	Emergency Response and Evacuation Planning	4-328
4.12.7	Conclusions on LNG Vessel Safety	4-329
4.12.8	Terrorism and Security Issues	4-330
4.12.9	Pipeline Safety Standards.....	4-331
4.12.10	Pipeline Accident Data.....	4-334
4.12.11	Impact on Public Safety	4-336
4.13	CUMULATIVE IMPACTS.....	4-338
4.13.1	Geology	4-340
4.13.2	Soils.....	4-340
4.13.3	Water Resources.....	4-341
4.13.4	Wetlands.....	4-345
4.13.5	Vegetation	4-346
4.13.6	Terrestrial and Aquatic Species.....	4-346
4.13.7	Threatened, Endangered, and Other Special Status Species	4-348
4.13.8	Land Use, Recreation, and Visual Resources.....	4-348
4.13.9	Socioeconomics.....	4-350
4.13.10	Cultural Resources	4-351
4.13.11	Air Quality and Noise	4-351
4.13.12	Reliability and Safety	4-353
4.13.13	Conclusions About Cumulative Impacts.....	4-354

5.0	CONCLUSIONS AND RECOMMENDATIONS.....	5-1
5.1	SUMMARY OF STAFF'S ENVIRONMENTAL ANALYSIS.....	5-1
5.1.1	Geology	5-1
5.1.2	Soils.....	5-2
5.1.3	Water Resources.....	5-3
5.1.4	Wetlands.....	5-6
5.1.5	Vegetation	5-7
5.1.6	Terrestrial and Aquatic Species.....	5-8
5.1.7	Threatened, Endangered and Other Special Status Species	5-11
5.1.8	Land Use, Recreation, and Visual Resources.....	5-12
5.1.9	Socioeconomics.....	5-15
5.1.10	Cultural Resources	5-17
5.1.11	Air Quality and Noise	5-17
5.1.12	Reliability and Safety	5-18
5.1.13	Cumulative Impacts	5-19
5.1.14	Alternatives	5-20
5.2	FERC STAFF'S RECOMMENDED MITIGATION.....	5-22

LIST OF APPENDICES

VOLUME 1

APPENDIX A	EIS DISTRIBUTION LIST FOR THE SPARROWS POINT LNG PROJECT	A-1
APPENDIX B	MID-ATLANTIC EXPRESS PIPELINE – PROPOSED ROUTE MAPS.....	B-1
APPENDIX C	TEMPORARY EXTRA WORKSPACES AND ACCESS ROADS	C-1
APPENDIX D	CONSOLIDATED DREDGE PLAN	D-1
APPENDIX E	ESSENTIAL FISH HABITAT ASSESSMENT	E-1
APPENDIX F	RESIDENCES AND OTHER STRUCTURES WITHIN 50 FEET OF THE CONSTRUCTION WORK AREA FOR THE MID-ATLANTIC EXPRESS PIPELINE	F-1
APPENDIX G	REFERENCES AND CONTACTS	G-1
APPENDIX H	LIST OF PREPARERS	H-1
APPENDIX I	WATERBODY CROSSINGS	I-1
APPENDIX J	WATERWAY SUITABILITY REPORT AND ADDITIONAL RECOMMENDED MITIGATION MEASURES.....	J-1
APPENDIX K	WATERWAY FOR LNG MARINE TRAFFIC MAPS	K-1
APPENDIX X	KEYWORD INDEX	X-1

VOLUME 2 – CD-ROM only

APPENDIX L	RESPONSE TO MARYLAND ADVISORY REPORT.....	L-1
APPENDIX M	PHOTO SIMULATIONS OF SPARROWS POINT FACILITY AND LNG CARRIER AT DOCK	M-1
APPENDIX N	PLAN FOR UNANTICIPATED DISCOVERY OF HAZARDOUS WASTES OR CONTAMINATED SITES	N-1
APPENDIX O	EXOTIC AND INVASIVE SPECIES CONTROL PLAN	O-1
APPENDIX P	COMMENT REONSES	P-1
APPENDIX Q	AQUATIC RESOURCES MITIGATION PLAN	Q-1
APPENDIX R	DRAFT GENERAL CONFORMITY DETERMINATION	R-1
APPENDIX S	HDD CONTINGENCY PLAN	S-1
APPENDIX T	ENVIRONMENTAL CONSTRUCTION PLAN (ECP) WITH BMPs	T-1
APPENDIX U	SITE-SPECIFIC PLANS	U-1
APPENDIX V	THREATENED AND ENDANGERED SPECIES PLANS	V-1
APPENDIX W	SPCC PLAN	W-1

