USGS
science for a changing world

Analytic Resource Assessment Method for Continuous (Unconventional) Oil and Gas Accumulations—The "ACCESS" Method

By Robert A. Crovelli, revised by Ronald R. Charpentier, 2012

Open-File Report 2012–1146

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

U.S. Department of the Interior
KEN SALAZAR, Secretary

U.S. Geological Survey
Marcia K. McNutt, Director

U.S. Geological Survey, Reston, Virginia: 2012

Suggested citation:
Crovelli, R.A., 2012, Analytical resources assessment method for continuous (unconventional) oil and gas accumulations—The "ACCESS Method": U.S. Geological Survey Open-File Report 2012–1146, 32 p. [Revised by Charpentier, R.R.]

Contents

Figures

Table

Analytic Resource Assessment Method for Continuous (Unconventional) Oil and Gas Accumulations—The "ACCESS" Method

By Robert A. Crovelli,[1] revised by Ronald R. Charpentier,[1] 2012

Introduction

The U.S. Geological Survey (USGS) periodically assesses petroleum resources of areas within the United States and the world. The purpose of this report is to explain the development of an analytic probabilistic method and spreadsheet software system called Analytic Cell-Based Continuous Energy Spreadsheet System (ACCESS). The ACCESS method is based upon mathematical equations derived from probability theory. The ACCESS spreadsheet can be used to calculate estimates of the undeveloped oil, gas, and NGL (natural gas liquids) resources in a continuous-type assessment unit. An assessment unit is a mappable volume of rock in a total petroleum system. In this report, the geologic assessment model is defined first, the analytic probabilistic method is described second, and the spreadsheet ACCESS is described third. In this revised version of Open-File Report 00–044, the text has been updated to reflect modifications that were made to the ACCESS program. Two versions of the program are added as appendixes.

Geologic Assessment Model

The geologic assessment model is called the FORSPAN model and is described in Schmoker (1999). The geologic assessment model for an assessment unit consists of the following components (see figs. 1 and 2 for additional descriptions):

A. A set of four assessment-unit probabilities:

1. Charge
2. Rocks
3. Timing
4. Access

B. A set of nine random variables for an oil assessment unit or a similar set for a gas assessment unit:

1. Total assessment-unit area
2. Area per cell
3. Percentage of total assessment-unit area that is untested

[1] U.S. Geological Survey, MS 939, Box 25046, Denver Federal Center, Denver, Colorado 80225

4. Percentage of untested assessment-unit area that has potential for additions to reserves
5. Total recovery per cell
6. Ratio of coproduct A
7. Ratio of coproduct B
8. Percent allocation to parcel (or land entity)
9. Percent allocation to offshore portion of parcel

(The assessment-unit area, untested percentage of assessment-unit area, percentage of untested assessment-unit area with potential, and area per cell are used to determine the number of potential cells, as explained later.)

C. A set of three descriptive parameters for each of the nine given random variables:

1. Minimum (F100)
2. Median (F50) or mode (most likely), depending on the version of the program (see p. 13)
3. Maximum (FO)

Examples of the basic input data form for the FORSPAN model are given in figures 1 and 2.

***FORSPAN* ASSESSMENT MODEL FOR CONTINUOUS ACCUMULATIONS--BASIC INPUT DATA FORM (NOGA, Version 9, 2-10-03)**									
IDENTIFICATION INFORMATION									
Assessment Geologist:	R.F. Dubiel and J.K. Pitman						Date:	10/27/2010	
Region:	North America						Number:	5	
Province:	Gulf Coast Mesozoic						Number:	5049	
Total Petroleum System:	Upper Jurassic-Cretaceous-Tertiary Composite						Number:	504901	
Assessment Unit:	Eagle Ford Shale Oil						Number:	50490170	
Based on Data as of:	IHS 2010								
Notes from Assessor:									
CHARACTERISTICS OF ASSESSMENT UNIT									
Assessment-unit type: Oil (<20,000 cfg/bo) **or Gas** (≥20,000 cfg/bo), incl. disc. & pot. additions								Oil	
What is the minimum total recovery per cell?	0.002	(mmbo for oil A.U.; bcfg for gas A.U.)							
Number of tested cells:	85								
Number of tested cells with total recovery per cell ≥ minimum:	64								
Established (discovered cel	X	Hypothetical (no cells):							
Median total recovery per cell (for cells ≥ min.): (mmbo for oil A.U.; bcfg for gas A.U.)									
1st 3rd discovered	0.017	2nd 3rd	0.039	3rd 3rd	0.011				
Assessment-Unit Probabilities:									
Attribute	Probability of occurrence (0-1.0)								
1. **CHARGE:** Adequate petroleum charge for an untested cell with total recovery ≥ minimum.	1.0								
2. **ROCKS:** Adequate reservoirs, traps, seals for an untested cell with total recovery ≥ minimum.	1.0								
3. **TIMING:** Favorable geologic timing for an untested cell with total recovery ≥ minimum.	1.0								
Assessment-Unit GEOLOGIC Probability (Product of 1, 2, and 3):	1.0								
NO. OF UNTESTED CELLS WITH POTENTIAL FOR ADDITIONS TO RESERVES									
1. Total assessment-unit area (acres): (uncertainty of a fixed value)									
calculated mean	16,474,000	minimum	14,827,000	mode	16,474,000	maximum	18,121,000		
2. Area per cell of untested cells having potential for additions to reserves (acres): (values are inherently variable)									
calculated mean	176	minimum	80	mode	128	maximum	320		
uncertainty of mean:	minimum	125	maximum	225					
3. Percentage of total assessment-unit area that is untested (%): (uncertainty of a fixed value)									
calculated mean	100	minimum	100	mode	100	maximum	100		

Figure 1. Example of basic input data form for FORSPAN assessment model. (Assessment-unit type: oil)

Assessment Unit (name, no.)
Eagle Ford Shale Oil, 50490170

NO. OF UNTESTED CELLS WITH POTENTIAL FOR ADDITIONS TO RESERVES (Continued)

4. Percentage of untested assessment-unit area that has potential for additions to reserves (%):
(a necessary criterion is that total recovery per cell ≥ minimum; uncertainty of a fixed value)

calculated mean	17	minimum	0.5	mode	9	maximum	40

Geologic evidence for estimates:
Good TOC and thermal maturity throughout AU.
Generation and migration north into Conv clastic AU and upsection into Austin Chalk.
Best area in SW where brittle marl and siltstone interbeds yield fractures.

TOTAL RECOVERY PER CELL

Total recovery per cell for untested cells having potential for additions to reserves:
(values are inherently variable; mmbo for oil A.U.; bcfg for gas A.U.)

calculated mean	0.055	minimum	0.002	median	0.03	maximum	1

AVERAGE COPRODUCT RATIOS FOR UNTESTED CELLS, TO ASSESS COPRODUCTS
(uncertainty of fixed but unknown values)

Oil assessment unit:	minimum	mode	maximum
Gas/oil ratio (cfg/bo)	1000	2000	3000
NGL/gas ratio (bngl/mmcfg)	10	20	30
Gas assessment unit:			
Liquids/gas ratio (bliq/mmcfg)			

Figure 1. Example of basic input data form for FORSPAN assessment model. (Assessment-unit type: oil).—Continued

