

St. George Basin Play 4: Pribilof Basin Play

Geological Assessment

GRASP UAI: AAAAAJAE

Play Area: 1,575 square miles

Play Water Depth Range: 410-690 feet

Play Depth Range: 3,000-5,000 feet

Play Exploration Chance: 0.175

Play 4, Pribilof Basin, St. George Basin OCS Planning Area, 2006 Assessment, Undiscovered Technically-Recoverable Oil & Gas			
Assessment Results as of November 2005			
Resource Commodity (Units)	Resources *		
	F95	Mean	F05
BOE (Mmboe)	0	139	551
Total Gas (Tcfg)	0.000	0.453	1.784
Total Liquids (Mmbo)	0	59	233
Free Gas** (Tcfg)	0.000	0.444	1.746
Solution Gas (Tcfg)	0.000	0.009	0.038
Oil (Mmbo)	0	35	141
Condensate (Mmbc)	0	23	93

* Risked, Technically-Recoverable
 ** Free Gas Includes Gas Cap and Non-Associated Gas
 F95 = 95% chance that resources will equal or exceed the given quantity
 F05 = 5% chance that resources will equal or exceed the given quantity
 BOE = total hydrocarbon energy, expressed in barrels-of-oil-equivalent, where 1 barrel of oil = 5,620 cubic feet of natural gas
 Mmb = millions of barrels
 Tcf = trillions of cubic feet

Table 1

Play 4, the “Pribilof Basin” play, is the least important play (of four plays) in the St. George Basin OCS Planning Area, with 20% (139 Mmboe) of the Planning Area energy endowment (712 Mmboe). The overall assessment results for play 4 are shown in [table 1](#). Oil and gas-condensate liquids form 42% of the hydrocarbon energy

endowment of play 4. [Table 5](#) reports the detailed assessment results by commodity for play 4.

[Table 3](#) summarizes the volumetric input data developed for the *GRASP* computer model of St. George basin play 4. [Table 4](#) reports the risk model used for play 4. The location of play 4 is shown in [figure 1](#).

The Pribilof basin is a half graben that is about 30-miles wide, trends northwest-southeast for about 70 miles, and contains as much as 20,000 feet of Cenozoic sedimentary rocks (Scholl and Hopkins, 1969). It lies between St. George Island and the continental slope west of Pribilof Canyon. The area encompassing play 4 has never been offered for leasing and no wells have been drilled there. Potential traps include anticlines in the acoustic basement with drape in overlying strata, upthrown fault traps over tilted basement blocks, and stratigraphic onlap onto basement highs.

There are no reservoir-rock or source-rock data for the Pribilof basin. However, seismic data suggest that the basal strata were deposited when the surrounding area was emergent (Comer and others, 1987). Therefore, restricted circulation in the early Tertiary may have been conducive to organic preservation, and strata with good source-rock potential may have been deposited. The oil window probably occurs at about 12,000 feet, so the basal strata should be thermally mature.

The hydrocarbon potential of play 4 is completely untested. The nearest well control, the Arco Y-0537 well, is more than 75 miles away. The small size of the

Pribilof basin limits the technically recoverable resource potential and the remoteness of the basin limits the economically recoverable resource potential in this assessment.

Play 4, Pribilof Basin, St. George Basin OCS Planning Area, 2006 Assessment, Conditional BOE Sizes of Ten Largest Pools			
Assessment Results as of November 2005			
Pool Rank	BOE Resources *		
	F95	Mean	F05
1	30	157	431
2	15	75	182
3	10	47	111
4	7	33	78
5	6.2	26	60
6	5.5	22	49
7	4.9	19	41
8	4.2	17	36
9	3.6	15	32
10	3.2	14	29

* Conditional, Technically-Recoverable, Millions of Barrels Energy-Equivalent (Mmboe), from "PSRK.out" file
 F95 = 95% chance that resources will equal or exceed the given quantity
 F05 = 5% chance that resources will equal or exceed the given quantity
 BOE = total hydrocarbon energy, expressed in barrels-of-oil-equivalent, where 1 barrel of oil = 5,620 cubic feet of natural gas

Table 2

A maximum of 12 hypothetical pools is forecast by the aggregation of the risk model and the prospect numbers model for play 4. These 12 pools range in mean conditional (un-risked) recoverable volumes from 11.9 Mmboe (pool rank 12) to 157 Mmboe (pool rank 1). Pool rank 1 ranges in possible conditional recoverable volumes from 30 Mmboe (F95) to 431 Mmboe (F05), or in a gas case from 0.169 Tcfge (F95) to 2.422 Tcfge (F05). [Table 2](#) shows the conditional sizes of the 10 largest pools in play 4.