LIST OF TABLES

Number	Table Title	Page
1.3-1	Major Permits, Approvals, and Consultations for the Sparrows Point Project	1-9
1.5-1	Primary Issues Identified and Comments Received During the Public Scoping Process and following the Release of the DEIS for the Sparrows Point Project.....	1-14
2.1.3-1	Aboveground Pipeline Facilities	2-10
2.2.2-1	Summary of Land Requirements Associated With Construction and Operation of the Pipeline and Aboveground Pipeline Facilities for the Mid-Atlantic Express Pipeline	2-13
2.2.2-2	Summary of Existing Rights-of-Way Co-located With or Paralleled by the Proposed Pipeline Route	2-18
2.4-1	Estimated Construction Schedule.....	2-36
2.7.1-1	Federal Siting and Design Requirements for LNG Facilities.....	2-39
3.2-1	Existing, Authorized, Proposed, and Planned LNG Terminals Considered as Alternatives	3-5
3.2.3-1	Comparison of Proposed Sparrows Point LNG Site and Seven Chesapeake Bay Alternative Locations	3-10
3.2.4-1	Terminal Design Types	3-23
3.2.7-1	COE Bucket Comparison Study Results	3-31
3.3.2-1	Comparison of Mid-Atlantic Express's Proposed Route With the Dundalk West Alternative.....	3-38
3.3.2-2	Comparison of Mid-Atlantic Express's Proposed Route With the Western Corridor Alternative.....	3-39
3.3.2-3	Comparison of Mid-Atlantic Express's Proposed Route With the SR 136 Alternative	3-43
3.3.2-4	Comparison of Mid-Atlantic Express's Proposed Route With the US I-95 & Greenfield Alternative.....	3-44
3.3.3-1	Comparison of Mid-Atlantic Express's Proposed Route With Variation 1	3-48
3.3.3-1B	Comparison of Mid-Atlantic Express's Proposed Route With Variation 1B	3-49
3.3.3-1C	Comparison of Mid-Atlantic Express's Proposed Route With Variation 1C	3-50
3.3.3-1D	Comparison of Mid-Atlantic Express's Proposed Route With Variation 1D	3-51
3.3.3-2	Comparison of Mid-Atlantic Express's Proposed Route With Variation 2	3-55
3.3.3-2A	Comparison of Mid-Atlantic Express's Proposed Route With Variation 2A	3-55
3.3.3-3	Comparison of Mid-Atlantic Express's Proposed Route With Variation 3	3-56
3.3.3-4	Comparison of Mid-Atlantic Express's Proposed Route With Variation 4.....	3-59
3.3.3-5	Comparison of Mid-Atlantic Express's Proposed Route With Variation 5	3-61
3.3.3-6	Comparison of Mid-Atlantic Express's Proposed Route With Variation 6.....	3-63
3.3.3-6A	Comparison of Mid-Atlantic Express's Proposed Route With Variation 6A	3-63
3.3.3-6B	Comparison of Mid-Atlantic Express's Proposed Route With Variation 6B	3-64
3.3.3-7	Comparison of Mid-Atlantic Express's Proposed Route With Variation 7	3-66
3.3.3-8	Comparison of Mid-Atlantic Express's Proposed Route With Variation 8	3-67
3.3.3-9	Comparison of Mid-Atlantic Express's Proposed Route With Variation 9	3-69
3.3.3-9A	Comparison of Mid-Atlantic Express's Proposed Route With Variation 9A	3-71
3.3.3-10	Comparison of Mid-Atlantic Express's Proposed Route With Variation 10	3-73
3.3.3-10A	Comparison of Mid-Atlantic Express's Proposed Route With Variation 10A	3-75
3.3.3-11	Comparison of Mid-Atlantic Express's Proposed Route With Variation 12A	3-79
3.3.3-12	Comparison of Mid-Atlantic Express's Proposed Route With Variation 12B	3-81
3.3.3-13	Comparison of Mid-Atlantic Express's Proposed Route With Variation 12C	3-82
3.3.3-14	Comparison of Mid-Atlantic Express's Proposed Route With Kirks Mill Variations A and B	3-87
3.3.3-15	Comparison of Romansville Road Variation A.....	3-90
3.3.3-16	Comparison of Romansville Road Variation B.....	3-90
3.3.3-17	Comparison of Mid-Atlantic Express's Proposed Route With Chesaco Avenue Variation	3-92

