

EXPLANATION OF CHUKCHI SHELF PLAY SUMMARIES

This section consists of page-size compilations of graphics that summarize the results of *GRASP* modeling of the undiscovered, conventionally recoverable oil and gas endowments of each of the plays identified and assessed in the province. Each play summary features a plot for risked cumulative probability distributions for oil, gas, and BOE (gas in oil-equivalent barrels added to oil), a table of results, and a plot showing ranked sizes (oil and gas shown separately) of individual hypothetical pools. These three components of the play summaries are each described below.

Risked Cumulative Probability Distributions for Plays

Each play summary provides, at page top, cumulative probability distributions for risked, undiscovered endowments of conventionally recoverable oil, gas, and BOE. Oil and BOE quantities are shown in billions of barrels (B bbl). Gas quantities are reported in trillions of cubic feet (Tcf). Resource quantities are plotted against “Cumulative frequency greater than %.” A cumulative frequency value represents the probability that the play resource endowment will exceed the quantity associated with the frequency value along one of the curves (fig. 0.1). Cumulative frequency values along the curves decrease as resource quantities increase. Accordingly, the cumulative frequencies, or “probabilities for exceedance,” of small resource quantities are high, and conversely, the probabilities for exceedance of large resource quantities are low.

The cumulative probability distributions are risked and curves are truncated approximately at the output play chance. In most plays, the output play chance is equal to the input play chance for success. However, in plays with very small numbers of pools, the output play chance may be significantly **lower** than the input play chance for success.

The output play chance is derived from MPRO, a module within *GRASP* which uses inputs for geologic chance of success to convert probability distributions for numbers of *prospects* to probability distributions for numbers of *pools*. The output play chance is obtained as a mathematic extrapolation to the probability at which the numbers of pools meets or exceeds zero. In plays with 5 or more pools at the mean, this probability usually equals the input play

chance for success. In plays with less than 5 pools at the mean, the zero-pool probability (or output play chance) may be much less than the input play chance. Deviation between the output play chance and the input play chance is greatest in those plays with mean numbers of pools less than unity. Such highly risky plays contribute very little resources to overall province endowments.

Identification numbers beginning with “UA” in the graphics labels are codes unique to each of the plays in the *GRASP* data bases.

Table for Risked Play Resource Endowments

Each play summary provides, at page center, a table for risked, undiscovered play endowments of oil, gas, and BOE in billions of barrels of oil (BBO) or trillions of cubic feet of gas (TCFG). Quantities are reported at the **mean**, **F95** (a low estimate having a 95-percent frequency of exceedance), and **F05** (a high estimate having a 5-percent frequency of exceedance). Tabulated resource quantities are risked and therefore correspond to points on the cumulative probability distributions shown at page top. For plays with chances for success (play level) less than 0.95, the risked resource quantities reported at **F95** are zero.

Ranked Pool Size Distributions for Plays

Each play summary provides, at page bottom, a plot showing pool sizes ranked according to size in BOE. The numbers of pools shown in the rank plots correspond to the maximum numbers of pools estimated to occur within the plays. Each pool in a pool rank plot is represented by a pair of adjoining vertical bars. The left bar of each pair represents the range (from **F75** to **F25** in the output probability distribution) of gas recoverable from the pool, and may include non-associated gas from an all-gas pool or associated gas from a gas cap and/or solution gas from oil, depending on pool type. The right bar of each pair represents the range (from **F75** to **F25**) of petroleum liquids recoverable from the same pool, and may include free oil, condensate from a gas cap, or condensate from a gas-only pool.

Volumes are shown in millions of barrels (MMbbl) of oil and billions of cubic feet (Bcf) of gas.

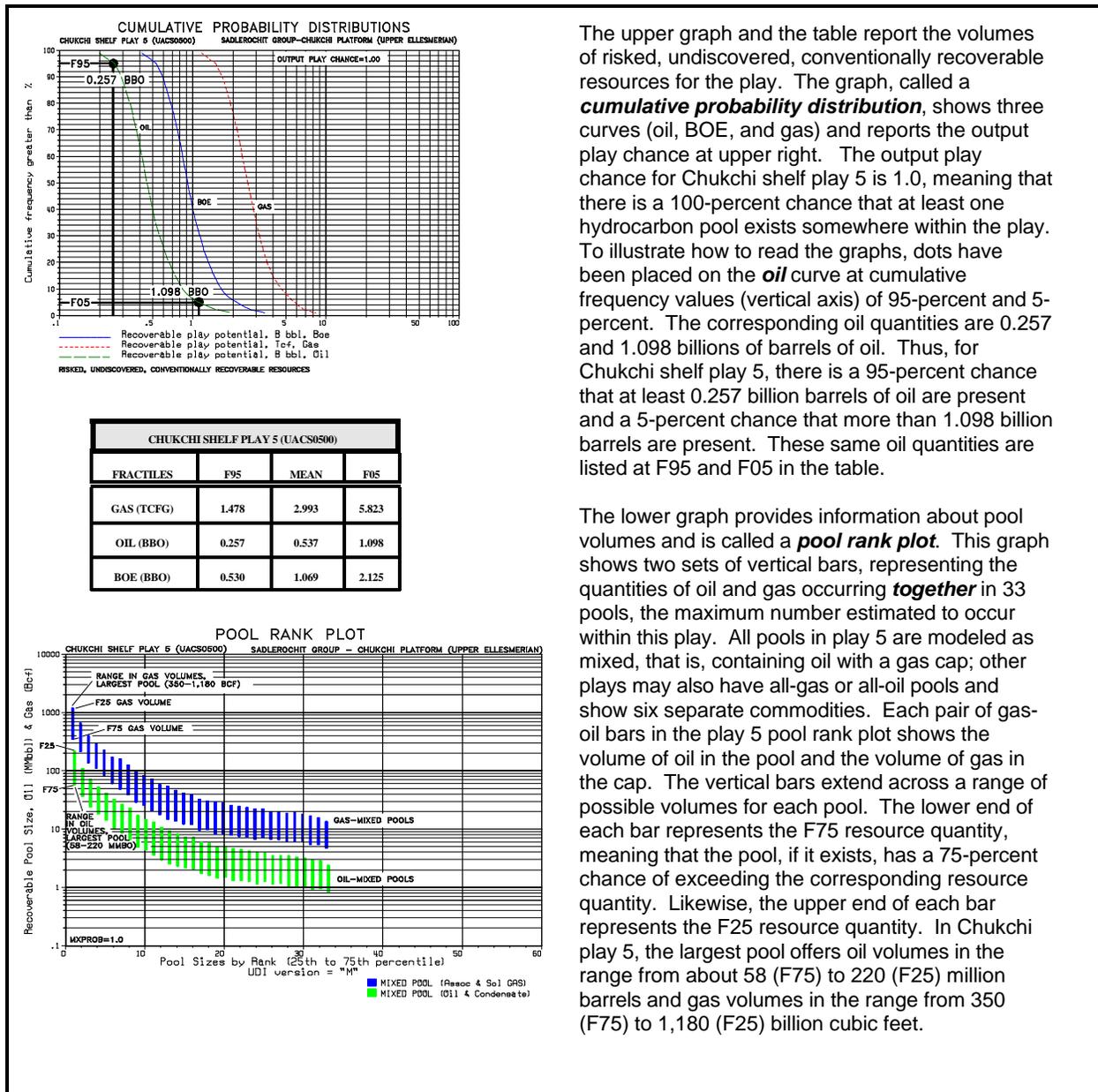


Figure 0.1: Sample play summary, Chukchi shelf play 5.

Extreme sizes outside the range between F75 and F25 volumes are not shown, but all pools offer (at low probabilities) high-side potential that may be several multiples of their median sizes (F50 or centers of vertical bars). For example, the largest pool in the pool rank plot in figure 0.1 shows F75-F25 ranges in oil volumes from 58 to 220 millions of barrels and gas volumes from 350 to 1,180 billions of cubic feet. But, these ranges do not capture the largest possible sizes of

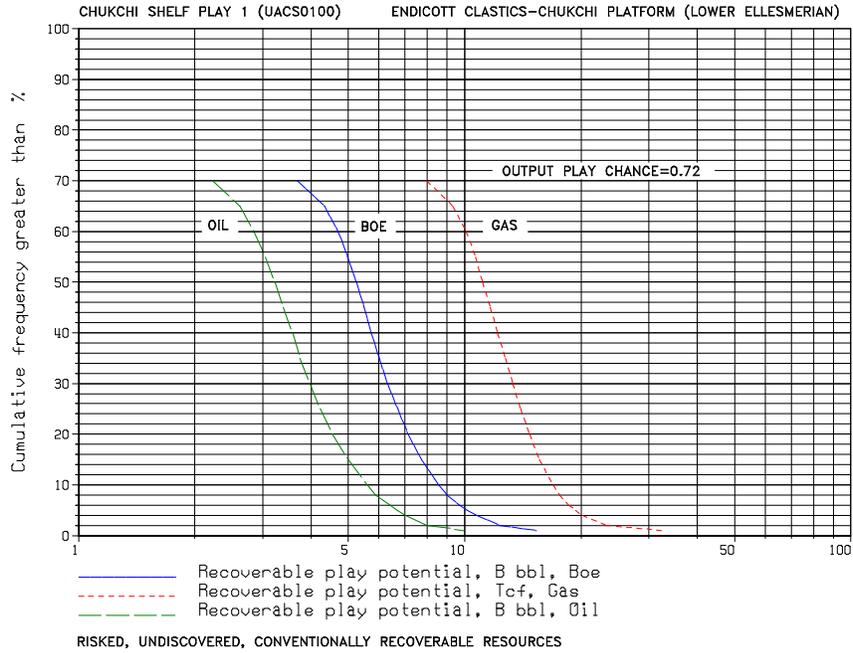
The upper graph and the table report the volumes of risked, undiscovered, conventionally recoverable resources for the play. The graph, called a **cumulative probability distribution**, shows three curves (oil, BOE, and gas) and reports the output play chance at upper right. The output play chance for Chukchi shelf play 5 is 1.0, meaning that there is a 100-percent chance that at least one hydrocarbon pool exists somewhere within the play. To illustrate how to read the graphs, dots have been placed on the **oil** curve at cumulative frequency values (vertical axis) of 95-percent and 5-percent. The corresponding oil quantities are 0.257 and 1.098 billions of barrels of oil. Thus, for Chukchi shelf play 5, there is a 95-percent chance that at least 0.257 billion barrels of oil are present and a 5-percent chance that more than 1.098 billion barrels are present. These same oil quantities are listed at F95 and F05 in the table.

The lower graph provides information about pool volumes and is called a **pool rank plot**. This graph shows two sets of vertical bars, representing the quantities of oil and gas occurring **together** in 33 pools, the maximum number estimated to occur within this play. All pools in play 5 are modeled as mixed, that is, containing oil with a gas cap; other plays may also have all-gas or all-oil pools and show six separate commodities. Each pair of gas-oil bars in the play 5 pool rank plot shows the gas volume of oil in the pool and the volume of gas in the cap. The vertical bars extend across a range of possible volumes for each pool. The lower end of each bar represents the F75 resource quantity, meaning that the pool, if it exists, has a 75-percent chance of exceeding the corresponding resource quantity. Likewise, the upper end of each bar represents the F25 resource quantity. In Chukchi play 5, the largest pool offers oil volumes in the range from about 58 (F75) to 220 (F25) million barrels and gas volumes in the range from 350 (F75) to 1,180 (F25) billion cubic feet.