In the computer simulation for play 4 a total of 16,841 “simulation pools” were sampled

for size. These simulation pools can be grouped according to the USGS size class system in which sizes double with each successive class. Pool size class 11 contains the largest share (4,697, or 28%) of simulation pools (conditional, technically recoverable BOE resources) for play 4. Pool size class 11 ranges from 32 to 64 Mmboe. The largest simulation pool for play 4 falls within pool size class 16, which ranges in size from 1,064 to 2,048 Mmboe (or 5.8 to 11.5 Tcfge). [Table 6](#) reports statistics for the simulation pools developed in the *GRASP* computer model for play 4.

GRASP Play Data Form (Minerals Management Service - Alaska Regional Office)

Basin: St. George Basin
Play Number: 4
Play UAI Number: AAAAAJAE

Assessor: Comer
Play Name: Pribilof Basin Play

Date: March, 2005

Play Area (mi²: millions of acres): 1,575 (1.008)
Reservoir Thermal Maturity, % Ro:

Play Depth Range, feet: 3000 - 4000 - 5000
Expected Oil Gravity, ° API: 35
Play Water Depth Range, feet: 410 - 550 - 690
Prospect Distance from shore, miles: 400

POOLS Module (Volumes of Pools, Acre-Feet)

Fractile	F100	F95	F90	F75	F50	Mean / Std. Dev.	F25	F15	F10	F05	F02	F01	F00
Prospect Area (acres)-Model Input	~				35838	---				47400			~
Prospect Area (acres)-Model Output	2043	10095	13355	21317	35838	36360 / 6225.8	40192	42743	44561	47400	50812	53222	60609
Fill Fraction (Fraction of Area Filled)	0.06	0.11	0.13	0.16	0.2	0.21192 / 0.074237	0.25	0.28	0.31	0.35	0.4	0.44	0.71
Productive Area of Pool (acres)	250	1884	2533	4153	7192	9884.15 / 8679.73	12456	16725	20149	27448	38292	47809	50000
Pay Thickness (feet)	48	80	87	101	120	123.848 / 31.888	142	155	165	181	200	215	303

MPRO Module (Numbers of Pools)

Play Level Chance	0.5	Prospect Level Chance	0.35	Exploration Chance	0.175
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Risk Model	Play Chance	Petroleum System Factors	Prospect Chance
	[See Risking Sheet]		

Fractile	F100	F95	F90	F75	F50	Mean / Std. Dev.	F25	F15	F10	F05	F02	F01	F00
Numbers of Prospects in Play	6	7	7	8	9	9.63 / 1.38	10	10	11	11	12	12	13
Numbers of Pools in Play	~	~	~	F49.07= 0	F45 = 1	1.69 / 2.01	3	4	5	5	6	7	12

Minimum Number of Pools	0	Mean Number of Pools	1.69	Maximum Number of Pools	12
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POOLS/PSRK/PSUM Module (Play Resources)

Fractile	F100	F95	F90	F75	F50	Mean / Std. Dev.	F25	F15	F10	F05	F02	F01	F00
Oil Recovery Factor (bbl/acre-foot)	31	66	74	92	116	123.302 / 44.738	147	166	181	205	236	260	424
Gas Recovery Factor (Mcft/acre-foot)	49	115	134	173	229	250.457 / 111.654	304	353	392	456	541	607	1084
Gas Oil Ratio (Sol'n Gas)(cf/bbl)	112	176	191	218	253	259.216 / 58.399	293	318	355	363	397	422	572
Condensate Yield ((bbl/Mmcf)	20	40	42	47	52	52.695 / 8.776	58	62	64	68	73	76	100

Pool Size Distribution Statistics from POOLS (1,000 BOE): μ (mu) = 10.8541692 σ^2 (sigma squared) = 0.96277077 Random Number Generator Seed = 554616

BOE Conversion Factor (cf/bbl)	5620	Probability Any Pool Contains Both Oil and Free Gas (Gas Cap)	0.2
Probability Any Pool is 100% Oil	0	Fraction of Pool Volume Gas-Bearing in Oil Pools with Gas Cap	0.3
Probability Any Pool is 100% Gas	0.8		

Table 3. Input data for St. George basin play 4, 2006 assessment.