FORSPAN ASSESSMENT MODEL FOR CONTINUOUS ACCUMULATIONS--BASIC INPUT DATA FORM (NOGA, Version 9, 2-10-03)											
IDENTIFICATION INFORMATION											
Assessment Geologist:	D.W. Houseknecht							Date:	26-Jan-10		
Region:	North America							Number:	5		
Province:	Arkoma Basin							Number:	5062		
Total Petroleum System:	Woodford-Chattanooga							Number:	506202		
Assessment Unit:	Woodford Shale Gas							Number:	50620261		
Based on Data as of:	IHS (2009)										
Notes from Assessor:											
CHARACTERISTICS OF ASSESSMENT UNIT											
Assessment-unit type: Oil (<20,000 cfg/bo) **or Gas** (≥20,000 cfg/bo), incl. disc. & pot. additions										Gas	
What is the minimum total recovery per cell?	0.02	(mmbo for oil A.U.; bcfg for gas A.U.)									
Number of tested cells:	985										
Number of tested cells with total recovery per cell ≥ minimum:	926										
Established (discovered cel	X	Hypothetical (no cells):									
Median total recovery per cell (for cells ≥ min.): (mmbo for oil A.U.; bcfg for gas A.U.)											
1st 3rd discovered	1	2nd 3rd	0.75	3rd 3rd	0.5						
Assessment-Unit Probabilities:											
Attribute						Probability of occurrence (0-1.0)					
1. **CHARGE:** Adequate petroleum charge for an untested cell with total recovery ≥ minimum.										1.0	
2. **ROCKS:** Adequate reservoirs, traps, seals for an untested cell with total recovery ≥ minimum.										1.0	
3. **TIMING:** Favorable geologic timing for an untested cell with total recovery ≥ minimum.										1.0	
Assessment-Unit GEOLOGIC Probability (Product of 1, 2, and 3):										1.0	
NO. OF UNTESTED CELLS WITH POTENTIAL FOR ADDITIONS TO RESERVES											
1. Total assessment-unit area (acres): (uncertainty of a fixed value)											
calculated mean	6,100,000	minimum	5,800,000	mode	6,100,000	maximum	6,400,000				
2. Area per cell of untested cells having potential for additions to reserves (acres): (values are inherently variable)											
calculated mean	167	minimum	60	mode	120	maximum	320				
uncertainty of mean:	minimum	100	maximum	240							
3. Percentage of total assessment-unit area that is untested (%): (uncertainty of a fixed value)											
calculated mean	97	minimum	96	mode	97	maximum	98				

Figure 2. Example of basic input data form for FORSPAN assessment model. (Assessment-unit type: gas)

Assessment Unit (name, no.)
Woodford Shale Gas, 50620261

NO. OF UNTESTED CELLS WITH POTENTIAL FOR ADDITIONS TO RESERVES
(Continued)

4. Percentage of untested assessment-unit area that has potential for additions to reserves (%):
(a necessary criterion is that total recovery per cell ≥ minimum; uncertainty of a fixed value)

calculated mean	38	minimum	10	mode	35	maximum	70

Geologic evidence for estimates:
Min scenario: lower productivity in (1) areas of low gross & net GR, (2) areas of high thermal maturity (>3.0 - 3.5%
along southern margin of AU, and (3) area of near-exposure along southwestern margin of Ozark uplift.
Max scenario: moderate to good productivity in areas (1), (2), and (3).

TOTAL RECOVERY PER CELL

Total recovery per cell for untested cells having potential for additions to reserves:
(values are inherently variable; mmbo for oil A.U.; bcfg for gas A.U.)

calculated mean	0.78	minimum	0.02	median	0.5	maximum	10

AVERAGE COPRODUCT RATIOS FOR UNTESTED CELLS, TO ASSESS COPRODUCTS
(uncertainty of fixed but unknown values)

Oil assessment unit:	minimum	mode	maximum
Gas/oil ratio (cfg/bo)			
NGL/gas ratio (bngl/mmcfg)			
Gas assessment unit:			
Liquids/gas ratio (bliq/mmcfg)	0	0	40

Figure 2. Example of basic input data form for FORSPAN assessment model. (Assessment-unit type: gas)—Continued

Analytic Probabilistic Method

The geologic assessment model FORSPAN is a description of a complex probability problem that needs to be solved in order to produce the estimates of the undeveloped petroleum resources (potential additions to reserves). The method derived herein, called ACCESS, is a system that solves the problem. That is, the model FORSPAN poses the problem, and the method ACCESS offers a solution. Simply stated, ACCESS is a solution of FORSPAN.

The nine given random variables (below) are assigned probability distributions as probability models that are based on the descriptive parameters (F100, F50 or mode, and F0). That is, each given random variable is assigned a probability distribution with the specified descriptive parameters: minimum, median or mode, and maximum. It is important to realize that the ACCESS method does not

depend upon the specific assignment of probability distributions; this means many assignments could be accommodated by a modification of ACCESS. The assignment is an operational decision. The following probability distributions were assigned to the set of nine given random variables for an oil assessment unit or for a gas assessment unit:

1. Assessment-unit area: Triangular distribution
2. Area per cell: Triangular distribution
3. Percentage of total assessment-unit area that is untested: Triangular distribution
4. Percentage of untested assessment-unit area that has potential for additions to reserves: Triangular distribution
5. Total recovery per cell: Truncated shifted lognormal distribution
6. Ratio of coproduct A: Triangular distribution
7. Ratio of coproduct B: Triangular distribution
8. Percent allocation to parcel (or land entity): Triangular distribution
9. Percent allocation to offshore: Triangular distribution

The mathematical equations for the triangular distribution are derived from probability theory in Crovelli (1999). The basic probability theory of the triangular distribution is given in Law and Kelton (1991). The probability theory of the lognormal distribution is given in Aitchison and Brown (1957).

A probabilistic method must be derived that combines given random variables of the geologic assessment model (FORSPAN) to determine parameters (especially the mean, standard deviation, F95 fractile, and F5 fractile) of new random variables of interest—these new random variables are functions of the given random variables. The new random variables of interest are the following measures of undeveloped petroleum resources (potential additions to reserves):

1. Oil in oil assessment unit
2. Gas in oil assessment unit
3. NGL in oil assessment unit
4. Gas in gas assessment unit
5. NGL in gas assessment unit
6. Oil in gas assessment unit

A probabilistic method is required to compute the estimates of a probability distribution in the form of parameters (especially the mean for a point estimate and fractiles F95 and F5 for an interval estimate). An analytic probabilistic method is a probabilistic method that uses mathematical equations from probability theory to obtain the estimates of the undeveloped petroleum resources in an assessment unit. The ACCESS method is an analytic probabilistic method that was developed by deriving the necessary mathematical equations based upon conditional probability theory and laws of expectation and variance. Three features of ACCESS are the following:

1. ACCESS relates the parameters with mathematical equations.
2. ACCESS computes the means, standard deviations, minimums, and maximums exactly.
3. ACCESS computes the estimates instantaneously.

For example, in the case of gas in a gas assessment unit, the following relationships are developed for the random variables:

N: Number of potential cells

X: Total recovery per cell (billion cubic feet of gas)

Y: Gas in gas assessment unit (billion cubic feet of gas)

$$Y = \sum_{i=1}^{N} X_i$$

The random variable *Y* is equal to the sum of a random number of random variables (total recoveries per cell). The mean and standard deviation of *Y* can be derived from the theory of conditional probability and conditional expectation (Ross, 1993). Parameters of particular interest for gas in a gas assessment unit are the mean, standard deviation, minimum, and maximum:

$$\mu_Y = \mu_N \mu_X$$

$$\sigma_Y = \sqrt{\mu_N \sigma_X^2 + \mu_X^2 \sigma_N^2}$$

$$\text{Min(Y)} = \text{Min(N) Min(X)}$$

$$\text{Max(Y)} = \text{Max(N) Max(X)}$$

Many of the mathematical equations for parameters of the new random variables of interest in the ACCESS method are derived using conditional probability theory in Crovelli (1992). A simplified flow chart of the analytic probabilistic method for resource assessment of continuous (unconventional) oil and gas accumulations (the ACCESS method) is displayed in figure 3. The number of potential cells and the total recovery per cell are combined probabilistically to obtain the undeveloped petroleum resources (potential additions to reserves) in an assessment unit.

How the assessment-unit area, untested percentage of the assessment-unit area, percentage of the untested assessment-unit area with potential, and area per cell are used to determine the number of potential cells will now be explained. The assessment-unit area, untested percentage of the assessment-unit area, and percentage of the untested assessment-unit area with potential are multiplied probabilistically to obtain the potential area of the assessment unit. Then the potential area of the assessment unit and area per cell are combined to generate the number of potential cells. This sequence of calculations for the number of potential cells is described in the flow chart of figure 4.