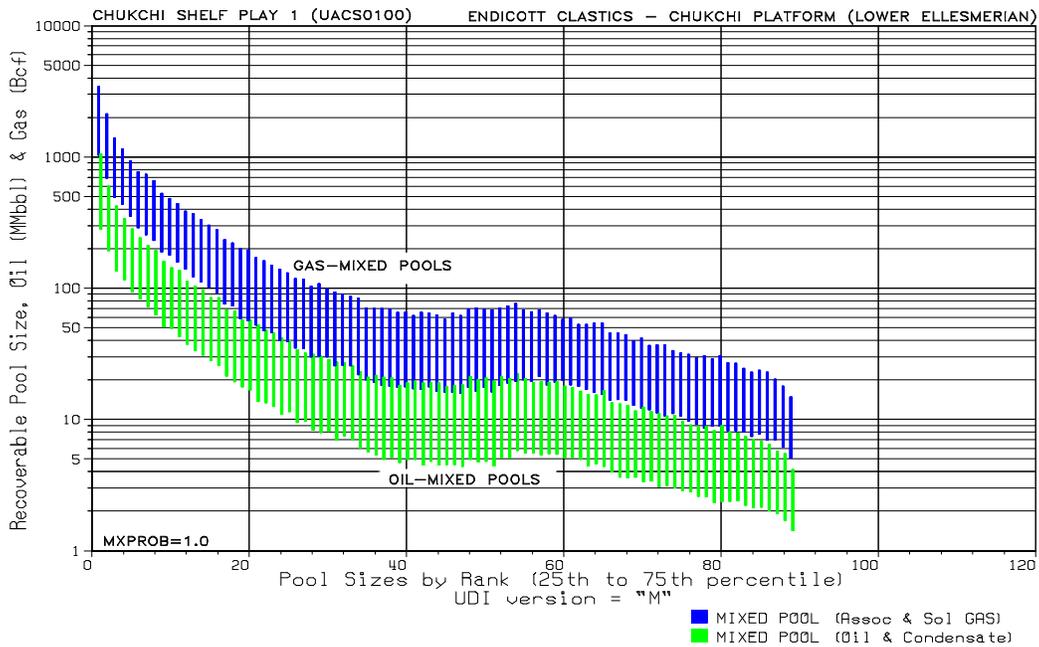
of the plot. For this presentation, a range based on F75-F25 values was chosen for visual clarity while still giving some impression of variance or spread.

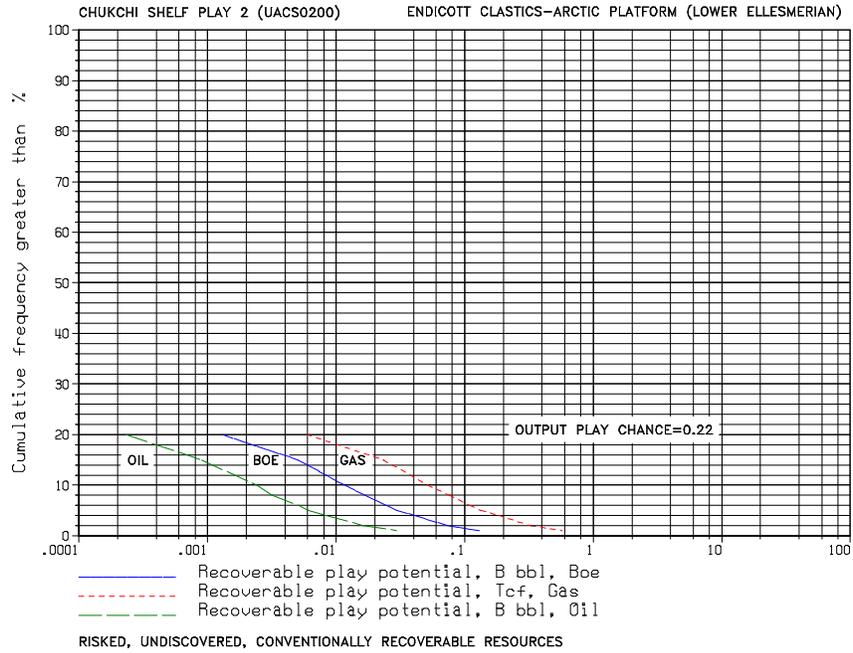
Pool volumes shown in the ranked plots are conditional upon success at the play level (i.e., a hydrocarbon pool existing *somewhere* within the play). The sizes of the pools posted in the rank plot have not been “risked”, or multiplied against play chance of success. Therefore, except where the play chance of success equals 1.0, the sum of the mean sizes of the pools in the rank plot will exceed the risked mean play endowment that is reported in the table at page center. In fact, several of the largest pools, or even just the largest pool, may post conditional resources exceeding the risked play endowment.

Designation of pool types (oil-only, versus oil with gas cap, versus gas-only) within the play model was controlled by three data entries. Each play was assigned probabilities for (or frequencies of) occurrence of any of three pool types within the play—“OPROB” for oil-only pools, “GPROB” for gas-only pools, and “MXPROB” for mixed (oil and gas cap) pools. As the model recognizes only these three pool types, these three probability values always sum to 1.0. The three probability values control frequency of pool type sampling during *GRASP* runs, and, with a random number generator in *GRASP*, ultimately dictate the sequence of pool types that appear in the play pool rank plots. The OPROB, GPROB, and/or MXPROB values that were used in the play models are posted, as appropriate, in the lower left corner of each pool rank plot.

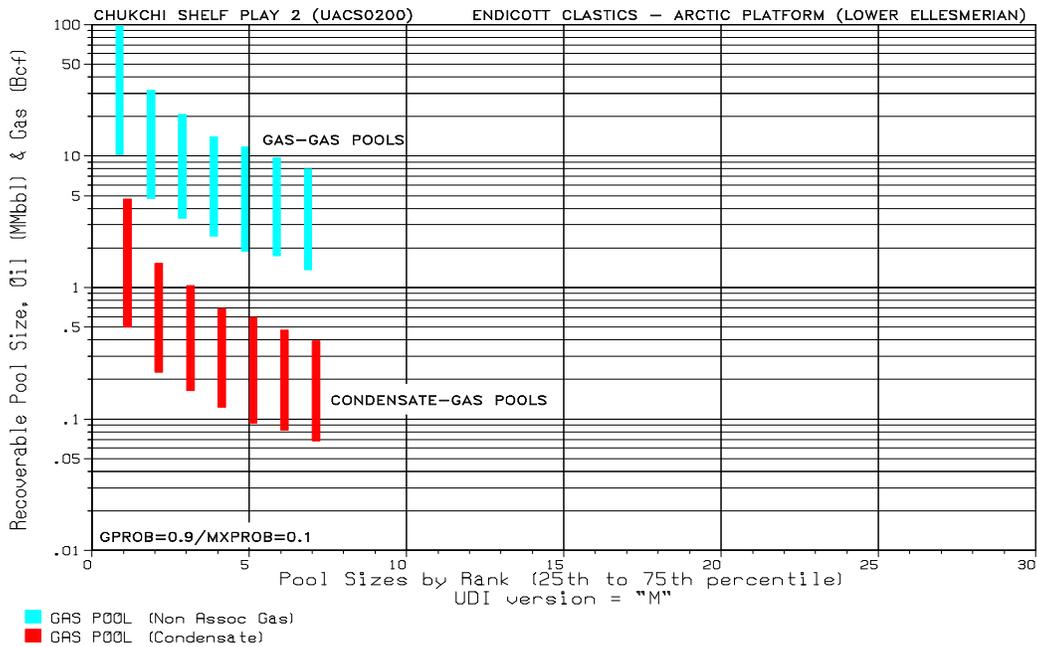


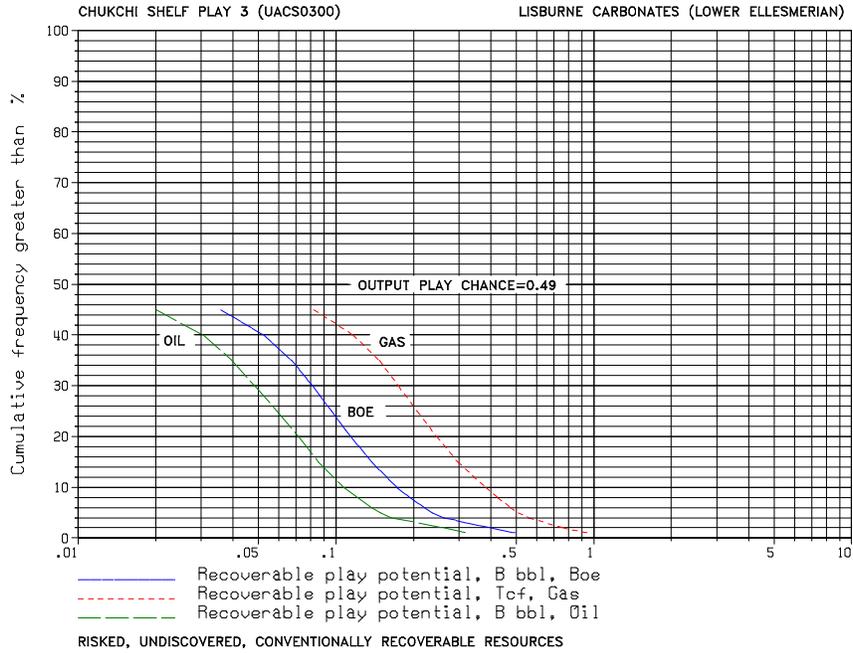
CHUKCHI SHELF PLAY 1 (UACS0100)			
FRACTILES	F95	MEAN	F05
GAS (TCFG)	0.000	9.762	19.377
OIL (BBO)	0.000	3.001	6.696
BOE (BBO)	0.000	4.738	10.140



