

U.S. Geological Survey Input-Data Forms for the Assessment of the Upper Jurassic Bossier Formation, U.S. Gulf Coast, 2016

Open-File Report 2018–1134

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**U.S. Department of the Interior
U.S. Geological Survey**

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U.S. Geological Survey
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Introduction

In 2016, the U.S. Geological Survey (USGS) completed an updated assessment of undiscovered, technically recoverable oil and gas resources in the Upper Jurassic Bossier Formation of the onshore U.S. Gulf Coast Province (Paxton and others, 2017). The Bossier Formation was assessed using both the standard continuous (unconventional) and conventional methodologies established by the USGS for three assessment units (AUs): (1) Bossier Eastern Shelf Sandstone Gas and Oil AU, (2) Bossier Western Shelf Sandstone Gas AU, and (3) Bossier Shale Continuous Gas AU. A fourth assessment unit, the Upper Jurassic Downdip Continuous Gas AU, was also defined but was not quantitatively assessed because of limited well data within the extent of the AU. The revised assessment resulted in total estimated mean resources of 2.9 billion barrels of oil, 108.6 trillion cubic feet of gas, and 1.1 billion barrels of natural gas liquids. The purpose of this report is to provide supplemental documentation of the input parameters used in the USGS 2016 Bossier Formation assessment.

Assessment Methodology

The USGS uses two different peer-reviewed methodologies to assess continuous (unconventional) and conventional resource accumulations. Continuous resource accumulations are defined as oil and (or) natural gas that have been generated from thermally mature source rock and have remained within or adjacent to the pod of active source rock. The continuous resources methodology focuses on uncertainties related to the average drainage area of wells and the average estimated ultimate recoveries of wells, in addition to the projection of future success ratios (Charpentier and Cook, 2012). In contrast, conventional petroleum resources are defined where oil and (or) natural gas have migrated into structural and (or) stratigraphic traps and are buoyant upon water. Conventional resource assessments therefore focus on the numbers and sizes of undiscovered conventional accumulations (Klett and others, 2005). Despite differences in the input parameters, both methodologies result in probabilistic estimates of undiscovered, technically recoverable petroleum resources. Supplemental documentation regarding these resource methodologies can be found in multiple published reports (Klett and Charpentier, 2003; Crovelli, 2005; Klett and others, 2005; Klett and Schmoker, 2005; Schmoker, 2005; Schmoker and Klett, 2005; Charpentier and Cook, 2012).

Summary Input-Data Forms for Assessment

The input-data forms for the three quantitatively assessed Bossier Formation AUs are provided in tables 1–3.

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Table 1. Input parameters for the Bossier Eastern Shelf Sandstone Gas and Oil Assessment Unit (50490118), Onshore U.S. Gulf Coast Province.

[Well production data from IHS Markit™ (2016). BCFG, billion cubic feet of gas; MMCFG, million cubic feet of gas; CFG, cubic feet of gas; MMBO, million barrels of oil; MMBOE, million barrels of oil equivalent; BO, barrel of oil; BLIQ, barrel of liquid; BNGL, barrel of natural gas liquids; no., number; m, meter; AU, assessment unit; API, American Petroleum Institute; IHS, IHS Markit; AL, Alabama; FL, Florida; LA, Louisiana; MS, Mississippi; TX, Texas; %, percent]

Assessment Unit (name, no.)
 Scenario (name, no.)

Bossier Eastern Shelf Sandstone Gas and Oil, 50490118

Probability of occurrence (0-1.0)

Scenario Probability:

Assessment-Unit Probabilities: (Adequacy for at least one undiscovered field of minimum size)

<u>Attribute</u>	<u>Probability of occurrence (0-1.0)</u>
1. CHARGE: Adequate petroleum charge:	<u>1.0</u>
2. ROCKS: Adequate reservoirs, traps, and seals:	<u>1.0</u>
3. TIMING OF GEOLOGIC EVENTS: Favorable timing:	<u>1.0</u>
Assessment-Unit GEOLOGIC Probability (Product of 1, 2, and 3):	<u>1.00</u>

UNDISCOVERED ACCUMULATIONS

Number of Undiscovered Accumulations: How many undiscovered accumulations exist that are at least the minimum size?: (uncertainty of fixed but unknown values)

Total Accumulations:	minimum (>0) _____	median _____	maximum _____
Oil/Gas Mix:	minimum _____	mode _____	maximum _____
	_____ number of oil accumulations / number of total accumulations		
	_____ number of oil accumulations / number of gas accumulations		
	_____ number of gas accumulations / number of oil accumulations		
Oil Accumulations:	minimum <u>1</u>	median <u>200</u>	maximum <u>500</u>
Gas Accumulations:	minimum <u>1</u>	median <u>400</u>	maximum <u>1000</u>

Sizes of Undiscovered Accumulations: What are the sizes (**grown**) of the above accumulations?: (variations in the sizes of undiscovered accumulations)

Oil in Oil Accumulations (MMBO):	minimum <u>0.5</u>	median <u>1.5</u>	maximum <u>1600</u>
Gas in Gas Accumulations (BCFG):	minimum <u>3</u>	median <u>18</u>	maximum <u>10000</u>

RATIOS FOR UNDISCOVERED ACCUMULATIONS, TO ASSESS COPRODUCTS

(variations in the properties of undiscovered accumulations)