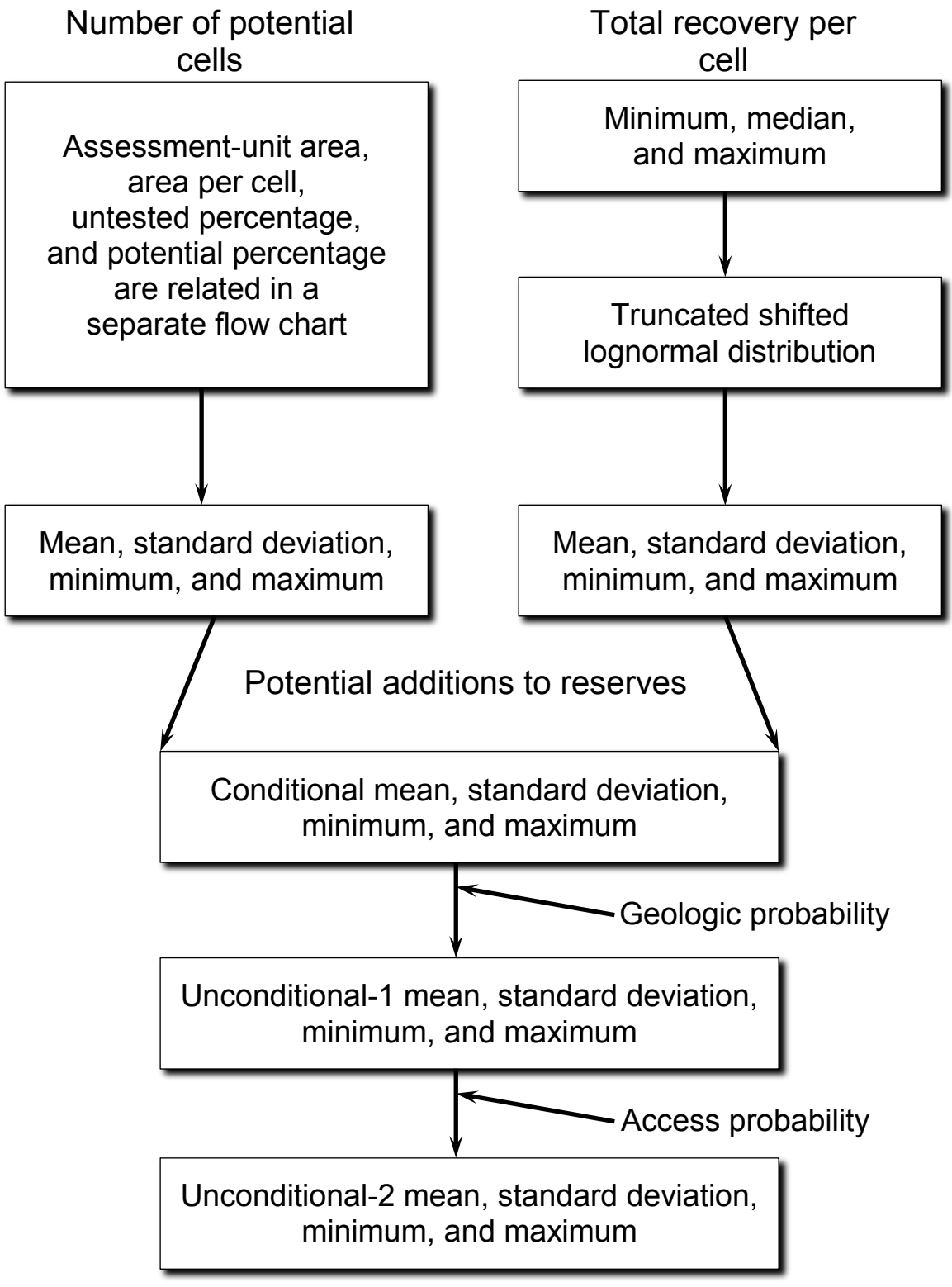

Figure 3. Simplified flow chart of the analytic probabilistic method for resource assessment of continuous (unconventional) oil and gas accumulations—the ACCESS method.

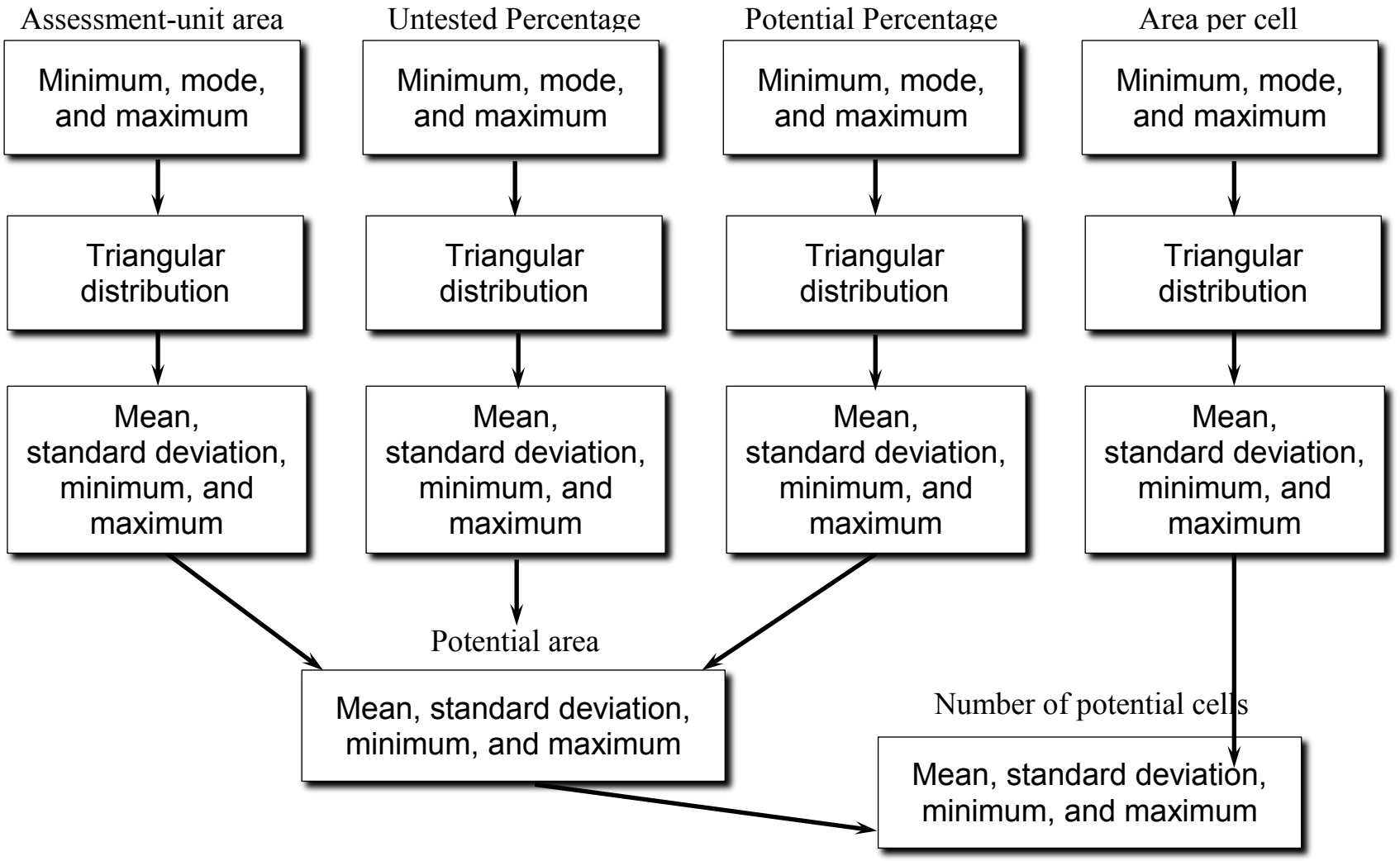

Figure 4. Flow chart of calculations for determining the number of potential cells.

Spreadsheet System

Given the geologic assessment model (the FORSPAN model, figs. 1 and 2), the analytic probabilistic method is used to create a spreadsheet probability system. The analytic probabilistic method of the previous section is incorporated into the ACCESS software system. ACCESS consists of a series of 54 panels in the spreadsheet. A panel is a set of approximately 11 columns of related calculations. Because the total number of columns in ACCESS is 657, it was necessary to construct ACCESS as a workbook with four worksheets called Cond (Conditional), Unc1 (Unconditional-1_, Unc2 (Unconditional-2), and Numb. Cond comprises Panels 1–22, Unc1 contains Panels 23–34, Unc2 contains Panels 35–46, and Numb contains Panels 47–54. Worksheet Cond is linked to the worksheet Numb. Worksheets Unc1 and Unc2 are linked to the worksheet Cond. The topics contained in the worksheets Cond, Unc1, Unc2, and Numb are the following:

1. Worksheet Cond: Input data (Panels 1–4), probability distribution calculations (Panels 5–10), and conditional (unrisked) resource estimates (Panels 11–22).
2. Worksheet Unc1: Unconditional-1 resource estimates, risked using the geologic probability of the assessment unit.
3. Worksheet Unc2: Unconditional-2 resource estimates, risked using both the geologic and the access ("geoacc") probability of the assessment unit.
4. Worksheet Numb: Input data (Panel 47), probability distribution calculations (Panels 48–54) for the number of potential cells.

