

TABLE OF CONTENTS

TABLE OF CONTENTS

List of Figures.....	xviii
List of Tables	xviii
List of Maps	xxvii
List of Appendices.....	xxviii
 EXECUTIVE SUMMARY	 ES-1
ES.1 Introduction.....	ES-1
ES.2 Purpose and Need	ES-1
ES.2.1 Purpose	ES-1
ES.2.2 Need	ES-2
ES.3 Conformance with BLM Land Use Plans and Other Laws and Policy	
Considerations	ES-2
ES.4 Public <u>and Agency Scoping</u>.....	ES-2
ES.5 Identified Issues.....	ES-3
Issue 1: Alternatives.....	ES-3
Issue 2: Air Quality.....	ES-3
Issue 3: Cultural Resources.....	ES-3
Issue 4: Mitigation	ES-3
Issue 5: Native American Consultation	ES-3
Issue 6: Noise.....	ES-4
Issue 7: Process	ES-4
Issue 8: Public Health and Safety	ES-4
Issue 9: Purpose and Need	ES-4
Issue 10: Recreation and Visual.....	ES-4
Issue 11: Socioeconomics	ES-4
Issue 12: Soils	ES-4
Issue 13: Special Designations.....	ES-4
Issue 14: Transportation.....	ES-4
Issue 15: Wildlife/Threatened and Endangered Species.....	ES-4
Issue 16: Vegetation.....	ES-4
Issue 17: Water Quality	ES-5
Issue 18: Wilderness Characteristics	ES-5
<u>ES.6 Public Comments and Meetings on the Draft EIS</u>.....	ES-5

ES.7 Alternatives.....	ES-5
ES.7.1 Alternative A: Proposed Action	ES-5
ES.7.2 Alternative B: Reduced Development.....	ES-7
ES.7.3 Alternative C: Full Development	ES-8
ES.7.4 Alternative D: No Action	ES-9
ES.7.5 Alternative E: <u>Reduced Development with Directional Drilling</u>	ES-9
<u>ES.7.6 Alternative F: Agency Preferred Alternative</u>	ES-10
ES.8 Affected Environment	ES-12
ES.9 Environmental Consequences.....	ES-13
<u>ES.10 Mitigation Measures</u>	ES-15
<u>ES.11 Agency Coordination and Consultation</u>	ES-15
<u>ES.11.1 Section 106 and Government-to-government Consultation</u>	ES-15
<u>ES.11.1.1 Section 106 Consultation</u>	ES-15
<u>ES.11.1.2 Government-to-government Consultation</u>	ES-16
<u>ES.11.2 Section 7 Consultation</u>	ES-17
<u>ES.11.3 Other Agency Coordination</u>	ES-17
ES.12 Next Steps/Decisions to be Made after the EIS	ES-17
 CHAPTER 1. INTRODUCTION AND BACKGROUND	 1-1
1.1 Project Overview.....	1-1
1.2 Background	1-1
1.2.1 The Environmental Impact Statement Decision Framework.....	1-2
1.2.2 Decisions to be Made After the EIS	1-2
1.3 Purpose and Need	1-3
1.3.1 Purpose.....	1-3
1.3.2 Need	1-3
1.4 Conformance with BLM Land Use Plans and Other Laws and Policy	
Considerations	1-3
1.4.1 Consistency with Local Plans	1-4
1.4.2 Other Regulations	1-4
1.5 Public Involvement and Scoping of Issues.....	1-5
Issue 1: Alternatives.....	1-5
Issue 2: Air Quality	1-5
Issue 3: Cultural Resources.....	1-5
Issue 4: Mitigation	1-5
Issue 5: Native American Consultation	1-5

Issue 6: Noise	1-5
Issue 7: Process	1-5
Issue 8: Public Health and Safety	1-6
Issue 9: Purpose and Need	1-6
Issue 10: Recreation and Visual.....	1-6
Issue 11: Socioeconomics	1-6
Issue 12: Soils	1-6
Issue 13: Special Designations.....	1-6
Issue 14: Transportation.....	1-6
Issue 15: Wildlife/Threatened and Endangered Species.....	1-6
Issue 16: Vegetation.....	1-6
Issue 17: Water Quality	1-6
Issue 18: Wilderness Characteristics	1-6
1.6 Authorizing Actions	1-7
CHAPTER 2. PROPOSED ACTION AND ALTERNATIVES	2-1
2.1 Management Actions Common to All Alternatives	2-2
2.2 Alternative A: Proposed Action.....	2-18
2.2.1 Access Roads	2-18
2.2.1.1 Land Requirements	2-18
2.2.1.2 Road Construction	2-20
2.2.2 Well Drilling and Completion	2-20
2.2.2.1 Land Requirements	2-20
2.2.2.2 Well Pad Construction	2-22
2.2.2.3 Well Drilling	2-22
2.2.2.4 Well Completion and Production.....	2-24
2.2.3 Pipelines.....	2-25
2.2.4 Water Supply and Disposal.....	2-26
2.2.5 Waste Disposal.....	2-30
2.2.6 Abandonment and Reclamation	2-31
2.2.6.1 Interim Reclamation.....	2-31
2.2.6.2 Dry Hole/Abandoned Locations	2-32
2.2.6.3 Evaporation Ponds	2-32
2.2.7 Workforce Requirements	2-32
2.2.8 Workovers.....	2-33
2.2.9 Applicant-committed Environmental Protection Measures and BMPs	2-34
2.2.9.1 Multiple Resources	2-34

2.2.9.2 Cultural Resources	2-35
2.2.9.3 Paleontological Resources	2-35
2.2.9.4 Invasive Weeds	2-35
2.2.9.5 Special Status Plants	2-35
2.2.9.6 Raptor Nests.....	2-36
2.2.9.7 Greater Sage-grouse Leks and Nesting Areas	2-37
2.2.9.8 Bald Eagle Wintering Areas	2-38
2.2.9.9 Mountain Plover Breeding Habitat	2-38
2.2.9.10 Mexican Spotted Owl (MSO) Habitat	2-38
2.2.9.11 Range Resources	2-38
2.2.9.12 Hazardous Materials and Emergency Response	2-39
2.3 Alternative B: Reduced Development.....	2-40
2.3.1 Access Roads	2-41
2.3.1.1 Land Requirements	2-41
2.3.1.2 Road Construction	2-41
2.3.2 Well Drilling and Completion	2-41
2.3.2.1 Land Requirements	2-41
2.3.2.2 Well Pad Construction	2-41
2.3.2.3 Well Drilling	2-41
2.3.2.4 Well Completion and Production.....	2-42
2.3.3 Pipelines.....	2-42
2.3.4 Water Supply and Disposal.....	2-42
2.3.5 Waste Disposal.....	2-42
2.3.6 Abandonment and Reclamation.....	2-42
2.3.6.1 Interim Reclamation.....	2-42
2.3.6.2 Dry Hole/Abandoned Location.....	2-43
2.3.7 Workforce Requirements	2-43
2.3.8 Workovers.....	2-43
2.3.9 Applicant-committed Environmental Protection Measures.....	2-43
2.3.9.1 Raptor Nests.....	2-43
2.3.9.2 Greater Sage-grouse Leks and Nesting Areas	2-43
2.3.9.3 Aesthetics	2-43
2.3.9.4 ACECs	2-44
2.4 Alternative C: Full Development.....	2-44
2.4.1 Access Roads	2-45
2.4.1.1 Land Requirements	2-45
2.4.1.2 Road Construction	2-45
2.4.2 Well Drilling and Completion	2-45
2.4.2.1 Land Requirements	2-45

2.4.2.2 Well Pad Construction	2-45
2.4.2.3 Well Drilling	2-45
2.4.2.4 Well Completion and Production.....	2-45
2.4.3 Pipelines.....	2-45
2.4.4 Water Supply and Disposal.....	2-46
2.4.5 Waste Disposal.....	2-46
2.4.6 Abandonment and Reclamation	2-46
2.4.6.1 Interim Reclamation.....	2-46
2.4.6.2 Dry Hole/Abandoned Location	2-46
2.4.7 Workforce Requirements	2-46
2.4.8 Workovers.....	2-47
2.4.9 Applicant-committed Environmental Protection Measures	2-47
2.5 Alternative D: No Action.....	2-47
2.5.1 Access Roads	2-48
2.5.1.1 Land Requirements	2-48
2.5.1.2 Road Construction	2-48
2.5.2 Well Drilling and Completion	2-48
2.5.2.1 Land Requirements	2-48
2.5.2.2 Well Pad Construction	2-48
2.5.2.3 Well Drilling	2-48
2.5.2.4 Well Completion and Production.....	2-48
2.5.3 Pipelines.....	2-48
2.5.4 Water Supply and Disposal.....	2-49
2.5.5 Waste Disposal.....	2-49
2.5.6 Abandonment and Reclamation	2-49
2.5.7 Workforce Requirements.....	2-49
2.5.8 Workovers.....	2-49
2.5.9 Applicant-committed Environmental Protection Measures	2-49
2.6 Alternative E: <u>Reduced Development with Directional Drilling</u>.....	2-50
2.6.1 Access Roads	2-51
2.6.1.1 Land Requirements	2-51
2.6.1.2 Road Construction	2-51
2.6.2 Well Drilling and Completion	2-51
2.6.2.1 Land Requirements	2-51
2.6.2.2 Well-pad Construction	2-51
2.6.2.3 Well Drilling.....	2-51
2.6.2.4 Well Completion and Production.....	2-52
2.6.3 Pipelines.....	2-52