<u>Oil Accumulations:</u>	minimum	median	maximum
Gas/oil ratio (CFG/BO):	<u>2</u>	<u>1250</u>	<u>5500</u>
NGL/gas ratio (BNGL/MMCFG):	<u>32</u>	<u>102</u>	<u>132</u>
<u>Gas Accumulations:</u>	minimum	median	maximum
Liquids/gas ratio (BLIQ/MMCFG):	<u>0.1</u>	<u>8</u>	<u>46</u>

SELECTED ANCILLARY DATA FOR UNDISCOVERED ACCUMULATIONS
 (variations in the properties of undiscovered accumulations)

<u>Oil Accumulations:</u>	minimum	median	maximum
API gravity (degrees):	<u>34</u>	<u>47</u>	<u>55</u>
Viscosity (centipoise):	<u>1.7</u>	<u>2</u>	<u>7.2</u>
Sulfur content of oil (%):	<u>0.4</u>	<u>0.5</u>	<u>1.5</u>
Depth (m) of water (if applicable):	<u>0</u>	<u>5</u>	<u>10</u>

	minimum	F75	median	F25	maximum
Drilling Depth (m):	<u>2000</u>		<u>3700</u>		<u>5500</u>

<u>Gas Accumulations:</u>	minimum	median	maximum
Inert gas content (%):	<u>0.4</u>	<u>0.7</u>	<u>5.1</u>
Carbon dioxide content (%):	<u>1.2</u>	<u>2.2</u>	<u>3.4</u>
Hydrogen sulfide content (%):	<u>0</u>	<u>0.06</u>	<u>0.6</u>
Depth (m) of water (if applicable):	<u>0</u>	<u>5</u>	<u>10</u>

	minimum	F75	median	F25	maximum
Drilling Depth (m):	<u>2000</u>		<u>5000</u>		<u>10000</u>

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO STATES
Surface Allocations

1. Alabama

Onshore: 8.95 area % of the AU

Oil in Oil Accumulations: 8.95 volume % of the AU
Gas in Gas Accumulations: 8.95 volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

2. Arkansas

Onshore: 4.75 area % of the AU

Oil in Oil Accumulations: 4.75 volume % of the AU
Gas in Gas Accumulations: 4.75 volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

3. Florida

Onshore: 4.39 area % of the AU

Oil in Oil Accumulations: 4.39 volume % of the AU
Gas in Gas Accumulations: 4.39 volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

4. Louisiana

Onshore: 49.26 area % of the AU

Oil in Oil Accumulations: 49.26 volume % of the AU
Gas in Gas Accumulations: 49.26 volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

Assessment Unit (name, no.)
Scenario (name, no.)

Bossier Eastern Shelf Sandstone Gas and Oil, 50490118

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO STATES
Surface Allocations

5. Mississippi

Onshore: 26.25 area % of the AU

Oil in Oil Accumulations: 26.25 volume % of the AU
Gas in Gas Accumulations: 26.25 volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

6. Texas

Onshore: 6.42 area % of the AU

Oil in Oil Accumulations: 6.42 volume % of the AU
Gas in Gas Accumulations: 6.42 volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

7. _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

8. _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

Assessment Unit (name, no.)
Scenario (name, no.)

Bossier Eastern Shelf Sandstone Gas and Oil, 50490118

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO STATES
Surface Allocations

9. _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

10. _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

11. _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

12. _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Assessment Unit (name, no.)
Scenario (name, no.)

Bossier Eastern Shelf Sandstone Gas and Oil, 50490118

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO PROVINCES
Surface Allocations

1. Province Number: 5049 Name: Gulf Coast Mesozoic

Onshore: 100.00 area % of the AU

Oil in Oil Accumulations: 100.00 volume % of the AU

Gas in Gas Accumulations: 100.00 volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

2. Province Number: _____ Name: _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

3. Province Number: _____ Name: _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

4. Province Number: _____ Name: _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Assessment Unit (name, no.)
Scenario (name, no.)

Bossier Eastern Shelf Sandstone Gas and Oil, 50490118

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO PROVINCES
Surface Allocations

5. Province Number: _____ Name: _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

6. Province Number: _____ Name: _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

7. Province Number: _____ Name: _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

8. Province Number: _____ Name: _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO LAND ENTITIES
Surface Allocations

1. <u>Federal Lands</u>	represents	<u>5.25</u>	area % of the AU
	Oil in Oil Accumulations:	<u>5.25</u>	volume % of the AU
	Gas in Gas Accumulations:	<u>5.25</u>	volume % of the AU
2. <u>Private Lands</u>	represents	<u>0.89</u>	area % of the AU
	Oil in Oil Accumulations:	<u>0.89</u>	volume % of the AU
	Gas in Gas Accumulations:	<u>0.89</u>	volume % of the AU
3. <u>Tribal Lands</u>	represents	<u>0.01</u>	area % of the AU
	Oil in Oil Accumulations:	<u>0.01</u>	volume % of the AU
	Gas in Gas Accumulations:	<u>0.01</u>	volume % of the AU
4. <u>Other Lands</u>	represents	<u>82.64</u>	area % of the AU
	Oil in Oil Accumulations:	<u>82.64</u>	volume % of the AU
	Gas in Gas Accumulations:	<u>82.64</u>	volume % of the AU
5. <u>AL State Lands</u>	represents	<u>0.20</u>	area % of the AU
	Oil in Oil Accumulations:	<u>0.20</u>	volume % of the AU
	Gas in Gas Accumulations:	<u>0.20</u>	volume % of the AU
6. <u>FL State Lands</u>	represents	<u>0.02</u>	area % of the AU
	Oil in Oil Accumulations:	<u>0.02</u>	volume % of the AU
	Gas in Gas Accumulations:	<u>0.02</u>	volume % of the AU
7. <u>LA State Lands</u>	represents	<u>1.75</u>	area % of the AU
	Oil in Oil Accumulations:	<u>1.75</u>	volume % of the AU
	Gas in Gas Accumulations:	<u>1.75</u>	volume % of the AU
8. <u>MS State Lands</u>	represents	<u>0.10</u>	area % of the AU
	Oil in Oil Accumulations:	<u>0.10</u>	volume % of the AU
	Gas in Gas Accumulations:	<u>0.10</u>	volume % of the AU

