

# Table of Contents

Acronyms and Abbreviations .....	ix
<b>1. PURPOSE AND NEED .....</b>	<b>1-1</b>
1.0 INTRODUCTION .....	1-1
1.1 PROJECT DESCRIPTION AND LOCATION .....	1-1
1.2 PURPOSE OF AND NEED FOR ACTION .....	1-3
1.3 PURPOSE OF THE ENVIRONMENTAL ANALYSIS PROCESS .....	1-3
1.4 RELATIONSHIP TO POLICIES, PLANS, AND PROGRAMS .....	1-4
1.4.1 Conformance With Land Use Plan .....	1-4
1.4.2 Relationship to Other Plans and Documents .....	1-4
1.5 DECISIONS REQUIRED .....	1-5
1.5.1 Montana Board of Oil and Gas Conservation.....	1-5
1.5.2 Bureau of Land Management.....	1-5
1.6 ISSUES AND CONCERNS .....	1-5
1.7 AUTHORIZING ACTIONS .....	1-6
<b>2. ALTERNATIVES INCLUDING THE PROPOSED ACTION.....</b>	<b>2-1</b>
2.0 INTRODUCTION .....	2-1
2.1 DEVELOPMENT OF ALTERNATIVES.....	2-1
2.1.1 Alternatives Considered but Eliminated from Detailed Analysis .....	2-1
2.2 DESCRIPTION OF THE ALTERNATIVES .....	2-5
2.2.1 Alternative A—No Federal Action.....	2-5
2.2.2 Alternative B—Proposed Action with Additional Mitigation .....	2-5
2.2.3 Alternative C—Maximum Development Alternative .....	2-6
2.2.4 Project Description Common to all Alternatives .....	2-8
2.2.5 Applicant-Committed Measures .....	2-20
2.3 COMPARISON OF ALTERNATIVES .....	2-29
<b>3. AFFECTED ENVIRONMENT .....</b>	<b>3-1</b>
3.0 INTRODUCTION .....	3-1
3.1 CLIMATE and AIR QUALITY .....	3-1
3.2 CULTURAL RESOURCES .....	3-5
3.3 GEOLOGY .....	3-9
3.3.1 Regional Geologic Overview .....	3-9
3.3.2 Quaternary Sediments.....	3-9
3.3.3 Tertiary Rocks .....	3-11
3.3.4 Upper Cretaceous Rocks .....	3-11
3.3.5 Paleontological Resources .....	3-12
3.3.6 Geologic Hazards .....	3-13
3.3.7 Non-petroleum Resources.....	3-14
3.3.8 Oil and Gas.....	3-14
3.4 WASTES, HAZARDOUS OR SOLID.....	3-15
3.5 WATER RESOURCES, SURFACE AND GROUND .....	3-17
3.5.1 Landform and Geology .....	3-18
3.5.2 Climate and Precipitation.....	3-18
3.5.3 Surface Water Quantity .....	3-19
3.5.4 Surface Water Quality .....	3-24
3.5.5 Waters of the U.S. ....	3-31
3.5.6 Groundwater Quantity .....	3-31
3.5.7 Groundwater Quality.....	3-31
3.5.8 Surface Water and Groundwater Rights .....	3-32
3.6 LIVESTOCK GRAZING .....	3-32