Number	Table Title	Page
3.3.3-18	Comparison of Mid-Atlantic Express's Proposed Route With Route Variation 13	3-94
3.3.3-19	Comparison of Mid-Atlantic Express's Proposed Route With Route Variation 14	3-96
4.2.1-1	Analytical Results of Soil Samples Collected Within the Proposed LNG Terminal Site	4-16
4.2.3-1	Soils Characteristics for the Proposed Pipeline Right-of-Way	4-20
4.2.3.2-1	Summary of Hydric Soils Along the Pipeline Route.....	4-23
4.2.3.5-1	Potential Shallow Bedrock Locations	4-25
4.3.1-1	Water Supply Wells Located Within 150 Feet of the Mid-Atlantic Express Pipeline Route.....	4-29
4.3.2-1	Results of June 2006 Sediment Chemical Analyses from the Sparrows Point Marine Sediments and Comparison to Previous Area Studies and to Marine Sediment Guidelines.....	4-41
4.3.2-2	Sorption and Affecting Factors for Metals in Sediments	4-53
4.3.2-3	Factors Affecting Bioavailability and Bioaccumulation of Metals	4-55
4.3.2-4	Hydrotest Water Discharge Locations and Volumes	4-73
4.4.2-1	Wetlands Impacted by Construction and Operation of the Proposed Mid-Atlantic Express Pipeline.....	4-77
4.4.2-2	Representative Wetland Plant Species (Listed by Wetland Type) Identified in the Sparrows Point LNG Terminal and Mid-Atlantic Express Pipeline Areas	4-80
4.4.2-3	Summary of Wetland Types Impacted by the Mid-Atlantic Express Pipeline.....	4-81
4.6.1-1	Terrestrial Wildlife Species Representative of Terrestrial Habitats That Would be Affected by the Proposed Project.....	4-93
4.6.1-2	Locations of Maryland-Designated Forest Interior Dwelling Species (FIDS) Habitat for Protection of Birds Crossed by the Proposed Pipeline Facilities	4-97
4.6.2-1	Representative Game and Commercial Fish Species Known to Occur in the Proposed LNG Terminal Vicinity	4-106
4.6.3-1	Fish Species for Which EFH has Been Identified and Ecologically Important Prey Species of Managed Finfish That Occur in the Vicinity of the Proposed LNG Terminal Area and Along the Proposed Pipeline Route.....	4-119
4.6.3-2	Summary of Essential Fish Habitat by Life Stage Along the LNG Vessel Marine Transit Route, Upper Chesapeake Bay.....	4-128
4.6.3-3	Summary of Essential Fish Habitat by Life Stage Along the LNG Vessel Marine Transit Route, Lower Chesapeake Bay	4-129
4.6.3-4	Summary of Essential Fish Habitat by Life Stage Along the LNG Vessel Marine Transit Route, Offshore Region.....	4-130
4.6.3-5	Key to Map Grid in Figure 4.6.31: NMFS Quadrangle Numbers And Names.....	4-132
4.7-1	Federally Listed Endangered and Threatened Species Potentially Occurring in the Project Area	4-135
4.7.1b	Summary of Bog Turtle Surveys in the Project Area.....	4-153
4.7-2	State Listed Endangered and Threatened Species Potentially Occurring in the Project Area....	4-159
4.8.1-1	Acres of Land Affected by Construction and Operation of the Mid-Atlantic Express Pipeline Facilities	4-176
4.8.1-2	Known Planned Residential and Commercial Developments Within 0.25 Mile of the Proposed Pipeline Route Construction Workspace	4-186
4.8.1-3	Recreational And Public Interest Areas Crossed or Within 0.25 Mile of the Proposed LNG Terminal Site or Pipeline Route	4-187
4.8.1-4	Parcels Containing Conservation Easements Crossed by the Proposed Pipeline Route	4-206
4.8.2..2-1	Summary of Areas of the Project Located in Baltimore County, Within Maryland's Designated Critical Areas.....	4-211
4.8.3-1	Contaminated Sites and Landfills Crossed by or Up-gradient from the Project	4-212
4.9.1-1	Existing Socioeconomic Conditions in the Project Area	4-225
4.9.1-2	Local Workforce Composition by Industry Classification.....	4-226
4.9.1-3	Temporary Construction Employment Positions	4-227