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO LAND ENTITIES
Surface Allocations

9. TX State Lands represents 0.08 area % of the AU

Oil in Oil Accumulations: 0.08 volume % of the AU

Gas in Gas Accumulations: 0.08 volume % of the AU

10. AL Offshore represents 0.80 area % of the AU

Oil in Oil Accumulations: 0.80 volume % of the AU

Gas in Gas Accumulations: 0.80 volume % of the AU

11. FL Offshore represents 1.26 area % of the AU

Oil in Oil Accumulations: 1.26 volume % of the AU

Gas in Gas Accumulations: 1.26 volume % of the AU

12. LA Offshore represents 5.95 area % of the AU

Oil in Oil Accumulations: 5.95 volume % of the AU

Gas in Gas Accumulations: 5.95 volume % of the AU

13. MS Offshore represents 0.81 area % of the AU

Oil in Oil Accumulations: 0.81 volume % of the AU

Gas in Gas Accumulations: 0.81 volume % of the AU

14. TX Offshore represents 0.24 area % of the AU

Oil in Oil Accumulations: 0.24 volume % of the AU

Gas in Gas Accumulations: 0.24 volume % of the AU

15. _____ represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO FEDERAL LAND SUBDIVISIONS
Surface Allocations

1. Bureau of Land Management (BLM) represents 0.00 area % of the AU
Oil in Oil Accumulations: 0.00 volume % of the AU
Gas in Gas Accumulations: 0.00 volume % of the AU

2. BLM Wilderness Areas (BLMW) represents _____ area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

3. BLM Roadless Areas (BLMR) represents _____ area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

4. National Park Service (NPS) represents 0.04 area % of the AU
Oil in Oil Accumulations: 0.04 volume % of the AU
Gas in Gas Accumulations: 0.04 volume % of the AU

5. NPS Wilderness Areas (NPSW) represents _____ area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

6. NPS Protected Withdrawals (NPSP) represents _____ area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

7. US Forest Service (FS) represents 2.49 area % of the AU
Oil in Oil Accumulations: 2.49 volume % of the AU
Gas in Gas Accumulations: 2.49 volume % of the AU

8. USFS Wilderness Areas (FSW) represents _____ area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

Assessment Unit (name, no.)
Scenario (name, no.)

Bossier Eastern Shelf Sandstone Gas and Oil, 50490118

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO FEDERAL LAND SUBDIVISIONS
Surface Allocations

9. USFS Roadless Areas (FSR) represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

10. USFS Protected Withdrawals (FSP) represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

11. US Fish and Wildlife Service (FWS) represents 1.16 area % of the AU

Oil in Oil Accumulations: 1.16 volume % of the AU

Gas in Gas Accumulations: 1.16 volume % of the AU

12. USFWS Wilderness Areas (FWSW) represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

13. USFWS Protected Withdrawals (FWSP) represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

14. Wilderness Study Areas (WS) represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

15. Department of Energy (DOE) represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

16. Department of Defense (DOD) represents 1.56 area % of the AU

Oil in Oil Accumulations: 1.56 volume % of the AU

Gas in Gas Accumulations: 1.56 volume % of the AU

Assessment Unit (name, no.)
Scenario (name, no.)

Bossier Eastern Shelf Sandstone Gas and Oil, 50490118

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO FEDERAL LAND SUBDIVISIONS
Surface Allocations

17. Bureau of Reclamation (BOR) represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

18. Tennessee Valley Authority (TVA) represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

19. Other Federal represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

20. _____ represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO ECOSYSTEMS
Surface Allocations

1. Coastal Plains and Flatwoods, Lower (CPFL) represents 20.47 area % of the AU
Oil in Oil Accumulations: 20.47 volume % of the AU
Gas in Gas Accumulations: 20.47 volume % of the AU

2. Coastal Plains and Flatwoods, Western Gulf (CPFW) represents 8.13 area % of the AU
Oil in Oil Accumulations: 8.13 volume % of the AU
Gas in Gas Accumulations: 8.13 volume % of the AU

3. Coastal Plains, Middle (CPMD) represents 14.36 area % of the AU
Oil in Oil Accumulations: 14.36 volume % of the AU
Gas in Gas Accumulations: 14.36 volume % of the AU

4. Eastern Gulf Prairies and Marshes (EGPM) represents 0.41 area % of the AU
Oil in Oil Accumulations: 0.41 volume % of the AU
Gas in Gas Accumulations: 0.41 volume % of the AU

5. Florida Coastal Lowlands (Western) (FCLW) represents 1.12 area % of the AU
Oil in Oil Accumulations: 1.12 volume % of the AU
Gas in Gas Accumulations: 1.12 volume % of the AU