The individual panel numbers and contents of the spreadsheet ACCESS are given in table 1.

A probability system is an orderly collection of random variables that are logically related in terms of their probability distributions and parameters. The spreadsheet-probability system ACCESS includes:

Conditional (unrisked) and unconditional (risked) estimates of undeveloped petroleum resources (potential additions to reserves) in

1. Assessment unit
2. Parcel (or land entity)
3. Offshore portion of parcel

The total number of new random variables or sets of estimates (mean, standard deviation, F95, and F5) per assessment unit:

1. 72 (2×4×3×3) if one parcel
2. 120 (2×4×3×5) if two parcels

For illustrative purposes, the ACCESS system is used here to compute the estimates of undeveloped petroleum resources for two assessment units. Note that these two assessment units were used as examples of the basic input data form for the FORSPAN model in figs. 1 and 2. The computer printout of the 54 panels in the ACCESS spreadsheet for this illustration is presented on the following pages. The panel captions explain how the panels are related with respect to their calculations. Examples of particular interest are:

Panel 11. Conditional estimates of undeveloped resources in assessment unit: oil in oil fields and gas in gas fields. Mean, standard deviation, minimum, and maximum are computed by combining

parameters from Panels 5 and 6. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution.

Note that the number of potential cells (Panel 5) and the total recovery per cell (Panel 6) produce the estimates for an assessment unit (Panel 11). The corresponding mathematical equations were given in the previous section.

Panel 23. Unconditional-1 estimates of undeveloped resources in assessment unit: oil in oil fields and gas in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying the geologic probability from Panel 23 to parameters from Panel 11. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution.

Note that the geologic probability (Panel 23) is applied to the conditional estimates (Panel 11) to generate the unconditional-1 (risked for geology) estimates (Panel 23).

Panel 35. Unconditional-2 estimates of undeveloped resources in assessment unit: oil in oil fields and gas in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying the geoacc probability from Panel 35 to parameters from Panel 11. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution.

Note that the geoacc probability (Panel 35) is applied to the conditional estimates (Panel 11) to generate the unconditional-2 (risked for geology and access) estimates (Panel 35).

Versions

Several versions of ACCESS exist. The unnumbered version, originally described in Open-File 00–044, was not used for any official USGS assessments. The first version actually used for assessments is here termed "version 1," which was used from 2000 to 2002. Version 1 differed from the previous version in that it included a variable for "Percentage of total assessment-unit area that is untested" (line 3). Each triangular distribution was described by the minimum, median, and maximum. Version 2 was used from 2003 to 2008. Each triangular distribution was described by the minimum, mode, and maximum. Version 3 was used from 2009 to 2011. It corrected an error in version 2 by which the gas-oil ratio in oil fields was set as a triangle with minimum, mode, and maximum as 240, 320, and 960, ignoring any input on panel 3. Otherwise, version 3 is the same as version 2. Examples given in this revised report are from ACCESS version 3.

Copies of the Microsoft Excel workbooks for versions 1 and 3 are included as part of this report.

Acknowledgments

The author wishes to acknowledge the helpful reviews of T.S. Dyman, J.W. Schmoker, T.A. Cook, and C.J. Schenk of the USGS.

References Cited

Aitchison, J., and Brown, J.A.C., 1957, The lognormal distribution: Cambridge, Cambridge University Press, 176 p.

Crovelli, R.A., 1992, Probabilistic methodology for estimation of undiscovered petroleum resources in play analysis of the United States: Nonrenewable Resources, v. 1, p. 153–162.

Crovelli, R.A., 1999, Probabilistic method for subdividing petroleum resources into depth slices: U.S. Geological Survey Open-File Report 99–343, 9 p.

Law, A.M., and Kelton, W.D., 1991, Simulation modeling and analysis (2d ed): New York, McGraw-Hill, Inc., 759 p.
Ross, S.M., 1993, Introduction to probability models (5th ed): New York, Academic Press, Inc., 556 p.
Schmoker, J.W., 1999, U.S. Geological Survey assessment model for continuous (unconventional) oil and gas accumulations—The "FORSPAN" model: U.S. Geological Survey Bulletin 2168, 9 p.

Table 1. Spreadsheet ACCESS panel numbers and contents. (NGL, natural gas liquids; Cond., conditional; Unc1., Unconditional 1; Unc2., Unconditional 2; Numb., define here)

(1) Input data: Assessment-unit probabilities
(2) Input data: Total recovery per cell
(3) Input data: Ratios used to assess coproducts
(4) Input data: Percent allocation to parcel and offshore portion of parcel
(5) Number of potential cells: Computed parameters
(6) Total recovery per cell: Truncated shifted lognormal distribution
(7) Ratios used to assess coproducts: Triangular distribution
(8) Ratios used to assess coproducts: Triangular distribution
(9) Percent allocation to parcel: Triangular distribution
(10) Percent allocation to offshore: Triangular distribution
(11) Cond. estimates in assessment unit: Oil in oil fields and gas in gas fields
(12) Cond. estimates in assessment unit: Gas in oil fields and NGL in gas fields
(13) Cond. estimates in assessment unit: NGL in oil fields and oil in gas fields
(14) Cond. estimates in assessment unit: Total in oil fields and total in gas fields
(15) Cond. allocation to parcel: Oil in oil fields and gas in gas fields
(16) Cond. allocation to parcel: Gas in oil fields and NGL in gas fields
(17) Cond. allocation to parcel: NGL in oil fields and oil in gas fields
(18) Cond. allocation to parcel: Total in oil fields and total in gas fields
(19) Cond. allocation to offshore: Oil in oil fields and gas in gas fields
(20) Cond. allocation to offshore: Gas in oil fields and NGL in gas fields
(21) Cond. allocation to offshore: NGL in oil fields and oil in gas fields
(22) Cond. allocation to offshore: Total in oil fields and total in gas fields
(23) Unc1. estimates in assessment unit: Oil in oil fields and gas in gas fields
(24) Unc1. estimates in assessment unit: Gas in oil fields and NGL in gas fields
(25) Unc1. estimates in assessment unit: NGL in oil fields and oil in gas fields
(26) Unc1. estimates in assessment unit: Total in oil fields and total in gas fields
(27) Unc1. allocation to parcel: Oil in oil fields and gas in gas fields
(28) Unc1. allocation to parcel: Gas in oil fields and NGL in gas fields
(29) Unc1. allocation to parcel: NGL in oil fields and oil in gas fields
(30) Unc1. allocation to parcel: Total in oil fields and total in gas fields
(31) Unc1. allocation to offshore: Oil in oil fields and gas in gas fields
(32) Unc1. allocation to offshore: Gas in oil fields and NGL in gas fields
(33) Unc1. allocation to offshore: NGL in oil fields and oil in gas fields
(34) Unc1. allocation to offshore: Total in oil fields and total in gas fields
(35) Unc2. estimates in assessment unit: Oil in oil fields and gas in gas fields
(36) Unc2. estimates in assessment unit: Gas in oil fields and NGL in gas fields
(37) Unc2. estimates in assessment unit: NGL in oil fields and oil in gas fields
(38) Unc2. estimates in assessment unit: Total in oil fields and total in gas fields
(39) Unc2. allocation to parcel: Oil in oil fields and gas in gas fields
(40) Unc2. allocation to parcel: Gas in oil fields and NGL in gas fields
(41) Unc2. allocation to parcel: NGL in oil fields and oil in gas fields
(42) Unc2. allocation to parcel: Total in oil fields and total in gas fields
(43) Unc2. allocation to offshore: Oil in oil fields and gas in gas fields
(44) Unc2. allocation to offshore: Gas in oil fields and NGL in gas fields
(45) Unc2. allocation to offshore: NGL in oil fields and oil in gas fields
(46) Unc2. allocation to offshore: Total in oil fields and total in gas fields
(47) Numb. input data: Assess.-unit area, potential percentage, and area per cell
(48) Numb. assessment-unit area: Triangular distribution
(49) Numb. potential percentage: Triangular distribution
(50) Numb. area per cell: Triangular distribution
(51) Numb. potential area: Lognormal distribution
(52) Numb. number of potential cells: Lognormal distribution

ACCESS

ACCESS: Analytic Cell-based Continuous Energy Spreadsheet System						R.A. Crovelli		(Panel 1)
Assessment Unit			Assessment-Unit Probabilities					
Name	No.	Fields	Charge	Rocks	Timing	Geologic	Access	GeoAcc
Eagle Ford Shale Oil	50490170	Oil	1	1	1	1	1	1
Woodford Shale Gas	50620261	Gas	1	1	1	1	1	1

Panel 1. Input data: assessment-unit name, number, and probabilities for charge, rocks, timing, and access. Geologic probability is the product of charge, rocks, and timing probabilities. "Geoacc" probability is the product of geologic and access probabilities.