**TABLE OF CONTENTS**

---

3.6.1 Range Resources ..... 3-32

3.7 RECREATION AND VISUAL RESOURCES ..... 3-33

3.7.1 Recreation ..... 3-33

3.7.2 Visual Resources ..... 3-36

3.8 SOCIOECONOMICS ..... 3-39

3.8.1 Regional Economy ..... 3-40

3.8.2 Population ..... 3-49

3.8.3 Temporary Housing Resources ..... 3-50

3.8.4 Local Government Service Demand ..... 3-51

3.8.5 Fiscal Conditions ..... 3-52

3.8.6 Affected Groups ..... 3-56

3.8.7 Environmental Justice ..... 3-59

3.9 SOILS ..... 3-62

3.9.1 General Description of Major Soil Types ..... 3-63

3.9.2 Soil Limitations ..... 3-63

3.10 TRANSPORTATION AND ACCESS ..... 3-74

3.10.1 Federal and State Highways ..... 3-74

3.10.2 County Roads ..... 3-78

3.10.3 BLM Roads ..... 3-78

3.10.4 Roads on Private Lands ..... 3-79

3.10.5 Current Natural Gas Drilling/Field-Development and Operations Traffic ..... 3-79

3.10.6 BLM Road Standards ..... 3-80

3.11 VEGETATION ..... 3-81

3.11.1 Vegetation Communities ..... 3-81

3.11.2 Vegetation Types ..... 3-82

3.11.3 Wetland and Riparian Areas ..... 3-85

3.11.4 Invasive, Non-Native Species ..... 3-88

3.12 WILDLIFE ..... 3-89

3.12.1 Introduction ..... 3-89

3.12.2 Wildlife Habitat ..... 3-90

3.12.3 General Wildlife ..... 3-90

3.12.4 West Nile Virus ..... 3-90

3.12.5 Big Game Species ..... 3-91

3.12.6 Upland Game Birds ..... 3-98

3.12.7 Raptors ..... 3-101

3.12.8 Colonial Nesting Waterbirds ..... 3-104

3.12.9 Shorebirds and Other Waterbirds (excluding colonial nesting species) ..... 3-107

3.12.10 Migratory Birds ..... 3-107

3.12.11 Amphibians and Reptiles ..... 3-108

3.12.12 Fish ..... 3-111

3.13 SPECIAL-STATUS WILDLIFE, FISH, AND PLANT SPECIES ..... 3-114

3.13.1 Threatened, Endangered, Candidate or Proposed Species of Wildlife,  
Fish, and Plants ..... 3-114

3.13.2 BLM Sensitive Species and Montana Animal and Plant  
Species of Concern ..... 3-116

3.14 HEALTH AND SAFETY ..... 3-141

3.14.1 Worker Safety ..... 3-141

3.14.2 Public Health and Safety ..... 3-141

3.15 NOISE ..... 3-142

4. ANALYSIS OF ENVIRONMENTAL CONSEQUENCES ..... 4-1

4.0 INTRODUCTION ..... 4-1

4.1 AIR QUALITY ..... 4-2

4.1.1 Alternative A—No Federal Action ..... 4-3

4.1.2 Alternative B—Proposed Action with Additional Mitigation ..... 4-4

---

**TABLE OF CONTENTS**

---

4.1.3	Alternative C—Maximum Development .....	4-7
4.2	CULTURAL RESOURCES .....	4-8
4.2.1	Alternative A—No Federal Action.....	4-8
4.2.2	Alternative B—Proposed Action with Additional Mitigation .....	4-8
4.2.3	Alternative C—Maximum Development Alternative .....	4-10
4.3	GEOLOGY, MINERALS, AND PALEONTOLOGY .....	4-11
4.3.1	Alternative A—No Federal Action.....	4-11
4.3.2	Alternative B—Proposed Action with Additional Mitigation .....	4-13
4.3.3	Alternative C—Maximum Development Alternative .....	4-14
4.4	WASTES, HAZARDOUS or SOLID .....	4-15
4.4.1	Alternative A—No Federal Action.....	4-15
4.4.2	Alternative B—Proposed Action with Additional Mitigation .....	4-17
4.4.3	Alternative C—Maximum Development Alternative .....	4-18
4.5	WATER RESOURCES, SURFACE AND GROUND .....	4-19
4.5.1	Alternative A—No Federal Action.....	4-19
4.5.2	Alternative B—Proposed Action with Additional Mitigation .....	4-22
4.5.3	Alternative C—Maximum Development Alternative .....	4-22
4.6	LIVESTOCK GRAZING .....	4-23
4.6.1	Alternative A—No Federal Action.....	4-23
4.6.2	Alternative B—Proposed Action with Additional Mitigation .....	4-23
4.6.3	Alternative C—Maximum Development Alternative .....	4-24
4.7	RECREATION AND VISUAL RESOURCES .....	4-24
4.7.1	Recreation .....	4-24
4.7.1.1	Alternative A—No Federal Action.....	4-24
4.7.1.2	Alternative B—Proposed Action with Additional Mitigation .....	4-26
4.7.1.3	Alternative C—Maximum Development .....	4-27
4.7.2	Visual Resources (VRM) .....	4-28
4.7.2.1	Alternative A—No Federal Action.....	4-28
4.7.2.2	Alternative B—Proposed Action with Additional Mitigation .....	4-29
4.7.2.3	Alternative C—Maximum Development Alternative .....	4-31
4.8	SOCIOECONOMICS .....	4-32
4.8.1	Alternative A—No Federal Action.....	4-32
4.8.2	Alternative B—Proposed Action with Additional Mitigation .....	4-42
4.8.3	Alternative C—Maximum Development Alternative .....	4-52
4.9	SOILS .....	4-61
4.9.1	Introduction .....	4-61
4.9.2	Impact Significance Criteria.....	4-61
4.9.3	Alternative A—No Federal Action.....	4-61
4.9.4	Alternative B—Proposed Action with Additional Mitigation .....	4-62
4.9.5	Alternative C—Maximum Development Alternative .....	4-63
4.9.6	Impacts Summary.....	4-64
4.9.7	Mitigation Measures .....	4-64
4.9.8	Residual Impacts .....	4-64
4.10	ACCESS AND TRANSPORTATION .....	4-64
4.10.1	Alternative A—No Federal Action.....	4-64
4.10.2	Alternative B—Proposed Action with Additional Mitigation .....	4-66
4.10.3	Alternative C—Maximum Development Alternative .....	4-68
4.11	VEGETATION.....	4-70
4.11.1	Alternative A—No Federal Action.....	4-70
4.11.2	Alternative B—Proposed Action with Additional Mitigation .....	4-71
4.11.3	Alternative C—Maximum Development Alternative .....	4-72
4.12	WILDLIFE .....	4-73
4.12.1	Alternative A—No Federal Action.....	4-73
4.12.2	Alternative B—Proposed Action with Additional Mitigation .....	4-81
4.12.3	Alternative C—Maximum Development Alternative .....	4-86
4.13	SPECIAL STATUS WILDLIFE, FISH, AND PLANT SPECIES.....	4-87