6. Louisiana Coast Prairies and Marshes (LCPM) represents 14.91 area % of the AU
Oil in Oil Accumulations: 14.91 volume % of the AU
Gas in Gas Accumulations: 14.91 volume % of the AU

7. Mid Coastal Plains, Western (MCPW) represents 13.82 area % of the AU
Oil in Oil Accumulations: 13.82 volume % of the AU
Gas in Gas Accumulations: 13.82 volume % of the AU

8. Mississippi Alluvial Basin (MABA) represents 17.72 area % of the AU
Oil in Oil Accumulations: 17.72 volume % of the AU
Gas in Gas Accumulations: 17.72 volume % of the AU

Ecosystem allocations do not include offshore areas, hence, sum total <100%

Assessment Unit (name, no.)
Scenario (name, no.)

Bossier Eastern Shelf Sandstone Gas and Oil, 50490118

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO ECOSYSTEMS
Surface Allocations

9. _____ represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

10. _____ represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

11. _____ represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

12. _____ represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Ecosystem allocations do not include offshore areas, hence the sum total <100%

Table 2. Input parameters for the Bossier Western Shelf Sandstone Gas Assessment Unit (50490119), Onshore U.S. Gulf Coast Province.

[Field-scale data from Nehring (2016), and well production data from IHS Markit™ (2016). BCFG, billion cubic feet of gas; MMCFG, million cubic feet of gas; CFG, cubic feet of gas; MMBO, million barrels of oil; MMBOE, million barrels of oil equivalent; BO, barrel of oil; BLIQ, barrel of liquid; BNGL, barrel of natural gas liquids; no., number; m, meter; AU, assessment unit; API, American Petroleum Institute; NRG, Nehring database; IHS, IHS Markit; TX, Texas; %, percent]

**USGS U.S. PETROLEUM RESOURCES ASSESSMENT
INPUT FORM FOR CONVENTIONAL ASSESSMENT UNITS (Version 7.0.2, 9 April 2015)**

IDENTIFICATION INFORMATION

Assessment Geologist:	<u>S.T. Paxton</u>	Date:	<u>20-Oct-16</u>
Region:	<u>North America</u>	Number:	<u>5</u>
Province:	<u>Gulf Coast Mesozoic</u>	Number:	<u>5049</u>
Total Petroleum System:	<u>Upper Jurassic-Cretaceous-Tertiary Composite</u>	Number:	<u>504901</u>
Assessment Unit:	<u>Bossier Western Shelf Sandstone Gas</u>	Number:	<u>50490119</u>
Scenario:		Number:	
Based on Data as of:	<u>NRG (2016, data current through 2014), IHS (2016)</u>		
Notes from Assessor:	<u></u>		

CHARACTERISTICS OF ASSESSMENT UNIT

Area of assessment unit: 66,411 square kilometers

Minimum assessed accumulation size: 0.5 MMBOE (grown)

No. of discovered accumulations exceeding minimum size: Oil: 0 Gas: 22

Uncertainty Class:	Check One	Number
Producing fields	<u>X</u>	<u></u>
Discoveries	<u></u>	<u></u>
Wells	<u></u>	<u></u>
Seismic	<u></u>	<u></u>
No seismic	<u></u>	<u></u>

Median size (grown) of discovered oil accumulations (MMBO):

1st 3rd	<u></u>	2nd 3rd	<u></u>	3rd 3rd	<u></u>
---------	---------	---------	---------	---------	---------

Median size (grown) of discovered gas accumulations (BCFG):

1st 3rd	<u>25.42</u>	2nd 3rd	<u>24.23</u>	3rd 3rd	<u>9.01</u>
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ANALOGS USED IN ESTIMATING INPUT

<u>Purpose</u>	<u>Analog or Analog Set</u>
1 <u></u>	<u></u> <u></u> <u></u>
2 <u></u>	<u></u> <u></u> <u></u>
3 <u></u>	<u></u> <u></u> <u></u>
4 <u></u>	<u></u> <u></u> <u></u>

Assessment Unit (name, no.)
 Scenario (name, no.)

Bossier Western Shelf Sandstone Gas, 50490119

Probability of occurrence (0-1.0)

Scenario Probability:

Assessment-Unit Probabilities: (Adequacy for at least one undiscovered field of minimum size)

<u>Attribute</u>	<u>Probability of occurrence (0-1.0)</u>
1. CHARGE: Adequate petroleum charge:	<u>1.0</u>
2. ROCKS: Adequate reservoirs, traps, and seals:	<u>1.0</u>
3. TIMING OF GEOLOGIC EVENTS: Favorable timing:	<u>1.0</u>
Assessment-Unit GEOLOGIC Probability (Product of 1, 2, and 3):	<u>1.00</u>

UNDISCOVERED ACCUMULATIONS

Number of Undiscovered Accumulations: How many undiscovered accumulations exist that are at least the minimum size?: (uncertainty of fixed but unknown values)

Total Accumulations:	minimum (>0) _____	median _____	maximum _____
Oil/Gas Mix:	minimum _____	mode _____	maximum _____
	_____ number of oil accumulations / number of total accumulations		
	_____ number of oil accumulations / number of gas accumulations		
	_____ number of gas accumulations / number of oil accumulations		
Oil Accumulations:	minimum <u>0</u>	median <u>0</u>	maximum <u>0</u>
Gas Accumulations:	minimum <u>1</u>	median <u>80</u>	maximum <u>300</u>