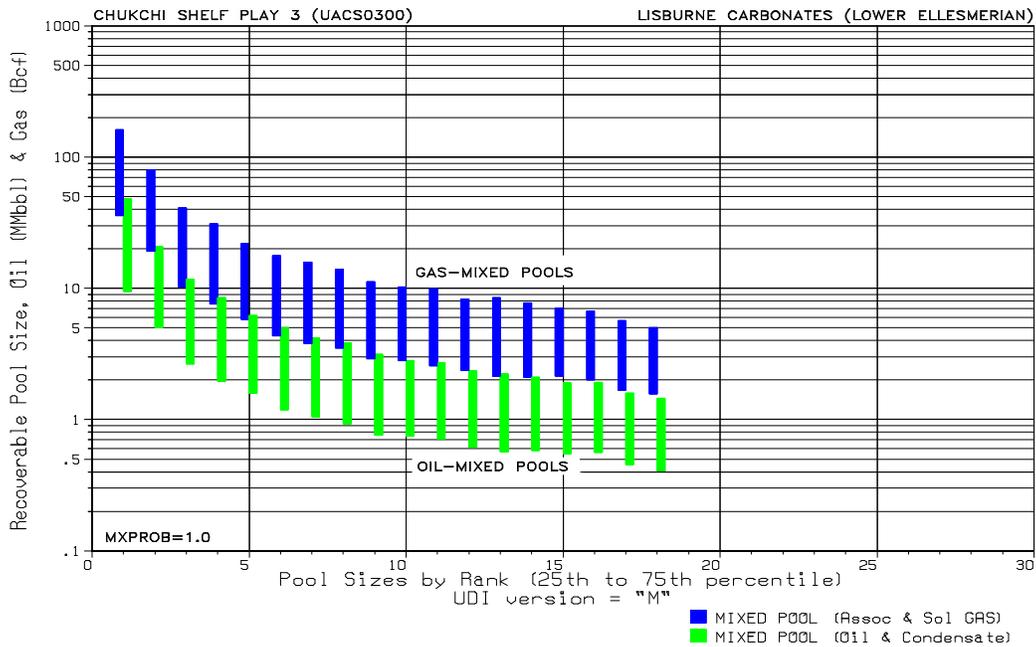


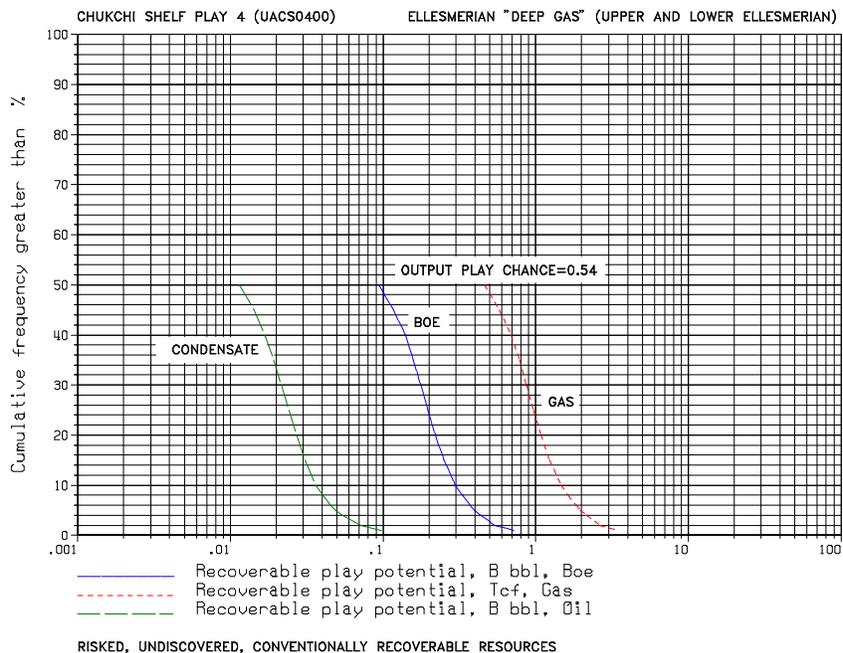
CHUKCHI SHELF PLAY 2 (UACS0200)			
FRACTILES	F95	MEAN	F05
GAS (TCFG)	0.000	0.035	0.133
OIL (BBO)	0.000	0.002	0.006
BOE (BBO)	0.000	0.008	0.030



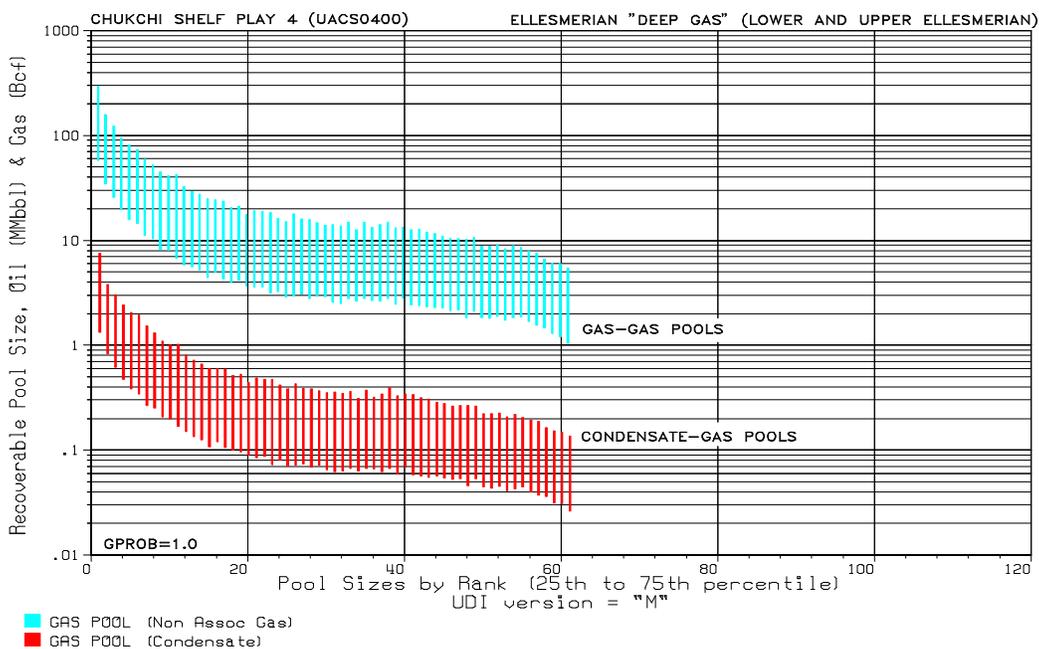


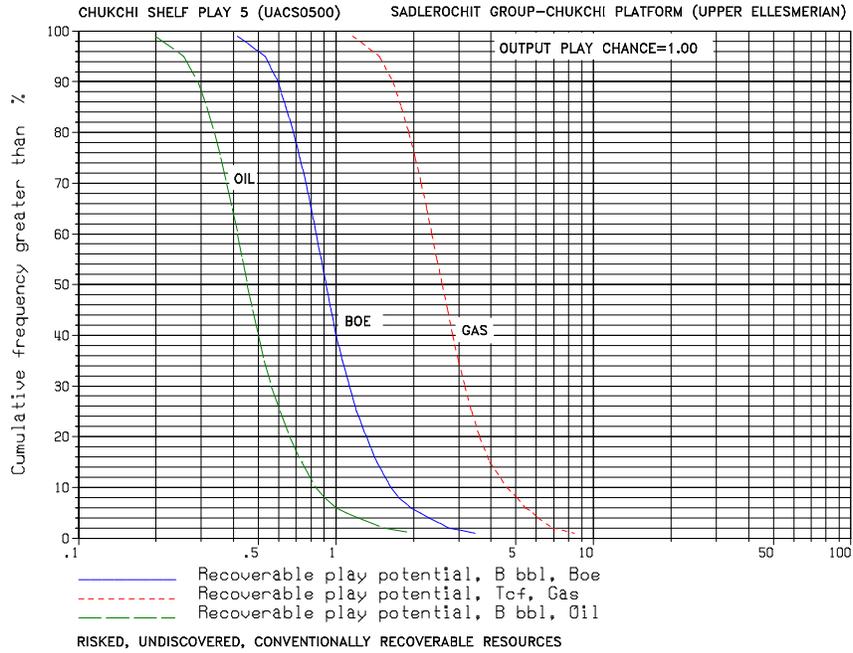
CHUKCHI SHELF PLAY 3 (UACS0300)			
FRACTILES	F95	MEAN	F05
GAS (TCFG)	0.000	0.137	0.509
OIL (BBO)	0.000	0.041	0.149
BOE (BBO)	0.000	0.065	0.236



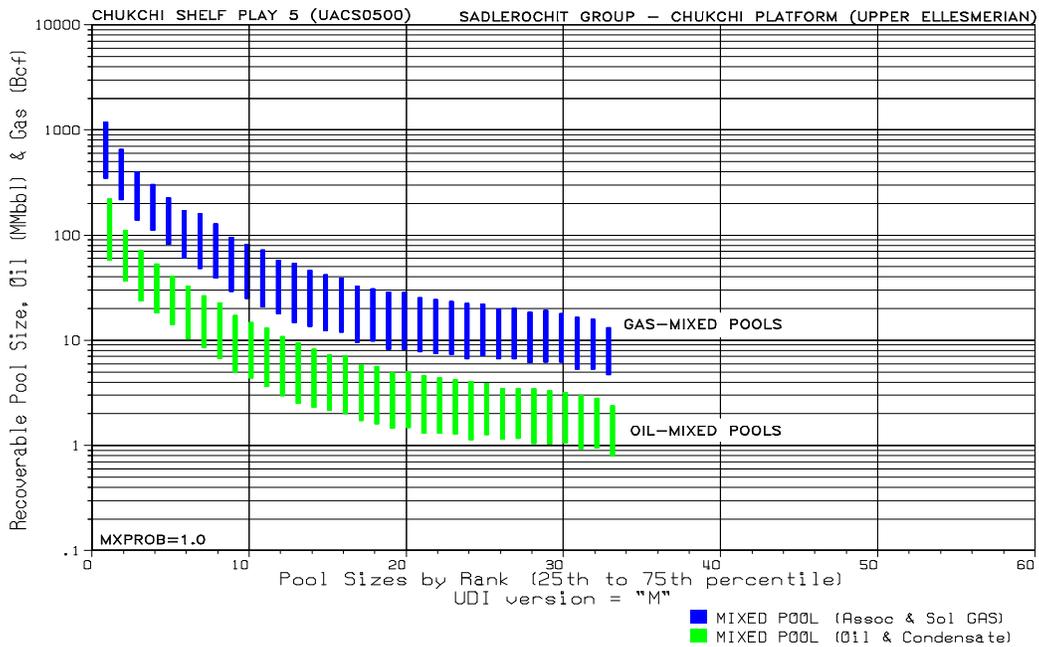


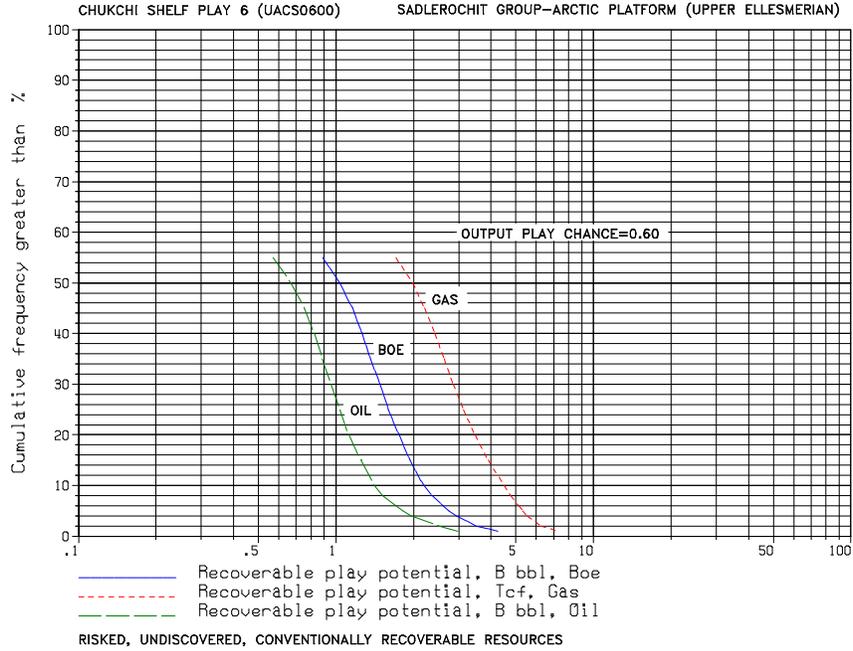
CHUKCHI SHELF PLAY 4 (UACS0400)			
FRACTILES	F95	MEAN	F05
GAS (TCFG)	0.000	0.629	1.962
OIL (BBO)	0.000	0.016	0.049
BOE (BBO)	0.000	0.128	0.399



