Table of Contents – Volume 1

Acronyms 1A

Executive Summary ES-1

Reader's Guide RG-1

1 CHAPTER 1: PURPOSE AND NEED FOR ACTION

1Purpose and Need 1-1
1.1 Introduction and Background 1-1
1.1.1 Historical Overview 1-2
1.1.2 Land Ownership within the Billings Field Office Planning Area 1-2
1.1.3 Description of the Billings Field Office Planning Area 1-3
1.2 Purpose and Need for the Resource Management Plan Revision 1-4
1.2.1 Purpose 1-4
1.2.2 Need for Revising the Existing Plan 1-5
1.3 Planning Process 1-6
1.3.1 Nine-Step Planning Process 1-7
1.4 Decision Framework 1-9
1.4.1 Planning Issues 1-10
1.4.2 Planning Criteria 1-17
1.4.3 Land Use Planning Decision Levels 1-19
1.5 Consistency with Other Programs, Plans, and Policies 1-20
1.5.1 County Plans 1-21
1.5.2 State Plans 1-22
1.5.3 Other Federal Agency Plans 1-23
1.5.4 Other Related Plans 1-23
1.6 Consultation and Coordination 1-26
1.6.1 Consultation with American Indian Tribes 1-26
1.6.2 Cooperating Agencies 1-27
1.6.3 Consultation with USFWS 1-28

1.7 Policy 1-29

2 CHAPTER 2: RESOURCE MANAGEMENT ALTERNATIVES

2 Description of Alternatives 2-1
2.1 Introduction 2-1
2.2 Developing the Range of Alternatives 2-2
2.2.1 Alternative Formulation 2-4
2.3 Key Components of the Alternatives 2-5
2.3.1 Desired Outcomes (Goals and Objectives) 2-5
2.3.2 Allowable Uses and Management Actions 2-5
2.3.3 Bureau of Land Management Policy and Administrative Actions 2-6
2.3.4 Adaptive Management 2-7
2.3.5 Best Management Practices 2-8
2.3.6 Land Health Standards 2-11
2.4 Alternatives Considered But Not Analyzed in Detail 2-12
2.4.1 Eliminate Livestock Grazing from BLM public lands 2-12
2.4.2 OHV Rock Crawl Area Proposed in Petroglyph Canyon 2-15
2.4.3 Sykes Ridge ACEC Proposal 2-15
2.4.4 Conservation Groups Alternative 2-16
2.5 Summary of Alternatives Considered in Detail 2-17
2.5.1 Alternative A (No Action Alternative) 2-27
2.5.2 Alternative B 2-29
2.5.3 Alternative C 2-31
2.5.4 Alternative D (Preferred Alternative) 2-34
2.6 Alternatives Considered in Detail 2-36
2.6.1 Format of the Alternatives 2-37
2.6.2 Energy and Minerals 2-38

2.7 Summary of Environmental Consequences by Alternative 2-177

3 CHAPTER 3: AFFECTED ENVIRONMENT

3 Affected Environment 3-1
3.1 Introduction 3-1
3.2 Physical, Biological, and Heritage Resources 3-1

3.2.1 Air 3-2
3.2.1.1 Regional Winds 3-2
3.2.1.2 Criteria Air Pollutants 3-3
3.2.1.3 Air Quality Monitoring 3-5
3.2.1.4 Carbon Monoxide 3-6
3.2.1.5 Lead 3-8
3.2.1.6 Nitrogen Dioxide 3-8
3.2.1.7 Ozone 3-8
3.2.1.8 Particulate Matter 3-9
3.2.1.9 Sulfur Dioxide 3-9
3.2.1.10 Air Quality Index 3-10
3.2.1.11 VOCs 3-11
3.2.1.12 Hazardous Air Pollutants 3-11
3.2.1.13 Other Pollutants 3-11
3.2.1.14 Criteria Pollutant Emissions 3-12
3.2.1.15 Emission Sources 3-12
3.2.1.16 Air Quality Related Values 3-13
3.2.1.17 Deposition 3-14
3.2.1.18 Visibility 3-15
3.2.1.19 Smoke Management 3-17
3.2.2 Climate 3-17
3.2.2.1 Temperature 3-18
3.2.2.2 Precipitation 3-19
3.2.2.3 Other Climatic Features 3-20
3.2.2.4 Climate Change 3-21
3.3 Geology 3-30
3.3.1 Geologic Setting 3-30
3.4 Soil 3-34
3.4.1 Geomorphic Group One: Shale and Sandstone Uplands 3-35
3.4.2 Geomorphic Group Two: Floodplains, Streams, Terraces, and Fans 3-35
3.4.3 Geomorphic Group Three: High Terraces and Benches 3-35
3.4.4 Geomorphic Group Four: Mountains and Foothills 3-35
3.5 Water 3-37
3.5.1 Surface Water 3-37

3.5.2 Ground Water ... 3-39
3.6 Vegetation ... 3-39
3.6.1 Forest and Woodlands ... 3-41
3.6.2 Rangelands and Shrublands ... 3-44
3.6.3 Riparian and Wetlands ... 3-50
3.6.4 Urban and Agricultural Lands ... 3-55
3.6.5 Invasive Species and Noxious Weeds ... 3-55
3.6.6 Special Status Plants ... 3-61
3.7 Wildlife Habitat and Special Status Species ... 3-63
3.7.1 Wildlife Habitat Threats ... 3-64
3.7.2 Priority Wildlife Species ... 3-65
3.7.3 Terrestrial Wildlife ... 3-68
3.7.3.1 Big Game ... 3-68
3.7.3.2 Non-Game Animals ... 3-73
3.7.3.3 Wildlife Special Status Species ... 3-75
3.7.3.4 Special Status Wildlife in Planning Area ... 3-76
3.7.3.5 Mammals ... 3-80
3.8 Fisheries Habitat and Special Status Species ... 3-102
3.8.1 Coldwater Species ... 3-103
3.8.2 Warmwater Species ... 3-104
3.8.3 Fisheries Management ... 3-105
3.8.4 Non-Native Invasive (Nuisance) Aquatic Species ... 3-105
3.8.5 Fisheries Special Status Species ... 3-107
3.8.5.1 Northern Redbelly X Finescale Dace (BLM Sensitive) ... 3-108
3.8.5.2 Sauger (BLM Sensitive) ... 3-108
3.8.5.3 Yellowstone Cutthroat Trout (BLM Sensitive) ... 3-109
3.9 Wild Horses and Burros and Pryor Mountain Wild Horse Range ... 3-110
3.9.1 Population and Resource Management ... 3-112
3.10 Cultural and Heritage Resources ... 3-113
3.10.1 Cultural History Overview ... 3-113
3.10.1.1 Paleoindian (11,500 B.P. to 7,500 Before Present [B.P.]) ... 3-114
3.10.1.2 Middle Prehistoric (7,500 B.P. to 1,800 B.P.) ... 3-114
3.10.1.3 Late Prehistoric Period (1,800 B.P. to 200 B.P.) ... 3-115