Sizes of Undiscovered Accumulations: What are the sizes (**grown**) of the above accumulations?: (variations in the sizes of undiscovered accumulations)

Oil in Oil Accumulations (MMBO):	minimum _____	median _____	maximum _____
Gas in Gas Accumulations (BCFG):	minimum <u>3</u>	median <u>6</u>	maximum <u>4000</u>

RATIOS FOR UNDISCOVERED ACCUMULATIONS, TO ASSESS COPRODUCTS

(variations in the properties of undiscovered accumulations)

<u>Oil Accumulations:</u>	minimum	median	maximum
Gas/oil ratio (CFG/BO):	_____	_____	_____
NGL/gas ratio (BNGL/MMCFG):	_____	_____	_____
<u>Gas Accumulations:</u>	minimum	median	maximum
Liquids/gas ratio (BLIQ/MMCFG):	<u>0.1</u>	<u>6</u>	<u>53</u>

SELECTED ANCILLARY DATA FOR UNDISCOVERED ACCUMULATIONS
 (variations in the properties of undiscovered accumulations)

<u>Oil Accumulations:</u>	minimum		median		maximum
API gravity (degrees):	_____		_____		_____
Viscosity (centipoise):	_____		_____		_____
Sulfur content of oil (%):	_____		_____		_____
Depth (m) of water (if applicable):	_____		_____		_____
Drilling Depth (m):	minimum	F75	median	F25	maximum

<u>Gas Accumulations:</u>	minimum		median		maximum
Inert gas content (%):	<u>0.1</u>		<u>0.2</u>		<u>0.3</u>
Carbon dioxide content (%):	<u>1.3</u>		<u>2</u>		<u>2.6</u>
Hydrogen sulfide content (%):	<u>0</u>		<u>0</u>		<u>0</u>
Depth (m) of water (if applicable):	_____		_____		_____
Drilling Depth (m):	minimum	F75	median	F25	maximum
	<u>2700</u>		<u>3500</u>		<u>6000</u>

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO STATES
Surface Allocations

1. Texas

Onshore: 100.00 area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: 100.00 volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

2. _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

3. _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

4. _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO STATES
Surface Allocations

5. _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

6. _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

7. _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

8. _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO STATES
Surface Allocations

9. _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

10. _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

11. _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

12. _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Assessment Unit (name, no.)
Scenario (name, no.)

Bossier Western Shelf Sandstone Gas, 50490119

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO PROVINCES
Surface Allocations

1. Province Number: 5049 Name: Gulf Coast Mesozoic

Onshore: 100.00 area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: 100.00 volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

2. Province Number: _____ Name: _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

3. Province Number: _____ Name: _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

4. Province Number: _____ Name: _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Assessment Unit (name, no.)
Scenario (name, no.)

Bossier Western Shelf Sandstone Gas, 50490119

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO PROVINCES
Surface Allocations

5. Province Number: _____ Name: _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

6. Province Number: _____ Name: _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

7. Province Number: _____ Name: _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

8. Province Number: _____ Name: _____

Onshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Offshore: _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO LAND ENTITIES
Surface Allocations

1. Federal Lands represents 0.81 area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: 0.81 volume % of the AU

2. Private Lands represents 0.10 area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: 0.10 volume % of the AU

3. Tribal Lands represents 0.00 area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: 0.00 volume % of the AU

4. Other Lands represents 98.74 area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: 98.74 volume % of the AU

5. TX State Lands represents 0.35 area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: 0.35 volume % of the AU

6. _____ represents _____ area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

7. _____ represents _____ area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

8. _____ represents _____ area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO LAND ENTITIES
Surface Allocations

9. _____ represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

10. _____ represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

11. _____ represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

12. _____ represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

13. _____ represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

14. _____ represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

15. _____ represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO FEDERAL LAND SUBDIVISIONS
Surface Allocations

1. Bureau of Land Management (BLM) represents _____ area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

2. BLM Wilderness Areas (BLMW) represents _____ area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

3. BLM Roadless Areas (BLMR) represents _____ area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

4. National Park Service (NPS) represents 0.00 area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: 0.00 volume % of the AU

5. NPS Wilderness Areas (NPSW) represents _____ area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

6. NPS Protected Withdrawals (NPSP) represents _____ area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

7. US Forest Service (FS) represents 0.36 area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: 0.36 volume % of the AU

8. USFS Wilderness Areas (FSW) represents _____ area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO FEDERAL LAND SUBDIVISIONS
Surface Allocations

9. USFS Roadless Areas (FSR) represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

10. USFS Protected Withdrawals (FSP) represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

11. US Fish and Wildlife Service (FWS) represents 0.02 area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: 0.02 volume % of the AU

12. USFWS Wilderness Areas (FWSW) represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

13. USFWS Protected Withdrawals (FWSP) represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

14. Wilderness Study Areas (WS) represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

15. Department of Energy (DOE) represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

16. Department of Defense (DOD) represents 0.42 area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: 0.42 volume % of the AU

Assessment Unit (name, no.)
Scenario (name, no.)