2.6.4 Water Supply and Disposal.....	2-52
2.6.5 Waste Disposal.....	2-52
2.6.6 Abandonment and Reclamation.....	2-52
2.6.6.1 Interim Reclamation.....	2-52
2.6.6.2 Dry Hole/Abandoned Location.....	2-53
2.6.7 Workforce Requirements.....	2-53
2.6.8 Workovers.....	2-53
2.6.9 Applicant-committed Environmental Protection Measures.....	2-53
2.7 Alternative F: Agency Preferred Alternative.....	2-53
<u>2.7.1 Access Roads</u>	2-54
<u>2.7.1.1 Land Requirements</u>	2-54
<u>2.7.1.2 Road Construction</u>	2-54
<u>2.7.2 Well Drilling and Completion</u>	2-55
<u>2.7.2.1 Land Requirements</u>	2-55
<u>2.7.2.2 Well-pad Construction</u>	2-55
<u>2.7.2.3 Well Drilling</u>	2-55
<u>2.7.2.4 Well Completion and Production</u>	2-55
<u>2.7.3 Pipelines</u>	2-55
<u>2.7.4 Water Supply and Disposal</u>	2-56
<u>2.7.5 Waste Disposal</u>	2-56
<u>2.7.6 Abandonment and Reclamation</u>	2-56
<u>2.7.6.1 Interim Reclamation</u>	2-57
<u>2.7.6.2 Dry Hole/Abandoned Location</u>	2-57
<u>2.7.7 Workforce Requirements</u>	2-57
<u>2.7.8 Workovers</u>	2-57
<u>2.7.9 Applicant-committed Environmental Protection Measures</u>	2-57
2.8 Comparison of Alternatives.....	2-57
2.9 Alternatives Considered but Eliminated from Detailed Analysis.....	2-58
2.9.1 Total Avoidance of Development In Sensitive Areas.....	2-58
2.9.2 Wells for Subsurface Water Disposal.....	2-60
<u>2.9.2.1 Assessment of Formation Suitability for Disposal</u>	2-60
<u>2.9.2.2 Comparison to Other Operators in Basin</u>	2-62
<u>2.9.2.3 Assessment of Suitability of Water Chemistry for Disposal</u>	2-63
2.9.3 Complete Reliance on Buried Pipelines and Centralized Tank Batteries.....	2-64
2.10 Summary of Impacts.....	2-65

CHAPTER 3. AFFECTED ENVIRONMENT	3-1
3.1 Introduction.....	3-1
3.1.1 General Setting.....	3-1
3.1.2 <u>Resources of Concern</u> and Other Resources Brought Forward for Analysis.....	3-1
3.2 Air Quality.....	3-2
3.2.1 Introduction.....	3-2
3.2.2 Climate.....	3-2
3.2.2.1 Temperature and Precipitation.....	3-2
3.2.2.2 Winds and Atmospheric Stability	3-4
3.2.3 Existing Air Quality	3-5
3.2.3.1 Regulatory Environment.....	3-5
3.2.3.2 Existing Sources of Air Pollution	3-19
3.2.3.3 Air Quality Related Values	3-20
3.3 Cultural Resources	3-27
3.3.1 <u>Area of Potential Effects (APE)</u>	3-27
3.3.2 Identifying Cultural Resources in the Project Area: <u>Predictive Modeling and Literature Reviews</u>	3-28
3.3.3 Cultural Resources in the Project Area.....	3-29
3.3.3.1 Prehistoric and Ethnographic Cultural Resources	3-30
3.3.3.2 Historical Cultural Resources	3-32
3.3.3.3 Non-archaeological Site Types	3-34
3.3.4 National Register-listed Sites.....	3-34
3.3.5 Summary of Cultural Resources	3-35
3.4 Geology and Minerals.....	3-35
3.4.1 Mineral Resources	3-35
3.4.1.1 Oil and Gas Resources	3-35
3.4.1.2 Tar Sands	3-35
3.4.1.3 Oil Shale.....	3-37
3.4.1.4 Gilsonite.....	3-38
3.4.1.5 Locatable Minerals.....	3-39
3.4.1.6 Mineral Materials.....	3-39
3.5 Land Use and Transportation	3-40
3.5.1 Land Use	3-40
3.5.2 Transportation	3-41
3.6 Livestock Management.....	3-43
3.6.1 Regional Management Overview	3-43
3.6.2 Allotments in the Project area.....	3-43

3.7 Paleontological Resources	3-46
3.7.1 Regional Overview	3-46
3.7.2 Resource Assessment Guidelines	3-47
3.7.2.1 Condition Classification System.....	3-47
3.7.2.2 Potential Fossil Yield Classification.....	3-47
3.7.3 Resource Assessment Overview	3-49
3.7.4 Summary	3-50
3.8 Recreation.....	3-50
3.8.1 Regional Overview	3-50
3.8.2 Recreational Opportunities	3-51
3.8.3 Recreation Use in Special Recreation Management Areas.....	3-52
3.8.3.1 Nine Mile Canyon SRMA	3-52
3.8.4 Recreation Use in Extensive Recreation Management Areas (<u>ERMAs</u>).....	3-53
3.8.4.1 Hunting and Fishing.....	3-54
3.8.4.2 OHV Recreation.....	3-54
3.8.4.3 River Recreation	3-55
3.8.4.4 Wetlands Recreation	3-56
3.8.4.5 Hiking	3-56
3.9 Socioeconomics.....	3-57
3.9.1 Population Growth, Distribution, and Characteristics	3-57
3.9.1.1 Labor Force Characteristics	3-58
3.9.2 Employment and Income	3-58
3.9.3 Housing.....	3-59
3.9.4 Public Services and Infrastructure	3-59
3.9.5 Public Costs and Revenue.....	3-60
3.9.6 <u>Tourism and Recreation</u>	3-61
3.9.7 <u>Environmental Justice</u>	3-62
3.10 Soils	3-64
3.10.1 Regional Overview	3-64
3.10.2 Soil Characteristics of Greatest Management Concern	3-64
3.10.2.1 Rehabilitation Restrictions.....	3-65
3.10.2.2 Presence of Biological Soil Crusts.....	3-68
3.10.3 Soils Resources Summary.....	3-68
3.11 Special Designations	3-69
3.11.1 Pariette Wetlands ACEC.....	3-69
3.11.2 Lower Green River Corridor ACEC	3-70
3.11.3 Nine Mile Canyon ACEC	3-70

3.11.4 Lower Green River Wild and Scenic River	3-71
3.12 Special Status Species	3-72
3.12.1 Federally Listed Threatened, Endangered, and Candidate Species	3-72
3.12.1.1 Threatened, Endangered, and Candidate Plant Species	3-73
3.12.1.2 Threatened, Endangered, and Candidate Wildlife Species	3-79
3.12.1.3 Threatened, Endangered, and Candidate Fish Species	3-82
3.12.2 BLM Sensitive Species	3-84
3.12.2.1 Sensitive Plant Species	3-85
3.12.2.2 Sensitive Wildlife Species	3-87
3.12.2.3 Sensitive Fish Species	3-93
3.12.3 Other Special Status Species	3-94
3.12.3.1 Raptors	3-94
3.12.3.2 Migratory Birds	3-96
3.13 Vegetation	3-98
3.13.1 Regional Overview	3-98
3.13.2 Vegetation Types	3-99
3.13.2.1 Scrub/Shrub	3-100
3.13.2.2 Evergreen Forest	3-102
3.13.2.3 Barren Lands	3-103
3.13.2.4 Grasslands/ Herbaceous	3-104
3.13.2.5 Woody Wetland	3-105
3.13.2.6 Disturbed and Agricultural Land	3-105
3.13.2.7 Other	3-106
3.13.2.8 Developed	3-106
3.13.2.9 Emergent Herbaceous Wetland	3-106
3.13.3 Invasive and Noxious Weeds	3-106
3.14 Visual Resources	3-107
3.14.1 Visual Resources Management (VRM)	3-108
3.14.2 Key Observation Points (KOPs) and Contrast Analysis	3-109
3.14.2.1 KOP 1—Green River Shoreline	3-110
3.14.2.2 KOP 2—Fourmile Bottom	3-110
3.14.2.3 KOP 3—West of Blind Canyon	3-111
3.14.2.4 KOP 4—Wild Horse Bench	3-111
3.14.2.5 KOP 5— Sand Wash Road	3-112
3.14.2.6 KOP 6—Wrinkle Road	3-112
3.14.2.7 KOP 7—Wrinkle Road and Devils Canyon	3-113
3.15 Water Resources	3-114
3.15.1 Regional Overview	3-114
3.15.2 Groundwater Resources	3-115