**TABLE OF CONTENTS**

---

4.13.1 Alternative A—No Federal Action..... 4-87

4.13.2 Alternative B—Proposed Action, with Additional Mitigation ..... 4-92

4.13.3 Alternative C—Maximum Development Alternative ..... 4-93

4.14 PUBLIC HEALTH AND SAFETY ..... 4-94

4.14.1 Alternative A—No Federal Action..... 4-94

4.14.2 Alternative B—Proposed Action with Additional Mitigation ..... 4-95

4.14.3 Alternative C—Maximum Development Alternative ..... 4-96

4.15 NOISE ..... 4-97

4.15.1 Alternative A—No Federal Action..... 4-97

4.15.2 Alternative B—Proposed Action with Additional Mitigation ..... 4-9593

4.15.3 Alternative C—Maximum Development Alternative ..... 4-99

4.16 UNAVOIDABLE ADVERSE IMPACTS ..... 4-100

4.16.1 Alternative A—No Federal Action..... 4-100

4.16.2 Alternative B—Proposed Action, with Additional Mitigation ..... 4-100

4.16.3 Alternative C—Maximum Development Alternative ..... 4-100

4.17 RELATIONSHIP BETWEEN SHORT-TERM USE OF THE ENVIRONMENT  
VS. LONG-TERM PRODUCTIVITY ..... 4-100

4.17.1 Alternatives A, B, and C ..... 4-100

4.18 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES..... 4-101

4.18.1 Alternatives A, B, and C ..... 4-101

5. CONSULTATION AND COORDINATION ..... 5-1

5.0 INTRODUCTION ..... 5-1

5.1 PUBLIC PARTICIPATION ..... 5-1

5.2 LIST OF PREPARERS ..... 5-4

6. REFERENCES ..... 6-1

**Appendices**

- Appendix A Master Authorization for Permit to Drill
- Appendix B Potential Bird Species Within or Near the BNGPA
- Appendix C Hazardous Materials Management Summary
- Appendix D Reclamation Plan