GRASP - Geologic and Economic Resource Assessment Model - PSUM Module Results

Minerals Management Service - Alaska OCS Region
 GRASP Model Version: 8.29.2005)
 Computes the Geologic Resource Potential of the Play

Play UAI: AAAAAJAE **Play No. 4**

World Level - World Level Resources
 Country Level - UNITED STATES OF AMERICA
 Region Level - MMS ALASKA REGION
 Basin Level - **ST. GEORGE** **BASIN**
Play Level - 4 Pribilof Basin Play

Geologist Comer
 Remarks Pribilof Basin
 Run Date & Time: Date 19-Sep-05 Time 14:11:22

Summary of Play Potential

Product	MEAN	Standard Deviation
BOE (Mboe)	139,290	209,670
Oil (Mbo)	35,279	93,620
Condensate (Mbc)	23,400	36,362
Free (Gas Cap & Nonassociated) Gas (Mmcf)	443,810	684,550
Solution Gas (Mmcf)	9,203	25,174

10000 (Number of Trials in Sample)
 0.4904 (MPhc [Probability] of First Occurrence of Non-Zero Resource)
 Windowing Feature: used

Empirical Probability Distributions of the Products

Greater Than Percentage	BOE (Mboe)	Oil (Mbo)	Condensate (Mbc)	Free (Gas Cap & Nonassociated) Gas (Mmcf)	Solution Gas (Mmcf)
100	0	0	0	0	0
99.99	0	0	0	0	0
99	0	0	0	0	0
95	0	0	0	0	0
90	0	0	0	0	0
85	0	0	0	0	0
80	0	0	0	0	0
75	0	0	0	0	0
70	0	0	0	0	0
65	0	0	0	0	0
60	0	0	0	0	0
55	0	0	0	0	0
50	0	0	0	0	0
45	58,781	4,197	12,437	235,800	1,070
40	104,300	14,535	20,360	386,590	3,458
35	143,220	27,938	25,985	494,490	7,364
30	181,960	33,747	33,241	637,400	8,751
25	227,720	47,114	40,886	773,480	11,770
20	275,120	47,836	51,762	974,390	12,051
15	338,530	82,455	57,458	1,095,800	20,376
10	418,060	115,460	68,880	1,284,100	29,466
8	466,150	113,670	80,033	1,501,400	29,737
6	514,860	140,260	85,131	1,590,400	36,485
5	550,690	140,550	92,737	1,745,600	38,247
4	597,100	197,500	88,926	1,693,700	52,325
2	754,840	232,950	117,230	2,212,100	62,084
1	921,550	310,770	136,800	2,582,700	81,045
0.1	1,376,600	286,360	290,320	4,420,200	75,209
0.01	1,870,000	0	411,940	8,194,400	0
0.001	1,943,200	0	430,730	8,499,800	0

Table 5. Assessment results by commodity for St. George basin play 4, 2006 assessment.

Classification and Size			Pool Count Statistics				Pool Types Count		Mixed Pool Range		Oil Pool Range		Gas Pool Range		Total Pool Range		Pool Resource Statistics (MMBOE)				
Class	Min (MMBOE)	Max (MMBOE)	Pool Count	Percentage	Trial Average	Trials w/Pool Avg	Mixed Pool	Oil Pool	Gas Pool	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Total Resource	Average Resource
1	0.0312	0.0625	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000
2	0.0625	0.125	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000
3	0.125	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000
4	0.25	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000
5	0.5	1	1	0.005938	0.0001	0.000204	0	0	1	0	0	0	1	1	1	1	1	1	1	0.705187	705.186665
6	1	2	7	0.041565	0.0007	0.001427	0	0	7	0	0	0	1	1	1	1	1	1	1	1.153005	1.745800
7	2	4	82	0.486907	0.0082	0.016718	3	0	79	1	1	0	0	1	2	1	2	2	2	2.035492	3.968027
8	4	8	432	2.565168	0.0432	0.088073	12	0	420	1	1	0	0	1	2	1	2	2	2	4.029006	7.996908
9	8	16	1444	8.574313	0.1444	0.294393	69	0	1375	1	1	0	0	1	4	1	4	4	4	8.000089	15.989108
10	16	32	3170	18.823111	0.317	0.646279	313	0	2857	1	2	0	0	1	5	1	5	5	5	16.002072	31.999304
11	32	64	4697	27.890268	0.4697	0.957594	727	0	3970	1	3	0	0	1	5	1	5	5	5	32.004300	63.989809
12	64	128	3981	23.638739	0.3981	0.811621	1021	0	2960	1	3	0	0	1	4	1	5	5	5	64.004502	127.990541
13	128	256	2160	12.825842	0.216	0.440367	754	0	1406	1	3	0	0	1	3	1	4	4	4	128.005647	255.801913
14	256	512	742	4.405914	0.0742	0.151274	333	0	409	1	2	0	0	1	2	1	3	3	3	256.225291	511.999818
15	512	1024	115	0.682857	0.0115	0.023445	70	0	45	1	1	0	0	1	1	1	1	1	1	512.864230	998.972073
16	1024	2048	10	0.059379	0.001	0.002039	7	0	3	1	1	0	0	1	1	1	1	1	1	1038.300000	1870.015000
17	2048	4096	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000
18	4096	8192	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000
19	8192	16384	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000
20	16384	32768	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000
21	32768	65536	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000
22	65536	131072	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000
23	131072	262144	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000
24	262144	524288	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000
25	524288	1048576	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.000000	0.000000
Not Classified			0	0	0	0	Below Class	0	0	0		Below Class	0	0	0		Below Class	0	0	0.000000	0.000000
			0	0	0	0	Above Class	0	0	0		Above Class	0	0	0		Above Class	0	0	0.000000	0.000000
Totals			16841	100	1.6841	3.433435															