3.15.2.1 Occurrence of Groundwater Resources	3-115
3.15.2.2 Recharge/Discharge of Aquifers	3-118
3.15.2.3 Groundwater Quality	3-118
3.15.3 Surface Water Resources	3-120
3.15.3.1 Project Area Drainages	3-120
3.15.3.2 Surface Water Occurrence	3-122
3.15.3.3 Surface Water Quality.....	3-122
3.15.4 Wetlands and Riparian Zones	3-133
3.15.5 Floodplains.....	3-133
3.16 Wildlife.....	3-133
3.16.1 Big Game	3-133
3.16.1.1 Mule Deer	3-136
3.16.1.2 Rocky Mountain Elk	3-138
3.16.1.3 Pronghorn.....	3-139
3.16.1.4 Rocky Mountain Bighorn Sheep.....	3-139
3.16.2 Mountain Lion (Cougar)	3-140
3.16.3 Upland Game	3-141
3.16.4 Reptiles, Amphibians, and Other Non-game Species	3-141
3.16.5 Aquatic Species.....	3-142
3.17 Wilderness Characteristics	3-142
 CHAPTER 4.0 ENVIRONMENTAL CONSEQUENCES	 4-1
4.1 Introduction.....	4-1
4.1.1 Analytical Assumptions	4-2
4.1.2 Types of Impacts to be Addressed	4-3
4.1.2.1 Unavoidable Adverse Impacts	4-3
4.1.2.2 Irretrievable and Irreversible Commitments of Resources	4-4
4.1.2.3 Relationship of Short-term Uses to Long-term Productivity.....	4-4
4.1.3 Consideration of Supplemental Authorities.....	4-4
4.1.4 Environmental Consequences of Alternatives	4-5
4.2 Air Quality.....	4-5
4.2.1 Near-field Air Quality.....	4-6
4.2.1.1 Development	4-6
4.2.1.2 Operations	4-12
4.2.2 Far-field Air Quality	4-36
4.2.2.1 Ambient Air Quality Impacts.....	4-39
4.2.2.2 Visibility Impairment.....	4-53
4.2.2.3 Terrestrial Acid Deposition.....	4-57

4.2.2.4 Aquatic Acid Deposition.....	4-60
4.2.3 Mitigation.....	4-67
4.2.4 Unavoidable Adverse Impacts	4-67
4.2.5 Irreversible and Irretrievable Effects	4-67
4.2.6 Relationship of Short-term Uses to Long-term Productivity.....	4-67
4.3 Cultural Resources	4-67
4.3.1 Direct and Indirect Effects	4-68
4.3.1.1 Alternative A: Proposed Action.....	4-70
4.3.1.2 Alternative B: Reduced Development	4-70
4.3.1.3 Alternative C: Full Development.....	4-71
4.3.1.4 Alternative D: No Action.....	4-71
4.3.1.5 Alternative E: <u>Reduced Development with Directional Drilling</u>	4-71
4.3.1.6 Alternative F: <u>Agency Preferred Alternative</u>	4-72
4.3.2 Mitigation.....	4-72
4.3.3 Unavoidable Adverse Impacts	4-73
4.3.4 Irretrievable and Irreversible Commitments of Resources	4-73
4.3.5 Relationship of Short-term Uses to Long-term Productivity.....	4-73
4.4 Geology and Minerals.....	4-73
4.4.1 Direct and Indirect Effects	4-74
4.4.1.1 Alternative A: Proposed Action.....	4-74
4.4.1.2 Alternative B: Reduced Development	4-77
4.4.1.3 Alternative C: Full Development.....	4-77
4.4.1.4 Alternative D: No Action.....	4-78
4.4.1.5 Alternative E: <u>Reduced Development with Directional Drilling</u>	4-79
4.4.1.6 Alternative F: <u>Agency Preferred Alternative</u>	4-80
4.4.2 Mitigation.....	4-80
4.4.3 Unavoidable Adverse Impacts	4-81
4.4.4 Irretrievable and Irreversible Commitments of Resources	4-81
4.4.5 Relationship of Short-term Uses to Long-term Productivity.....	4-81
4.5 Land Use and Transportation	4-81
4.5.1 Direct and Indirect Effects	4-81
4.5.1.1 Alternative A: Proposed Action.....	4-81
4.5.1.2 Alternative B: Reduced Development	4-90
4.5.1.3 Alternative C: Full Development.....	4-92
4.5.1.4 Alternative D: No Action.....	4-94
4.5.1.5 Alternative E: <u>Reduced Development with Directional Drilling</u>	4-95
4.5.1.6 Alternative F: <u>Agency Preferred Alternative</u>	4-97
4.5.2 Mitigation.....	4-99

4.5.2.1 Land Use Mitigation	4-99
4.5.2.2 Transportation Mitigation	4-99
4.5.3 Unavoidable Adverse Impacts	4-100
4.5.4 Irretrievable and Irreversible Commitments of Resources	4-100
4.5.5 Relationship of Short-term Uses to Long-term Productivity	4-100
4.6 Livestock Management.....	4-100
4.6.1 Direct and Indirect Effects	4-101
4.6.1.1 Alternative A: Proposed Action.....	4-101
4.6.1.2 Alternative B: Reduced Development	4-104
4.6.1.3 Alternative C: Full Development.....	4-104
4.6.1.4 Alternative D: No Action.....	4-104
4.6.1.5 Alternative E: <u>Reduced Development with Directional Drilling</u>	4-104
4.6.1.6 Alternative F: <u>Agency Preferred Alternative</u>	4-104
4.6.2 Mitigation.....	4-105
4.6.3 Unavoidable Adverse Impacts	4-105
4.6.4 Irretrievable and Irreversible Commitments of Resources	4-105
4.6.5 Relationship of Short-term Uses to Long-term Productivity	4-105
4.7 Paleontological Resources	4-105
4.7.1 Direct and Indirect Effects	4-106
4.7.1.1 Alternative A: Proposed Action.....	4-106
4.7.1.2 Alternative B: Reduced Development	4-109
4.7.1.3 Alternative C: Full Development.....	4-109
4.7.1.4 Alternative D: No Action.....	4-110
4.7.1.5 Alternative E: <u>Reduced Development with Directional Drilling</u>	4-110
4.7.1.6 Alternative F: <u>Agency Preferred Alternative</u>	4-110
4.7.2 Mitigation.....	4-111
4.7.3 Unavoidable Adverse Impacts	4-111
4.7.4 Irretrievable and Irreversible Commitments of Resources	4-111
4.7.5 Relationship of Short-term Uses to Long-term Productivity	4-112
4.8 Recreation.....	4-112
4.8.1 Direct and Indirect Effects	4-115
4.8.1.1 Alternative A: Proposed Action.....	4-116
4.8.1.2 Alternative B: Reduced Development	4-123
4.8.1.3 Alternative C: Full Development.....	4-126
4.8.1.4 Alternative D: No Action.....	4-129
4.8.1.5 Alternative E: <u>Reduced Development with Directional Drilling</u>	4-131
4.8.1.6 Alternative F: <u>Agency Preferred Alternative</u>	4-134
4.8.2 Mitigation.....	4-137

4.8.3 Unavoidable Adverse Impacts	4-137
4.8.4 Irretrievable and Irreversible Commitments of Resources	4-137
4.8.5 Relationship of Short-term Uses to Long-term Productivity	4-138
4.9 Socioeconomics	4-138
4.9.1 Direct and Indirect Effects	4-138
4.9.1.1 Alternative A: Proposed Action	4-138
4.9.1.2 Alternative B: Reduced Development	4-146
4.9.1.3 Alternative C: Full Development	4-146
4.9.1.4 Alternative D: No Action	4-147
4.9.1.5 Alternative E: <u>Reduced Development with Directional Drilling</u>	4-148
4.9.1.6 Alternative F: <u>Agency Preferred Alternative</u>	4-148
4.9.2 Mitigation	4-149
4.9.3 Unavoidable Adverse Impacts	4-149
4.9.4 Irretrievable and Irreversible Commitments of Resources	4-149
4.9.5 Relationship of Short-term Uses to Long-term Productivity	4-150
4.10 Soils	4-150
4.10.1 Direct and Indirect Effects	4-150
4.10.1.1 Alternative A: Proposed Action	4-150
4.10.1.2 Alternative B: Reduced Development	4-157
4.10.1.3 Alternative C: Full Development	4-158
4.10.1.4 Alternative D: No Action	4-159
4.10.1.5 Alternative E: <u>Reduced Development with Directional Drilling</u>	4-160
4.10.1.6 Alternative F: <u>Agency Preferred Alternative</u>	4-161
4.10.2 Mitigation	4-163
4.10.3 Unavoidable Adverse Impacts	4-164
4.10.4 Irretrievable and Irreversible Commitments of Resources	4-164
4.10.5 Relationship of Short-term Uses to Long-term Productivity	4-164
4.11 Special Designations	4-164
4.11.1 Direct and Indirect Effects	4-165
4.11.1.1 Alternative A: Proposed Action	4-165
4.11.1.2 Alternative B: Reduced Development	4-173
4.11.1.3 Alternative C: Full Development	4-176
4.11.1.4 Alternative D: No Action	4-179
4.11.1.5 Alternative E: <u>Reduced Development with Directional Drilling</u>	4-183
4.11.1.6 Alternative F: <u>Agency Preferred Alternative</u>	4-185
4.11.2 Mitigation	4-187
4.11.3 Unavoidable Adverse Impacts	4-188
4.11.4 Irretrievable and Irreversible Commitments of Resources	4-188