							(Panel 2)
					Total Recovery Per Cell		
		Number of Potential Cells			Oil (mmbo) and Gas (bcfg)		
No.	Fields				Minimum	Median	Maximum
50490170	Oil	See Panel 47 for input data			0.002	0.03	1
50620261	Gas	See Panel 47 for input data			0.02	0.5	10

Panel 2. Input data: total recovery per cell—minimum, mode, and maximum. See Panel 47 for input data pertaining to the number of potential cells.

								(Panel 3)
	Oil fields:	Gas/oil ratio (cfg/bo)			NGL/gas ratio (bngl/mmcfg)			
	Gas fields:	NGL/gas ratio (bngl/mmcfg)			Oil/gas ratio (bo/mmcfg)			
No.	Fields	Minimum	Mode	Maximum	Minimum	Mode	Maximum	
50490170	Oil	1000	2000	3000	10	20	30	
50620261	Gas	0	0	40	0	0	0	

Panel 3. Input data: ratios used to assess coproducts of undeveloped oil and gas fields—minimum, mode, and maximum.

							(Panel 4)
		Percent Allocation					
		Parcel			Offshore		
Parcel	Fields	Minimum	Mode	Maximum	Minimum	Mode	Maximum
Texas	Oil	58.88	58.88	58.88	0	0	0
Oklahoma	Gas	85	85	85	0	0	0

Panel 4. Input data: percent allocation to parcel and offshore portion of parcel—minimum, mode, and maximum.

									(Panel 5)
		Number of Potential Untested Cells							
No.	Flds	Min,F100					Max,F0	Mean	S.D.
50490170	Oil	232	See Panels 48-54 for calculations				90605	15444.38	7976.192
50620261	Gas	1740	See Panels 48-54 for calculations				73173	13609.1	4377.83

Panel 5. Number of potential untested cells: computed parameters are imported from Panel 54. See Panels 48–54 for sequence of calculations.

										(Panel 6)
		Total Recovery Per Cell (mmbo and bcfg) -- Truncated Shifted Lognormal Distribution								
No.	Flds	Min,F100	Med,F50	Mu	Sigma	E(X)	E(X^2)	Max,F0	Mean	S.D.
50490170	Oil	0.002	0.03	-3.57555	1.15649	0.053255	0.008905	1	0.055255	0.077902
50620261	Gas	0.02	0.5	-0.73397	0.98206	0.764647	1.381312	10	0.784647	0.89254

Panel 6. Total recovery per cell: truncated shifted lognormal distribution. Mean and standard deviation are computed.

										(Panel 7)
Oil fields:		Gas/oil ratio (cfg/bo) -- Triangular Distribution								
Gas fields:		NGL/gas ratio (bngl/mmcfg) -- Triangular Distribution								
No.	Flds	Min,F100	Med,F50	Midpoint	Mode			Max,F0	Mean	S.D.
50490170	Oil	1000	2000	2000	2000			3000	2000	408.2483
50620261	Gas	0	11.71573	20	0			40	13.33333	9.42809

Panel 7. Ratios used to assess coproducts: triangular distribution. Midpoint, median, mean, and standard deviation are computed.

										(Panel 8)
Oil fields:		NGL/gas ratio (bngl/mmcfg) -- Triangular Distribution								
Gas fields:		Oil/gas ratio (bo/mmcfg) -- Triangular Distribution								
No.	Flds	Min,F100	Med,F50	Midpoint	Mode			Max,F0	Mean	S.D.
50490170	Oil	10	20	20	20			30	20	4.082483
50620261	Gas	0	0	0	0			0	0	0

Panel 8. Ratios used to assess coproducts: triangular distribution. Midpoint, median, mean, and standard deviation are computed.

Percent Allocation of Undeveloped Resources by Volume to Parcel										(Panel 9)
		Percent Resources in Oil/Gas Fields -- Triangular Distribution								
Parcel	Flds	Min,F100	Med,F50	Midpoint	Mode			Max,F0	Mean	S.D.
Texas	Oil	58.88	58.88	58.88	58.88			58.88	58.88	0
Oklahoma	Gas	85	85	85	85			85	85	0

Panel 9. Percent allocation of undeveloped resources by volume to parcel: triangular distribution. Midpoint, median, mean, and standard deviation are computed.

Percent Allocation of Undeveloped Resources by Volume to Offshore										(Panel 10)
		Percent Resources in Oil/Gas Fields -- Triangular Distribution								
Parcel	Flds	Min,F100	Med,F50	Midpoint	Mode			Max,F0	Mean	S.D.
Texas	Oil	0	0	0	0			0	0	0
Oklahoma	Gas	0	0	0	0			0	0	0

Panel 10. Percent allocation of undeveloped resources by volume to offshore portion of parcel: triangular distribution. Midpoint, median, mean, and standard deviation are computed.

CONDITIONAL ESTIMATES OF UNDEVELOPED RESOURCES IN ASSESSMENT UNIT										(Panel 11)
		Oil in Oil Fields (mmbo)								
		Gas in Gas Fields (bcfg)								
No.	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
50490170	Oil	853.382	440.8324	0.464	340.6918	546.1581	758.196	1052.555	1687.336	90605
50620261	Gas	10678.33	3436.627	34.8	6065.16	8225.118	10164.9	12562.11	17035.8	731730

Panel 11. Conditional estimates of undeveloped resources in assessment unit: oil in oil fields and gas in gas fields. Mean, standard deviation, minimum, and maximum are computed by combining parameters from Panels 5 and 6. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution.

CONDITIONAL ESTIMATES OF UNDEVELOPED RESOURCES IN ASSESSMENT UNIT										(Panel 12)
		Gas in Oil Fields (bcfg)								
		NGL in Gas Fields (mmbngl)								
No.	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
50490170	Oil	1706.764	964.9344	0.464	624.7984	1041.548	1485.76	2119.41	3533.089	271815
50620261	Gas	142.3778	115.2613	0	34.42281	68.55412	110.661	178.6312	355.7498	29269

Panel 12. Conditional estimates of undeveloped resources in assessment unit: gas in oil fields and NGL in gas fields. Mean, standard deviation, minimum, and maximum are computed by combining parameters from Panels 7 and 11. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution.

CONDITIONAL ESTIMATES OF UNDEVELOPED RESOURCES IN ASSESSMENT UNIT										(Panel 13)
		NGL in Oil Fields (mmbngl)								
		Oil in Gas Fields (mmbo)								
No.	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
50490170	Oil	34.13528	20.89278	0.00464	11.5125	19.90131	29.1147	42.59357	73.63023	8154.5
50620261	Gas	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0

Panel 13. Conditional estimates of undeveloped resources in assessment unit: NGL in oil fields and oil in gas fields. Mean, standard deviation, minimum, and maximum are computed by combining parameters from Panels 8 and 12 for NGL in oil fields and parameters from Panels 8 and 11 for oil in gas fields. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution.

CONDITIONAL ESTIMATES OF UNDEVELOPED RESOURCES IN ASSESSMENT UNIT										(Panel 14)
		Total Resources in Oil Fields (mmbo & mmboe & mmbngl)								
		Total Resources in Gas Fields (mmboe & mmbngl & mmbo)								
No.	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
50490170	Oil	1171.978	609.8713	0.54597	464.7129	747.2827	1039.64	1446.369	2325.837	144062
50620261	Gas	1922.1	627.5688	5.8	1082.491	1474.179	1827.17	2264.695	3084.152	151224

Panel 14. Conditional estimates of undeveloped resources in assessment unit: total resources in oil fields and total resources in gas fields. Mean, standard deviation, minimum, and maximum are computed by combining parameters from Panels 7, 8, and 11. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution.