---

## TABLE OF CONTENTS

---

### List of Tables

Table 1.7-1.	Federal, State, and County Authorizing Actions.....	1-7
Table 2.2-1.	Surface Disturbances due to Flowlines for Alternative A .....	2-12
Table 2.2-2.	Surface Disturbances due to Flowlines for Alternative B .....	2-12
Table 2.2-3.	Surface Disturbances due to Flowlines for Alternative C .....	2-12
Table 2.2-4.	Artificial Lifts, All Operators .....	2-15
Table 2.2-5.	Artificial Lifts, Fidelity E&P.....	2-16
Table 2.2-6.	Artificial Lifts, Noble .....	2-16
Table 2.2-7.	Artificial Lifts, Omimex .....	2-16
Table 2.2-8.	Artificial Lifts, Decker .....	2-16
Table 2.2-9.	Proposed Gas Compression .....	2-20
Table 2.3-1.	Bowdoin Natural Gas Project—Comparison of Alternatives. ....	2-30
Table 2.3-2.	Bowdoin Natural Gas Project—Summary Comparison of Effects.....	2-35
Table 3.0-1.	Critical Elements Requiring Mandatory Evaluation .....	3-1
Table 3.1-1.	Mean Monthly Temperature Ranges and Total Precipitation Amounts for Malta, MT .....	3-2
Table 3.1-2.	Wind Direction Frequency Distribution for Glasgow, MT.....	3-2
Table 3.1-3.	Wind Speed Distribution .....	3-3
Table 3.1-5.	Air Pollutant Background Concentrations, Montana and National Ambient Air Quality Standards, and Prevention of Significant Deterioration (PSD) Increments.....	3-4
Table 3.5-1.	Temperature and Precipitation Data.....	3-19
Table 3.5-2.	BNGPA Surface Water Bodies by Sub-Basin .....	3-20
Table 3.5-3.	Designated Beneficial Uses by Water Body Class .....	3-26
Table 3.5-4.	Summary of State and Federal Water Quality Act Listed Water Bodies Within the BNGPA .....	3-27
Table 3.5-5.	General Water Quality of the Milk River at USGS Station 06155900 Milk River at Cree Crossing Near Saco, MT .....	3-30
Table 3.5-6.	General Water Quality of the Milk River at USGS Station 06164510 Milk River at Juneberg Bridge Near Saco, MT.....	3-30
Table 3.5-7.	General Water Quality of Beaver Creek at USGS Station 06166000 Below Guston Coulee Near Saco, MT .....	3-30
Table 3.7-1.	BLM Lands in the BNGPA by VRM Class .....	3-36
Table 3.8-1.	Full and Part-Time Employment, by Selected Industrial Clusters, 2004 .....	3-42
Table 3.8-2.	Overview of Local Agriculture, 2002.....	3-42
Table 3.8-3.	Personal Income, Phillips and Valley Counties, 2004 .....	3-48
Table 3.8-4.	Population in Phillips and Valley County and Communities: 1990, 2000 and 2004 .....	3-50
Table 3.8-5.	Temporary Housing Units in Communities Near the BNGPA .....	3-51
Table 3.8-6.	Distribution of Assessed Valuation, by Property Class, FY 2004–05.....	3-52
Table 3.8-7.	Statutory Allocations of the Local Shares of the Oil and Gas Production Tax .....	3-53
Table 3.8-8.	Distributions of Federal Mineral Royalties, FY 2005 and 2006 .....	3-54
Table 3.8-9.	Selected Financial Characteristics for Affected Units of Local Government .....	3-55
Table 3.8-10.	Percentage of Minorities in the U.S., Montana, Areas Within and Near the BNGPA, Nearby Communities, Montana and U.S. ....	3-60
Table 3.8-11.	American Indian Populations Associated With Reservations and Trust Lands Within and Near the BNGPA .....	3-61
Table 3.8-12.	Percentage of Low-Income Population Within and Near the BNGPA, Nearby Communities, Montana and U.S. ....	3-62