4.11.5 Relationship of Short-term Uses to Long-term Productivity	4-188
4.12 Special Status Species	4-189
4.12.1 Direct and Indirect Effects	4-190
4.12.1.1 Alternative A: Proposed Action.....	4-190
4.12.1.2 Alternative B: Reduced Development	4-234
4.12.1.3 Alternative C: Full Development.....	4-248
4.12.1.4 Alternative D: No Action.....	4-262
4.12.1.5 Alternative E: <u>Reduced Development with Directional Drilling</u>	4-276
4.12.1.6 Alternative F: <u>Agency Preferred Alternative</u>	4-289
4.12.2 <u>Mitigation Measures</u>	4-302
4.12.2.1 <u>Mitigation Measures</u> for Special Status Plants	4-302
4.12.2.2 <u>Mitigation Measures</u> the Western Yellow-billed Cuckoo	4-303
4.12.2.3 <u>Mitigation Measures</u> for Raptors, including the Bald Eagle, Golden Eagle, Mexican Spotted Owl, Burrowing Owl, Ferruginous Hawk, and Short- eared Owl	4-303
4.12.2.4 <u>Mitigation Measures</u> for Migratory Birds.....	4-304
4.12.2.5 <u>Mitigation Measures</u> for Greater Sage-grouse.....	4-305
4.12.2.6 <u>Mitigation Measures</u> for Colorado River System Endangered and Sensitive Fish.....	4-305
4.12.2.7 <u>Mitigation Measures</u> for Bats.....	4-306
4.12.2.8 <u>Mitigation Measures</u> for White-tailed Prairie Dog	4-307
4.12.3 Unavoidable Adverse Impacts	4-307
4.12.4 Irretrievable and Irreversible Commitments of Resources	4-307
4.12.5 Relationship of Short-term Uses to Long-term Productivity	4-307
4.13 Vegetation	4-308
4.13.1 Direct and Indirect Effects	4-308
4.13.1.1 Alternative A: Proposed Action.....	4-308
4.13.1.2 Alternative B: Reduced Development	4-314
4.13.1.3 Alternative C: Full Development.....	4-315
4.13.1.4 Alternative D: No Action.....	4-316
4.13.1.5 Alternative E: <u>Reduced Development with Directional Drilling</u>	4-317
4.13.1.6 Alternative F: <u>Agency Preferred Alternative</u>	4-317
4.13.2 Mitigation.....	4-318
4.13.3 Unavoidable Adverse Impacts	4-320
4.13.4 Irretrievable and Irreversible Commitments of Resources	4-320
4.13.5 Relationship of Short-term Uses to Long-term Productivity.....	4-320
4.14 Visual Resources	4-320
4.14.1 Methodology	4-322
4.14.2 Direct and Indirect Effects	4-323

4.14.2.1 Alternative A: Proposed Action.....	4-323
4.14.2.2 Alternative B: Reduced Development	4-327
4.14.2.3 Alternative C: Full Development.....	4-328
4.14.2.4 Alternative D: No Action.....	4-330
4.14.2.5 Alternative E: <u>Reduced Development with Directional Drilling</u>	4-331
4.14.2.6 Alternative F: <u>Agency Preferred Alternative</u>	4-333
4.14.3 Mitigation.....	4-335
4.14.4 Unavoidable Adverse Impacts	4-335
4.14.5 Irretrievable and Irreversible Commitments of Resources	4-336
4.14.6 Relationship of Short-term Uses to Long-term Productivity	4-336
4.15 Water Resources	4-336
4.15.1 Direct and Indirect Effects	4-337
4.15.1.1 Alternative A: Proposed Action.....	4-337
4.15.1.2 Alternative B: Reduced Development	4-354
4.15.1.3 Alternative C: Full Development.....	4-357
4.15.1.4 Alternative D: No Action.....	4-359
4.15.1.5 Alternative E: <u>Reduced Development with Directional Drilling</u>	4-361
4.15.1.6 Alternative F: <u>Agency Preferred Alternative</u>	4-363
4.15.2 Mitigation.....	4-365
4.15.3 Unavoidable Adverse Impacts	4-368
4.15.4 Irretrievable and Irreversible Commitments of Resources	4-368
4.15.5 Relationship of Short-term Uses to Long-term Productivity	4-368
4.16 Wildlife.....	4-368
4.16.1 Direct and Indirect Effects	4-369
4.16.1.1 Alternative A: Proposed Action.....	4-369
4.16.1.2 Alternative B: Reduced Development	4-389
4.16.1.3 Alternative C: Full Development.....	4-392
4.16.1.4 Alternative D: No Action.....	4-396
4.16.1.5 Alternative E: <u>Reduced Development with Directional Drilling</u>	4-399
4.16.1.6 Alternative F: <u>Agency Preferred Alternative</u>	4-402
4.16.2 Mitigation.....	4-405
4.16.3 Unavoidable Adverse Impacts	4-406
4.16.4 Irretrievable and Irreversible Commitments of Resources	4-406
4.16.5 Relationship of Short-term Uses to Long-term Productivity	4-406
4.17 Wilderness Characteristics	4-407
4.17.1 Direct and Indirect Effects	4-407
4.17.1.1 Alternative A: Proposed Action Alternative.....	4-407
4.17.1.2 Alternative B: Reduced Development	4-408

4.17.1.3 Alternative C: Full Development.....	4-408
4.17.1.4 Alternative D: No Action.....	4-409
4.17.1.5 Alternative E: <u>Reduced Development with Directional Drilling</u>	4-409
4.17.1.6 Alternative F: <u>Agency Preferred Alternative</u>	4-409
4.17.2 Mitigation.....	4-409
4.17.3 Unavoidable Adverse Impacts	4-410
4.17.4 Irretrievable and Irreversible Commitments of Resources	4-410
4.17.5 Relationship of Short-term Uses to Long-term Productivity.....	4-410
4.18 Cumulative Impacts.....	4-410
4.18.1 Introduction.....	4-410
4.18.2 <u>Past, Present, and Reasonably Foreseeable Future Actions and Development</u>	4-412
4.18.2.1 Geology and Minerals.....	4-412
4.18.2.2 Land Use and Transportation.....	4-416
4.18.2.3 Livestock Management.....	4-416
4.18.2.4 Recreation	4-416
4.18.2.5 Riparian.....	4-416
4.18.2.6 Soils.....	4-482
4.18.2.7 Special Designations.....	4-417
4.18.2.8 Special Status Species.....	4-417
4.18.2.9 Vegetation Treatments	4-483
4.18.2.10 Wildlife	4-418
4.18.3 Cumulative Impacts Related to the Proposed Action and Alternatives.....	4-418
4.18.3.1 Air Quality	4-418
4.18.3.2 Cultural Resources	4-449
4.18.3.3 Geology and Minerals.....	4-452
4.18.3.4 Land Use and Transportation.....	4-530
4.18.3.5 Livestock Management.....	4-533
4.18.3.6 Paleontology	4-537
4.18.3.7 Recreation	4-461
4.18.3.8 Socioeconomics <u>and Environmental Justice</u>	4-463
4.18.3.9 Soils.....	4-542
4.18.3.10 Special Designations.....	4-466
4.18.3.11 Special Status Species.....	4-546
4.18.3.12 Vegetation	4-469
4.18.3.13 Visual Resources.....	4-549
4.18.3.14 Water Resources	4-472
4.18.3.15 Wildlife	4-555
4.18.3.16 Wilderness Characteristics.....	4-477

CHAPTER 5. CONSULTATION AND COORDINATION	5-1
5.1 Introduction.....	5-1
5.2 Persons, Groups, and Agencies Consulted	5-1
5.2.1 Federal Offices	5-1
5.2.2 Tribes	5-1
5.2.3 State Offices.....	5-1
5.2.4 Local Offices.....	5-1
5.2.5 Special Interest.....	5-2
5.2.6 Industry	5-2
5.2.7 Media	5-3
5.3 Coordination.....	5-3
5.4 Summary of Public <u>and Agency Scoping</u>.....	5-4
<u>5.5 Summary of Public Comment on the Draft EIS</u>	5-4
<u>5.5.1 Draft EIS Availability and Public Meetings</u>	5-4
<u>5.5.2 Responding to Comments on the Draft EIS</u>	5-5
<u>5.6 Section 106 and Government-to-government Consultation</u>.....	5-6
<u>5.6.1 Section 106 Consultation</u>	5-6
<u>5.6.2 Government-to government Consultation</u>	5-7
<u>5.6.3 Section 7 Consultation</u>	5-8
5.7 List of Preparers	5-9
References	X-1
Acronyms and Glossary	X-23
Index.....	X-49