CONDITIONAL ALLOCATION OF UNDEVELOPED RESOURCES TO PARCEL										(Panel 15)
		Oil in Oil Fields (mmbo)								
		Gas in Gas Fields (bcfg)								
Parcel	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
Texas	Oil	502.4713	259.5621	0.2732	200.5993	321.5779	446.426	619.7445	993.5033	53348
Oklahoma	Gas	9076.583	2921.133	29.58	5155.386	6991.351	8640.15	10677.8	14480.43	621971

Panel 15. Conditional allocation of undeveloped resources to parcel: oil in oil fields and gas in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying parameters from Panel 9 to parameters from Panel 11. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution.

CONDITIONAL ALLOCATION OF UNDEVELOPED RESOURCES TO PARCEL (Panel 16)										
		Gas in Oil Fields (bcfg)								
		NGL in Gas Fields (mmbngl)								
Parcel	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
Texas	Oil	1004.943	568.1534	0.2732	367.8813	613.2636	874.813	1247.909	2080.283	160045
Oklahoma	Gas	121.0211	97.97206	0	29.25939	58.27101	94.062	151.8366	302.3873	24879

Panel 16. Conditional allocation of undeveloped resources to parcel: gas in oil fields and NGL in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying parameters from Panel 9 to parameters from Panel 12. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution.

CONDITIONAL ALLOCATION OF UNDEVELOPED RESOURCES TO PARCEL (Panel 17)										
		NGL in Oil Fields (mmbngl)								
		Oil in Gas Fields (mmbo)								
Parcel	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
Texas	Oil	20.098852	12.301671	0.002732	6.778558	11.71789	17.14276	25.07909	43.35348	4801.34
Oklahoma	Gas	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0

Panel 17. Conditional allocation of undeveloped resources to parcel: NGL in oil fields and oil in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying parameters from Panel 9 to parameters from Panel 13. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution. Cells with "#DIV/0!" are not calculated because the distribution is not lognormal.

CONDITIONAL ALLOCATION OF UNDEVELOPED RESOURCES TO PARCEL (Panel 18)										
		Total Resources in Oil Fields (mmbo & mmboe & mmbngl)								
		Total Resources in Gas Fields (mmboe & mmbngl & mmbo)								
Parcel	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
Texas	Oil	690.0606	359.0922	0.32147	273.6229	440	612.139	851.6221	1369.453	84824
Oklahoma	Gas	1633.785	533.4335	4.93	920.117	1253.052	1553.1	1924.991	2621.529	128541

Panel 18. Conditional allocation of undeveloped resources to parcel: total resources in oil fields and total resources in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying parameters from Panel 9 to parameters from Panel 14. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution.

CONDITIONAL ALLOCATION OF UNDEVELOPED RESOURCES TO OFFSHORE (Panel 19)										
		Oil in Oil Fields (mmbo)								
		Gas in Gas Fields (bcfg)								
Parcel	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
Texas	Oil	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0
Oklahoma	Gas	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0

Panel 19. Conditional allocation of undeveloped resources to offshore portion of parcel: oil in oil fields and gas in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying parameters from Panel 10 to parameters from Panel 15. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution. Cells with "#DIV/0!" are not calculated because the distribution is not lognormal.

CONDITIONAL ALLOCATION OF UNDEVELOPED RESOURCES TO OFFSHORE (Panel 20)										
		Gas in Oil Fields (bcfg)								
		NGL in Gas Fields (mmbngl)								
Parcel	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
Texas	Oil	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0
Oklahoma	Gas	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0

Panel 20. Conditional allocation of undeveloped resources to offshore portion of parcel: gas in oil fields and NGL in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying parameters from Panel 10 to parameters from Panel 16. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution. Cells with "#DIV/0!" are not calculated because the distribution is not lognormal.

CONDITIONAL ALLOCATION OF UNDEVELOPED RESOURCES TO OFFSHORE (Panel 21)										
		NGL in Oil Fields (mmbngl)								
		Oil in Gas Fields (mmbo)								
Parcel	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
Texas	Oil	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0
Oklahoma	Gas	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0

Panel 21. Conditional allocation of undeveloped resources to offshore portion of parcel: NGL in oil fields and oil in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying parameters from Panel 10 to parameters from Panel 17. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution. Cells with "#DIV/0!" are not calculated because the distribution is not lognormal.

CONDITIONAL ALLOCATION OF UNDEVELOPED RESOURCES TO OFFSHORE										(Panel 22)
		Total Resources in Oil Fields (mmbo & mmboe & mmbngl)								
		Total Resources in Gas Fields (mmboe & mmbngl & mmbo)								
Parcel	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
Texas	Oil	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0
Oklahoma	Gas	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0

Panel 22. Conditional allocation of undeveloped resources to offshore portion of parcel: total resources in oil fields and total resources in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying parameters from Panel 10 to parameters from Panel 18. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution. Cells with "#DIV/0!" are not calculated because the distribution is not lognormal.

	UNCONDITIONAL ESTIMATES OF UNDEVELOPED RESOURCES IN ASSESSMENT UNIT										(Panel 23)
			Oil in Oil Fields (mmbo)								
Probab			Gas in Gas Fields (bcfg)								
Geologic	No.	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
1	50490170	Oil	853.382	440.8324	0.464	340.6918	546.1581	758.196	1052.555	1687.336	90605
1	50620261	Gas	10678.33	3436.627	34.8	6065.16	8225.118	10164.9	12562.11	17035.8	731730

Panel 23. Unconditional-1 estimates of undeveloped resources in assessment unit: oil in oil fields and gas in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying the geologic probability from Panel 23 to parameters from Panel 11. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution.

UNCONDITIONAL ESTIMATES OF UNDEVELOPED RESOURCES IN ASSESSMENT UNIT										(Panel 24)
		Gas in Oil Fields (bcfg)								
		NGL in Gas Fields (mmbngl)								
No.	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
50490170	Oil	1706.764	964.9344	0.464	624.7984	1041.548	1485.76	2119.41	3533.089	271815
50620261	Gas	142.3778	115.2613	0	34.42281	68.55412	110.661	178.6312	355.7498	29269

Panel 24. Unconditional-1 estimates of undeveloped resources in assessment unit: gas in oil fields and NGL in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying the geologic probability from Panel 23 to parameters from Panel 12. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution.

UNCONDITIONAL ESTIMATES OF UNDEVELOPED RESOURCES IN ASSESSMENT UNIT (Panel 25)										
		NGL in Oil Fields (mmbngl)								
		Oil in Gas Fields (mmbo)								
No.	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
50490170	Oil	34.13528	20.89278	0.00464	11.51249738	19.90131	29.1147	42.59357	73.63023	8154.5
50620261	Gas	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0

Panel 25. Unconditional-1 estimates of undeveloped resources in assessment unit: NGL in oil fields and oil in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying the geologic probability from Panel 23 to parameters from Panel 13. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution. Cells with "#DIV/0!" are not calculated because the distribution is not lognormal.

UNCONDITIONAL ESTIMATES OF UNDEVELOPED RESOURCES IN ASSESSMENT UNIT (Panel 26)										
		Total Resources in Oil Fields (mmbo & mmboe & mmbngl)								
		Total Resources in Gas Fields (mmboe & mmbngl & mmbo)								
No.	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
50490170	Oil	1171.978	609.8713	0.54597	464.7129	747.2827	1039.64	1446.369	2325.837	144062
50620261	Gas	1922.1	627.5688	5.8	1082.491	1474.179	1827.17	2264.695	3084.152	151224

Panel 26. Unconditional-1 estimates of undeveloped resources in assessment unit: total resources in oil fields and total resources in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying the geologic probability from Panel 23 to parameters from Panel 14. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution.

UNCONDITIONAL ALLOCATION OF UNDEVELOPED RESOURCES TO PARCEL (Panel 27)										
		Oil in Oil Fields (mmbo)								
		Gas in Gas Fields (bcfg)								
Parcel	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
Texas	Oil	502.4713	259.5621	0.273203	200.5993	321.5779	446.4259	619.7445	993.5033	53348.2
Oklahoma	Gas	9076.583	2921.133	29.58	5155.386	6991.351	8640.151	10677.8	14480.43	621971

Panel 27. Unconditional-1 allocation of undeveloped resources to parcel: oil in oil fields and gas in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying the geologic probability from Panel 23 to parameters from Panel 15. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution.