3.10.1.4 Protohistoric Period (200 B.P. to 50 B.P.) 3-115
3.10.1.5 Historic Period (A.D. 1700 to the present) 3-116
3.10.2 Site Types 3-116
3.10.2.1 Prehistoric Site Types 3-117
3.10.2.2 Historic Site Types 3-118
3.10.3 Cultural Resource Existing Conditions 3-119
3.10.4 Native American Concerns 3-121
3.10.5 Ethnographic Overview 3-121
3.10.6 Traditional Cultural Properties 3-122
3.11 Paleontological Resources 3-125
3.11.1 Paleontological Overview 3-125
3.11.2 The Fossil Record 3-127
3.11.2.1 Vertebrate Fossils 3-127
3.11.2.2 Nonvertebrate Fossils 3-127
3.11.2.3 Paleontological Localities 3-127
3.11.2.4 Potential Fossil Yield Classification 3-128
3.11.2.5 Paleontological Resource Condition and Trend 3-131
3.11.2.6 Paleontological Resource Management on Public Lands 3-132
3.12 Visual Resources 3-132
3.12.1 Visual Resources Management 3-133
3.12.2 Visual Resource Management Analysis Process 3-135
3.13 Fire Ecology and Management 3-136
3.13.1 Wildfire Occurrence 3-137
3.13.2 Fuels Treatments 3-139
3.13.3 Fire Regimes and Condition Causes 3-139
3.13.4 Frequency Fire Intensity Estimated 3-140
3.13.5 Condition 3-140
3.14 Wilderness Characteristics 3-141
3.14.1 Pryor Mountain Unit 3-142
3.14.2 Burnt Timber Canyon Unit 3-144
3.14.3 Meeteetse Unit 3-145
3.14.4 Bad Canyon Unit 3-147
3.14.5 Weatherman Draw Unit 3-148
3.15 Cave and Karsts Resources 3-149

3.16 Resource Uses ... 3-151
3.17 Energy and Mineral Resources ... 3-151
3.17.1 Solid Leasable Minerals ... 3-152
3.17.1.1 Coal ... 3-152
3.17.2 Fluid Minerals ... 3-154
3.17.2.1 Geothermal Energy ... 3-154
3.17.2.2 Oil and Gas ... 3-154
3.17.3 United States Geological Survey Oil and Gas Assessments ... 3-160
3.17.3.1 1995 USGS Assessment ... 3-160
3.17.3.2 Subsequent USGS Assessments ... 3-161
3.17.4 Federal Drilling Activity ... 3-162
3.17.4.1 Existing Federal Leases ... 3-163
3.17.4.2 Well Spacing ... 3-163
3.17.4.3 Unitization and Communitization ... 3-163
3.17.4.4 Projected Reasonably Foreseeable Development for Oil and Gas ... 3-164
3.17.4.5 Locatable Minerals ... 3-165
3.17.4.6 Mineral Materials ... 3-166
3.18 Forestry and Woodland Products ... 3-167
3.18.1 Forest and Woodland Communities ... 3-168
3.18.2 Wood Products ... 3-168
3.19 Lands and Realty ... 3-169
3.19.1 Land Tenure Adjustments and Access ... 3-170
3.19.2 Disposals ... 3-171
3.19.3 Exchanges ... 3-172
3.19.4 Acquisitions ... 3-172
3.19.5 Rights-of-Way, Leases, and Permits ... 3-173
3.19.6 Utility Corridors ... 3-174
3.19.7 Leases, Permits, and Easements ... 3-174
3.19.8 Communication Sites ... 3-175
3.19.9 Airport Grants and Leases ... 3-176
3.19.10 Recreation and Public Purpose Leases and Conveyances ... 3-176
3.19.11 Withdrawals ... 3-177
3.19.12 Land Classifications ... 3-178

3.19.13 Trespass 3-179
3.20 Livestock Grazing 3-180
3.20.1 Bureau of Land Management Grazing History 3-180
3.20.2 Grazing Permits and Leases 3-185
3.20.3 Range Health Standard Assessments....3-186
3.20.4 Guidelines for Grazing Management 3-187
3.20.5 Range Improvement Projects 3-188
3.20.6 Prohibited Acts 3-188
3.20.7 Factors Influencing Grazing....3-188
3.21 Recreation and Visitor Services 3-189
3.21.1 Four Dances Natural Area ACEC and SRMA 3-190
3.21.2 Sundance Lodge Recreation Area SRMA....3-190
3.21.3 Other Recreation Management Areas 3-191
3.21.3.1 Acton Recreation Area....3-191
3.21.3.2 Asparagus Point Area 3-192
3.21.3.3 Pryor Mountains Area....3-192
3.21.3.4 Shepherd Ah-Nei Recreation Area 3-192
3.21.3.5 South Hills Area....3-193
3.21.3.6 17 Mile Area 3-193
3.21.3.7 Horsethief Recreation Area....3-194
3.21.3.8 Yellowstone River Corridor....3-194
3.21.3.9 Bundy Island 3-195
3.21.3.10 Bundy Island/Mill Creek....3-195
3.21.4 Special Recreation Permits....3-195
3.22 Trails and Travel Management....3-196
3.23 Renewable Energy....3-200
3.23.1 Wind 3-201
3.23.2 Solar Resources 3-203
3.23.3 Biomass Energy and Resources....3-203
3.23.4 Geothermal 3-204
3.23.5 Hydroelectric 3-204
3.24 Transportation and Facilities 3-205
3.24.1 Federal Roads, Airports, and Railways 3-205
3.24.2 State and County Roads....3-205
3.24.3 BLM Roads 3-206

3.24.4 Road System Maintenance 3-208
3.24.5 Facilities 3-209
3.25 Special Designations 3-210
3.26 Pompeys Pillar 3-211
3.26.1 General Overview 3-211
3.26.2 National Monument 3-211
3.26.3 National Historic Landmark 3-212
3.26.4 Area of Critical Environmental Concern 3-212
3.26.4.1 Historic Zone 3-213
3.26.4.2 Historic Zone - Developed 3-213
3.26.4.3 General Management Zone 3-213
3.26.5 Current Land Usage at Pompeys Pillar National Historic Landmark and National Monument 3-213
3.27 Areas of Critical Environmental Concern 3-214
3.27.1 National Natural Landmark 3-214
3.27.2 Laws, Regulations and Policies 3-214
3.27.3 Existing ACECs 3-215
3.27.3.1 Bridger Fossil Area ACEC 3-215
3.27.3.2 Castle Butte ACEC 3-216
3.27.3.3 East Pryor Mountains ACEC 3-216
3.27.3.4 Four Dances Natural Area ACEC 3-216
3.27.3.5 Meeteetse Spires ACEC 3-217
3.27.3.6 Petroglyph Canyon ACEC 3-217
3.27.3.7 Pompeys Pillar ACEC 3-218
3.27.3.8 Stark Site ACEC 3-218
3.27.3.9 Weatherman Draw ACEC 3-218
3.28 Wilderness Study Areas 3-218
3.28.1 WSAs in the Planning Area 3-220
3.28.1.1 Big Horn Tack-On WSA 3-220
3.28.1.2 Burnt Timber Canyon WSA 3-221
3.28.1.3 Pryor Mountain WSA 3-221
3.28.1.4 Twin Coulee WSA 3-221
3.29 Wild and Scenic Rivers 3-221
3.29.1 Eligibility Phase 3-222
3.29.2 Suitability Phase 3-223

3.30 Pryor Mountain Wild Horse Range (PMWHR) 3-223
3.31 National Historic Trails 3-224
3.32 Social and Economic Conditions.....3-225
3.32.1 Social Conditions.....3-225
3.32.1.1 Attitudes and Social Trends 3-225
3.32.2 Economic Conditions 3-241
3.32.2.1 Demographic and Economic Characteristics and Trends 3-241
3.32.2.2 BLM Land and Mineral Uses that Affect the Local Economy 3-245
3.32.2.3 Economic Contributions 3-248
3.32.2.4 Recreation Use 3-249
3.32.2.5 Timber Harvest 3-250
3.32.2.6 Lands and Realty Actions 3-251
3.32.2.7 Direct BLM Contributions to Area Economic Activity 3-252
3.32.2.8 Ecosystem Restoration.....3-252
3.32.2.9 Payments to Counties.....3-253
3.32.2.10 Employment and Income 3-254