List of Figures

Figure 2-1. Example of a well pad layout	2-21
Figure 3-1. Wind Rose of Canyonlands NP wind speed direction data 1995-1999 (blowing from)	3-5
Figure 3-2. Gasco Uinta Basin Natural Gas Development project area with surrounding Prevention of Significant Deterioration Class I and Class II areas.	3-9
Figure 3-3. West Tavaputs EIS ozone modeling demonstration.	3-16
Figure 3-4. UBAQS ozone modeling demonstration.	3-17
Figure 3-5. UBAQS PM _{2.5} modeling demonstration.	3-18
Figure 3-6. Visibility conditions at Canyonlands National Park, Utah.	3-23
Figure 3-7. Visibility conditions at Weminuche Wilderness, Colorado.	3-24
Figure 3-8. Reconstructed 20% clearest seasonal visibility condition.	3-27
Figure 3-9. Generalized stratigraphy and major aquifers in project area.	3-116
Figure 3-10. Geologic cross-section.	3-117
Figure 4-1. Proposed Action near-field operations five-year average of 6 th high maximum predicted PM ₁₀ impacts.	4-15
Figure 4-2. Class I and Sensitive Class II areas within analysis area.	4-38
Figure 4-3. Daily trips by project vehicles over the life of the project.	4-85

List of Tables

Table ES-1. Comparison of Alternatives	ES-12
Table 1-1. Issues Addressed in EIS	1-7
Table 1-2. Regulatory Compliance and Mandates for Gasco Uinta Basin Natural Gas Development Project Components	1-8
Table 1-3. Major Permits, Approvals, and Authorizing Actions Required for the Proposed Gasco Uinta Basin Natural Gas Development Project	1-9
Table 2-1. Regulatory Requirements, BLM Policy Guidelines, Standard Operating Practices, and Applicant-committed <u>Best Management Practices (BMPs)</u> Common to All Alternatives	2-3
Table 2-2. Main Access Routes in the Project Area	2-19
Table 2-3. Seed Used on the Topsoil during Interim Reclamation	2-32
Table 2-4. Estimated Worker Days per Well	2-33
Table 2-5. Estimated Vehicle Roundtrips per Well	2-33
Table 2-6. Raptor Nest Buffers and Timing Constraints	2-36
Table 2-7. Comparison of Alternatives	2-57
Table 2-8. Project Area Average Produced Water Scaling Constituents	2-63
Table 2-9. Summary of Impacts	2-67
Table 3-1. Temperature, Precipitation, and Snowfall at Nutters Ranch, Utah (1963–1986)	3-2
Table 3-2. Temperature, Precipitation, and Snowfall at <u>Sunnyside</u> , Utah (1963–1986)	3-3
Table 3-3. National Ambient Air Quality Standards	3-7
Table 3-4. Prevention of Significant Deterioration (<u>PSD</u>) Increments	3-9
Table 3-5. <u>Hazardous Air Pollutant (HAP)</u> Reference Exposure Levels and Reference Concentrations (<u>RfCs</u>)	3-10
Table 3-6. <u>Criteria Pollutant Background in the Uinta Basin</u>	3-19

Table 3-7. Nitrogen and Sulfur Deposition at Canyonlands, Utah	3-21
Table 3-8. Potential Acid Neutralizing Capacity Changes at Sensitive Lakes	3-21
Table 3-9. Canyonlands National Park Reconstructed Visibility Conditions (20% cleanest)...	3-25
Table 3-10. Weminuche Wilderness Reconstructed Visibility Conditions (20% cleanest)	3-25
Table 3-11. White River National Forest Reconstructed Visibility Conditions (20% cleanest).....	3-26
Table 3-12. Estimated Number of Barrels of Bitumen Contained within the STSAs in and Near the Project Area	3-36
Table 3-13. Project Area Rights of Grants.....	3-40
Table 3-14. <u>Nine Mile Canyon Backcountry Byway Segments Included in Gasco's Proposed Transportation Network (north to south)</u>	3-42
Table 3-15. Allotment Acreages and <u>Animal Unit Months (AUMs)</u> in the Project Area	3-45
Table 3-16. Summarized Paleontological Sensitivities of Geologic Units in the Project Area Using the Condition Classification System and the PFYC System ¹	3-50
Table 3-17. <u>Typical Sound Levels Measured in the Environment and Industry</u>	3-52
Table 3-18. Acres and Percentage of Project Area Open, Limited, and Closed to OHV Use...	3-55
Table 3-19. Uintah and Duchesne County Population 1990–2004	3-58
Table 3-20. Uintah and Duchesne County Employment and Income 1990–2000	3-59
Table 3-21. Gasco's 2005 Tax Contributions	3-60
Table 3-22. <u>Poverty and Minority Population Characteristics of Selected Communities in Duchesne and Uintah Counties, 2000</u>	3-64
Table 3-23. Parameter Ranges Used to Define Soil Features Restrictive to Rehabilitation.....	3-65
Table 3-24. Extent of Soils with Restrictive Characteristics in the Project Area (in acres)	3-66
Table 3-25. Acres of Wildlife Habitat within Nine Mile Canyon ACEC.....	3-71
Table 3-26. Acres and Percentage of Unfavorable Migratory Bird Habitat in the Project Area Due to Existing Roads	3-96
Table 3-27. Acres of National Land Cover Description Vegetation Types in the Project Area .	3-99
Table 3-28. BLM <u>Visual Resource Management (VRM)</u> Class Objectives.....	3-108
Table 3-29. VRM Designations in the Project Area	3-109
Table 3-30. <u>Known Groundwater Users in the Project Area</u>	3-119
Table 3-31. <u>Available Water Quality Data for the Project Area</u>	3-120
Table 3-32. Subbasin Drainage Area (in Acres) <u>in the Project Area</u> , <u>Percentage of Project Area</u>	3-121
Table 3-33. Beneficial Use Designations for Streams in the Project Area	3-123
Table 3-34. <u>Water Quality Standards for Beneficial Uses Pertinent to Pariette Draw, Nine Mile Creek, and Their Watersheds</u>	3-124
Table 3-35. <u>Summary of Water Quality Data for Parameters of Concern for Creeks Downstream of the Project Area in the Pariette Draw Watershed</u>	3-129
Table 3-36. <u>Summary of Data for Temperature (°C) at Nine Mile Creek</u>	3-130
Table 3-37. <u>Summary of TMDL Load Reductions in Pariette Draw (STORET site 4933480) Required for Surface Waters Downstream of the Proposed Project</u>	3-130
Table 3-38. BLM-designated Big Game Habitat in the Project Area.....	3-134
Table 3-39. BLM Habitat Designation Definitions	3-135
Table 3-40. UDWR-defined Big Game Habitat in the Project Area	3-135
Table 3-41. UDWR Habitat Definitions	3-136

Table 3-42. Miles of Roads, Acres of Unfavorable Habitat, and Percentage of Unfavorable Habitat Under Current Conditions in BLM-designated Big Game Habitat	3-137
Table 3-43. Miles of Roads, Acres of Unfavorable Habitat, and Percentage of Unfavorable Habitat Under Current Conditions in UDWR Big Game Habitat	3-137
Table 4-1. Supplemental Authorities to be Considered	4-4
Table 4-2. Annual Well Development Emissions for Each Alternative	4-7
Table 4-3. Alternative A (Proposed Action) Near-field Development Impacts	4-8
Table 4-4. Predicted Near-field Development Impacts	4-9
Table 4-5. Greenhouse Gases – Project Development Emissions (tons/yr)	4-10
Table 4-6. Greenhouse Gases – Central Facility Emissions (per facility) Tons/yr	4-11
Table 4-7. Annual Operations Emissions for Each Alternative (tons/year)	4-12
Table 4-8. Water Evaporation Facility (WEF) and Production Well Sites 1-hour NO ₂ Modeling Analysis	4-14
Table 4-9. Alternative A Proposed Action) Near-field Operations Criteria Pollutants Predicted Impacts	4-15
Table 4-10. Alternative B Near-field Operations Criteria Pollutants Predicted Impacts	4-16
Table 4-11. Alternative C Near-field Operations Criteria Pollutant Predicted Impacts	4-17
Table 4-12. Alternative D (No Action) Near-field Operations Criteria Pollutant Predicted Impacts	4-17
Table 4-13. Alternative E Near-field Operations Criteria Pollutant Predicted Impacts	4-18
Table 4-14. Alternative F Near-field Operations Criteria Pollutant Predicted Impacts (modeling not performed, impacts assumed equal to or less than Alternative A).....	4-19
Table 4-15. Greenhouse Gases – Overall Operational Emissions ^a (tons/year).....	4-20
Table 4-16. Utah Toxic Screening Level (TSL) Impacts for Each Alternative	4-21
Table 4-17. Alternative A (Proposed Action) Non-carcinogenic Acute REL and RfC Impacts	4-23
Table 4-18. Alternative B Non-carcinogenic Acute REL and RfC Impacts.....	4-24
Table 4-19. Alternative C Non-carcinogenic Acute REL and RfC Impacts.....	4-25
Table 4-20. Alternative D (No Action) Non-carcinogenic Acute REL and RfC Impacts	4-26
Table 4-21. Alternative E Non-carcinogenic Acute REL and RfC Impacts	4-27
Table 4-22. Alternative F Non-carcinogenic Acute REL and RfC Impacts ^j	4-28
Table 4-23. WEF-controlled Emission Scenario: HAP Impacts from the WEF	4-29
Table 4-24. Proposed Action Carcinogenic HAP Risk.....	4-30
Table 4-25. Carcinogenic HAP MLE Risk for Each Alternative	4-32
Table 4-26. Carcinogenic HAP MEI Risk for Each Alternative	4-32
Table 4-27. Summary of Near-field Operation Predicted Impacts	4-34
Table 4-28. Summary of Near-field Operation Predicted Impacts to PSD Class II Increments	4-34
Table 4-29. Summary of HAP REL Operation Impacts for Each Alternative	4-34
Table 4-30. Summary of HAP RfC Operation Impacts for each alternative	4-35
Table 4-31. Summary of Total Carcinogenic HAP Risk for Each Alternative	4-36
Table 4-32. Class I and Sensitive Class II ^a Areas	4-36
Table 4-33. Sensitive Lakes	4-37
Table 4-34. Alternative A (Proposed Action) Maximum Pollutant Concentrations for Modeled Years (2001–2003) at Class I Areas (micrograms per cubic meter)	4-40