Number	Table Title	Page
4.9.1-4	Permanent Employment Positions.....	4-227
4.9.2-1	Housing and Vacancy Rates.....	4-228
4.9.3-1	Public Services	4-229
4.9.4-1	Traffic During Construction.....	4-230
4.9.4-2	Traffic During Operation	4-231
4.9.4-3	Level of Service Analysis	4-232
4.9.6-1	Project Construction and Operation Estimated Tax Revenue	4-240
4.9.7-1	Racial/Ethnic Statistics for the Terminal Site and Mid-Atlantic Express Pipeline Construction Corridor	4-243
4.9.7-2	Income and Poverty Statistics	4-244
4.9.7-3	Summary of Socioeconomic Data for LNG Terminal Project Area	4-244
4.10.1-2	Previously Recorded Terrestrial Archaeological Sites Within Pipeline Right-of-Way	4-254
4.10.1-3	Newly Investigated Terrestrial Archaeological Sites in Pipeline Right-of-Way	4-255
4.10.1-4	Previously Recorded Terrestrial Archaeological Sites Within Pipeyard/Staging Area.....	4-257
4.11.1-1	Ambient Air Quality Standards.....	4-260
4.11.1-2	Existing Ambient Air Concentrations for the Project Area.....	4-263
4.11.1-3	PSD Class I and Class II Increments.....	4-265
4.11.1-4	Estimated Emissions From LNG Terminal and Pipeline Interconnect Construction with Non-Jurisdictional Power Plant.....	4-273
4.11.1-5	Operating Emissions Summary for the Proposed Stationary Source Configurations	4-276
4.11.1-6	Operating Emissions Summary for the Proposed Mobile Sources	4-277
4.11.1-7	Predicted Ambient Air Quality Concentrations for Worst-Case Facility Configurations.....	4-280
4.11.1-8	Greenhouse Gas Construction Emissions Summary	4-284
4.11.1-9	Greenhouse Gas Operating Emissions Summary.....	4-285
4.11.2-1	Noise Sensitive Areas Near the LNG Site.....	4-286
4.11.2-2	Measured Daytime and Nighttime Noise Levels at NSAs Nearest to the LNG Site.....	4-287
4.11.2-3	Measured Noise Levels at the Property Boundary	4-289
4.11.2-4	Predicted Noise Levels at NSAs and Fenceline Locations From Pile Driving Activities.....	4-290
4.11.2-5	Predicted Noise Levels From HDD Activities	4-290
4.11.2-6	Predicted Noise Levels (Ldn) from Construction and Maintenance Dredging	4-291
4.11.2-7	Predicted Sound Levels (Leq) From Construction and Maintenance Dredging	4-291
4.11.2-8	Predicted Noise Levels (Ldn) From LNG Terminal and Optional Power Plant	4-292
4.11.2-9	Predicted Sound Levels (Leq) From LNG Terminal and Optional Power Plant at NSAs and Fenceline.....	4-292
4.12.4-1	Impoundment Areas for LNG Spills	4-308
4.12.4-2	Thermal Exclusion Zones.....	4-309
4.12.5.3-1	Minimum Striking Speed to Penetrate LNG Cargo Tanks.....	4-317
4.12.5.3-2	LNG Spills on Water from a 140,000 m ³ LNG Vessel.....	4-320
4.12.10-1	Natural Gas Service Incidents by Cause	4-335
4.12.10-2	Outside Forces Incidents by Cause (1970-1984).....	4-336
4.12.10-3	External Corrosion by Level of Control (1970-1984)	4-336
4.12.11-1	Annual Average Fatalities-Natural Gas Transmission and Gathering Systems	4-337
4.12.11-2	Nationwide Accidental Deaths	4-337
4.13-1	Existing, Approved, or Proposed Activities/Projects That Could Contribute to Cumulative Impacts Associated With Construction of the Sparrows Point Project	4-338
4.13.3-1	Summary of Dredging and Marine Projects in Baltimore and Anne Arundel Counties That Could Contribute to Cumulative Impacts Associated With Construction of the Sparrows Point LNG Project.....	4-343
4.13.11-1	Predicted Cumulative Ambient Air Quality Concentrations for LNG Terminal (With Power Plant) and Ecron Ethanol	4-352