List of Tables

Table 1-1 Land Ownership – Billings Planning Area 1-3
Table 2-1 Comparative Summary of Proposed Land Use Decisions for Physical, Biological, and Cultural/Heritage Resources and Resource Uses by Alternative 2-18
Table 2-2 Comparative Summary of Proposed Special Designations by Alternative ... 2-25
Table 2-3 Organization of Comprehensive Alternatives Table 2-37
Table 2-4 Acres of Federal Mineral Estate Available or Not for Oil and Gas Leasing 2-40
Table 2-5 Lease Terms and Stipulations by Alternative 2-43
Table 2-6 Detailed Table of Alternatives 2-52
Table 2-7 Summary of Environmental Consequences by Alternative 2-178
Table 2-8 Summary Comparison of Impacts 2-196
Table 3-1 Prevailing Wind Directions and Average Speeds (mph) for Billings 3-2
Table 3-2 Federal and State Ambient Air Quality Standards 3-4
Table 3-3 Air Quality Monitoring Stations in the BiFO or Vicinity 3-5
Table 3-4 Air Quality Index Report 3-11
Table 3-5 BiFO Criteria Pollutant Emissions by County 3-12
Table 3-6 Largest 2008 Emission Sources by Pollutant 3-12
Table 3-7 Class I and potential sensitive Class II Areas in or near the BiFO 3-14
Table 3-8 Monthly Climate Summary for Billings, Montana 3-18
Table 3-9 Estimated Annual GHG Emissions 3-22
Table 3-10 Annual Stream Flow Data 3-37
Table 3-11 Impaired Water Bodies 3-38
Table 3-12 Vegetation Cover Types in the Planning Area 3-40
Table 3-13 Forest/Woodland Vegetation Cover Types 3-41
Table 3-14 Rangeland Cover Types 3-45
Table 3-15 Shrubland Cover Types 3-47
Table 3-16 Rangeland Conditions 3-50
Table 3-17 2010 Functional Condition of Lotic Systems by County (miles) 3-53
Table 3-18 Functional Condition of Lentic Systems by County 3-53
Table 3-19 DEQ Impaired Waters List in the Planning Area 3-54
Table 3-20 Noxious and Invasive Weed Species by County 3-59
Table 3-21 Special Status Plant Species 3-61

Table 3-22 Habitat for Priority Wildlife Species in the Planning Area 3-66
Table 3-23 Big Game Habitat and Distribution by Land Ownership in the Planning Area 3-69
Table 3-24 Upland Game Bird Habitat and Distribution by Ownership in the Planning Area 3-72
Table 3-25 Waterfowl Species Known to Occur in the Planning Area 3-73
Table 3-26 Special Status Wildlife Species in the Planning Area 3-77
Table 3-27 Black-tailed Prairie Dog Acreage in the Planning Area 3-80
Table 3-28 White-tailed Prairie Dog Acreage in the Planning Area 3-81
Table 3-29 Greater Sage Grouse Habitat and Lek Sites in the Planning Area 3-85
Table 3-30 Native and Non-Native Fish Species Occurring in the Planning Area 3-103
Table 3-31 Fish Bearing Streams in the Decision area 3-104
Table 3-32 Aquatic Nuisance Species in the Planning Area 3-106
Table 3-33 Prehistoric Site Types 3-117
Table 3-34 Historic Site Types 3-119
Table 3-35 Potential Fossil Yield Classification 3-128
Table 3-36 Potential Fossil Yield Classification Acres 3-129
Table 3-37 Geologic Formations Present in the Planning Area 3-129
Table 3-38 VRM Classes and Acreage 3-134
Table 3-39 Fires by Class Size 3-138
Table 3-40 Fires by Cause 3-138
Table 3-41 Fire Activity in the Planning Area Since 2000 3-138
Table 3-42 Fuels Treatments from 2003-2010 3-139
Table 3-43 Fire Regime Classifications and BiFO Estimated Acreage 3-140
Table 3-44 Fire Regime Condition Class Description and BiFO Estimated Acreage ...3-140
Table 3-45 Active Oil and Gas Fields in the Planning Area 3-156
Table 3-46 Federal Wells in the BiFO Planning Area 3-158
Table 3-47 Federal Oil and Gas Production in the BiFO Planning Area 3-159
Table 3-48 Summary of Federal Wells Drilled in the Last 18 Years 3-162
Table 3-49 All Well Types, All Ownerships in the Planning Area 3-163
Table 3-50 Claims and Saleable Mineral Permits in the Planning Area 3-167
Table 3-51 Wood Products Harvested and Sold in the Planning Area (1994-2008).....3-168
Table 3-52 Land Status by County 3-169
Table 3-53 Land Tenure Category Acreage 3-170
Table 3-54 Land Exchanges, Acres Disposed/Acquired 3-171

Table 3-55 Land Acquisitions/Donations 3-172
Table 3-56 Existing ROWs in the Decision Area 3-173
Table 3-57 Recreation and Public Purpose Leases in the Planning Area 3-176
Table 3-58 Areas Currently Withdrawn from Mineral Entry 3-178
Table 3-59 Summary AUMs by County and Preference Code in the Planning Area (Calendar Year 2008) 3-186
Table 3-60 Planning Area Visits and Visitor Use Days by Primary Recreation Activities 3-189
Table 3-61 Estimated Number of Vehicles Used Off-Highway in Montana (1990-1998) 3-197
Table 3-62 Wind Potential in the Billings Field Office in Comparison to All Ownership 3-202
Table 3-63 State Highway Conditions in the Planning Area 3-206
Table 3-64 Roads in the Decision Area 3-207
Table 3-65 Pompeys Pillar Designations and Rationales 3-212
Table 3-66 ACECs in the Planning Area 3-215
Table 3-67 WSAs in the Planning Area 3-219
Table 3-68 Wild and Scenic Rivers and River Segments Eligibility 3-223
Table 3-69 Demographic and Social Information for the Montana and Wyoming Planning Area Counties 3-229
Table 3-70 Environmental Justice Information for the Planning Area by County 3-240
Table 3-71 BLM Surface and Mineral Estate and Major BLM Land/Mineral Uses by County within the Billings RMP Planning Area 3-243
Table 3-72 Selected Economic and Demographic Statistics 3-244
Table 3-73 Average Annual Authorized Livestock Grazing Use (AUMs), Billing Years 1999-2009 3-245
Table 3-74 Forest Products Harvested and Sold in the Billings Field Office (1994-2008) 3-251
Table 3-75 Federal Rights-of-Way Revenues by Type 3-251
Table 3-76 Fuels Treatments (2003-2008) 3-253
Table 3-77 Annual Payments to Counties from BLM-Related Land/Mineral Uses 3-253
Table 3-78 Billings BLM Related Employment, and Income by Major BLM Program Area 3-254
Table 3-79 Current Role of BLM-Related Contributions to the Area Economy 3-254

List of Figures

Figure 1-1 Nine Step Planning Process 1-9
Figure 2-1 Reasonable Range of Alternatives for the Billings and Pompeys Pillar National Monument RMP/EIS 2-4
Figure 2-2 Adaptive Management Strategy Phases 2-7
Figure 3-1 Wind Rose for Pryor Mountain, Montana (data from 2006-2010) 3-3
Figure 3-2 Ambient Air Quality Concentrations in the BiFO Planning Area (2009-2011) 3-7
Figure 3-3 Visibility Trends on the Best and Worst Visibility Days (2005-2009) 3-16
Figure 3-4 Montana Average Daily Maximum Temperature 3-19
Figure 3-5 Montana Average Annual Precipitation 3-20
Figure 3-6 Long-Term Historical Temperature and Precipitation Trends 3-24
Figure 3-7 Near-Term Predicted Temperature Increases 3-25
Figure 3-8 Examples of Resource Impacts Due to Climate Change 3-27
Figure 3-9 Stratigraphic Column 3-32
Figure 3-10 Sage-Grouse Management Zones in the Western U.S. and Canada 3-91
Figure 3-11 Agricultural Lands within the Sage-Grouse Conservation Area 3-92
Figure 3-12 Linear Density of Fences on Public Lands in the Sage-Grouse Conservation Area 3-93
Figure 3-13 Water Developments on Lands Managed by the US Bureau of Land Management 3-94
Figure 3-14 Locations of Producing Oil and Gas Wells within Sage-Grouse Management Zones I and II 3-95
Figure 3-15 Contoured Secondary Roads in the Sage-Grouse Conservation Area 3-96
Figure 3-16 Spatial extent of Three Human-footprint-intensity Classes for the Conterminous US within the Current Range of Sage-Grouse and Sage-Grouse Management Zones 3-97
Figure 3-17 Grazing Land Classification 3-184