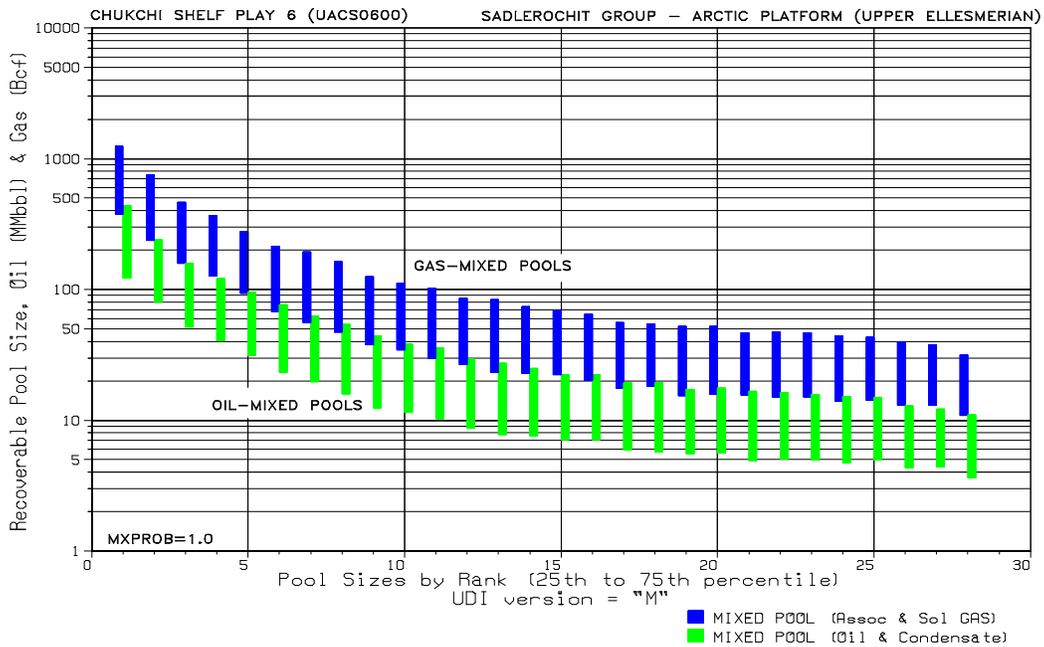


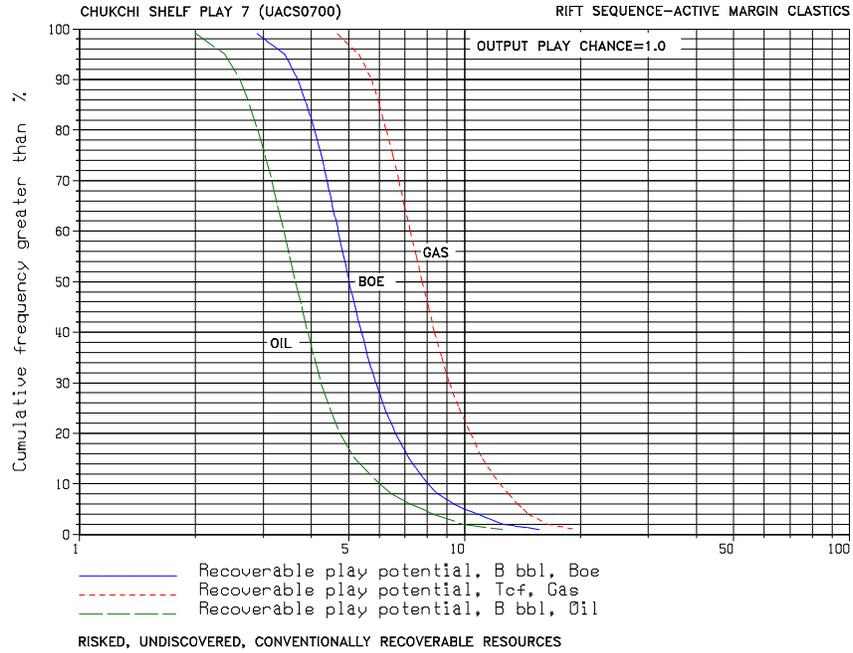
CHUKCHI SHELF PLAY 5 (UACS0500)			
FRACTILES	F95	MEAN	F05
GAS (TCFG)	1.478	2.993	5.823
OIL (BBO)	0.257	0.537	1.098
BOE (BBO)	0.530	1.069	2.125



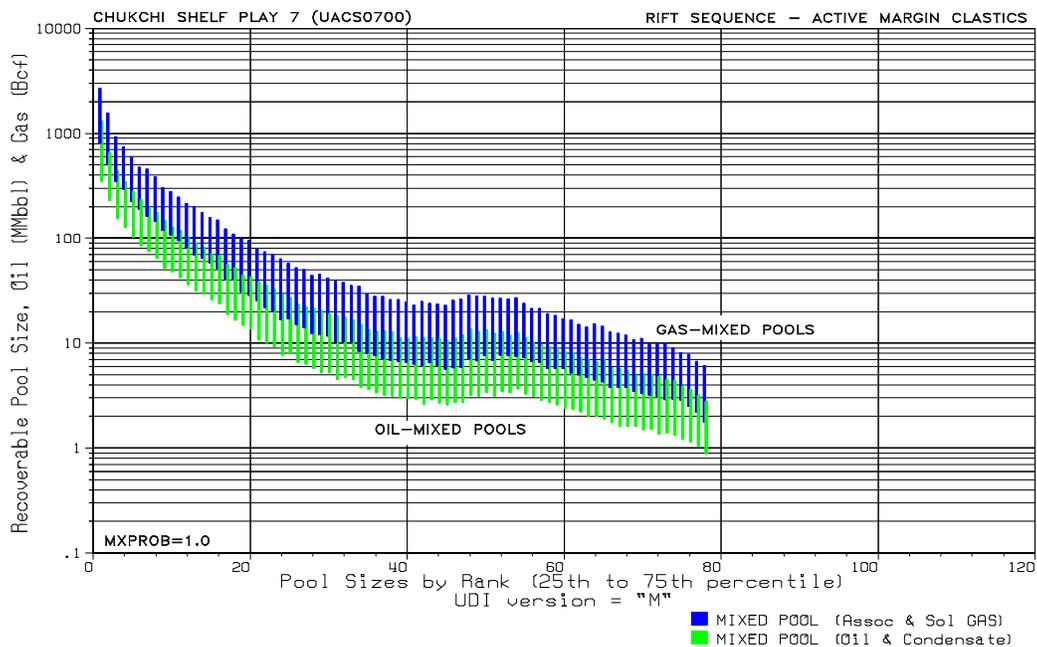


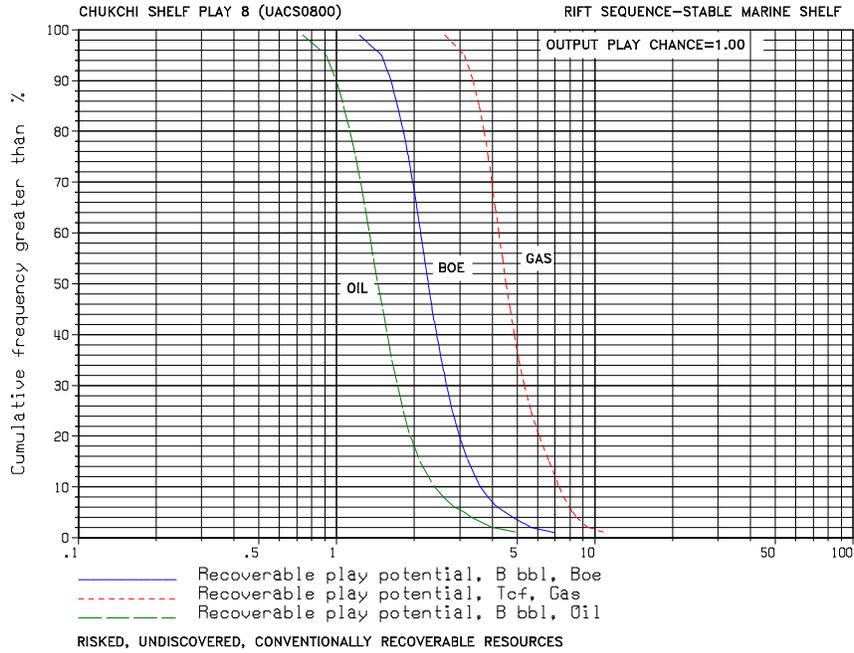
CHUKCHI SHELF PLAY 6 (UACS0600)			
FRACTILES	F95	MEAN	F05
GAS (TCFG)	0.000	1.935	5.314
OIL (BBO)	0.000	0.660	1.818
BOE (BBO)	0.000	1.005	2.737



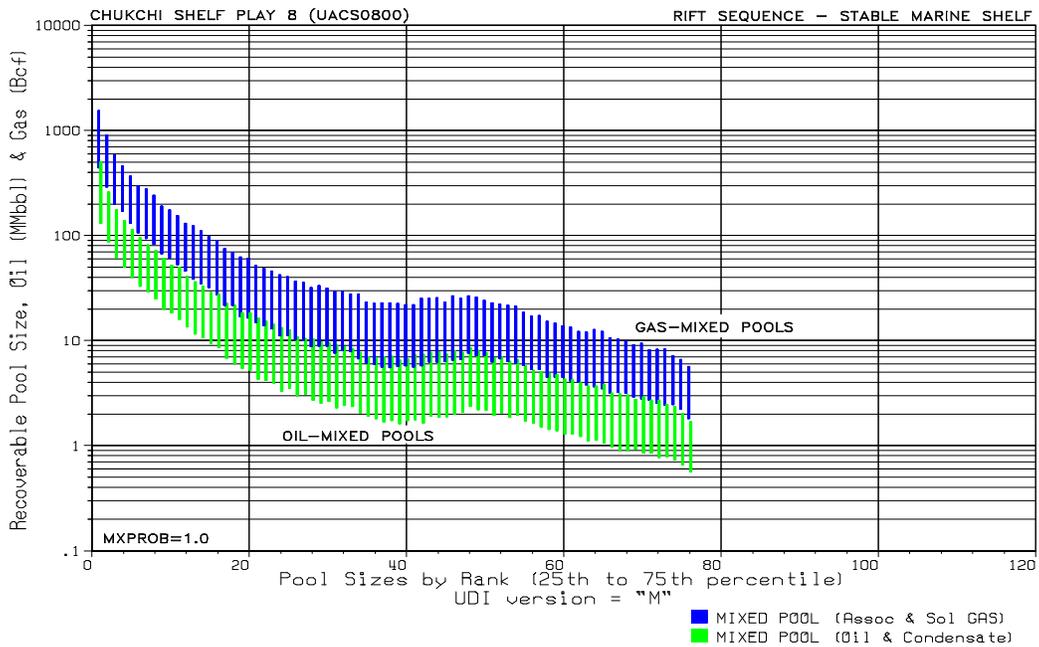


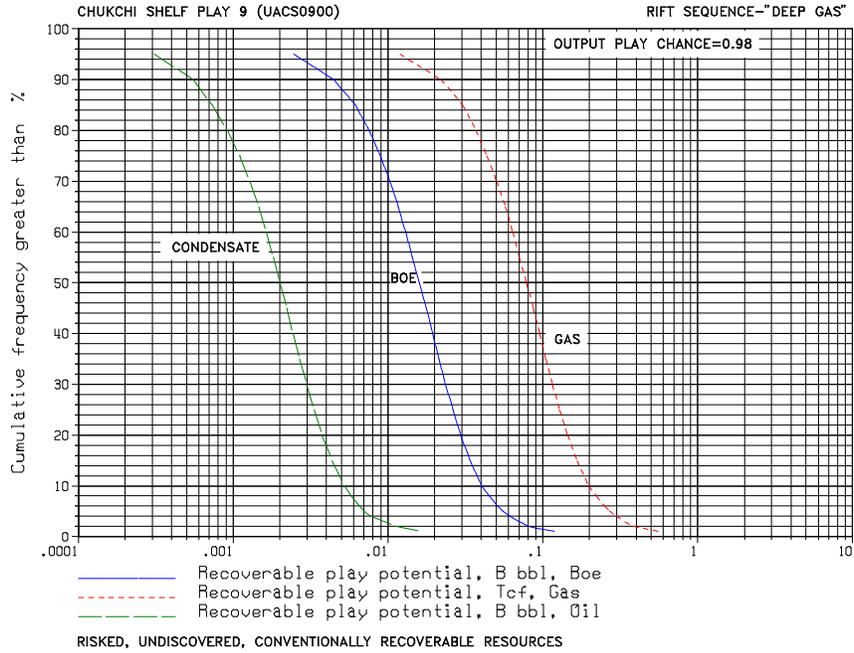
CHUKCHI SHELF PLAY 7 (UACS0700)			
FRACTILES	F95	MEAN	F05
GAS (TCFG)	5.314	8.547	14.204
OIL (BBO)	2.385	4.136	7.770
BOE (BBO)	3.410	5.656	9.968