Number of Pools not Classified: 0	Min and Max refer to numbers of pools of the relevant size class that occur within any single trial in the simulation.	Min and Max refer to aggregate resources of the relevant size class that occur within any single trial in the simulation.
Number of Pools below Class 1: 0		
Number of Trials with Pools: 4905		

Table 6. Statistics for simulation pools created in computer sampling run for St. George basin play 4, 2006 assessment.

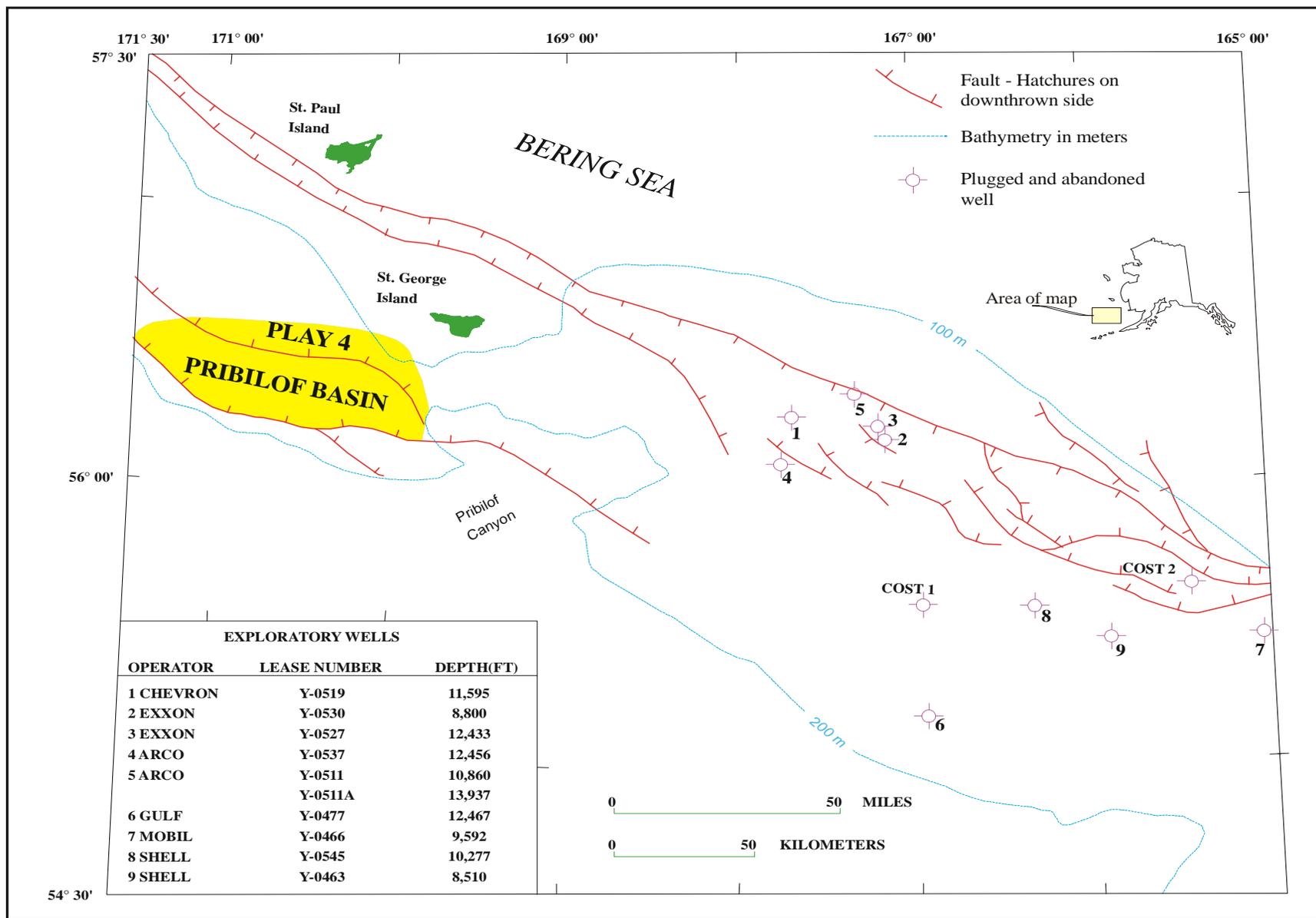


Figure 1. Map location of St. George basin play 4, 2006 assessment.