Bossier Western Shelf Sandstone Gas, 50490119

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO FEDERAL LAND SUBDIVISIONS
Surface Allocations

17. Bureau of Reclamation (BOR) represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

18. Tennessee Valley Authority (TVA) represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

19. Other Federal represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

20. _____ represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO ECOSYSTEMS
Surface Allocations

1. Blackland Prairies (BLPR) represents 18.87 area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: 18.87 volume % of the AU

2. Mid Coastal Plains, Western (MCPW) represents 8.53 area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: 8.53 volume % of the AU

3. Oak Woods and Prairies (OWPR) represents 44.24 area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: 44.24 volume % of the AU

4. Rio Grande Plain (RGPL) represents 26.85 area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: 26.85 volume % of the AU

5. Stockton Plateau (STPT) represents 1.51 area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: 1.51 volume % of the AU

6. _____ represents _____ area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

7. _____ represents _____ area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

8. _____ represents _____ area % of the AU
Oil in Oil Accumulations: _____ volume % of the AU
Gas in Gas Accumulations: _____ volume % of the AU

Assessment Unit (name, no.)
Scenario (name, no.)

Bossier Western Shelf Sandstone Gas, 50490119

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO ECOSYSTEMS
Surface Allocations

9. _____ represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

10. _____ represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

11. _____ represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

12. _____ represents _____ area % of the AU

Oil in Oil Accumulations: _____ volume % of the AU

Gas in Gas Accumulations: _____ volume % of the AU

Table 3. Input parameters for the Bossier Shale Continuous Gas Assessment Unit (50490163), Onshore U.S. Gulf Coast Province.

[Well production data from IHS Markit™ (2016). bcfg, billion cubic feet of gas; mmcfg, million cubic feet of gas; cfg, cubic feet of gas; mmbo, million barrels of oil; bo, barrel of oil; bliq, barrel of liquid; bnlg, barrel of natural gas liquids; NGL, natural gas liquids; no., number; m, meter; AU, assessment unit; EUR, estimated ultimate recovery; IHS, IHS Markit; API, American Petroleum Institute; %, percent; CO₂, carbon dioxide; frac, hydraulic fracturing; BTU, British thermal unit]

**USGS U.S. PETROLEUM RESOURCES ASSESSMENT
INPUT DATA FORM FOR CONTINUOUS ACCUMULATIONS (version 1.3, April 29, 2015)**

IDENTIFICATION INFORMATION

Assessment Geologist:	<u>S.T. Paxton</u>	Date:	<u>20-Oct-16</u>
Region:	<u>North America</u>	Number:	<u>5</u>
Province:	<u>Gulf Coast Mesozoic</u>	Number:	<u>5049</u>
Total Petroleum System:	<u>Upper Jurassic-Cretaceous-Tertiary Composite</u>	Number:	<u>504901</u>
Assessment Unit:	<u>Bossier Shale Continuous Gas</u>	Number:	<u>50490163</u>
Based on Data as of:	<u>IHS (2016)</u>		
Notes from Assessor:	<u>Coproduct ratios and ancillary data from Haynesville Western Shelf AU 50490116</u>		

CHARACTERISTICS OF ASSESSMENT UNIT

Assessment-unit type: oil (<20,000 cfg/bo) _____ gas (>20,000 cfg/bo) X
heavy oil (<10 API) _____

Well type: vertical _____ horizontal X

Major reservoir type (Choose one.):
shale X low-permeability clastics _____
coal _____ low-permeability carbonates _____
diatomite _____

Minimum EUR per well 0.02 (mmbo for oil AU; bcfg for gas AU)

Number of tested wells: 266

Number of tested wells with EUR > minimum: 199

Historic success ratio, tested wells (%) 75

Assessment-Unit Probability:

What is the probability that at least one well within the AU will have
production capacity of at least the minimum EUR? 1.0

NUMBER OF UNDRILLED WELLS WITH POTENTIAL FOR ADDITIONS TO RESERVES

1. Productive area of accumulation (acres): (triangular)

calculated mean 10,517,667 minimum 20,000 mode 5,612,000 maximum 25,921,000

2. Uncertainty about average drainage area of wells (acres): (triangular)

calculated mean 113 minimum 60 mode 100 maximum 180

3. Percentage of total assessment-unit area that is untested (%): (triangular)

calculated mean 99.7 minimum 99.5 mode 99.7 maximum 99.9

4. Percentage of untested assessment-unit area in sweet spots (%): (triangular)

calculated mean 100 minimum 100 mode 100 maximum 100

ESTIMATED ULTIMATE RECOVERY (EUR) PER WELL

SWEET SPOTS

5a. Future success ratio (%): (triangular)

calculated mean 50 minimum 10 mode 50 maximum 90

5b. Uncertainty about average EUR (mmbo for oil; bcfg for gas): (shifted truncated lognormal)

calculated mean 1.109 minimum 0.5 median 1 maximum 3

NON-SWEET SPOTS

6a. Future success ratio (%): (triangular)

calculated mean _____ minimum _____ mode _____ maximum _____

6b. Uncertainty about average EUR (mmbo for oil; bcfg for gas): (shifted truncated lognormal)

calculated mean _____ minimum _____ median _____ maximum _____

UNCERTAINTY ABOUT AVERAGE COPRODUCT RATIOS FOR UNTESTED WELLS

(triangular)

Oil assessment unit:

minimum

mode

maximum

Gas/oil ratio (cfg/bo)

NGL/gas ratio (bnl/mmcf)

Gas assessment unit:

Liquids/gas ratio (bliq/mmcf)

1

3

5

SELECTED ANCILLARY DATA FOR UNTESTED WELLS
 (no specified distribution type)