**TABLE OF CONTENTS**

---

Table 3.9-1.	Potential Soil Limitations Within the BNGPA.....	3-66
Table 3.9-2.	Factors and Criteria Used to Determine Reclamation Potential at the BNGPA.....	3-72
Table 3.10-1.	Highway and Road Miles Within the BNGPA by Surface Ownership .....	3-74
Table 3.10-2.	MDT Traffic Counts for Highways Within the BNGPA.....	3-77
Table 3.10-3.	Level of Service Information for Highways Providing Access to the BNGPA .....	3-78
Table 3.10-4.	Phillips and Valley County Roads Providing Access to the BNGPA .....	3-78
Table 3.11-1.	Acreage and Proportion of Wetlands Within the BNGPA.....	3-85
Table 3.11-2.	Montana Noxious Weed Species .....	3-89
Table 3.12-1.	Seasonal Ranges (acres) of Big Game Species Within the BNGPA .....	3-93
Table 3.12-2.	Occurrence Potential of Raptor and Vulture Species Within the BNGPA .....	3-102
Table 3.12-3.	Occurrence Potential and Preferred Wetland Type of Colonial Nesting Waterbird Species Within or Near the BNGPA .....	3-104
Table 3.12-4.	Occurrence Potential of Amphibian and Reptile Species Within the BNGPA.....	3-109
Table 3.12-5.	Occurrence Potential of Fish and Mussel Species Within the BNGPA and Adjacent Waters .....	3-112
Table 3.13-1.	Occurrence Potential of Threatened and Endangered Animal Species Within the BNGPA .....	3-114
Table 3.13-2.	Condition of Greater Sage-grouse Habitat Within the BNGPA .....	3-127
Table 3.13-3.	Occurrence Potential, Status, and Associations of Montana Animal Species of Concern present in the BNGPA.....	139
Table 4.1-1.	Maximum Predicted Concentrations from a Typical Drill Rig Compared to MAAQS/NAAQS Standards.....	4-4
Table 4.1-2.	Proposed Compression Emissions.....	4-5
Table 4.1-3.	Total Proposed BNGPA Emissions .....	4-5
Table 4.8-1.	Employment and Income Multipliers for Oil and Gas Development and Operations in Phillips and Valley Counties, 2003.....	4-34
Table 4.8-2.	Personal Income in Phillips and Valley Counties Associated With Alternative A (millions of \$2006) .....	4-36
Table 4.8-3.	Projected Montana Gas Production Tax Revenues: Alternative A.....	4-40
Table 4.8-4.	Distribution of Gas Production Taxes, 30-Year Assessment Period: Alternative A (millions).....	4-40
Table 4.8-5.	Personal Income in Phillips and Valley Counties Associated With Alternative A (millions of \$2006) .....	4-46
Table 4.8-6.	Projected Montana Gas Production Tax Revenues: Alternatives A & B .....	4-50
Table 4.8-7.	Distribution of Gas Production Taxes, 30-Year Assessment Period: Alternatives A & B.....	4-50
Table 4.8-8.	Personal Income in Phillips and Valley Counties Associated With Alternatives A & C (millions of \$2006) .....	4-56
Table 4.8-9.	Projected Montana Gas Production Tax revenues: Alternatives A & C .....	4-58
Table 4.8-10.	Distribution of Gas Production Taxes, 30-Year Assessment Period: Alternatives A & C.....	4-58
Table 4.15-1.	Noise Readings 1,000 Feet from Compressor Stations in the BNGPA .....	4-98
Table 5-1.	List of BLM Interdisciplinary Reviewers.....	5-4
Table 5-2.	List of Consultant Interdisciplinary Team EA Preparers.....	5-5
Table B-1.	Occurrence Potential and Pertinent Wildlife Section of Bird Species Within or Near the BNGPA .....	B-1

---

**TABLE OF CONTENTS**

---

**List of Figures**

Figure 1.1-1. General Location Map, Bowdoin Natural Gas Development Project ..... 1-2

Figure 2.2-1. Existing Oil and Gas Infrastructure in the BNGPA ..... 2-7

Figure 3.5-1. Surface Water Resources Associated With the BNGPA..... 3-22

Figure 3.7-1. BLM Lands by VRM Class in the BNGPA ..... 3-37

Figure 3.8-1. Total Full and Part-Time Employment, 1970–2004..... 3-41

Figure 3.8-2. Annual Natural Gas Production, Phillips and Valley Counties: 1986–2005 ..... 3-44

Figure 3.8-3. Bowdoin Gas Field Annual Drilling Levels 1995–2005..... 3-44

Figure 3.8-4. Phillips and Valley County Labor Force Trends, 1990–2005 ..... 3-47

Figure 3.8-5. Trends in Phillips & Valley County Unemployment Rates: 1990–2005..... 3-47

Figure 3.8-6. Phillips and Valley County Population: 1990–2005..... 3-49

Figure 3.8-7. 2004 County Assessed Mill Levies: Phillips and Valley Counties and Montana  
Statewide Average..... 3-56

Figure 3.9-1. Water Erosion Hazard as Determined by Soil Erosion Factor (Kw) and Slope..... 3-67

Figure 3.9-2. Water Erosion Hazard of Soils in the BNGPA ..... 3-68

Figure 3.9-3. Wind Erosion Hazard of Soils in the BNGPA ..... 3-69

Figure 3.9-4. Vehicle Trafficability for Roads Used During Drilling and Completion Activities  
in the BNGPA ..... 3-70