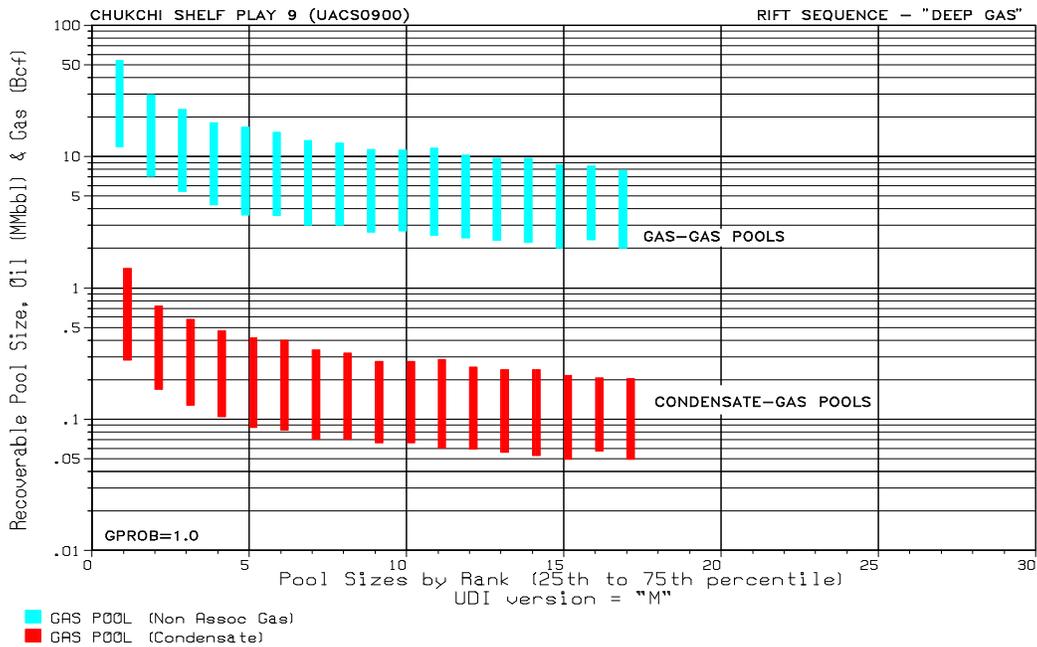


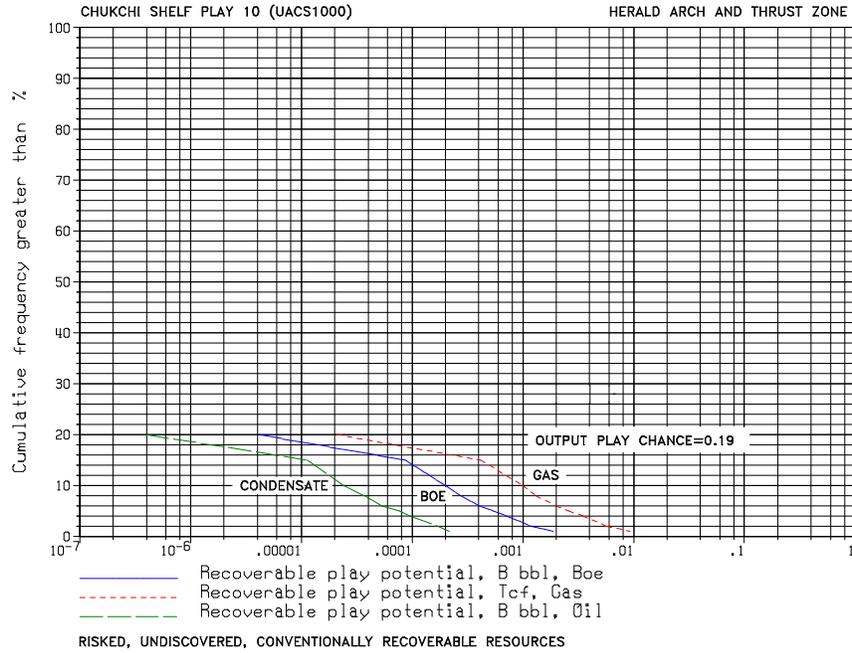
CHUKCHI SHELF PLAY 8 (UACS0800)			
FRACTILES	F95	MEAN	F05
GAS (TCFG)	3.118	5.026	8.193
OIL (BBO)	0.910	1.645	3.121
BOE (BBO)	1.492	2.539	4.487



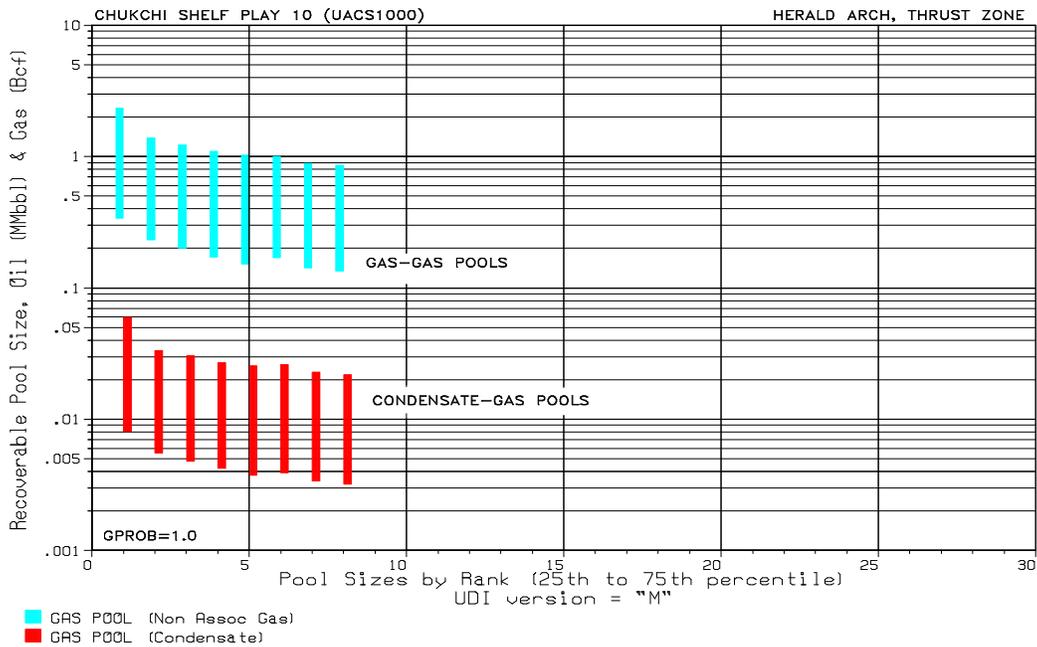


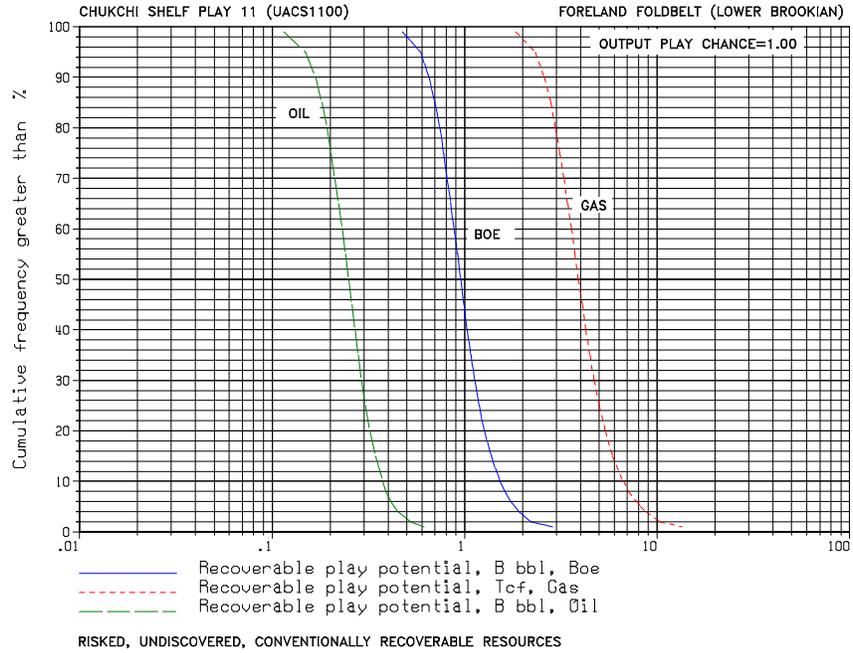
CHUKCHI SHELF PLAY 9 (UACS0900)			
FRACTILES	F95	MEAN	F05
GAS (TCFG)	0.012	0.108	0.269
OIL (BBO)	0.0003	0.003	0.007
BOE (BBO)	0.002	0.022	0.055