<u>Oil assessment unit:</u>	minimum		median		maximum
API gravity of oil (degrees)	_____		_____		_____
Sulfur content of oil (%)	_____		_____		_____
Depth (m) of water (if applicable)	_____		_____		_____
Drilling depth (m)	minimum	F75	median	F25	maximum

<u>Gas assessment unit:</u>	minimum		median		maximum
Inert-gas content (%)	0.40		1.00		5.00
CO ₂ content (%)	1.00		2.00		3.00
Hydrogen sulfide content (%)	0.00		0.10		0.60
Heating value (BTU)	946		1020		1221
Depth (m) of water (if applicable)	0		5		10
Drilling depth (m)	minimum	F75	median	F25	maximum
	1500		3800		5200

Completion practices:

1. Typical well-completion practices (conventional, open hole, open cavity, other)	<u>conventional</u>
2. Fraction of wells drilled that are typically stimulated	<u>1.00</u>
3. Predominant type of stimulation (none, frac, acid, other)	<u>frac. and acid</u>
4. Historic fraction of wells drilled that are horizontal	<u>1.00</u>

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO STATES
(continued)

6. _____

Onshore: _____ area % of the AU
 _____ mean volume % of the AU

Offshore: _____ area % of the AU
 _____ mean volume % of the AU

7. _____

Onshore: _____ area % of the AU
 _____ mean volume % of the AU

Offshore: _____ area % of the AU
 _____ mean volume % of the AU

8. _____

Onshore: _____ area % of the AU
 _____ mean volume % of the AU

Offshore: _____ area % of the AU
 _____ mean volume % of the AU

9. _____

Onshore: _____ area % of the AU
 _____ mean volume % of the AU

Offshore: _____ area % of the AU
 _____ mean volume % of the AU

10. _____

Onshore: _____ area % of the AU
 _____ mean volume % of the AU

Offshore: _____ area % of the AU
 _____ mean volume % of the AU

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO PROVINCES
Surface Allocations

1. Number: 5049 Name: Gulf Coast Mesozoic

Onshore: 100.00 area % of the AU
100.00 mean volume % of the AU

Offshore: _____ area % of the AU
_____ mean volume % of the AU

2. Number: _____ Name: _____

Onshore: _____ area % of the AU
_____ mean volume % of the AU

Offshore: _____ area % of the AU
_____ mean volume % of the AU

3. Number: _____ Name: _____

Onshore: _____ area % of the AU
_____ mean volume % of the AU

Offshore: _____ area % of the AU
_____ mean volume % of the AU

4. Number: _____ Name: _____

Onshore: _____ area % of the AU
_____ mean volume % of the AU

Offshore: _____ area % of the AU
_____ mean volume % of the AU

5. Number: _____ Name: _____

Onshore: _____ area % of the AU
_____ mean volume % of the AU

Offshore: _____ area % of the AU
_____ mean volume % of the AU

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO PROVINCES
(continued)

6. Number: _____ Name: _____

Onshore: _____ area % of the AU
_____ mean volume % of the AU

Offshore: _____ area % of the AU
_____ mean volume % of the AU

7. Number: _____ Name: _____

Onshore: _____ area % of the AU
_____ mean volume % of the AU

Offshore: _____ area % of the AU
_____ mean volume % of the AU

8. Number: _____ Name: _____

Onshore: _____ area % of the AU
_____ mean volume % of the AU

Offshore: _____ area % of the AU
_____ mean volume % of the AU

9. Number: _____ Name: _____

Onshore: _____ area % of the AU
_____ mean volume % of the AU

Offshore: _____ area % of the AU
_____ mean volume % of the AU

10. Number: _____ Name: _____

Onshore: _____ area % of the AU
_____ mean volume % of the AU

Offshore: _____ area % of the AU
_____ mean volume % of the AU

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO GENERAL LAND OWNERSHIPS
Surface Allocations

1. Federal Lands	is	<u>4.02</u>	% of the AREA of the AU
mean VOLUME % in entity		<u>4.02</u>	
2. Private Lands	is	<u>0.16</u>	% of the AREA of the AU
mean VOLUME % in entity		<u>0.16</u>	
3. Tribal Lands	is	<u>0.00</u>	% of the AREA of the AU
mean VOLUME % in entity		<u>0.00</u>	
4. Other Lands	is	<u>93.72</u>	% of the AREA of the AU
mean VOLUME % in entity		<u>93.72</u>	
5. <u>Louisiana State Lands</u>	is	<u>0.46</u>	% of the AREA of the AU
mean VOLUME % in entity		<u>0.46</u>	
6. <u>Mississippi State Lands</u>	is	<u>0.12</u>	% of the AREA of the AU
mean VOLUME % in entity		<u>0.12</u>	
7. <u>Texas State Lands</u>	is	<u>0.13</u>	% of the AREA of the AU
mean VOLUME % in entity		<u>0.13</u>	
8. <u>Louisiana Offshore</u>	is	<u>0.47</u>	% of the AREA of the AU
mean VOLUME % in entity		<u>0.47</u>	
9. <u>Mississippi Offshore</u>	is	<u>0.92</u>	% of the AREA of the AU
mean VOLUME % in entity		<u>0.92</u>	
10. _____	is	_____	% of the AREA of the AU
mean VOLUME % in entity		_____	

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO GENERAL LAND OWNERSHIPS
(continued)