Figure 3.9-5. Vehicle Trafficability for Roads Used During Production Activities in the BNGPA..... 3-71

Figure 3.9-6. Reclamation Potential of Soils in the BNGPA ..... 3-73

Figure 3.10-1. Highways and Roads Providing Access to and Within the BNGPA, by Ownership ..... 3-75

Figure 3.10-2. BNGPA Highway and Road Infrastructure by Surface Type ..... 3-76

Figure 3.10-3. Typical Days of Well Site Activity for a BNGPA Well Completed in 3 Zones ..... 3-79

Figure 3.11-1. Topography and EPA Level III and IV Omernik Ecoregions Within the BNGPA ..... 3-83

Figure 3.11-2. GAP Vegetation Land Cover Types Within the BNGPA ..... 3-84

Figure 3.12-1. Seasonal Ranges of Pronghorn and Elk Within and Near the BNGPA ..... 3-94

Figure 3.12-2. Seasonal Ranges of Mule Deer Within the BNGPA..... 3-95

Figure 3.12-3. Range of White-tailed Deer Within the BNGPA ..... 3-96

Figure 3.12-4. Locations and Potential Movement Corridors of Moose and Bison Within and Near the  
BNGPA 3-97

Figure 3.12-5. Habitat of Ring-necked Pheasant and Wild Turkey Within the BNGPA..... 3-99

Figure 3.12-6. Habitat, Lek Locations, and Two-mile Lek Buffers of Sharp-tailed Grouse  
Within the BNGPA ..... 3-100

Figure 3.12-7. Location of Raptor Nests and Potential Arboreal, Cliff, and Badland Nesting  
Habitat Within and Immediately Adjacent to the BNGPA ..... 3-103

Figure 3.12-8. Potential Breeding Areas and Habitat of Colonial Nesting Waterbirds, Shorebirds,  
and Other Waterbirds within and near the BNGPA ..... 3-106

Figure 3.12-9. Location of Amphibian and Reptile Sightings Within the BNGPA ..... 3-110

Figure 3.13-1. Black-tailed Prairie Dog Colonies Within the BNGPA ..... 3-118

Figure 3.13-2. Habitat Condition Classes and Two-mile Lek Buffers of Greater Sage-grouse  
Within the BNGPA ..... 3-129

Figure 4.8-1. Historic and Assumed Alternative A Drilling Levels..... 4-32

Figure 4.8-2. Projected Number of Producing Wells in the BNGPA: Alternative A ..... 4-33

Figure 4.8-3. Estimated Total BNGPA-Related Employment by Category: Alternative A ..... 4-35

Figure 4.8-4. Estimated Total BNGPA-Related Employment: Alternative A..... 4-36

---

**TABLE OF CONTENTS**

---

Figure 4.8-5. BNGPA Projected Wells by Mineral Ownership: Alternative A ..... 4-38

Figure 4.8-6. Forecasted BNGPA Natural Gas Production: Alternative A ..... 4-38

Figure 4.8-7. Historic and Assumed Alternative B Drilling Levels ..... 4-43

Figure 4.8-8. Projected Number of Producing Wells in the BNGPA: Alternative A & B ..... 4-44

Figure 4.8-9. Estimated Total BNGP-Related Employment by Category: Alternatives A & B ..... 4-45

Figure 4.8-10. Estimated Total BNGP-Related Employment: Alternatives A & B ..... 4-46

Figure 4.8-11. BNGPA Projected Wells by Mineral Ownership: Alternatives A & B ..... 4-48

Figure 4.8-12. Forecasted BNGPA Natural Gas Production: Alternatives A & B ..... 4-49

Figure 4.8-13. Historic and Alternative C Assumed Drilling Levels ..... 4-53

Figure 4.8-14. Projected Number of Producing Wells in the BNGPA: All Alternatives ..... 4-54

Figure 4.8-17. Forecasted BNGPA Natural Gas Production: All Alternatives ..... 4-57