UNCONDITIONAL ALLOCATION OF UNDEVELOPED RESOURCES TO PARCEL (Panel 28)										
		Gas in Oil Fields (bcfg)								
		NGL in Gas Fields (mmbngl)								
Parcel	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
Texas	Oil	1004.943	568.1534	0.273203	367.8813	613.2636	874.813	1247.909	2080.283	160045
Oklahoma	Gas	121.0211	97.97206	0	29.25939	58.27101	94.062	151.8366	302.3873	24878.8

Panel 28. Unconditional-1 allocation of undeveloped resources to parcel: gas in oil fields and NGL in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying the geologic probability from Panel 23 to parameters from Panel 16. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution.

UNCONDITIONAL ALLOCATION OF UNDEVELOPED RESOURCES TO PARCEL (Panel 29)										
		NGL in Oil Fields (mmbngl)								
		Oil in Gas Fields (mmbo)								
Parcel	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
Texas	Oil	20.09885	12.30167	0.002732	6.778558	11.71789	17.142756	25.07909	43.35348	4801.34
Oklahoma	Gas	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0

Panel 29. Unconditional-1 allocation of undeveloped resources to parcel: NGL in oil fields and oil in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying the geologic probability from Panel 23 to parameters from Panel 17. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution. Cells with "#DIV/0!" are not calculated because the distribution is not lognormal.

UNCONDITIONAL ALLOCATION OF UNDEVELOPED RESOURCES TO PARCEL (Panel 30)										
		Total Resources in Oil Fields (mmbo & mmboe & mmbngl)								
		Total Resources in Gas Fields (mmboe & mmbngl & mmbo)								
Parcel	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
Texas	Oil	690.0606	359.0922	0.321469	273.6229	440	612.1387	851.6221	1369.453	84823.7
Oklahoma	Gas	1633.785	533.4335	4.93	920.117	1253.052	1553.098	1924.991	2621.529	128541

Panel 30. Unconditional-1 allocation of undeveloped resources to parcel: total resources in oil fields and total resources in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying the geologic probability from Panel 23 to parameters from Panel 18. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution.

UNCONDITIONAL ALLOCATION OF UNDEVELOPED RESOURCES TO OFFSHORE										(Panel 31)
		Oil in Oil Fields (mmbo)								
		Gas in Gas Fields (bcfg)								
Parcel	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
Texas	Oil	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0
Oklahoma	Gas	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0

Panel 31. Unconditional-1 allocation of undeveloped resources to offshore portion of parcel: oil in oil fields and gas in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying the geologic probability from Panel 23 to parameters from Panel 19. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution. Cells with "#DIV/0!" are not calculated because the distribution is not lognormal.

UNCONDITIONAL ALLOCATION OF UNDEVELOPED RESOURCES TO OFFSHORE										(Panel 32)
		Gas in Oil Fields (bcfg)								
		NGL in Gas Fields (mmbngl)								
Parcel	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
Texas	Oil	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0
Oklahoma	Gas	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0

Panel 32. Unconditional-1 allocation of undeveloped resources to offshore portion of parcel: gas in oil fields and NGL in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying the geologic probability from Panel 23 to parameters from Panel 20. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution. Cells with "#DIV/0!" are not calculated because the distribution is not lognormal.

UNCONDITIONAL ALLOCATION OF UNDEVELOPED RESOURCES TO OFFSHORE										(Panel 33)
		NGL in Oil Fields (mmbngl)								
		Oil in Gas Fields (mmbo)								
Parcel	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
Texas	Oil	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0
Oklahoma	Gas	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0

Panel 33. Unconditional-1 allocation of undeveloped resources to offshore portion of parcel: NGL in oil fields and oil in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying the geologic probability from Panel 23 to parameters from Panel 21. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution. Cells with "#DIV/0!" are not calculated because the distribution is not lognormal.

UNCONDITIONAL ALLOCATION OF UNDEVELOPED RESOURCES TO OFFSHORE (Panel 34)										
		Total Resources in Oil Fields (mmbo & mmboe & mmbngl)								
		Total Resources in Gas Fields (mmboe & mmbngl & mmbo)								
Parcel	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
Texas	Oil	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0
Oklahoma	Gas	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0

Panel 34. Unconditional-1 allocation of undeveloped resources to offshore portion of parcel: total resources in oil fields and total resources in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying the geologic probability from Panel 23 to parameters from Panel 22. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution. Cells with "#DIV/0!" are not calculated because the distribution is not lognormal.

	UNCONDITIONAL ESTIMATES OF UNDEVELOPED RESOURCES IN ASSESSMENT UNIT (Panel 35)										
			Oil in Oil Fields (mmbo)								
Probab			Gas in Gas Fields (bcfg)								
GeoAcc	No.	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
1	50490170	Oil	853.382	440.8324	0.464	340.6918	546.1581	758.196	1052.555	1687.336	90605
1	50620261	Gas	10678.33	3436.627	34.8	6065.16	8225.118	10164.9	12562.11	17035.8	731730

Panel 35. Unconditional-2 estimates of undeveloped resources in assessment unit: oil in oil fields and gas in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying the geoacc probability from Panel 35 to parameters from Panel 11. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution.

UNCONDITIONAL ESTIMATES OF UNDEVELOPED RESOURCES IN ASSESSMENT UNIT (Panel 36)										
		Gas in Oil Fields (bcfg)								
		NGL in Gas Fields (mmbngl)								
No.	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
50490170	Oil	1706.764	964.9344	0.464	624.7984	1041.548	1485.76	2119.41	3533.089	271815
50620261	Gas	142.3778	115.2613	0	34.42281	68.55412	110.661	178.6312	355.7498	29269

Panel 36. Unconditional-2 estimates of undeveloped resources in assessment unit: gas in oil fields and NGL in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying the geoacc probability from Panel 35 to parameters from Panel 12. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution.

UNCONDITIONAL ESTIMATES OF UNDEVELOPED RESOURCES IN ASSESSMENT UNIT (Panel 37)										
		NGL in Oil Fields (mmbngl)								
		Oil in Gas Fields (mmbo)								
No.	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
50490170	Oil	34.13528	20.89278	0.00464	11.512497	19.90131	29.1147	42.59357	73.63023	8154.5
50620261	Gas	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0

Panel 37. Unconditional-2 estimates of undeveloped resources in assessment unit: NGL in oil fields and oil in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying the geoacc probability from Panel 35 to parameters from Panel 13. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution. Cells with "#DIV/0!" are not calculated because the distribution is not lognormal.

UNCONDITIONAL ESTIMATES OF UNDEVELOPED RESOURCES IN ASSESSMENT UNIT (Panel 38)										
		Total Resources in Oil Fields (mmbo & mmboe & mmbngl)								
		Total Resources in Gas Fields (mmboe & mmbngl & mmbo)								
No.	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
50490170	Oil	1171.978	609.8713	0.54597	464.7129	747.2827	1039.638	1446.369	2325.837	144062
50620261	Gas	1922.1	627.5688	5.8	1082.491	1474.179	1827.174	2264.695	3084.152	151224

Panel 38. Unconditional-2 estimates of undeveloped resources in assessment unit: total resources in oil fields and total resources in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying the geoacc probability from Panel 35 to parameters from Panel 14. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution.

UNCONDITIONAL ALLOCATION OF UNDEVELOPED RESOURCES TO PARCEL (Panel 39)										
		Oil in Oil Fields (mmbo)								
		Gas in Gas Fields (bcfg)								
Parcel	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
Texas	Oil	502.4713	259.5621	0.273203	200.5993	321.5779	446.4259	619.7445	993.5033	53348.2
Oklahoma	Gas	9076.583	2921.133	29.58	5155.386	6991.351	8640.151	10677.8	14480.43	621971

Panel 39. Unconditional-2 allocation of undeveloped resources to parcel: oil in oil fields and gas in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying the geoacc probability from Panel 35 to parameters from Panel 15. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution.