This page intentionally left blank

Table of Contents – Volume 2

4 CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

4 Environmental Consequences 4-1
4.1 Introduction 4-1
4.1.1 Analysis Background.....4-1
4.1.1.1 Approach to the Analysis.....4-1
4.1.1.2 Impact Analysis Terminology.....4-2
4.1.1.3 Assumptions for Analysis 4-3
4.1.1.4 Methods and Assumptions for Surface Disturbance.....4-5
4.1.1.4.1 Vegetation.....4-5
4.1.1.4.2 Rangelands 4-5
4.1.1.4.3 Invasive Species and Noxious Weeds 4-6
4.1.1.4.4 Wildlife and Fisheries Habitat and Special Status Species.....4-7
4.1.1.4.5 Fire Ecology and Management.....4-7
4.1.1.4.6 Lands and Realty 4-7
4.1.1.4.7 Livestock Grazing 4-8
4.1.1.4.8 Renewable Energy.....4-9
4.1.1.5 Availability of Data and Incomplete Information.....4-10
4.2 Impacts to Physical, Biological, and Heritage Resources 4-11
4.2.1 Air.....4-11
4.2.1.1 Methods and Assumptions.....4-11
4.2.1.2 Environmental Consequences.....4-12
4.2.1.3 Impacts to Air Quality 4-14
4.2.1.3.1 Near-Field Air Pollutant Concentrations for Criteria Air Pollutants 4-14
4.2.1.3.2 Near-Field Air Pollutant Concentrations for HAPs 4-17
4.2.1.3.3 Far-Field Criteria Air Pollutant Concentrations 4-20
4.2.1.3.4 Far-Field AQRV Impacts 4-21

4.2.1.3.5 ARMP and Adaptive Management Strategy for Oil and Gas Resources 4-22
4.2.1.4 Impacts Common to All Alternatives 4-23
4.2.1.5 Alternative A 4-27
4.2.1.6 Alternative B 4-30
4.2.1.7 Alternative C 4-31
4.2.1.8 Alternative D (Preferred Alternative) 4-33
4.2.1.9 Cumulative Air Quality Impacts 4-34
4.2.2 Climate 4-37
4.2.2.1 Methods and Assumptions 4-37
4.2.2.2 Impacts Common to All Alternatives 4-41
4.2.2.3 Alternative A 4-44
4.2.2.4 Alternative B 4-44
4.2.2.5 Alternative C 4-44
4.2.2.6 Alternative D 4-44
4.2.2.7 Cumulative Climate Impacts 4-45
4.2.3 Geology 4-45
4.2.4 Soil 4-45
4.2.4.1 Methods and Assumptions 4-46
4.2.4.2 Impacts Common to All Alternatives 4-49
4.2.4.3 Alternative A 4-54
4.2.4.4 Alternative B 4-61
4.2.4.5 Alternative C 4-67
4.2.4.6 Alternative D (Preferred Alternative) 4-73
4.2.4.7 Cumulative Impacts 4-78
4.2.5 Water 4-78
4.2.5.1 Methods and Assumptions 4-80
4.2.5.2 Environmental Consequences 4-81
4.2.5.3 Impacts Common to All Alternatives 4-82
4.2.5.4 Alternative A 4-87
4.2.5.5 Alternative B 4-91
4.2.5.6 Alternative C 4-96
4.2.5.7 Alternative D (Preferred Alternative) 4-100
4.2.5.8 Cumulative Impacts 4-104
4.2.6 Vegetation 4-106

4.2.6.1 Forests and Woodlands/Forestry and Woodland Products 4-106
4.2.6.1.1 Methods and Assumptions 4-106
4.2.6.1.2 Impacts Common to All Alternatives for All Resources and Resource Uses.....4-108
4.2.6.1.3 Alternative A 4-112
4.2.6.1.4 Alternative B 4-115
4.2.6.1.5 Alternative C 4-118
4.2.6.1.6 Alternative D (Preferred Alternative).....4-120
4.2.6.1.7 Cumulative Impacts.....4-122
4.2.6.2 Rangelands and Shrublands 4-124
4.2.6.2.1 Assumptions 4-125
4.2.6.2.2 Environmental Consequences 4-125
4.2.6.2.3 Impacts Common to All Alternatives.....4-126
4.2.6.2.4 Alternative A 4-138
4.2.6.2.5 Alternative B 4-143
4.2.6.2.6 Alternative C 4-146
4.2.6.2.7 Alternative D (Preferred Alternative).....4-150
4.2.6.2.8 Cumulative Impacts.....4-152
4.2.6.3 Riparian and Wetlands.....4-157
4.2.6.3.1 Methods and Assumptions 4-157
4.2.6.3.2 Environmental Consequences 4-158
4.2.6.3.3 Impacts Common to All Alternatives.....4-159
4.2.6.3.4 Alternative A 4-163
4.2.6.3.5 Alternative B 4-167
4.2.6.3.6 Alternative C 4-172
4.2.6.3.7 Alternative D (Preferred Alternative).....4-176
4.2.6.4 Cumulative Impacts 4-180
4.2.6.7 Invasive Species and Noxious Weeds.....4-182
4.2.6.7.1 Methods and Assumptions 4-183
4.2.6.7.2 Environmental Consequences 4-184
4.2.6.7.3 Impacts Common to All Alternatives.....4-184
4.2.6.7.4 Alternative A 4-187
4.2.6.7.5 Alternative B 4-198
4.2.6.7.6 Alternative C 4-205

4.2.6.7.7 Alternative D (Preferred Alternative).....4-211
4.2.6.8 Cumulative Impacts 4-217
4.2.6.10 Special Status Plants 4-219
4.2.6.10.1 Methods and Assumptions 4-219
4.2.6.10.2 Environmental Consequences 4-220
4.2.6.10.3 Impacts Common to All Alternatives.....4-220
4.2.6.10.4 Alternative A 4-225
4.2.6.10.5 Alternative B 4-227
4.2.6.10.6 Alternative C 4-230
4.2.6.10.7 Alternative D (Preferred Alternative).....4-233
4.2.6.11 Cumulative Impacts 4-235
4.2.7 Wildlife Habitat and Special Status Species 4-235
4.2.7.1 Methods and Assumptions.....4-236
4.2.7.2 Impacts Common to All Alternatives 4-242
4.2.7.3 Alternative A.....4-250
4.2.7.4 Alternative B.....4-258
4.2.7.5 Alternative C.....4-268
4.2.7.6 Alternative D (Preferred Alternative) 4-279
4.2.7.7 Cumulative Impacts 4-284
4.2.8 Fisheries Habitat and Special Status Species 4-289
4.2.8.1 Methods and Assumptions.....4-290
4.2.8.2 Environmental Consequences.....4-292
4.2.8.3 Impacts Common to All Alternatives 4-292
4.2.8.4 Alternative A.....4-298
4.2.8.5 Alternative B.....4-302
4.2.8.6 Alternative C.....4-307
4.2.8.7 Alternative D (Preferred Alternative) 4-311
4.2.8.8 Cumulative Impacts 4-315
4.2.9 Wild Horses and Burros and Pryor Mountain Wild Horse Range 4-318
4.2.9.1 Methods and Assumptions.....4-318
4.2.9.2 Environmental Consequences.....4-318
4.2.9.3 Alternative A.....4-319
4.2.9.4 Alternative B.....4-322
4.2.9.5 Alternative C.....4-325