## Acronyms and Abbreviations

bbls	barrels
Bcf	billion cubic feet
BWPD	barrels of water per day
CIAA	Cumulative Impact Assessment Area
DOI	U.S. Department of the Interior
dBA	decibels
dv	deciview
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
ERMA	Extensive Recreation Management Area
ESA	Endangered Species Act of 1973
F	Fahrenheit
FAS	fishing access sites
FEMA	Federal Emergency Management Act
Fidelity	Fidelity Exploration & Production Company
FLAG	Federal Land Managers' Air Quality Related Values Workgroup
FLPMA	Federal Land Policy and Management Act
FMDH	Frances Mahon Deaconess Hospital
FMR	federal mineral royalties
frac	fracture stimulation
ft	foot (or feet)
FWS	U.S. Fish and Wildlife Service
FY	fiscal year
GAP	Montana Gap Analysis Program
GFFS	Great Falls Field Station
GIS	geographic information system
g/hp-hr	grams per horsepower-hour
gpd	gallons per day
gpm	gallons per minute
GPS	Global Positioning System
HAP	hazardous air pollutants
HDPE	high-density polyethylene
hp	horsepower
H <sub>2</sub> S	hydrogen sulfide
HUC	hydrologic Unit Code
HWA	Hayden-Wing Associates
ID	interdisciplinary
IDT	interdisciplinary team
IMPROVE	Interagency Monitoring of PROtected Visual Environments
in	inches
JVPRMP	Judith Valley Phillips Resource Management Plan
kg	kilograms
kg/ha	kilograms per hectare
km	kilometer

## ACRONYMS AND ABBREVIATIONS

---

LOP	life of project
LOS	levels of service
m	meter
MAAQS	Montana Ambient Air Quality Standards
MBOGC	Montana Board of Oil and Gas Conservation
MCA	Montana County Noxious Weed Act
MCF	thousand cubic feet
mcf/d	thousand cubic feet per day
mcf/gpd	thousand cubic feet of gas per day
mg/l	milligrams per liter
MBDD	Montana Bird Distribution Database
MDEQ	Montana Department of Environmental Quality
MDEQ-ARMB	Montana Department of Environmental Quality – Air Resources Management Bureau
MDT	Montana Department of Transportation
MDU	Montana Dakota Utilities
MFO	Malta Field Office
MFWP	Montana Department of Fish, Wildlife and Parks
mm	millimeter
mph	miles per hour
mscfd	thousand standard cubic feet per day
MT	Montana, Montana State Highway
MTNHP	Montana Natural Heritage Program
N <sub>2</sub>	nitrogen
NA	not applicable
NAAQS	National Ambient Air Quality Standards
NASIS	National Soils Information System
NEPDG	National Energy Policy Development Group
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO <sub>x</sub>	nitrogen oxide
NO <sub>2</sub>	nitrogen dioxide
NO <sub>3</sub> <sup>-</sup>	nitrate
NP	National Park
NRCS	National Resource Conservation Service
NRHP	National Register of Historic Places
NSR	New Source Review
NTL	Notice to Lessee
NTU	Nephelometric Turbidity Unit
NWR	National Wildlife Refuge
O <sub>3</sub>	ozone
OSHA	Occupational Safety and Health Administration
pH	acidity measurement unit (negative logarithm of the hydrogen ion [H <sup>+</sup> ] concentration)
PEM	palustrine, emergent, seasonally flooded
PM <sub>2.5</sub>	particulate matter less than 2.5 microns in effective diameter
PM <sub>10</sub>	particulate matter less than 10 microns in effective diameter
ppm	parts per million
PSD	prevention of significant deterioration
RCRA	Resource Conservation and Recovery Act

## ACRONYMS AND ABBREVIATIONS

---

RFD	reasonably foreseeable development
RMP	Resource Management Plan
RO	reverse osmosis
ROD	Record of Decision
rpm	revolutions per minute
RV	recreational vehicle
SAR	sodium absorption ratio
SARA	Superfund Amendments and Reauthorization Act
SHPO	State Historic Preservation Office
SO <sub>2</sub>	sulfur dioxide
SPCC	Spill Prevention Control and Countermeasures
SVR	standard visual range
TCF	trillion cubic feet
TD	total depth (well)
TDS	total dissolved solids
Thalweg	The line defining the lowest points along the length of a river bed or valley
TMDL	total maximum daily load
TNW	Traditionally Navigable Water
TPQ	threshold planning quantity
TSS	total suspended solids
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USFS	U.S. Forest Service
USGS	United States Geological Survey
VOC	volatile organic compounds
VRM	visual resource management
WBIP	Williston Basin Interstate Pipelines
WSA	Wilderness Study Area
°F	degrees Fahrenheit
µg/m <sup>3</sup>	micrograms per cubic meter