LIST OF FIGURES

Number	Figure Title	Page
2.1-1	General Project Location	2-2
2.1-2	Proposed Pipeline General Location	2-3
2.1.1-1	Terminal Facilities Layout	2-5
2.1.1-2	Shoreline and Related Features	2-6
2.2.1-1	Property and Associated Dredge and Temporary Work Space Areas	2-11
2.2.1-2	Dredge Material Recycling Facility Plan	2-12
2.2.2.1-1	Typical Right-of-way Cross-Section Adjacent to Foreign Pipeline	2-15
2.2.2.1-2	Typical Right-of-way Cross-Section with Topsoil Segregation	2-16
2.2.2.1-3	Typical Pipeline Construction Right-of-way Within BG&E Right-of-way	2.17
2.3.1.3-1	Proposed Dredging Area	2-23
2.3.2-1	Typical Pipeline Construction Sequence	2-28
3.2.3-1	Alternative LNG Terminal Locations	3-11
3.2.3-2	Proposed LNG Terminal	3-12
3.2.3-3	Cove Point - LNG Terminal Site Alternative	3-13
3.2.3-4	Calvert Cliffs - LNG Terminal Site Alternative	3-14
3.2.3-5	Greenbury Point - LNG Terminal Site Alternative	3-15
3.2.3-6	Fishing Point - LNG Terminal Site Alternative	3-16
3.2.3-7	Swan Creek - LNG Terminal Site Alternative	3-17
3.2.3-8	Kent Island - LNG Terminal Site Alternative	3-18
3.2.3-9	Mittal Steel - LNG Terminal Site Alternative	3-19
3.3.2-1	Major Route Alternatives	3-36
3.3.2.1-1	Dundalk West Route Alternative	3-37
3.3.2.2-1	Western Corridor Route Alternative	3-40
3.3.2.3-1	S.R. 136 Route Alternative	3-42
3.3.2.4-1	U.S. I-95 Greenfield Alternative	3-45
3.3.3-1	Route Variations 1, 1B, 2, 2A	3-47
3.3.3-1A	Route Variation 1C	3-53
3.3.3-1B	Route Variation 1D	3-54
3.3.3-2	Route Variation 3	3-57
3.3.3-3	Route Variation 4	3-58
3.3.3-4	Route Variation 5	3-60
3.3.3-5	Route Variation 6	3-62
3.3.3-6	Route Variations 6A and 6B	3-65
3.3.3-7	Route Variations 7 and 8	3-68
3.3.3-8	Route Variation 9	3-70
3.3.3-8A	Route Variation 9A	3-72
3.3.3-9	Route Variation 10	3-74
3.3.3-9A	Route Variation 10A	3-76
3.3.3-10	Route Variation 11	3-78
3.3.3-11	Route Variations 12A and 12B	3-80
3.3.3-12	Route Variation 12C	3-85
3.3.3-13	Kirks Mill Variations	3-88
3.3.3-13A	Kirks Mill Variation A	3-89
3.3.3-14	Romansville Road Variations A and B	3-91
3.3.3-15	Chesaco Avenue Variation	3-93
3.3.3-16	Variation 13	3-95

Number	Figure Title	Page
3.3.3-17	Variation 14	3-97
4.2.1-1	Soil Investigation Sample Locations	4-15
4.3.2.4-1	Vibracore Sediment Sampling Locations	4-40
4.3.2.4-2	Sediment Analytical Results - Shallow Samples, June 2006	4-44
4.3.2.4-3	Sediment Analytical Results - Intermediate Depth Samples, June 2006	4-45
4.3.2.4-4	Sediment Analytical Results - Deep Samples, June 2006	4-46
4.3.2.4-5	Sediment Analytical Results - Shallow Samples, August 2007	4-50
4.3.2.4-6	Sediment Analytical Results - Intermediate Depth Samples, August 2007	4-51
4.3.2.4-7	Sediment Analytical Results - Deep Samples, August 2007	4-52
4.3.2.5-1	Sediment Transport Model: Accumulated Sediment Deposition, for 12.5 days after Tug Propeller Wash Re-Suspension of Sediments	4-59
4.6.1-1	Historic Waterfowl Concentration Areas and Licensed Offshore Blinds	4-95
4.6.3-1	Essential Fish Habitat (EFH) Along the LNG Vessel Marine Transit Route	4-131
4.9.7-1	Proposed LNG Terminal Location and Surrounding Communities	4-242
4.11.2-1	Location Map for Noise Sensitive Areas (NSA's) Near the Proposed Sparrows Point LNG Terminal	4-288
4.12.4-1	Thermal Exclusion Zones	4-310
4.12.4-2	Vapor Dispersion Exclusion Zone	4-312