11. _____ is _____ % of the AREA of the AU
mean VOLUME % in entity _____
12. _____ is _____ % of the AREA of the AU
mean VOLUME % in entity _____
13. _____ is _____ % of the AREA of the AU
mean VOLUME % in entity _____
14. _____ is _____ % of the AREA of the AU
mean VOLUME % in entity _____
15. _____ is _____ % of the AREA of the AU
mean VOLUME % in entity _____
16. _____ is _____ % of the AREA of the AU
mean VOLUME % in entity _____
17. _____ is _____ % of the AREA of the AU
mean VOLUME % in entity _____
18. _____ is _____ % of the AREA of the AU
mean VOLUME % in entity _____
19. _____ is _____ % of the AREA of the AU
mean VOLUME % in entity _____
20. _____ is _____ % of the AREA of the AU
mean VOLUME % in entity _____

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO FEDERAL LAND SUBDIVISIONS
Surface Allocations

- | | | | |
|--------------------------------------|----|-------------------|-------------------------|
| 1. Bureau of Land Management (BLM) | is | <u>0.00</u> | % of the AREA of the AU |
| mean VOLUME % in entity | | <u>0.00</u> | |
| 2. BLM Wilderness Areas (BLMW) | is | <u> </u> | % of the AREA of the AU |
| mean VOLUME % in entity | | <u> </u> | |
| 3. BLM Roadless Areas (BLMR) | is | <u> </u> | % of the AREA of the AU |
| mean VOLUME % in entity | | <u> </u> | |
| 4. National Park Service (NPS) | is | <u>0.00</u> | % of the AREA of the AU |
| mean VOLUME % in entity | | <u>0.00</u> | |
| 5. NPS Wilderness Areas (NPSW) | is | <u> </u> | % of the AREA of the AU |
| mean VOLUME % in entity | | <u> </u> | |
| 6. NPS Protected Withdrawals (NPSP) | is | <u> </u> | % of the AREA of the AU |
| mean VOLUME % in entity | | <u> </u> | |
| 7. US Forest Service (FS) | is | <u>2.95</u> | % of the AREA of the AU |
| mean VOLUME % in entity | | <u>2.95</u> | |
| 8. USFS Wilderness Areas (FSW) | is | <u> </u> | % of the AREA of the AU |
| mean VOLUME % in entity | | <u> </u> | |
| 9. USFS Roadless Areas (FSR) | is | <u> </u> | % of the AREA of the AU |
| mean VOLUME % in entity | | <u> </u> | |
| 10. USFS Protected Withdrawals (FSP) | is | <u> </u> | % of the AREA of the AU |
| mean VOLUME % in entity | | <u> </u> | |

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO ECOSYSTEMS
Surface Allocations

1. <u>Blackland Prairies (BLPR)</u>	is	<u>0.88</u>	% of the AREA of the AU
mean VOLUME % in entity		<u>0.88</u>	
2. <u>Coastal Plains and Flatwoods, Lower (CPFL)</u>	is	<u>8.12</u>	% of the AREA of the AU
mean VOLUME % in entity		<u>8.12</u>	
3. <u>Coastal Plains and Flatwoods, Western Gulf (CF)</u>	is	<u>11.00</u>	% of the AREA of the AU
mean VOLUME % in entity		<u>11.00</u>	
4. <u>Coastal Plains, Middle (CPMD)</u>	is	<u>3.19</u>	% of the AREA of the AU
mean VOLUME % in entity		<u>3.19</u>	
5. <u>Louisiana Coast Prairies and Marshes (LCPM)</u>	is	<u>1.71</u>	% of the AREA of the AU
mean VOLUME % in entity		<u>1.71</u>	
6. <u>Mid Coastal Plains, Western (MCPW)</u>	is	<u>34.37</u>	% of the AREA of the AU
mean VOLUME % in entity		<u>34.37</u>	
7. <u>Mississippi Alluvial Basin (MABA)</u>	is	<u>4.06</u>	% of the AREA of the AU
mean VOLUME % in entity		<u>4.06</u>	
8. <u>Oak Woods and Prairies (OWPR)</u>	is	<u>23.61</u>	% of the AREA of the AU
mean VOLUME % in entity		<u>23.61</u>	
9. <u>Rio Grande Plain (RGPL)</u>	is	<u>11.66</u>	% of the AREA of the AU
mean VOLUME % in entity		<u>11.66</u>	
10. _____	is	_____	% of the AREA of the AU
mean VOLUME % in entity		_____	

Ecosystem allocations do not include offshore areas, hence the sum total <100%

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO ECOSYSTEMS
(continued)

11. _____ is _____ % of the AREA of the AU
mean VOLUME % in entity _____
12. _____ is _____ % of the AREA of the AU
mean VOLUME % in entity _____
13. _____ is _____ % of the AREA of the AU
mean VOLUME % in entity _____
14. _____ is _____ % of the AREA of the AU
mean VOLUME % in entity _____
15. _____ is _____ % of the AREA of the AU
mean VOLUME % in entity _____
16. _____ is _____ % of the AREA of the AU
mean VOLUME % in entity _____
17. _____ is _____ % of the AREA of the AU
mean VOLUME % in entity _____
18. _____ is _____ % of the AREA of the AU
mean VOLUME % in entity _____
19. _____ is _____ % of the AREA of the AU
mean VOLUME % in entity _____
20. _____ is _____ % of the AREA of the AU
mean VOLUME % in entity _____

Ecosystem allocations do not include offshore areas, hence the sum total <100%