4.2.9.6 Alternative D (Preferred Alternative) 4-328
4.2.9.7 Cumulative Impacts 4-331
4.2.10 Cultural and Heritage Resources 4-333
4.2.10.1 Methods and Assumptions 4-334
4.2.10.2 Environmental Consequences 4-336
4.2.10.3 Impacts Common to All Alternatives 4-336
4.2.10.4 Alternative A 4-343
4.2.10.5 Alternative B 4-347
4.2.10.6 Alternative C 4-351
4.2.10.7 Alternative D (Preferred Alternative) 4-354
4.2.10.8 Cumulative Impacts 4-357
4.2.11 Paleontological Resources 4-359
4.2.11.1 Methods and Assumptions 4-359
4.2.11.2 Environmental Consequences 4-361
4.2.11.3 Impacts Common to All Alternatives 4-362
4.2.11.4 Cumulative Impacts 4-365
4.2.12 Visual Resources 4-365
4.2.12.1 Methods and Assumptions 4-366
4.2.12.2 Environmental Consequences 4-367
4.2.12.3 Impacts Common to All 4-367
4.2.12.4 Alternative A 4-372
4.2.12.5 Alternative B 4-376
4.2.12.6 Alternative C 4-379
4.2.12.7 Alternative D (Preferred Alternative) 4-382
4.2.12.8 Cumulative Impacts 4-384
4.2.13 Fire Ecology and Management 4-385
4.2.13.1 Methods and Assumptions 4-385
4.2.13.2 Environmental Consequences 4-387
4.2.13.3 Impacts Common to All Alternatives 4-387
4.2.13.4 Alternative A 4-388
4.2.13.5 Alternative B 4-392
4.2.13.6 Alternative C 4-394
4.2.13.7 Alternative D (Preferred Alternative) 4-397
4.2.13.8 Cumulative Impacts 4-400
4.2.14 Wilderness Characteristics 4-400

4.2.14.1 Methods and Assumptions 4-400
4.2.14.2 Environmental Consequences 4-402
4.2.14.3 Impacts Common to All Alternatives 4-403
4.2.14.4 Alternative A 4-408
4.2.14.5 Alternative B 4-409
4.2.14.6 Alternative C 4-411
4.2.14.7 Alternative D (Preferred Alternative) 4-413
4.2.14.8 Cumulative Impacts 4-415
4.2.15 Cave and Karst Resources 4-415
4.2.15.1 Methods and Assumptions 4-416
4.2.15.2 Environmental Consequences 4-417
4.2.15.3 Impacts Common to All Alternatives 4-417
4.2.15.4 Alternative A 4-418
4.2.15.5 Alternative B 4-418
4.2.15.6 Alternative C 4-419
4.2.15.7 Alternative D (Preferred Alternative) 4-420
4.2.15.8 Cumulative Impacts 4-420
4.3 Impacts to Resource Uses 4-421
4.3.1 Energy and Mineral Resources 4-421
4.3.1.1 Solid Minerals 4-421
4.3.1.1.1 Solid Leasable Minerals 4-421
4.3.1.1.2 Fluid Minerals 4-422
4.3.1.2 Impacts Common to All Alternatives 4-425
4.3.1.2.1 Geothermal Resources 4-425
4.3.1.3 Alternative A 4-426
4.3.1.3.1 Fluid Minerals 4-426
4.3.1.4 Alternative B 4-429
4.3.1.4.1 Fluid Minerals 4-429
4.3.1.5 Alternative C 4-434
4.3.1.5.1 Fluid Minerals 4-434
4.3.1.6 Alternative D (Preferred Alternative) 4-439
4.3.1.6.1 Leasable Minerals 4-439
4.3.1.6.2 Locatable Minerals 4-444
4.3.1.6.3 Mineral Materials 4-446
4.3.2 Forestry and Wood Products 4-448

4.3.3 Lands and Realty 4-448
4.3.3.1 Methods and Assumptions 4-448
4.3.3.2 Environmental Consequences 4-449
4.3.3.3 Impacts Common to All Alternatives 4-450
4.3.3.4 Alternative A 4-455
4.3.3.5 Alternative B 4-459
4.3.3.6 Alternative C 4-463
4.3.3.7 Alternative D (Preferred Alternative) 4-468
4.3.3.8 Cumulative Impacts 4-471
4.3.4 Livestock Grazing 4-472
4.3.4.1 Methods and Assumptions 4-472
4.3.4.2 Environmental Consequences 4-473
4.3.4.3 Impacts Common to All Alternatives 4-474
4.3.4.4 Alternative A 4-478
4.3.4.5 Alternative B 4-483
4.3.4.6 Alternative C 4-485
4.3.4.7 Alternative D (Preferred Alternative) 4-487
4.3.4.8 Cumulative Impacts 4-489
4.3.5 Recreation and Visitor Services 4-492
4.3.5.1 Methods and Assumptions 4-492
4.3.5.2 Environmental Consequences 4-493
4.3.5.3 Impacts Common to All Alternatives 4-494
4.3.5.4 Alternative A 4-496
4.3.5.5 Alternative B 4-502
4.3.5.6 Alternative C 4-506
4.3.5.7 Alternative D (Preferred Alternative) 4-511
4.3.5.8 Cumulative Impacts 4-515
4.3.6 Trails and Travel Management 4-516
4.3.6.1 Methods and Assumptions 4-518
4.3.6.2 Environmental Consequences 4-518
4.3.6.3 Impacts Common to All Alternatives 4-519
4.3.6.4 Alternative A 4-520
4.3.6.5 Alternative B 4-522
4.3.6.6 Alternative C 4-523
4.3.6.7 Alternative D (Preferred Alternative) 4-524

4.3.6.8 Cumulative Impacts 4-525
4.3.7 Renewable Energy 4-526
4.3.7.1 Methods and Assumptions 4-527
4.3.7.2 Environmental Consequences 4-528
4.3.7.3 Impacts Common to All Alternatives 4-528
4.3.7.4 Alternative A 4-530
4.3.7.5 Alternative B 4-530
4.3.7.6 Alternative C 4-531
4.3.7.7 Alternative D (Preferred Alternative) 4-531
4.3.7.8 Cumulative Impacts 4-532
4.3.8 Transportation and Facilities 4-533
4.3.8.1 Methods and Assumptions 4-534
4.3.8.2 Environmental Consequences 4-535
4.3.8.3 Impacts Common to All 4-535
4.3.8.4 Cumulative Impacts 4-535
4.4 Special Designations 4-535
4.4.1 Pompeys Pillar National Monument and ACEC 4-535
4.4.1.1 Impacts Common to All Alternatives 4-535
4.4.1.2 Alternative A 4-536
4.4.1.3 Alternative B 4-536
4.4.1.4 Alternative C 4-538
4.4.1.5 Alternative D (Preferred Alternative) 4-538
4.4.2 Areas of Critical Environmental Concern 4-538
4.4.2.1 Methods and Assumptions 4-539
4.4.2.2 Analysis of Alternatives – Summary of Impacts 4-540
4.4.2.3 Impacts Common to all Alternatives 4-540
4.4.2.4 Bridger Fossil Area ACEC 4-543
4.4.2.4.1 Impacts Common 4-543
4.4.2.4.2 Alternative A 4-543
4.4.2.4.3 Alternative B 4-544
4.4.2.4.4 Alternative C 4-544
4.4.2.4.5 Alternative D (Preferred Alternative) 4-545
4.4.2.5 Castle Butte ACEC 4-545
4.4.2.5.1 Impacts Common 4-545
4.4.2.5.2 Alternative A 4-545