Table 4-35. Alternative B Maximum Pollutant Concentrations for Modeled Years (2001–2003) at Class I Areas (micrograms per cubic meter).....	4-41
Table 4-36. Alternative C Maximum Pollutant Concentrations for Modeled Years (2001–2003) at Class I Areas (micrograms per cubic meter).....	4-42
Table 4-37. Alternative D (No Action) Maximum Pollutant Concentrations for Modeled Years (2001–2003) at Class I Areas (micrograms per cubic meter)	4-43
Table 4-38. Alternative E Maximum Pollutant Concentrations for Modeled Years (2001–2003) at Class I Areas (micrograms per cubic meter).....	4-44
Table 4-39. <u>Alternative F^b Maximum Pollutant Concentrations for Modeled Years (2001–2003) at Class I Areas (micrograms per cubic meter)</u>	4-45
Table 4-40. Alternative A (Proposed Action) Maximum Pollutant Concentrations for Modeled Years (2001–2003) at Class II Areas (micrograms per cubic meter)...	4-46
Table 4-41. Alternative B Maximum Pollutant Concentrations for Modeled Years (2001–2003) at Class II Areas (micrograms per cubic meter)	4-47
Table 4-42. Alternative C Maximum Pollutant Concentrations for Modeled Years (2001–2003) at Class II Areas (micrograms per cubic meter)	4-48
Table 4-43. Alternative D (No Action) Maximum Pollutant Concentrations for Modeled Years (2001–2003) at Class II Areas (micrograms per cubic meter).....	4-49
Table 4-44. Alternative E Maximum Pollutant Concentrations for Modeled Years (2001–2003) at Class II Areas (micrograms per cubic meter)	4-50
Table 4-45. <u>Alternative F^b Maximum Pollutant Concentrations for Modeled Years (2001–2003) at Class II Areas (micrograms per cubic meter)</u>	4-51
Table 4-46. Far-field Maximum Predicted Potential Impact at Class I Areas NAAQS Comparison for Each Alternative (micrograms per cubic meter) ¹	4-52
Table 4-47. Far-field Maximum Predicted Potential Impact at Class II Areas NAAQS Comparison for Each Alternative (micrograms per cubic meter) ¹	4-52
Table 4-48. Alternative A (Proposed Action) Screening Visibility Impacts	4-53
Table 4-49. Alternative B Screening Visibility Impacts.....	4-54
Table 4-50. Alternative C Screening Visibility Impacts.....	4-54
Table 4-51. Alternative D (No Action) Screening Visibility Impacts	4-55
Table 4-52. Alternative E Screening Visibility Impacts	4-55
Table 4-53. <u>Alternative F¹ Screening Visibility Impacts</u>	4-56
Table 4-54. Alternative A (Proposed Action) Far-field Maximum Predicted Potential Impacts Nitrogen and Sulfur Deposition.....	4-57
Table 4-55. Alternative B Far-field Maximum Predicted Potential Impacts Nitrogen and Sulfur Deposition	4-58
Table 4-56. Alternative C Far-field Maximum Predicted Potential Impacts Nitrogen and Sulfur Deposition	4-58
Table 4-57. Alternative D (No Action) Far-field Maximum Predicted Potential Impacts Nitrogen and Sulfur Deposition	4-59
Table 4-58. Alternative E Far-field Maximum Predicted Potential Impacts Nitrogen and Sulfur Deposition	4-59
Table 4-59. <u>Alternative F¹ Far-field Maximum Predicted Potential Impacts Nitrogen and Sulfur Deposition</u>	4-60
Table 4-60. Alternative A (Proposed Action) Far-field Maximum Predicted Potential Impacts Acid Neutralization Capacity (ANC)	4-61

Table 4-61. Alternative B Far-field Maximum Predicted Potential Impacts Acid Neutralization Capacity	4-62
Table 4-62. Alternative C Far-field Maximum Predicted Potential Impacts Acid Neutralization Capacity	4-63
Table 4-63. Alternative D (No Action) Far-field Maximum Predicted Potential Impacts Acid Neutralization Capacity	4-64
Table 4-64. Alternative E Far-field Maximum Predicted Potential Impacts Acid Neutralization Capacity	4-65
Table 4-65. <u>Alternative F ² Far-field Maximum Predicted Potential Impacts Acid Neutralization Capacity</u>	4-66
Table 4-66. Acres of Surface Disturbance and Percentage of Each Probability Zone in the Project Area Disturbed	4-68
Table 4-67. Miles of New Roads in Each Probability Zone	4-68
Table 4-68. Impacts Below the Upper Rim of Nine Mile Canyon	4-70
Table 4-69. Natural Gas Produced by Alternative ¹	4-74
Table 4-70. Acres of Surface Disturbance in Areas Open to Oil and Gas Leasing	4-74
Table 4-71. Acres of Tar Sands Impacted	4-75
Table 4-72. Acres of Gilsomite and Oil Shale Impacted	4-76
Table 4-73. Acres of Salable Minerals Impacted	4-76
Table 4-74. Acres of Surface Disturbance by Landowner and Alternative	4-82
Table 4-75. Estimated Vehicle Trips by Alternative	4-84
Table 4-76. Main Access Routes in the Project Area, and the Number of Wells (and Percentage of the Alternative's Total) They Would Service under Each Alternative	4-88
Table 4-77. Road Network Expansion in the Project Area under Each Alternative	4-89
Table 4-78. Acres of Vegetation Impacted by Alternative	4-101
Table 4-79. Forage Lost (AUMs) in <u>the</u> Project Area by Allotment*	4-103
Table 4-80. Acreage and Percentage of Land Disturbance by Alternative in Condition Class and PFYC-classified Areas with High Potential to Yield Fossils	4-107
Table 4-81. Miles of New Roads in <u>the</u> Project Area by Alternative	4-108
Table 4-82. <u>Noise Levels from Common Construction Equipment and Attenuation Distances¹</u>	4-114
Table 4-83. Acres of Disturbance from Well Pads and Evaporation Facilities and Miles of New Roads by Alternative	4-117
Table 4-84. Well Sites, Miles of New Roads, and Estimated Surface Disturbance (acres and percentage of total SRMA) in the Nine Mile Canyon SRMA by Alternative ..	4-117
Table 4-85. Wells and Miles of New Roads Visible from Nine Mile Creek and the Green River by Alternative	4-120
Table 4-86. Acres of Disturbance by OHV Status and Alternative	4-121
Table 4-87. Miles of New Access Roads in Closed and Limited OHV Use Areas	4-122
Table 4-88. Acres of Disturbance within the Border of Pariette Wetlands ACEC by Alternative	4-122
Table 4-89. Well Sites, Miles of New Roads, and Acres of Disturbance within a 3-mile Radius of Wells Draw	4-123
Table 4-90. Revenue and Expenditures per Well	4-139
Table 4-91. Revenue per Alternative	4-139