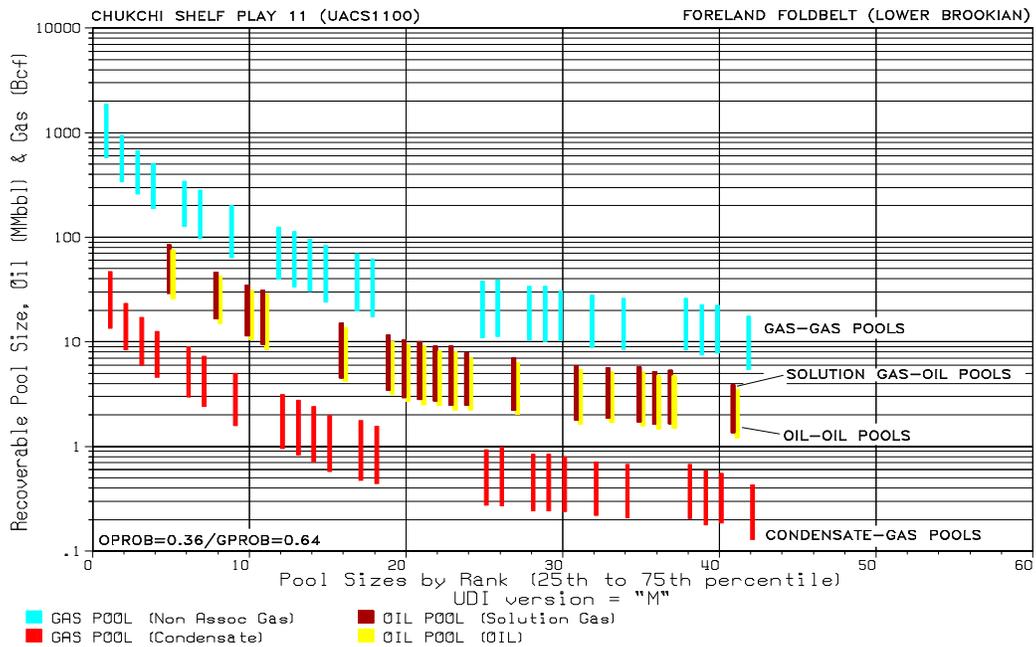


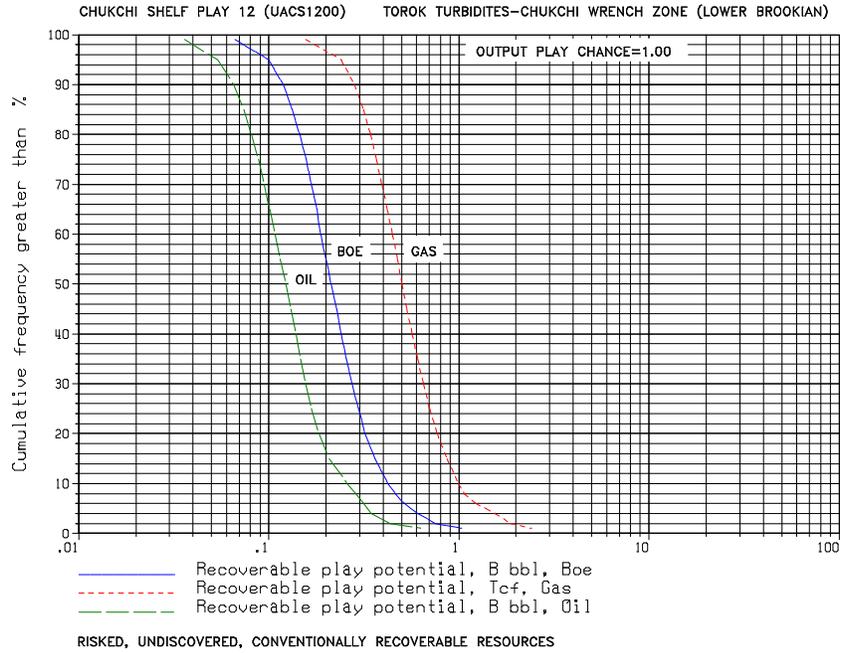
CHUKCHI SHELF PLAY 10 (UACS1000)			
FRACTILES	F95	MEAN	F05
GAS (TCFG)	0.000	0.0006	0.003
OIL (BBO)	0.000	0.00002	0.00008
BOE (BBO)	0.000	0.0001	0.0005



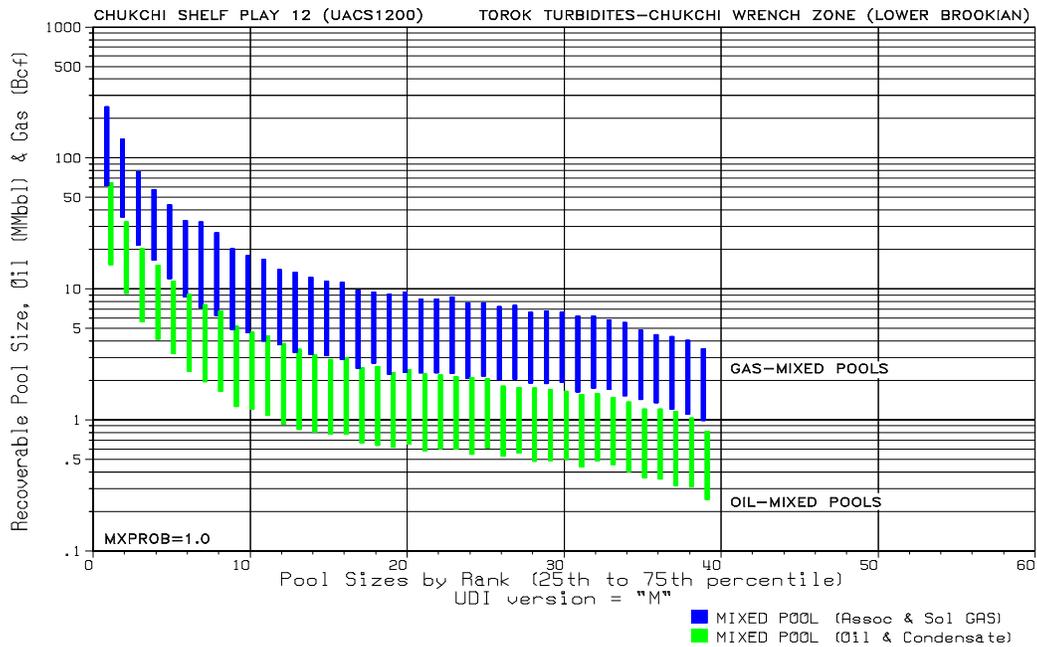


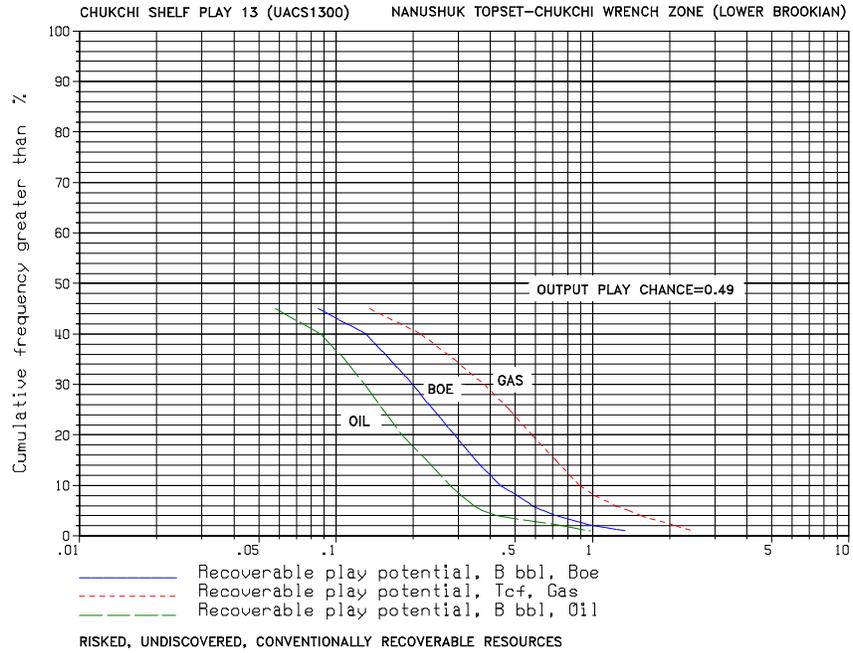
CHUKCHI SHELF PLAY 11 (UACS1100)			
FRACTILES	F95	MEAN	F05
GAS (TCFG)	2.328	4.491	8.225
OIL (BBO)	0.149	0.265	0.430
BOE (BBO)	0.590	1.065	1.821



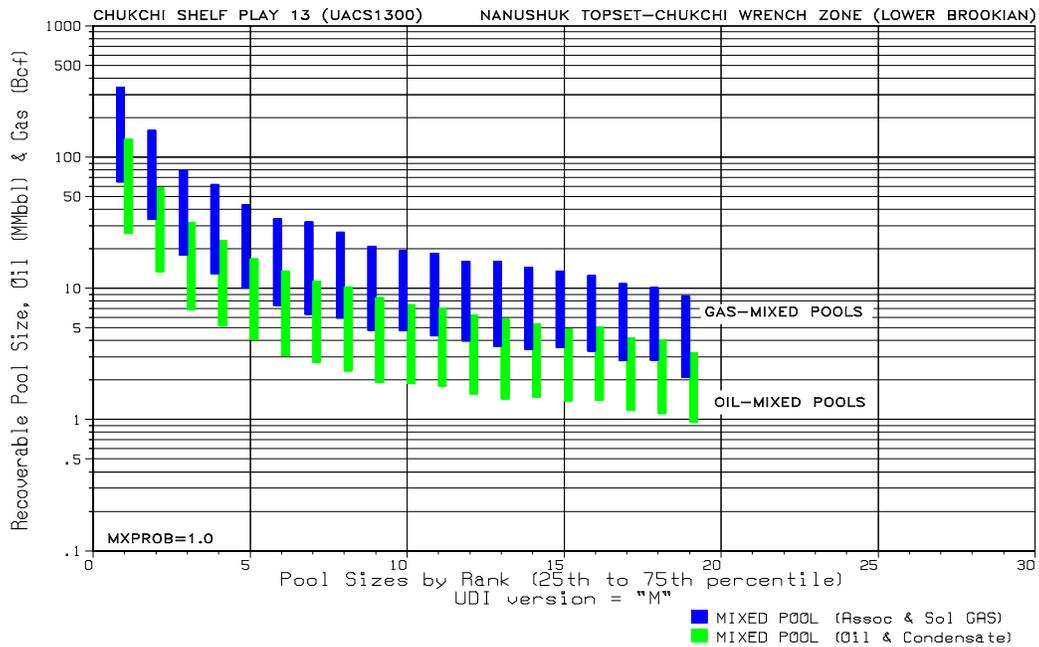


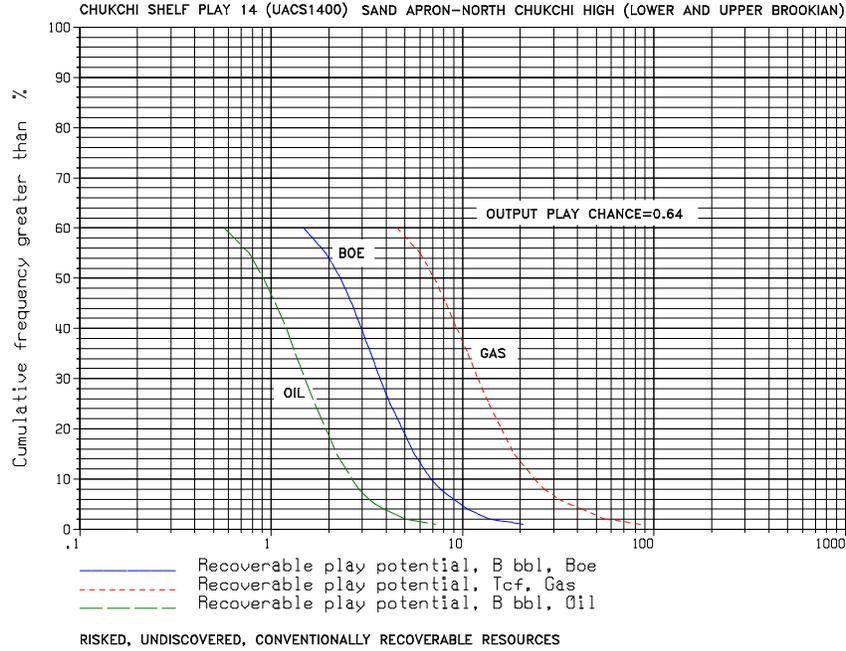
CHUKCHI SHELF PLAY 12 (UACS1200)			
FRACTILES	F95	MEAN	F05
GAS (TCFG)	0.240	0.635	1.384
OIL (BBO)	0.054	0.147	0.331
BOE (BBO)	0.100	0.261	0.556