4.4.2.5.3 Alternative B 4-546
4.4.2.5.4 Alternative C 4-546
4.4.2.5.5 Alternative D (Preferred Alternative).....4-546
4.4.2.6 East Pryor ACEC 4-547
4.4.2.6.1 Impacts Common.....4-547
4.4.2.6.2 Impacts Common to Action Alternatives (Alternatives B through D) 4-547
4.4.2.6.3 Alternative A 4-548
4.4.2.6.4 Alternative B 4-548
4.4.2.6.5 Alternative C 4-549
4.4.2.6.6 Alternative D (Preferred Alternative).....4-549
4.4.2.7 Four Dances ACEC.....4-550
4.4.2.7.1 Impacts Common.....4-550
4.4.2.7.2 Alternative A 4-550
4.4.2.7.3 Alternative B 4-550
4.4.2.7.4 Alternative C 4-551
4.4.2.7.5 Alternative D (Preferred Alternative).....4-551
4.4.2.8 Grove Creek ACEC 4-551
4.4.2.8.1 Impacts Common to Action Alternatives (Alternatives B through D) 4-551
4.4.2.8.2 Alternative A 4-552
4.4.2.8.3 Alternative B 4-552
4.4.2.8.4 Alternative C 4-553
4.4.2.8.5 Alternative D (Preferred Alternative).....4-553
4.4.2.9 Meeteetse Spires ACEC.....4-554
4.4.2.9.1 Impacts Common to All Alternatives.....4-554
4.4.2.9.2 Impacts Common to Action Alternatives (Alternatives B through D) 4-554
4.4.2.9.3 Alternative A 4-554
4.4.2.9.4 Alternative B 4-555
4.4.2.9.5 Alternative C 4-556
4.4.2.9.6 Alternative D (Preferred Alternative).....4-556
4.4.2.10 Petroglyph Canyon ACEC.....4-556
4.4.2.10.1 Impacts Common.....4-556
4.4.2.10.2 Impacts Common to Action Alternatives (Alternatives B through D) 4-557

4.4.2.10.3 Alternative A 4-557
4.4.2.10.4 Alternative B 4-558
4.4.2.10.5 Alternative C 4-558
4.4.2.10.6 Alternative D (Preferred Alternative).....4-559
4.4.2.11 Pryor Foothills Research Natural Area ACEC 4-559
4.4.2.11.1 Impacts Common to Action Alternatives (Alternatives B through D) 4-559
4.4.2.11.2 Alternative A 4-560
4.4.2.11.3 Alternative B 4-560
4.4.2.11.4 Alternative C 4-561
4.4.2.11.5 Alternative D (Preferred Alternative).....4-562
4.4.2.12 Stark Site ACEC 4-562
4.4.2.12.1 Impacts Common.....4-562
4.4.2.12.2 Impacts Common to Action Alternatives (Alternatives B through D) 4-562
4.4.2.12.3 Alternative A 4-563
4.4.2.12.4 Alternative B 4-563
4.4.2.12.5 Alternative C 4-564
4.4.2.12.6 Alternative D (Preferred Alternative).....4-564
4.4.2.13 Weatherman Draw ACEC.....4-564
4.4.2.13.1 Impacts Common.....4-564
4.4.2.13.2 Alternative A 4-565
4.4.2.13.3 Alternative B 4-565
4.4.2.13.4 Alternative C 4-566
4.4.2.13.5 Alternative D 4-567
4.4.2.14 Greater Sage-Grouse Habitat Area ACEC.....4-567
4.4.2.14.1 Impacts under Alternative B.....4-567
4.4.2.14.2 Impacts under Alternative C and D 4-567
4.4.2.15 Cumulative Impacts from ACECs 4-567
4.4.3 Wilderness Study Areas (WSAs) 4-568
4.4.3.1 Methods and Assumptions.....4-568
4.4.3.2 Environmental Consequences.....4-569
4.4.3.3 Impacts Common to All Alternatives 4-569
4.4.3.4 Alternative A.....4-570
4.4.3.5 Alternative B.....4-570

4.4.3.6 Alternative C 4-571
4.4.3.7 Alternative D (Preferred Alternative) 4-571
4.4.3.8 Cumulative Impacts 4-571
4.4.4 Wild and Scenic Rivers 4-571
4.4.4.1 Methods and Assumptions 4-573
4.4.4.2 Environmental Consequences 4-573
4.4.4.3 Impacts Common to All Alternatives 4-573
4.4.4.4 Alternative A 4-575
4.4.4.5 Alternative B 4-576
4.4.4.6 Alternative C 4-578
4.4.4.7 Alternative D (Preferred Alternative) 4-579
4.4.4.8 Cumulative Impacts 4-581
4.4.5 Pryor Mountain Wild Horse Range 4-581
4.4.6 National Historic Trails 4-581
4.4.6.1 Methods and Assumptions 4-582
4.4.6.2 Environmental Consequences 4-582
4.4.6.3 Impacts Common to All Alternatives 4-584
4.4.6.4 Alternative A 4-585
4.4.6.5 Alternative B 4-586
4.4.6.6 Alternative C 4-586
4.4.6.7 Alternative D (Preferred Alternative) 4-587
4.4.6.8 Cumulative Impacts 4-587
4.5 Social and Economic Conditions 4-588
4.5.1 Social Conditions 4-588
4.5.1.1 Methods and Assumptions 4-588
4.5.1.2 Impacts Common 4-589
4.5.1.3 Tribal Issues – Tribal Treaty Rights 4-590
4.5.1.4 Environmental Justice 4-590
4.5.1.5 Alternative A 4-590
4.5.1.6 Alternative B 4-591
4.5.1.7 Alternative C 4-592
4.5.1.8 Alternative D (Preferred Alternative) 4-593
4.5.1.9 Cumulative Impacts 4-594
4.5.2 Economic Conditions 4-594

4.5.2.1 Methods, Assumptions, and Incomplete Information 4-594
4.5.2.2 Impacts Common to All Alternatives 4-599
4.5.2.3 Impacts by Alternative 4-604
4.5.2.4 Alternative A 4-607
4.5.2.5 Alternative B 4-608
4.5.2.6 Alternative C 4-609
4.5.2.7 Alternative D (Preferred Alternative) 4-610
4.5.2.8 Unavoidable Adverse Impacts 4-611
4.5.2.9 Short-Term Uses versus Long-Term Productivity 4-611
4.5.2.10 Irreversible and Irretrievable Impacts 4-611
4.6 Cumulative Impacts 4-611
4.6.1 Methods and Assumptions 4-612
4.6.2 Environmental Consequences 4-613
4.6.3 Physical Resources 4-613
4.6.4 Mineral Resources 4-614
4.6.5 Fire and Fuels Management 4-615
4.6.6 Biological Resources 4-615
4.6.7 Heritage and Visual Resources 4-617
4.6.8 Land Resources 4-618
4.6.8.1 Special Designations 4-619
4.6.9 Socioeconomic Resources 4-621
4.7 Irreversible and Irretrievable Commitment of Resources 4-622
4.8 Unavoidable Adverse Impacts 4-625
4.9 Relationship of Short-Term Uses of the Environment to Long-Term Productivity 4-627

5 CHAPTER 5: CONSULTATION AND COORDINATION

5 Consultation and Coordination 5-1
5.1 Introduction 5-1
5.2 Public Participation Opportunities 5-1
5.2.1 Scoping 5-2
5.2.2 Transportation Planning Workshops 5-3
5.3 Consultation and Coordination 5-3
5.3.1 Tribal Consultation 5-3

5.3.2 Tribal Consultation Responsibilities 5-4
5.3.3 U.S. Fish and Wildlife Service Consultation.....5-5
5.3.4 State Historic Preservation Office Consultation.....5-6
5.3.5 Resource Advisory Council.....5-6
5.3.6 Cooperating Agencies 5-7
5.3.7 Informal Consultation and Collaboration.....5-8
5.4 Plan Distribution.....5-9
5.5 List of Preparers 5-11
References 6-1

GLOSSARY

The glossary is included at the end of Volume 2 following the References.