UNCONDITIONAL ALLOCATION OF UNDEVELOPED RESOURCES TO PARCEL										(Panel 40)
		Gas in Oil Fields (bcfg)								
		NGL in Gas Fields (mmbngl)								
Parcel	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
Texas	Oil	1004.943	568.1534	0.2732032	367.8813	613.264	874.813	1247.91	2080.28	160045
Oklahoma	Gas	121.0211	97.97206	0	29.25939	58.271	94.062	151.837	302.387	24879

Panel 40. Unconditional-2 allocation of undeveloped resources to parcel: gas in oil fields and NGL in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying the geoacc probability from Panel 35 to parameters from Panel 16. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution.

UNCONDITIONAL ALLOCATION OF UNDEVELOPED RESOURCES TO PARCEL										(Panel 41)
		NGL in Oil Fields (mmbngl)								
		Oil in Gas Fields (mmbo)								
Parcel	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
Texas	Oil	20.09885	12.30167	0.002732	6.7785585	11.717891	17.14276	25.07909	43.353477	4801.34
Oklahoma	Gas	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0

Panel 41. Unconditional-2 allocation of undeveloped resources to parcel: NGL in oil fields and oil in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying the geoacc probability from Panel 35 to parameters from Panel 17. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution. Cells with "#DIV/0!" are not calculated because the distribution is not lognormal.

UNCONDITIONAL ALLOCATION OF UNDEVELOPED RESOURCES TO PARCEL										(Panel 42)
		Total Resources in Oil Fields (mmbo & mmboe & mmbngl)								
		Total Resources in Gas Fields (mmboe & mmbngl & mmbo)								
Parcel	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
Texas	Oil	690.0606	359.0922	0.321469	273.6229	440	612.1387	851.6221	1369.453	84823.7
Oklahoma	Gas	1633.785	533.4335	4.93	920.117	1253.052	1553.098	1924.991	2621.529	128541

Panel 42. Unconditional-2 allocation of undeveloped resources to parcel: total resources in oil fields and total resources in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying the geoacc probability from Panel 35 to parameters from Panel 18. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution.

UNCONDITIONAL ALLOCATION OF UNDEVELOPED RESOURCES TO OFFSHORE										(Panel 43)
		Oil in Oil Fields (mmbo)								
		Gas in Gas Fields (bcfg)								
Parcel	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
Texas	Oil	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0
Oklahoma	Gas	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0

Panel 43. Unconditional-2 allocation of undeveloped resources to offshore portion of parcel: oil in oil fields and gas in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying the geoacc probability from Panel 35 to parameters from Panel 19. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution. Cells with "#DIV/0!" are not calculated because the distribution is not lognormal.

UNCONDITIONAL ALLOCATION OF UNDEVELOPED RESOURCES TO OFFSHORE										(Panel 44)
		Gas in Oil Fields (bcfg)								
		NGL in Gas Fields (mmbngl)								
Parcel	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
Texas	Oil	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0
Oklahoma	Gas	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0

Panel 44. Unconditional-2 allocation of undeveloped resources to offshore portion of parcel: gas in oil fields and NGL in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying the geoacc probability from Panel 35 to parameters from Panel 20. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution. Cells with "#DIV/0!" are not calculated because the distribution is not lognormal.

UNCONDITIONAL ALLOCATION OF UNDEVELOPED RESOURCES TO OFFSHORE										(Panel 45)
		NGL in Oil Fields (mmbngl)								
		Oil in Gas Fields (mmbo)								
Parcel	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
Texas	Oil	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0
Oklahoma	Gas	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0

Panel 45. Unconditional-2 allocation of undeveloped resources to offshore portion of parcel: NGL in oil fields and oil in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying the geoacc probability from Panel 35 to parameters from Panel 21. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution. Cells with "#DIV/0!" are not calculated because the distribution is not lognormal.

UNCONDITIONAL ALLOCATION OF UNDEVELOPED RESOURCES TO OFFSHORE										(Panel 46)
		Total Resources in Oil Fields (mmbo & mmboe & mmbngl)								
		Total Resources in Gas Fields (mmboe & mmbngl & mmbo)								
Parcel	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
Texas	Oil	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0
Oklahoma	Gas	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0

Panel 46. Unconditional-2 allocation of undeveloped resources to offshore portion of parcel: total resources in oil fields and total resources in gas fields. Mean, standard deviation, minimum, and maximum are computed by applying the geoacc probability from Panel 35 to parameters from Panel 22. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution. Cells with "#DIV/0!" are not calculated because the distribution is not lognormal.

													(Panel 47)
					Untested			Potential/Untested					
		Assessment-Unit Area (acres)			Percentage (%)			Percentage (%)			Area Per Cell (acres)		
No.	Flds	Minimum	Mode	Maximum	Min	Mod	Max	Min	Mod	Max	Min	Mod	Max
50490170	Oil	14827000	16474000	18121000	100	100	100	0.5	9	40	80	128	320
50620261	Gas	5800000	6100000	6400000	96	97	98	10	35	70	60	120	320

Panel 47. Input data for number of potential cells: assessment-unit area, untested percentage of assessment-unit area, potential percentage of untested area, and area per cell -minimum, mode, and maximum.

								(Panel 48)
		Assessment-Unit Area (acres) -- Triangular Distribution						
No.	Flds	Min,F100	Med,F50	Max,F0	Midpoint	Mode	Mean	S.D.
50490170	Oil	14827000	16474000	18121000	16474000	16474000	16474000	672384.9
50620261	Gas	5800000	6100000	6400000	6100000	6100000	6100000	122474.5

Panel 48. Assessment-unit area: triangular distribution. Midpoint, median, mean, and standard deviation are computed.

								(Panel 49)
		Untested Percentage (%) -- Triangular Distribution						
No.	Flds	Min,F100	Med,F50	Max,F0	Midpoint	Mode	Mean	S.D.
50490170	Oil	100	100	100	100	100	100	0
50620261	Gas	96	97	98	97	97	97	0.408248

Panel 49. Untested percentage of assessment-unit area: triangular distribution. Midpoint, median, mean, and standard deviation are computed.

								(Panel 50)
		Potential/Untested Percentage (%) -- Triangular Distribution						
No.	Flds	Min,F100	Med,F50	Max,F0	Midpoint	Mode	Mean	S.D.
50490170	Oil	0.5	15.25631	40	20.25	9	16.5	8.487736
50620261	Gas	10	37.5963	70	40	35	38.33333	12.30402

Panel 50. Potential percentage of untested area: triangular distribution. Midpoint, median, mean, and standard deviation are computed.

								(Panel 51)
		Area Per Cell (acres) -- Triangular Distribution						
No.	Flds	Min,F100	Med,F50	Max,F0	Midpoint	Mode	Mean	S.D.
50490170	Oil	80	168.2107	320	200	128	176	51.84593
50620261	Gas	60	158.7548	320	190	120	166.6667	55.57777

Panel 51. Area per cell: triangular distribution. Midpoint, median, mean, and standard deviation are computed.

(Panel 52)

Potential Untested Percentage (%)

No.	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
50490170	Oil	16.5	8.487736	0.5	6.612732	10.58213	14.67252	20.344	32.5558	40
50620261	Gas	37.18333	11.93603	9.6	21.15147	28.66267	35.40396	43.73077	59.26021	68.6

Panel 52. Potential percentage of assessment-unit area. Mean, standard deviation, minimum, and maximum are computed by combining parameters from Panels 48 and 49. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution.

(Panel 53)

Potential Untested Area (acres)

No.	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
50490170	Oil	2718210	1403825	74135	1085410	1739836	2415140	3352558	5373915	7248400
50620261	Gas	2268183	729667.1	556800	1288617	1747313	2159207	2668196	3617968	4390400

Panel 53. Potential untested area of assessment unit. Mean, standard deviation, minimum, and maximum are computed by combining parameters from Panels 48 and 49. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution.

(Panel 54)

Number of Potential Untested Cells

No.	Flds	Mean	S.D.	Min,F100	F95	F75	Med,F50	F25	F5	Max,F0
50490170	Oil	15444.38	7976.192	232	6167	9885	13722	19049	30533	90605
50620261	Gas	13609.1	4377.83	1740	7732	10484	12955	16009	21707	73173

Panel 54. Number of potential untested cells. Mean, standard deviation, minimum, and maximum are computed by combining parameters from Panels 50 and 51. Fractiles F95, F75, F50, F25, and F5 are approximated by a lognormal distribution.