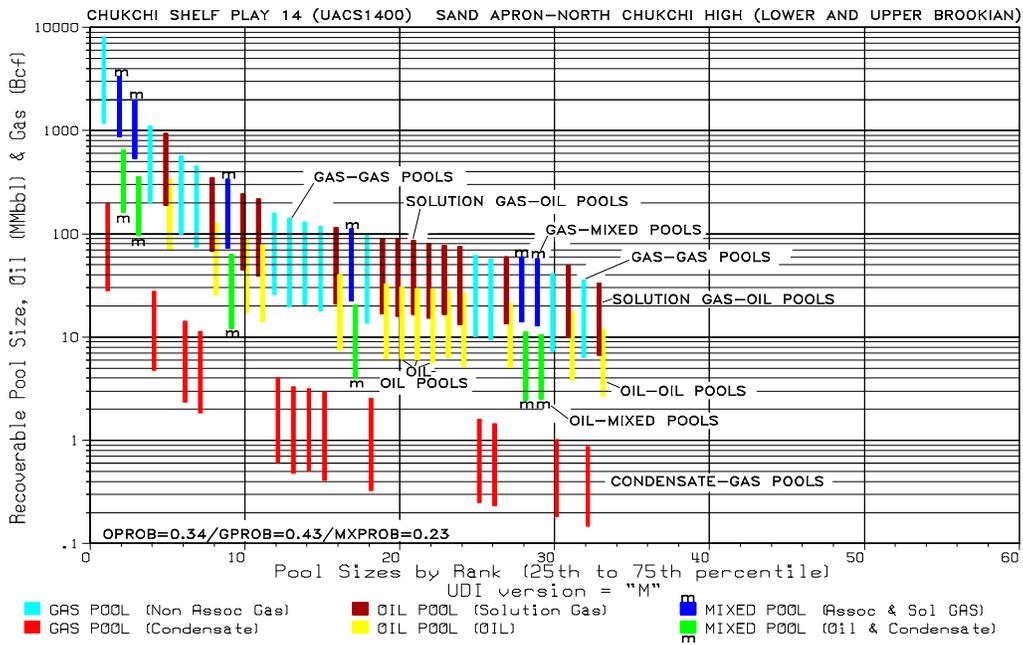


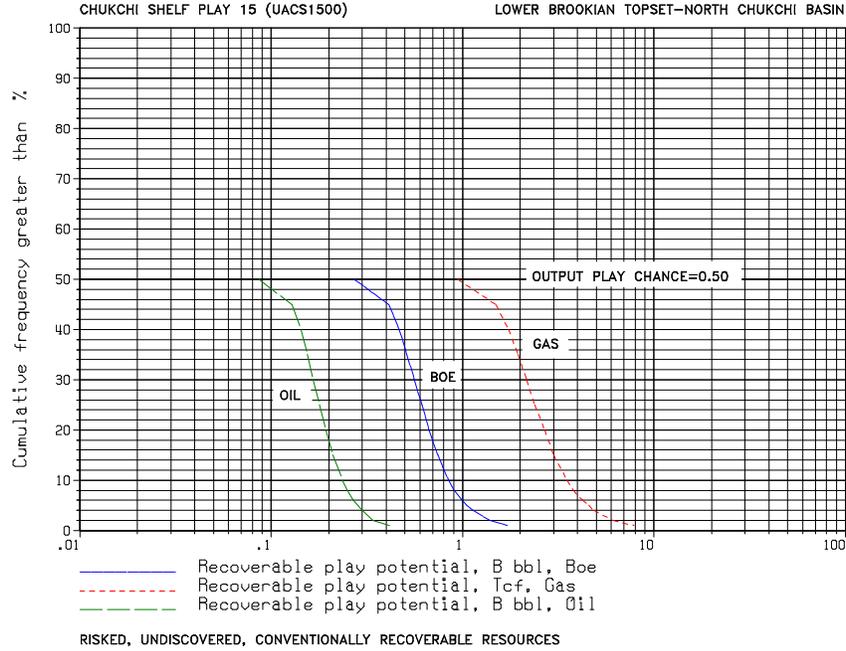
CHUKCHI SHELF PLAY 13 (UACS1300)			
FRACTILES	F95	MEAN	F05
GAS (TCFG)	0.000	0.326	1.376
OIL (BBO)	0.000	0.110	0.371
BOE (BBO)	0.000	0.168	0.642



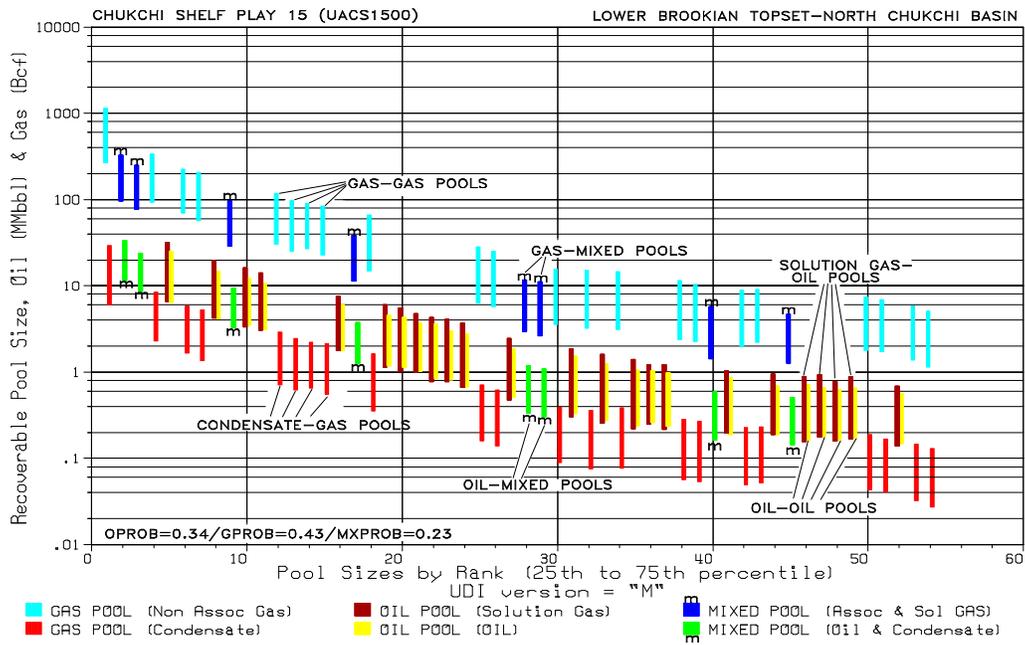


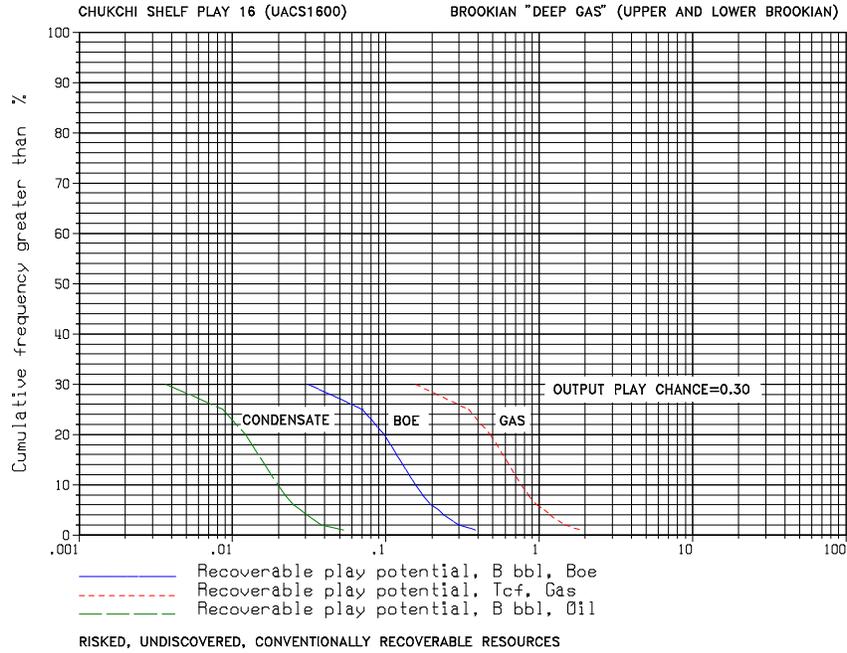
CHUKCHI SHELF PLAY 14 (UACS1400)			
FRACTILES	F95	MEAN	F05
GAS (TCFG)	0.000	13.082	36.046
OIL (BBO)	0.000	1.182	3.497
BOE (BBO)	0.000	3.510	9.761



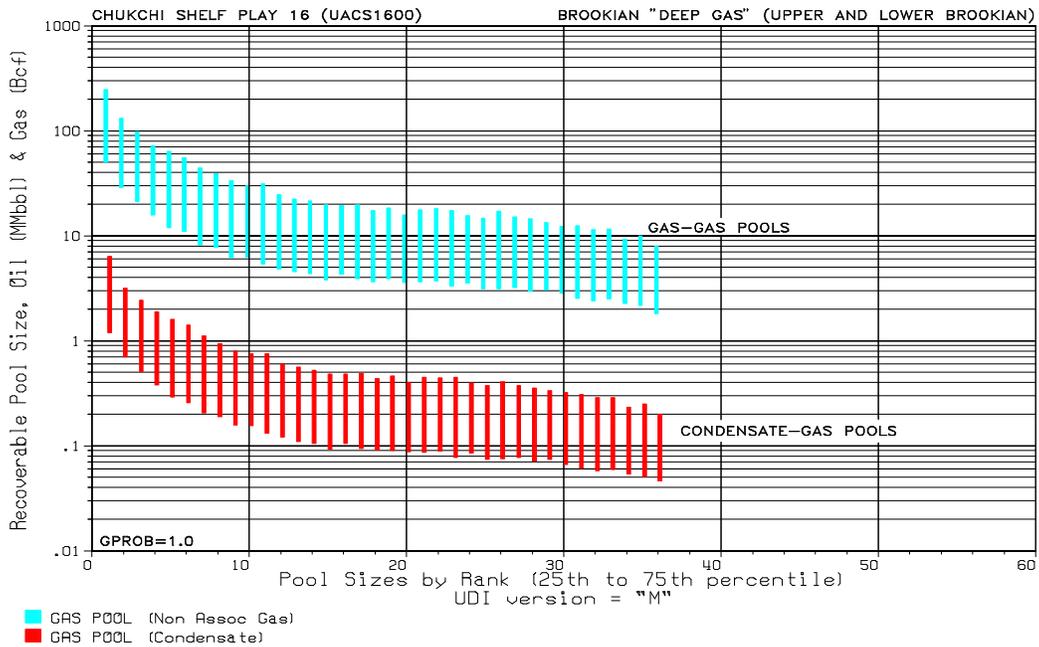


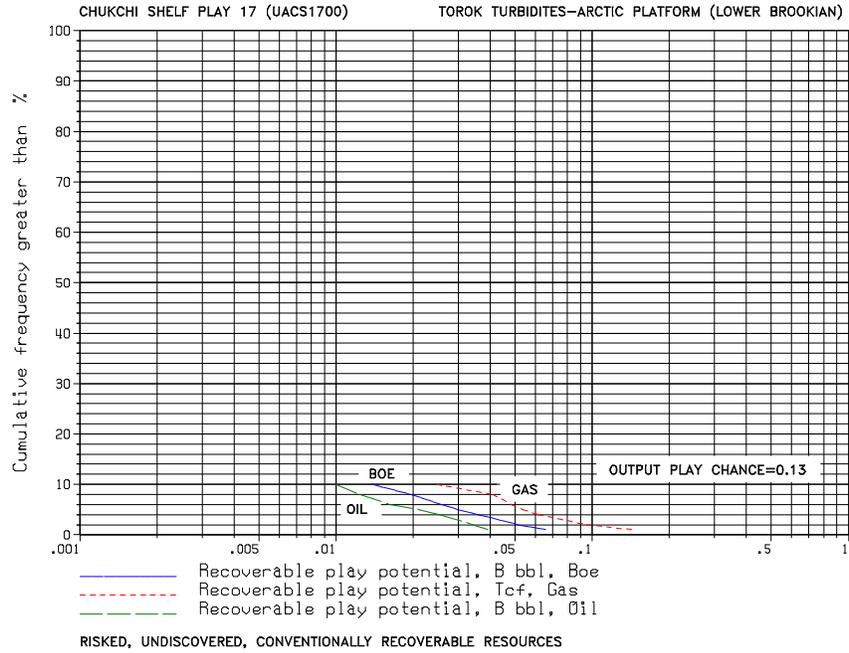
CHUKCHI SHELF PLAY 15 (UACS1500)			
FRACTILES	F95	MEAN	F05
GAS (TCFG)	0.000	1.491	4.564
OIL (BBO)	0.000	0.099	0.283
BOE (BBO)	0.000	0.365	1.051