List of Tables

Table 4-1 Surface Disturbance from Forest and Woodland Treatment by Alternative.....4-5
Table 4-2 Surface Disturbance by Rangeland Vegetation Treatments by Alternative.....4-6
Table 4-3 Surface Disturbance from Invasive, Noxious Weed Treatments by Alternative (acres).....4-6
Table 4-4 Surface Disturbance from Management-Ignited Prescribed Fire Potential by Alternative (Acres).....4-7
Table 4-5 Numbers of Rights-of-Way and Acres of Disturbance.....4-8
Table 4-6 Surface Disturbance from Livestock Grazing Development by Alternative.....4-9
Table 4-7 Estimated Maximum Annual Criteria and Hazardous Air Pollutant Emissions from Alternatives.....4-12
Table 4-8 Estimated Maximum Annual Criteria and Hazardous Air Pollutant Emissions as a Percentage of Existing Emissions 4-13
Table 4-9 Near-Field Criteria Air Pollutant Summary for All Alternatives 4-15
Table 4-10 Health Effects of Modeled HAPs.....4-18
Table 4-11 Acute Short-Term HAP Modeling Results for All Alternatives.....4-18
Table 4-12 Chronic Non-Carcinogenic HAP Modeling Results for All Alternatives.....4-19
Table 4-13 Carcinogenic HAP Modeling Results for All Alternatives.....4-19
Table 4-14 Estimated Alternative A Maximum Annual Criteria and Hazardous Air Pollutant Emissions.....4-28
Table 4-15 Estimated Alternative B Maximum Annual Criteria and Hazardous Air Pollutant Emissions.....4-30
Table 4-16 Estimated Alternative C Maximum Annual Criteria and Hazardous Air Pollutant Emissions.....4-31
Table 4-17 Estimated Alternative D Maximum Annual Criteria and Hazardous Air Pollutant Emissions.....4-33
Table 4-18 Comparison of BLM and non-BLM Annual Criteria and Hazardous Air Pollutant Emissions from Oil and Gas Activity.....4-35
Table 4-19 Estimated Maximum Annual GHG Emissions from Alternatives.....4-41
Table 4-20 Water Erosion Hazard Rating 4-47
Table 4-21 Wind Erosion Index 4-47
Table 4-22 Fluid Mineral Management Summary for All Alternatives.....4-58
Table 4-23 Sage Grouse Core Area / Oil and Gas Activity Summary Table.....4-285

Table 4-24 Average Treatment Acreage by Alternative 4-386
Table 4-25 Total Acreage Recommended for Closure for Solid Leasable Mineral Development 4-421
Table 4-26 Forecast Drilling Depths, and Initial Surface Disturbance by Basin 4-423
Table 4-27 Forecast Drilling Activity and Surface: 2010 – 2014 4-423
Table 4-28 Forecast Drilling Activity and Surface: 2015 – 2030 4-424
Table 4-29 Alternative A – Areas Unavailable to Fluid Mineral Development 4-426
Table 4-30 Alternative A – Approximate Acres of Federal Mineral Estate Available or Unavailable for Oil and Gas Leasing[1] 4-426
Table 4-31 Alternative A – Acres Affected by Oil and Gas Stipulations 4-427
Table 4-32 Alternative B – Areas Unavailable to Fluid Mineral Development 4-430
Table 4-33 Alternative B – Approximate Acres of Federal Mineral Estate Available or Unavailable for Oil and Gas Leasing[1] 4-431
Table 4-34 Alternative B – Acres Affected by Oil and Gas Stipulations 4-431
Table 4-35 Alternative C – Areas Unavailable to Fluid Mineral Development 4-435
Table 4-36 Alternative C - Approximate Acres of Federal Mineral Estate Available or Unavailable for Oil and Gas Leasing[1] 4-435
Table 4-37 Alternative C – Acres Affected by Oil and Gas Stipulations 4-436
Table 4-38 Alternative D – Areas Unavailable to Fluid Mineral Development 4-439
Table 4-39 Alternative D – Approximate Acres of Federal Mineral Estate Available or Unavailable for Oil and Gas Leasing[1] 4-439
Table 4-40 Alternative D – Acres Affected by Oil and Gas Stipulations 4-440
Table 4-41 Impact by Percent/Acres on Wind Potential Development in Alternative A.....4-530
Table 4-42 Impact by Percent/Acres on Wind Potential Development in Alternative B.....4-530
Table 4-43 Impact by Percent/Acres on Wind Potential Development in Alternative C.....4-531
Table 4-44 Impact by Percent/Acres on Wind Potential Development in Alternative D.....4-532
Table 4-45 Existing and Proposed ACECs by Alternative 4-539
Table 4-46 Average Annual Federal Oil and Gas Leasing, Rents, and Production by Alternative.....4-596
Table 4-47 Employment by Resource Use and Other Contribution to Local Economy by Alternative (Average Annual) 4-605
Table 4-48 Income by Resource Use and Other Contribution to Local Economy by Alternative (Annual Average – $1,000).....4-605
Table 4-49 Federal, State, and Local Revenues by Alternative 4-606

Table 4-50 Comparison of Estimated Average Annual Economic Contributions from BLM Land and Mineral Uses 4-607
Table 4-51 Irreversible and Irretrievable Commitment of Resources Summary 4-623
Table 5-1 Federal, Tribal, State and Local Representatives Invited to Participate As Cooperating Agencies for the Billings and Pompeys Pillar National Monument RMP/EIS 5-9
Table 5-2 Billings and Pompeys Pillar National Monument RMP/EIS Preparers 5-11
Table 5-3 Montana State Office Reviewers 5-15
Table 5-4 Cooperating Agencies and Contacts 5-16

List of Figures

Figure 4-1. Example of Extent of Area Exceeding the PM_{10} 24-hour Class I Increment During Construction 4-17
Figure 4-2 Summary of Route/Miles by TMA 4-517

Table of Contents – Volume 3

APPENDICES

Appendix A Laws, Regulations, Policies, and Guidance
Appendix B Best Management Practices (BMPs)
Appendix C Oil and Gas Lease Stipulations
Appendix D Fluid Minerals and Procedures in Oil and Gas
Appendix E Areas of Critical Environmental Concern (ACECs)
Appendix F Cultural and Heritage Resources
Appendix G Split Estate Lands
Appendix H Wildlife Resources
Appendix I Land Health Standards
Appendix J Land Tenure Adjustment
Appendix K Lands with Wilderness Characteristics
Appendix L Livestock Screening Criteria Checklist
Appendix M Coal
Appendix N Recreation Management Areas
Appendix O Travel Management
Appendix P Visual Resource Management
Appendix Q 1975 Memorandum between Montana and Wyoming - Administration of the Pryor Mountain Wild Horse Range
Appendix R Wild and Scenic Rivers (WSR)
Appendix S Range Allotments
Appendix T Air Quality Resource Management Plan (ARMP)
Appendix U Water Rights
Appendix V Recreation Setting Characteristics
Appendix W Pompeys Pillar National Monument
Appendix X Implementation and Monitoring

Appendices Y, Z, AA, AB, and AC are included in Volume 4

This page intentionally left blank.

Table of Contents – Volume 4

APPENDICES

Appendix Y Air Emission Summaries
Appendix Z Properly Functioning Condition (Riparian)
Appendix AA Monitoring of Greater Sage-Grouse and Sagebrush Habitats
Appendix AB Mitigation Measures and Conservation Actions for Greater Sage-Grouse
Appendix AC Billings Field Office and Pompeys Pillar National Monument Sign Plan

MAPS

Maps, with the exception of the Travel Management Area maps (TMA) by alternative, are included in Volume 4. All maps, including the TMA maps, are included on the CD located in Volume 4.