ACRONYMS AND ABBREVIATIONS

$\mu\text{g}/\text{m}^3$	micrograms per cubic meter
ABSG	ABSG Consulting Inc.
ACHP	Advisory Council on Historic Preservation
AES	AES Sparrows Point LNG, LLC
AET	apparent effects threshold
AMSC	Area Maritime Security Committee
ANSI	American National Standards Institute
APE	area of potential effect
API	American Petroleum Institute
AQCRs	Air quality control regions
ARMP	Aquatic Resources Mitigation Plan
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASMFC	Atlantic States Marine Fishery Commission
ASTM	American Society for Testing and Materials
ATWS	additional temporary workspaces
AWOIS	Automated Wreck and Obstruction Information System
BA	biological assessment
BACT	best available control technology
Bcf/d	billion cubic feet per day
BGE	Baltimore Gas & Electric Company
BMP	Best Management Practice
BOG	boil-off-gas
BSC	Bethlehem Steel Corporation
BTS	Bureau of Transportation Statistics
Btu	British thermal unit
BWI	Barletta Willis Inc. – current owners of the Sparrows Point Shipyard and owners of the proposed LNG Terminal site
CAA	Clean Air Act
CAAA	1990 Clean Air Act Amendments
CAROW	Controlled Access Rights-of-Way
CCNPP	Calvert Cliffs Nuclear Power Plant
CDC	certain dangerous cargo
CDP	Consolidated Dredge Plan
CEII	critical energy infrastructure information
CEMS	continuous emissions monitoring system
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
Certificate	Certificate of Public Convenience and Necessity
cfm	cubic feet per minute
CFR	Code of Federal Regulations
CFRA	Coastal Facilities Review Act
CIS	close interval surveys
CO	carbon monoxide
CO ₂	carbon dioxide

ACRONYMS AND ABBREVIATIONS

Coast Guard	U.S. Coast Guard
COE	U.S. Army Corps of Engineers
Columbia	Columbia Gas Transmission Corporation
COMAR	Code of Maryland Regulations
Commission	Federal Energy Regulatory Commission
COTP	Captain of the Port (U.S. Coast Guard)
CPT	Cone Penetration Test
CR	Conservation Recommendation (by NMFS)
CR ⁶⁺	hexavalent chromium
CWA	Clean Water Act
CY	cubic yards
CZMA	Coastal Zone Management Act of 1972
CZMP	Coastal Zone Management Program
dBA	decibels on the A-weighted scale
DEIS	Draft Environmental Impact Statement
DHMH	Maryland Department of Health and Mental Hygiene
DMCF	Dredged Material Containment Facilities
DMPA	dredged material placement area
DMRF	dredged material recycling facility
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOJ	U.S. Justice Department
DOT	U.S. Department of Transportation
Dth/d	dekatherms per day
DWPA	Deepwater Port Act
ECMR Program	Environmental Compliance Monitoring and Reporting Program
ECP	Environmental Construction Plan
EFH	essential fish habitat
EI	Environmental Inspector
EIA	U.S. Department of Energy, Energy Information Administration
EIS	environmental impact statement
EMS	Emergency Medical Service
EPA	U.S. Environmental Protection Agency
ERC	emergency release coupling
ERP	Emergency Response Plan
ESA	Endangered Species Act
ESD	emergency shutdown
Excelerate	Excelerate Energy, L.L.C.
FCA	Maryland Forest Conservation Act
FCP	Forest Conservation Plan
FEED	Front-end Engineering Design
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FPC	Federal Power Commission
FMSC	Federal MARSEC Coordinator