<u>Table 4-92. Potential Environmental Justice Impacts Common to All Action Alternatives ...</u>	4-143
Table 4-93. Acres of Rehabilitation Restrictive Soil Features Disturbed under Each Alternative	4-151
Table 4-94. Surface Disturbance within Vegetation Communities Associated with Biological Soil Crusts	4-153
Table 4-95. Surface Disturbance of Slopes Greater than 30% and 40% under Each Alternative	4-154
Table 4-96. Estimated Sediment Erosion and Delivery under Each Alternative	4-156
Table 4-97. Acres of Special Status Species Habitat (and Percentage in ACEC) Directly Disturbed within the Nine Mile Canyon ACEC	4-170
Table 4-98. Acres of Wildlife Habitat Directly Disturbed within the Nine Mile Canyon ACEC	4-170
Table 4-99. Total Acres of Disturbance, Number of Wells with 0.25 Mile, and Number of Wells within Line-of-sight of the Lower Green River Suitable WSR	4-171
Table 4-100. Direct Impact of Shrubby Reed-mustard Habitats* in the Project Area under Each Alternative	4-192
<u>Table 4-101. Surface Disturbance and New Roads within the Pariette Cactus's Potential Habitat* and 2009 Core Conservation Areas** in the Project Area under Each Alternative</u>	4-195
Table 4-102. Surface Disturbance and New Roads within the Uinta Basin Hookless Cactus <u>Potential Habitats</u> * in the Project Area under Each Alternative	4-196
Table 4-103. Number of Uinta Basin Hookless Cactus Potentially Located in Areas Proposed for Development under Each Alternative	4-197
Table 4-104. Surface Disturbance of Graham's Beardtongue Occupied Habitat in the Project Area under Each Alternative	4-199
Table 4-105. Surface Disturbance of Suitable MSO Habitat* in the Project Area Under Each Alternative	4-201
<u>Table 4-106. Surface Disturbance of Greater Sage-grouse Lek Buffer and Brooding Habitat under Each Alternative</u>	4-203
Table 4-107. Surface Disturbance of WYBC Riparian Habitat in the Project Area under Each Alternative	4-205
Table 4-108. Potential Impacts to Green River Fishes and Development within or near the Green River Floodplain	4-207
Table 4-109. Surface Disturbance of Potential Untermann Daisy Habitat* in the Project Area under Each Alternative	4-212
<u>Table 4-110. Surface Disturbance of Known Sterile Yucca Habitat* in the Project Area under Each Alternative</u>	4-213
Table 4-111. Surface Disturbance of Prairie Dog Habitat in the Project Area under Each Alternative	4-215
Table 4-112. Surface Disturbance of Big Free-tailed Bat Potential Habitat in the Project Area Under Each Alternative	4-216
Table 4-113. Surface Disturbance of Spotted Bat Potential Habitat in the Project Area under Each Alternative	4-217
Table 4-114. Surface Disturbance within 0.5 Mile of Burrowing Owl Nests under Each Alternative	4-218

Table 4-115. Surface Disturbance of Ferruginous Hawk Nest Buffer and Potential Foraging Habitat under Each Alternative	4-220
Table 4-116. Surface Disturbance within 0.5 Mile of Known Bald Eagle Roosting Sites, Surface Disturbance of Potential (Riparian) Roosting Habitat, and Total Length of New Roads in the Project Area under Each Alternative.....	4-221
Table 4-117. Acres Disturbed within 0.5 Mile of Golden Eagle Nests for Each Alternative .	4-222
Table 4-118. Surface Disturbance of Short-eared Owl Potential Habitat under Each Alternative	4-223
Table 4-119. Surface Disturbance of Lewis' Woodpecker Potential Habitat under Each Alternative	4-224
Table 4-120. Surface Disturbance of Mountain Plover Known Breeding Habitat under Each Alternative	4-225
Table 4-121. Raptor Nest Buffers and Timing Constraints	4-227
Table 4-122. Surface Disturbance and New Roads within 0.5-mile Radius of Raptor Nest Sites under Each Alternative	4-228
Table 4-123. Acres of Surface Disturbance (and Percentage of Habitat Type Disturbed) in Migratory Bird Species Habitat by Alternative.....	4-230
Table 4-124. Habitat Fragmentation in Migratory Bird Species Habitat by Alternative (Percentage of Habitat Fragmented).....	4-232
Table 4-125. Acres of Direct Disturbance of each NLCD Vegetation Type Present in the Project Area and Percentage of Each Type Disturbed	4-309
Table 4-126. Length of New Road and Acres with Increased Risk of Invasive Weeds under Each Alternative*	4-313
Table 4-127. Acres of Disturbance within <u>Visual Resource Management (VRM) Class Designations</u> , by Alternative	4-323
Table 4-128. Produced Water by Alternative for 45-year Life of Project (<u>LOP</u>) and <u>Percentage</u> Decrease in Water Stored in Uinta Basin Aquifers	4-337
Table 4-129. Withdrawals (acre-feet) from Green River Tributaries and Sources by Alternative	4-342
Table 4-130. Road Crossings of Ephemeral Streams under Each Alternative	4-343
Table 4-131. Estimated Additional Erosion and Sediment Delivery to Drainages and the Green River by Alternative	4-343
Table 4-132. Estimated Sediment Erosion and Delivery to Project Area Drainages (above Background Rates) under Each Alternative	4-345
Table 4-133. Acres (and Percent) of Disturbance in Soils with Excess Salts.....	4-347
Table 4-134. Miles of Pipeline and Pipeline Stream Crossings by Alternative.....	4-349
Table 4-135. Closest Pipeline Stream Crossing to Perennial Streams (Miles) under Each Alternative	4-349
Table 4-136. Miles of Pipeline and Risk of Pipeline Incidents by Alternative	4-351
Table 4-137. Acres of Evaporative Facilities under Each Alternative	4-352
Table 4-138. Acres of Disturbance (and Percentage of Total Riparian Area Present) in Riparian Areas by Alternative	4-353
Table 4-139. Acres of Disturbance in the 100-year Floodplain by Floodplain and in Total; Well Pads Sited in the 100-year Floodplain.....	4-354

Table 4-141. Acres of Disturbance (and Percentage of Total Designated Habitat in the Project Area Disturbed) in BLM-designated Habitat for Mule Deer, Elk, Pronghorn Antelope, and Rocky Mountain Bighorn Sheep by Alternative	4-371
Table 4-142. Acres of Disturbance (and Percentage of Total Habitat Disturbed in the Project Area) in UDWR Habitat for Mule Deer, Elk, Pronghorn Antelope, and Rocky Mountain Bighorn Sheep by Alternative	4-372
Table 4-143. Miles of New Roads in BLM-designated Habitat in the Project Area for Mule Deer, Elk, Pronghorn Antelope, and Rocky Mountain Bighorn Sheep by Alternative	4-374
Table 4-144. Miles of New Roads in UDWR-designated Habitat in the Project Area for Mule Deer, Elk, Pronghorn Antelope, and Rocky Mountain Bighorn Sheep by Alternative	4-375
Table 4-145. Estimated Maximum % Increase over Current Traffic Volume by Alternative	4-376
Table 4-146. Acres and Percentage of BLM-designated Mule Deer Habitat in the Project Area Unfavorable Due to Habitat Fragmentation	4-385
Table 4-147. Acres and Percentage of UDWR Mule Deer Habitat in the Project Area Unfavorable Due to Habitat Fragmentation	4-386
Table 4-148. Acres and Percentage of BLM-designated Elk Habitat in the Project Area Unfavorable Due to Habitat Fragmentation	4-387
Table 4-149. Acres and Percentage of UDWR Elk Habitat in the Project Area Unfavorable Due to Habitat Fragmentation	4-387
Table 4-150. Acres of BLM-designated Rocky Mountain Bighorn Sheep Habitat in Patches <159 km ² , Percent Habitat Unfavorable, and Total Miles of Roads in BLM-designated Habitat	4-388
Table 4-151. Acres of UDWR Rocky Mountain Bighorn Sheep Habitat in Patches <159 km ² and Percent Habitat Unfavorable	4-388
Table 4-152. Impacts to Non-WSA Lands with Wilderness Characteristics.....	4-408
Table 4-153. Land Use Planning and Environmental Documents <u>and Other Data Used for Cumulative Impacts Analysis</u>	4-411
Table 4-154. <u>Existing</u> Oil and Gas Activity in the <u>BLM Vernal FO</u>	4-413
Table 4-155. <u>Reasonably Foreseeable</u> Oil and Gas <u>Projects within the BLM Vernal FO Planning Area</u>	4-414
Table 4-156. Class I and Sensitive Class II PSD Areas.....	4-419
Table 4-157. Sensitive Lakes	4-485
Table 4-158. Cumulative with Alternative A (Proposed Action) Maximum Pollutant Concentrations for Modeled Years (2001–2003) at Class I Areas (micrograms per cubic meter)	4-486
Table 4-159. Cumulative with Alternative B Maximum Pollutant Concentrations for Modeled Years (2001–2003) at Class I Areas (micrograms per cubic meter) ..	4-488
Table 4-160. Cumulative with Alternative C Maximum Pollutant Concentrations for Modeled Years (2001–2003) at Class I Areas (micrograms per cubic meter) ..	4-490
Table 4-161. Cumulative with Alternative D (No Action) Maximum Pollutant Concentrations for Modeled Years (2001–2003) at Class I Areas (micrograms per cubic meter)	4-423
Table 4-162. Cumulative with Alternative E Maximum Pollutant Concentrations for Modeled Years (2001–2003) at Class I Areas (micrograms per cubic meter) ..	4-493