List of Maps

1. BiFO Planning Area
1a. Public Land in BiFO Planning Area
2. BiFO Federal Mineral Estate
3. Air Quality Airsheds
4. Air Quality Non-Attainment Areas
5. Soil – Major Land Resource Areas
6. Soil – Wind Erodibility
7. Soil – T Factor
8. Floodplain Areas
9. Vegetation
10. Riparian – Properly Functioning Condition Surveys
11. Riparian Priority Recovery Areas – Alternatives B and D
12. Riparian Priority Recovery Areas – Alternative C
13. Invasive Species and Noxious Weeds
14. Special Status Plants

15. Big Game Winter Ranges
16. Antelope Range Distribution
17. Bighorn Sheep Range Distribution
18. Elk Range Distribution
19. Mule Deer Range Distribution
20. White-tailed Deer Range Distribution
21. Grizzly Bear Habitat
22. Lynx Habitat
23. Sage Grouse PPAs, RAs, and General Habitat
24. Sage Grouse PPAs, RAs, and General Habitat overlay with Oil and Gas RFD
25. Sprague's Pipit Habitat
26. Red & Blue Ribbon Streams
27. Conservation Populations of YCT
28. YCT Suitable Recovery Habitat
29. PMWHR map
30. Herd Area Map
31. PMWHR – Alternative A
32. PMWHR – Alternative B
33. PMWHR – Alternative C
34. PMWHR – Alternative D
35. Potential Fossil Yield Classification
36. Wildland Fire Locations
37. High Potential Fire Damage Hazard Soils
38. VRI - Alternative A
39. VRM –Alternative B
40. VRM – Alternative C
41. VRM – Alternative D
42. LWC – Alternative A
43. LWC – Alternative B
44. LWC – Alternative C
45. LWC - Alternative D
46. Cave and Karst Area Locations
47. Coal Locations
48. Active Oil Fields
49. RFD map

50. Fluid Minerals – standard leasing terms – Alternative A
51. Fluid Minerals – standard leasing terms – Alternative B
52. Fluid Minerals – standard leasing terms – Alternative C
53. Fluid Minerals – standard leasing terms – Alternative D
54. Fluid Minerals - major/moderate constraints – Alternative A
55. Fluid Minerals - major/moderate constraints – Alternative B
56. Fluid Minerals - major/moderate constraints – Alternative C
57. Fluid Minerals - major/moderate constraints – Alternative D
58. Locatable Minerals – Alternative A
59. Locatable Minerals – Alternative B
60. Locatable Minerals – Alternative C
61. Locatable Minerals – Alternative D
62. Mineral Materials – Alternative A
63. Mineral Materials – Alternative B
64. Mineral Materials – Alternative C
65. Mineral Materials – Alternative D
66. Land Tenure
67. Withdrawals
68. ROW Avoidance – Alternative A
69. ROW Avoidance – Alternative B
70. ROW Avoidance – Alternative C
71. ROW Avoidance – Alternative D
72. ROW Exclusion – Alternative A
73. ROW Exclusion – Alternative B
74. ROW Exclusion – Alternative C
75. ROW Exclusion – Alternative D
76. ROW Corridors – Alternatives A and B
77. ROW Corridors – Alternative C
78. ROW Corridors – Alternative D
79. Recreation Areas
80. SRMA – Alternative A
81. SRMA – Alternative B
82. SRMA – Alternative C
83. SRMA – Alternative D
84. Sundance Lodge SMRA - Alternatives A, B, C, D

85. Four Dances Natural Area SRMA – Alternatives A, B, C, D
86. Acton ERMA – Alternative A
86a. Acton SRMA, Alternatives B, C, D
87. Asparagus Point EMRA – Alternatives A and B
88. Asparagus Point SRMA – Alternatives C and D
89. Pryor Mountain ERMA – Alternative A
90. Pryor Mountain SRMA – Alternatives B, C, D
91. Shepherd Ah-Nei ERMA – Alternative A
92. Shepherd Ah-Nei SRMA – Alternatives B, C, D
93. South Hills ERMA – Alternatives A and B
94. South Hills SRMA – Alternatives C and D
95. 17 Mile ERMA – Alternatives A, B, D
96. 17 Mile SRMA – Alternative C
97. Horsethief ERMA – Alternatives A and B
98. Horsethief SRMA – Alternatives C and D
99. Yellowstone River Corridor SRMA – Alternatives C and D
99a. Yellowstone River Corridor ERMA – Alternative B
100. Mill Creek/Bundy SRMA – Alternative C
100a. Mill Creek/Bundy ERMA – Alternative D
101. Bundy Island SRMA – Alternative B
102. Areas Closed to Target Shooting – Alternative A
103. Areas Closed to Target Shooting – Alternative B
104. Areas Closed to Target Shooting – Alternative C
105. Areas Closed to Target Shooting – Alternative D
106. Travel Management Areas
107. Gage Dome TMA – Alternative A
108. Gage Dome TMA – Alternative B
109. Gage Dome TMA – Alternative C
110. Gage Dome TMA – Alternative D
111. Horsethief TMA – Alternative A
112. Horsethief TMA – Alternative B
113. Horsethief TMA – Alternative C
114. Horsethief TMA – Alternative D
115. Acton TMA – Alternative A
116. Acton TMA – Alternative B

117. Acton TMA – Alternative C
118. Acton TMA – Alternative D
119. Shepherd Ah-Nei TMA – Alternative A
120. Shepherd Ah-Nei TMA – Alternative B, C, D
121. Pompeys Pillar NM, NHL, ACEC
122. Range Allotments
123. Mill Creek/Bundy TMA – Alternative A
124. Mill Creek/Bundy TMA – Alternative B
125. Mill Creek/Bundy TMA – Alternative C
126. Mill Creek/Bundy TMA – Alternative D
127. South Hills TMA – Alternative A
128. South Hills TMA – Alternative B
129. South Hills TMA – Alternative C
130. South Hills TMA – Alternative D
131. Tin Can Hill TMA – Alternative A
132. Tin Can Hill TMA – Alternative B
133. Tin Can Hill TMA – Alternative C
134. Tin Can Hill TMA – Alternative D
135. Cottonwood/Weatherman Draw TMA – Alternative A
136. Cottonwood/Weatherman Draw TMA – Alternative B
137. Cottonwood/Weatherman Draw TMA – Alternative C
138. Cottonwood/Weatherman Draw TMA – Alternative D
139. Warren TMA – Alternative A
140. Warren TMA – Alternative B
141. Warren TMA – Alternative C
142. Warren TMA – Alternative D
143. Pryor Mountain TMA – Alternative A
144. Pryor Mountain TMA – Alternative B
145. Pryor Mountain TMA – Alternative C
146. Pryor Mountain TMA – Alternative D
147. Grove Creek TMA – Alternative A
148. Grove Creek TMA – Alternative B
149. Grove Creek TMA – Alternative C
150. Grove Creek TMA – Alternative D
151. Wind Potential – Planning Area

152. Wind Potential – BLM Administered Land Only
153. Renewable Energy – Alternative A
154. Renewable Energy – Alternative B
155. Renewable Energy – Alternative C
156. Renewable Energy – Alternative D
157. Pompeys Pillar NM - Alternative A
158. Pompeys Pillar NM – Alternatives B, C, D
159. Areas of Critical Environmental Concern (ACECs)
160. Twin Coulee WSA
161. Pryor Mountain WSAs
162. Wild and Scenic River – Alternative A
163. Wild and Scenic River – Alternative B
164. Wild and Scenic River – Alternative C
165. Wild and Scenic River – Alternative D
166. National Historic Trails
167. Oil and Gas RFD with Federal Mineral Estate
168. BLM Sage-Grouse PPAs, RAs, GHAs, and MT FWP Core Areas
169. Greater Sage-Grouse Habitat ACEC – Alt B