ACRONYMS AND ABBREVIATIONS

FSD	Forest Stand Delineation
FSO	Facility Security Officer
FSRU	Floating, storage, and regasification units
FTU	Formazin Turbidity Units
FWS	U.S. Fish and Wildlife Service
g	gravity
g/ml	grams per milliliter
GAO	U.S. Government Accountability Office
GBS	gravity based structure
GCA	General Conformity Analysis
GES	Groundwater & Environmental Services
GH	natural gas-fired heaters
GI	gastrointestinal
gpm	gallons per minute
GPS	Global Positioning System
Gulf Gateway	Gulf Gateway Energy Bridge
HAP	hazardous air pollutant
HCAs	high consequence areas
HDD	horizontal directional drill
HNI	Highway Needs Inventory
HP	high pressure
hp	horsepower
HPA	Habitat Protection Area
HTF	heat transfer fluid
HUD	U.S. Department of Housing and Urban Development
IBA	Important Bird Area
IBC	International Building Code
IDA	Intensely Developed Area
IMO	International Maritime Organization
INGAA	Interstate Natural Gas Association of America
IP	intermediate pressure
km	kilometers
K _{oc}	organic carbon partition coefficient
kPa	kilopascals
kV	kilovolt
LAER	Lowest Achievable Emission Rate
lb/kWh	pounds per kilowatt hour
lb/MMBtu	pound per MMBtu
LDA	Limited Development Area
L _{dn}	day-night sound level
L _{eq}	equivalent sound level
L _{eq(24)}	24-hour equivalent sound level
LFL	lower flammable limit
LHG	liquid hazardous gas
LNG	liquefied natural gas
LOI	Letter of Intent

ACRONYMS AND ABBREVIATIONS

LOR	Letter of Recommendation
LOS	Level of Service
LP	low pressure
LUST	leaking underground storage tank
m ³	cubic meters
MACT	Maximum Achievable Control Technology
MAOP	maximum allowable operating pressure
MAFMC	Mid-Atlantic Fishery Management Council
MAPA	Old Maryland and Pennsylvania Railroad
MARAD	Maritime Administration of the DOT
MARSEC	Homeland Security and Coast Guard Marine Security
MCE	Maximum Considered Earthquake
MCS	Management Classification System
MCY	million cubic yards
MDE	Maryland Department of the Environment
MDNR	Maryland Department of Natural Resources
MDOT	Maryland Department of Transportation
MD-SHPO	Maryland State Historic Preservation Officer
Memorandum	Memorandum of Understanding on Natural Gas Transportation Facilities
mg/L	milligrams per liter
MHHW	Mean Higher High Water
MHT	Maryland Historic Trust
Mid-Atlantic Express	Mid-Atlantic Express, L.L.C.
MIHP	Maryland Inventory of Historic Places
MLLW	Mean Lower Low Water
MLV	mainline valve
MMcf	million cubic feet
MMcf/d	million cubic feet per day
MMI	Modified Mercalli Intensity
MP	milepost
MPSC	Maryland Public Service Commission
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
msl	mean sea level
MSO	Marine Safety Office
MSSA	Maryland Saltwater Sport Fisherman's Association
MSU	Marine Safety Unit
MTA	Maryland Transportation Authority
MTBE	Methyl tert-butyl ether
NAAQS	National Ambient Air Quality Standards
NAVD88	North American Vertical Datum of 1988
NDE	nondestructive examination
NEHRP	National Earthquake Hazard Reduction Program
NEPA	National Environmental Policy Act of 1969
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NFRAP	No Further Remedial Action Planned

ACRONYMS AND ABBREVIATIONS

ng/g	nanograms/gram
NGA	Natural Gas Act
NGS	National Geodetic Survey
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NNSR	Nonattainment New Source Review
NO ₂	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent to Prepare an Environmental Impact Statement for the Proposed Sparrows Point LNG and Mid-Atlantic Express Pipeline
Northeast Gateway	Northeast Gateway Energy Bridge
NO _x	nitrogen oxides
NPC	National Petroleum Council
NPDES	National Pollutant Discharge Elimination System
NPL	National Priority List
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSA	noise sensitive area
NSPS	New Source Performance Standards
NSR	New Source Review
NTWSSC	Nontidal Wetland of Special State Concern
NVIC 05-05	<i>Navigation and Vessel Inspection Circular – Guidance on Assessing the Suitability of a Waterway for Liquefied Natural Gas (LNG) Marine Traffic</i>
NWI	National Wetland Inventory
NWR	National Wildlife Refuges
O ₃	ozone
OBE	Operating Basis Earthquake
OCRM	NOAA Office of Coast and Ocean Resource Management
OEP	FERC's Office of Energy Projects
OPS	Office of Pipeline Safety
OSHA	Occupational Safety and Health Administration
PA	Programmatic Agreement
PAH	polycyclic aromatic hydrocarbon
PA-SHPO	Pennsylvania State Historic Preservation Officer
PAX	Patuxent River Naval Air Station
Pb	lead
PCBs	polychlorinated biphenyls
PDCNR	Pennsylvania Department of Conservation and Natural Resources
PDEP	Pennsylvania Department of Environmental Protection
PDM	processed dredged material
PEL	Probable Effects Level
PERC	powered emergency release coupling
PFBC	Pennsylvania Fish and Boat Commission
pg/L	picograms per liter
PGA	peak ground acceleration