Table 4-163. <u>Cumulative with Alternative F¹ Maximum Pollutant Concentrations for Modeled Years (2001–2003) at Class I Areas (micrograms per cubic meter)</u> ..	4-495
Table 4-164. Cumulative with Alternative B Maximum Pollutant Concentrations for Modeled Years (2001–2003) at Class II Areas (micrograms per cubic meter).	4-497
Table 4-165. Cumulative with Alternative C Maximum Pollutant Concentrations for Modeled Years (2001–2003) at Class II Areas (micrograms per cubic meter).	4-499
Table 4-166. Cumulative with Alternative D (No Action) Maximum Pollutant Concentrations for Modeled Years (2001–2003) at Class II Areas (micrograms per cubic meter)	4-501
Table 4-167. Cumulative with Alternative E Maximum Pollutant Concentrations for Modeled Years (2001–2003) at Class II Areas (micrograms per cubic meter).	4-502
Table 4-168. <u>Cumulative with Alternative F¹ Maximum Pollutant Concentrations for Modeled Years (2001–2003) at Class II Areas (micrograms per cubic meter)</u> .	4-504
Table 4-169. Cumulative with Alternative A (Proposed Action) Nitrogen and Sulfur Deposition Maximum Predicted Potential Impacts from 2001–2003	4-505
Table 4-170. Cumulative with Alternative B Nitrogen and Sulfur Deposition Maximum Predicted Potential Impacts from 2001–2003	4-505
Table 4-171. Cumulative with Alternative C Nitrogen and Sulfur Deposition Maximum Predicted Potential Impacts from 2001–2003	4-431
Table 4-172. Cumulative with Alternative D (No Action) Nitrogen and Sulfur Deposition Maximum Predicted Potential Impacts from 2001–2003.....	4-431
Table 4-173. Cumulative with Alternative E Nitrogen and Sulfur Deposition Maximum Predicted Potential Impacts from 2001–2003	4-432
Table 4-174. <u>Cumulative with Alternative F¹ Nitrogen and Sulfur Deposition Maximum Predicted Potential Impacts from 2001–2003</u>	4-432
Table 4-175. <u>Cumulative Nitrogen and Sulfur Deposition Maximum Predicted Potential Impacts from 2001–2003</u>	4-433
Table 4-176. Alternative A (Proposed Action) Screening Visibility Impacts	4-511
Table 4-177. Alternative B Screening Visibility Impacts.....	4-436
Table 4-178. Alternative C Screening Visibility Impacts.....	4-512
Table 4-179. Alternative D (No Action) Screening Visibility Impacts	4-437
Table 4-180. Alternative E Screening Visibility Impacts	4-513
Table 4-181. <u>Alternative F¹ Screening Visibility Impacts</u>	4-438
Table 4-182. Gasco Maximum of 2001–2003 Cumulative with Alternatives Refined Visibility Impacts for Each Alternative.....	4-515
Table 4-183. 12-km Emissions Modeling Domain Grid Totals (average tons/day).....	4-516
Table 4-184. <u>Summary of Proposed Action Maximum Predicted Ozone Impacts (parts per billion)</u>	4-441
Table 4-185. Emission Reductions Resulting from the Implementation of ACEPMs, <u>Alternative A</u> (tons/year).....	4-442
Table 4-186. Cumulative Impacts within the Nine Mile Canyon SRCMA	4-451
Table 4-187. <u>Cumulative Impacts to Traffic on Nine Mile Canyon Backcountry Byway Above the Rim of Nine Mile Canyon from Gasco and the WTP</u>	4-533
Table 4-188. <u>AUMs and Percentage of Total Forage Lost in Each Allotment</u>	4-535

Table 4-189. Surface Disturbance (Acres) by Special Designation Area.....	4-545
Table 5-1. List of BLM Preparers.....	5-8
Table 5-2. List of Non-BLM Preparers.....	5-9

List of Maps

Map 1. <u>Regional location</u>	Map section, page 1
Map 2. Project location.....	Map section, page 2
Map 3. Alternative A, including proposed well pads, roads, pipelines, and evaporation facilities.....	Map section, page 3
Map 4. Alternative B, including proposed well pads, roads, pipelines, and evaporation facilities.....	Map section, page 4
Map 5. Alternative C, including proposed well pads, roads, pipelines, and evaporation facilities.....	Map section, page 5
Map 6. Alternative D, including <u>proposed</u> well pads, roads, pipelines, and evaporation facilities.....	Map section, page 6
Map 7. Alternative E, including <u>proposed</u> well pads, roads, pipelines, and evaporation facilities.....	Map section, page 7
Map 8. Alternative F, including <u>proposed</u> well pads, roads, pipelines, and evaporation facilities.....	Map section, page 8
Map 9. Geologic formations and deposits.....	Map section, page 9
Map 10. Land ownership with existing roads and pipelines.....	Map section, page 10
Map 11. Grazing allotments.....	Map section, page 11
Map 12. Paleontological <u>condition classifications</u>	Map section, page 12
Map 13. Potential Fossil Yield Classifications.....	Map section, page 13
Map 14. Recreation designations and resources, including OHV designations and SRMA boundaries.....	Map section, page 14
Map 15. Alkaline soils, including degree of restrictiveness.....	Map section, page 15
Map 16. Droughty soils, including degree of restrictiveness.....	Map section, page 16
Map 17. Soil reclamation potential risk.....	Map section, page 17
Map 18. Soil rooting depth, including degree of restrictiveness.....	Map section, page 18
Map 19. Soils with excess salt, including degree of restrictiveness.....	Map section, page 19
Map 20. Soils with excess sodium, including degree of restrictiveness.....	Map section, page 20
Map 21. Soils with water erosion hazard, including degree of hazard.....	Map section, page 21
Map 22. Soils with wind erosion hazard, including degree of hazard.....	Map section, page 22
Map 23. Steep slopes.....	Map section, page 23
Map 24. Special designations including ACECs and WSRs.....	Map section, page 24
Map 25. Reasonably foreseeable future actions and development.....	Map section, page 25
Map 26. Main transportation routes.....	Map section, page 27
Map 27. Vegetation types.....	Map section, page 29
Map 28. Visual Resource Management classes, <u>key observation points</u> , and natural landscapes.....	Map section, page 30
Map 29. Watershed boundaries, <u>impaired streams, perennial versus intermittent streams, and floodplains</u>	Map section, page 31
Map 30. Wetlands and riparian areas.....	Map section, page 32

Map 31. Pronghorn antelope habitat.....	Map section, page 33
Map 32. Rocky Mountain bighorn sheep habitat.....	Map section, page 34
Map 33. Mule deer habitat.....	Map section, page 35
Map 34. Rocky Mountain elk habitat.....	Map section, page 36
Map 35. Non-WSA lands with wilderness characteristics.....	Map section, page 37
Map 36. <u>Environmental justice communities</u>	Map section, page 38
Map 37. <u>Special status species plant distribution</u>	Map section, page 39
Map 38. <u>Geologic cross-section plan view</u>	Map section, page 40
Map 39. <u>Water rights in the project area</u>	Map section, page 41
Map 40. <u>Mexican spotted owl (MSO) habitat</u>	Map section, page 42

APPENDICES

Appendix A. <u>Interdisciplinary Team Analysis Record Checklist</u>	A-1
Appendix B. <u>TES Plant Conservation Measures</u>	B-1
Appendix C. <u>Visual Key Observation Points and Contrast Analysis Worksheets</u>	C-1
Appendix D. <u>Special Status Species Retained and Eliminated from Detailed Analysis</u>	D-1
Appendix E. <u>Soils Characteristics in the Project Area</u>	E-1
Appendix F. <u>Determination on Special Status Species</u>	F-1
Appendix G. <u>Plan for Surface Reclamation and Monitoring</u>	G-1
Appendix H. <u>Near-field Air Quality Technical Support Document</u>	H-1
Appendix I. <u>Far-field Air Quality Technical Support Document</u>	I-1
Appendix J. <u>Ozone Impact Assessment (Revised April 2010)</u>	J-1
Appendix K. <u>Greenhouse Gas Emissions Inventory</u>	K-1
Appendix L. <u>Evaporation Pond Near-field Air Quality Technical Support Document</u>	L-1
Appendix M. <u>Transportation Plan</u>	M-1
Appendix N. <u>Sample Spill Prevention, Control and Countermeasure Response Plan</u>	N-1
Appendix O. <u>Long-term Monitoring Plan for Water Resources</u>	O-1
Appendix P. <u>Public Comment Summary and Agency Response</u>	P-1
Appendix Q. <u>Programmatic Agreement</u>	Q-1
Appendix R. <u>Ambient Air Quality Impact Analysis – Alternative F. Well Site Production Equipment NO₂ Modeling</u>	R-1
Appendix S. <u>Final Biological Opinion for the Gasco Energy Inc. Field Development Project Environmental Impact Statement/Biological Assessment</u>	S-1

CD Contents

1. Appendix A to Appendix H: AERMOD Input Example File
2. Appendix B to Appendix H: AERMOD Output Example File
3. Appendix A to Appendix I: CALMET Input Example File
4. Appendix B to Appendix I: CALPUFF Input Example File
5. Appendix B to Appendix L: Modeling Files
6. Appendix B to Appendix R: Modeling Files
7. Full Searchable PDF of this FEIS.