ACRONYMS AND ABBREVIATIONS

PHEL	potentially highly erodible land
PHMSA	Pipeline and Hazardous Materials Safety Administration
PHPCP	<i>Pipeline Hydrotesting and Pre-Commissioning Plan</i>
Plan	Upland Erosion Control, Revegetation and Maintenance Plan
PM	particulate matter
PM ₁₀	particulate matter having an aerodynamic diameter of 10 microns or less
PM ₂₅	particulate matter having an aerodynamic diameter of 2.5 microns or less
PNDI	Pennsylvania Natural Diversity Inventory
POB	Port of Baltimore
POTW	Publicly Owned Treatment Works
ppm	parts per million
ppmdv	parts per million dry volume
ppt	part-per trillion
Procedures	<i>Wetland and Waterbody Construction and Mitigation Procedures</i>
PSD	Prevention of Significant Deterioration
psig	pounds per square inch gauge
PSM	Process Safety Management
PTE	potential to emit
PVC	polyvinyl chloride
Quest	Quest Consultants, Inc.
RACT	Reasonably Available Control Technology
RCA	Resource Conservation Area
RCRA	Resource Conservation and Recovery Act
RMP	risk management plan
RNA	Regulated Navigation Area
ROW	right-of-way
RPT	rapid phase transition
RSPA	Research and Special Programs Administration (DOT)
Sandia Report	<i>Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water</i>
SAV	submerged aquatic vegetation
SCADA	Supervisory Control and Data Acquisition
scfm	standard cubic feet per minute
SCR	Selective Catalytic Reduction
SCV	submerged combustion vaporizers
sf	square feet
SHA	State Highway Administration
SHPO	State Historic Preservation Office
SIGTTO	Society of International Gas Tanker and Terminal Operators
SIL	significant impact level
SIP	state implementation plan
SNG	Southern Natural Gas Company
SO ₂	sulfur dioxide
SOLAS	International Convention for the Safety of Life at Sea
SONRIS	Strategic Online Natural Resource Information System
SPCC Plans	Spill Prevention, Control and Countermeasure Plans

ACRONYMS AND ABBREVIATIONS

SPMS	special purpose monitoring stations
SPS	SPS Limited Partnership LLLP
SPT	Standard Penetration Test
SQuRT	Screening Quick Reference Tables
SR	State Route
SRBC	Susquehanna River Basin Commission
SSBP	site-specific blasting plan
SSE	Safe Shutdown Earthquake
SSTL	Site Specific Target Level
SSURGO	Soil Survey Geographic Information
STATSGO	State Soil Geographic Information
STL buoy	submerged turret loading buoy
STV	Shell and Tube Vaporization
SVOC	semi volatile organic compound
sw	solid waste
SWAs	Solid Waste Acceptance Facilities
SWL	Solid Waste Landfill
TEL	Threshold Effects Level
TETCO	Texas Eastern Transmission Corporation
TMP	Transit Management Plan
TNT	trinitrotoluene
TOC	Total Organic Carbon
TPH	total petroleum hydrocarbons
tpy	tons per year
Transco	Transcontinental Gas Pipeline Corporation
Trunkline Gas	CMS Trunkline Gas Company, L.L.C.
TSP	total suspended particulate
TSS	Traffic Separation Scheme
USC	United States Code
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
uV	ultraviolet
VCP	Voluntary Cleanup Program
VDEQ	Virginia Department of Environmental Quality
VIMS	Virginia Institute of Marine Science
VOC	volatile organic compound
VOL	volatile organic liquid
WEG	wind erodibility group
WRAW	Waterway Risk Assessment Workshop
WSA	waterway sustainability assessment
WSR	Waterway Suitability Report
Yd ³	cubic yards