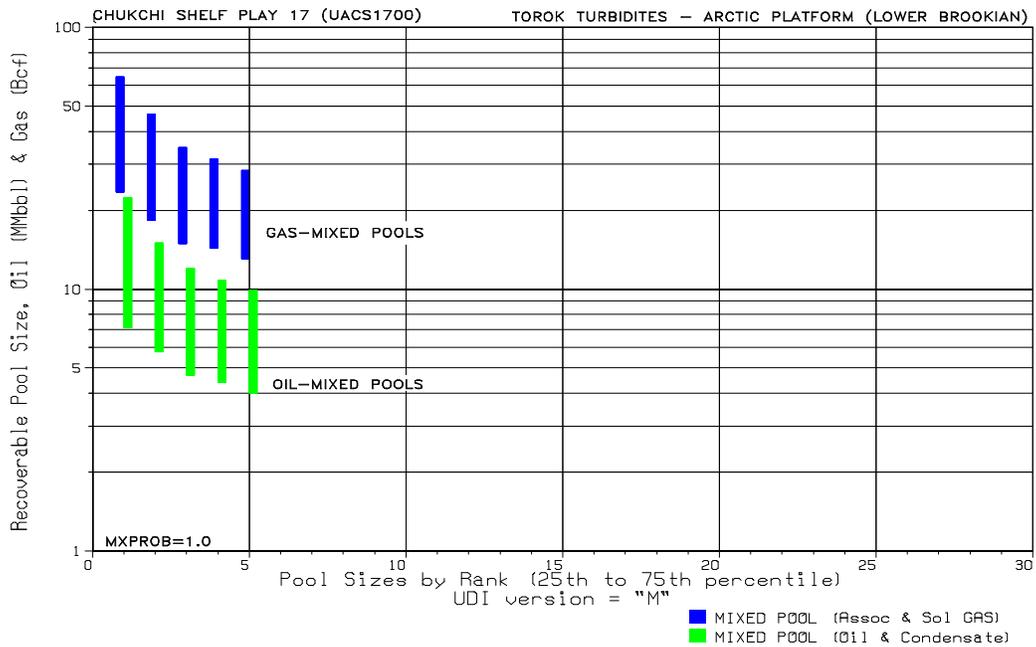


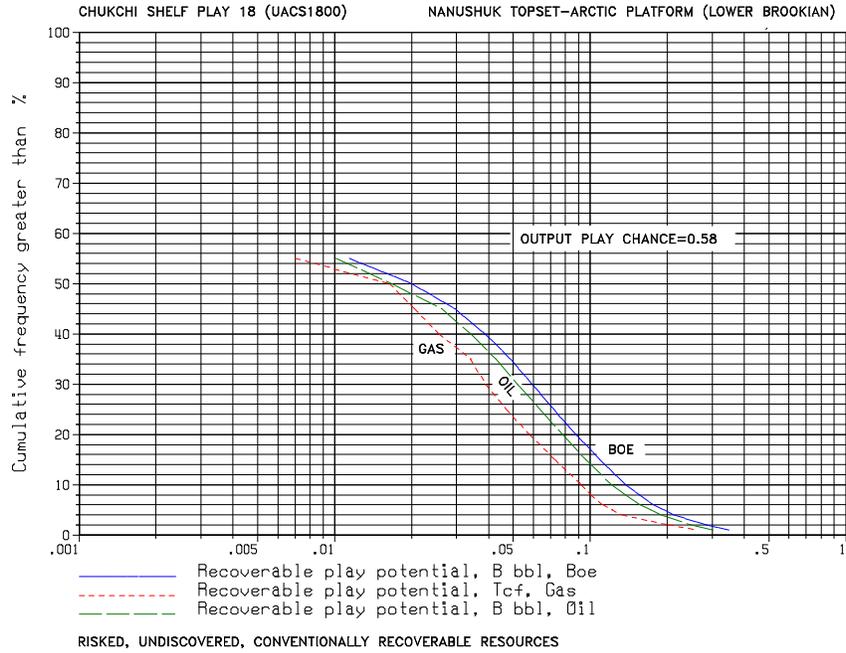
CHUKCHI SHELF PLAY 16 (UACS1600)			
FRACTILES	F95	MEAN	F05
GAS (TCFG)	0.000	0.237	1.076
OIL (BBO)	0.000	0.006	0.028
BOE (BBO)	0.000	0.048	0.220



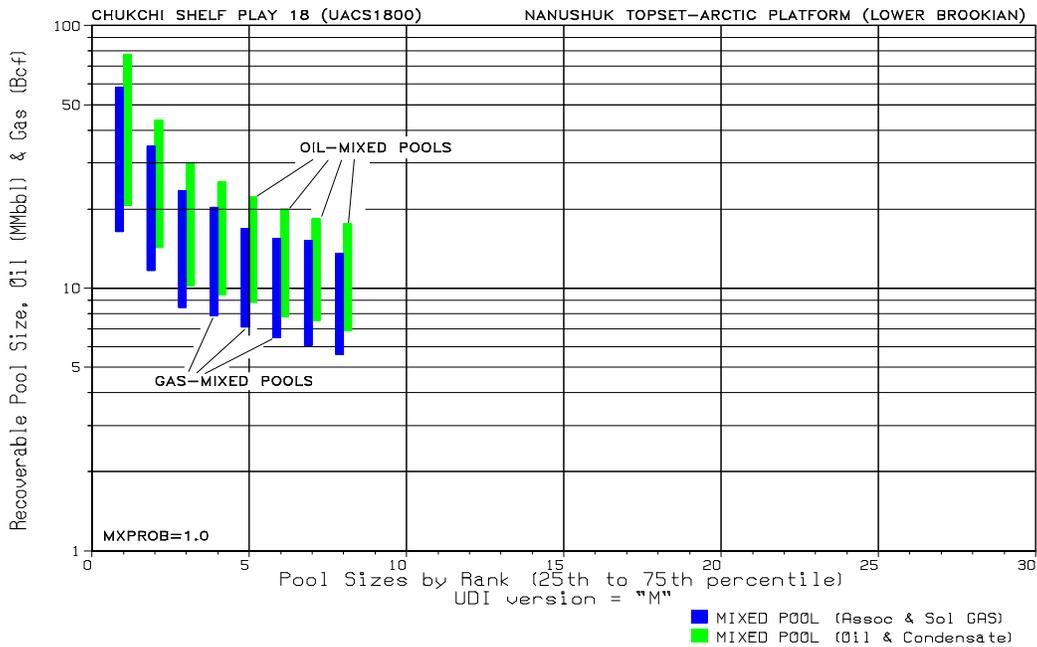


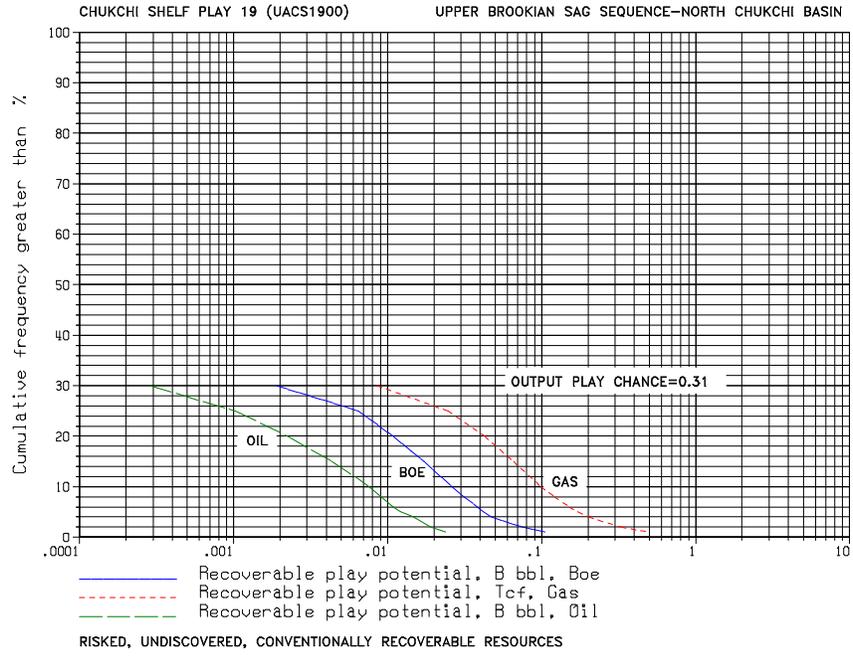
CHUKCHI SHELF PLAY 17 (UACS1700)			
FRACTILES	F95	MEAN	F05
GAS (TCFG)	0.000	0.008	0.053
OIL (BBO)	0.000	0.003	0.021
BOE (BBO)	0.000	0.004	0.030



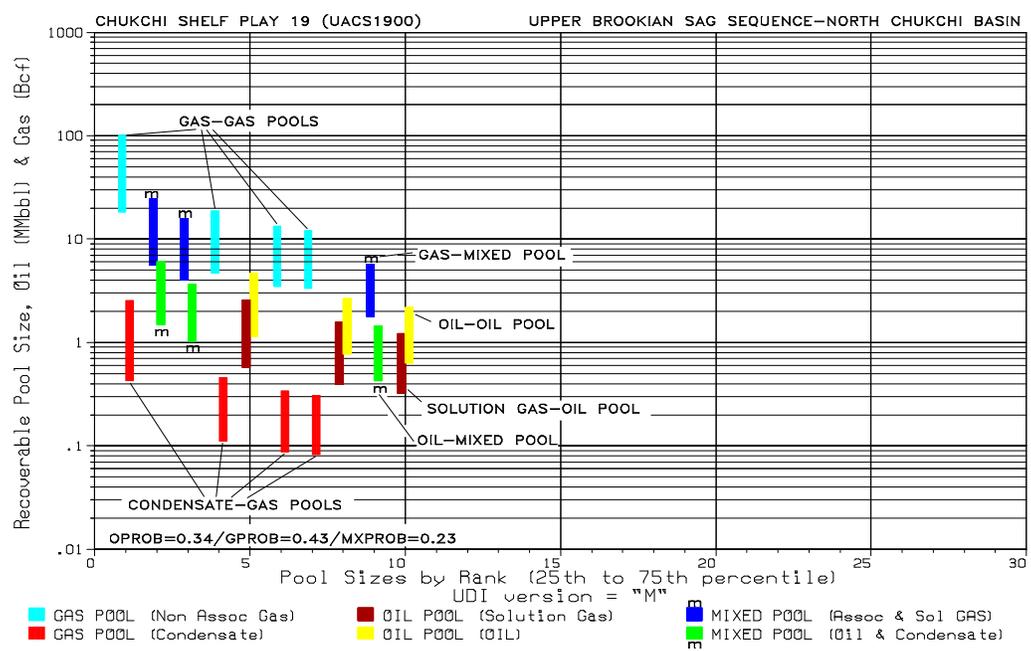


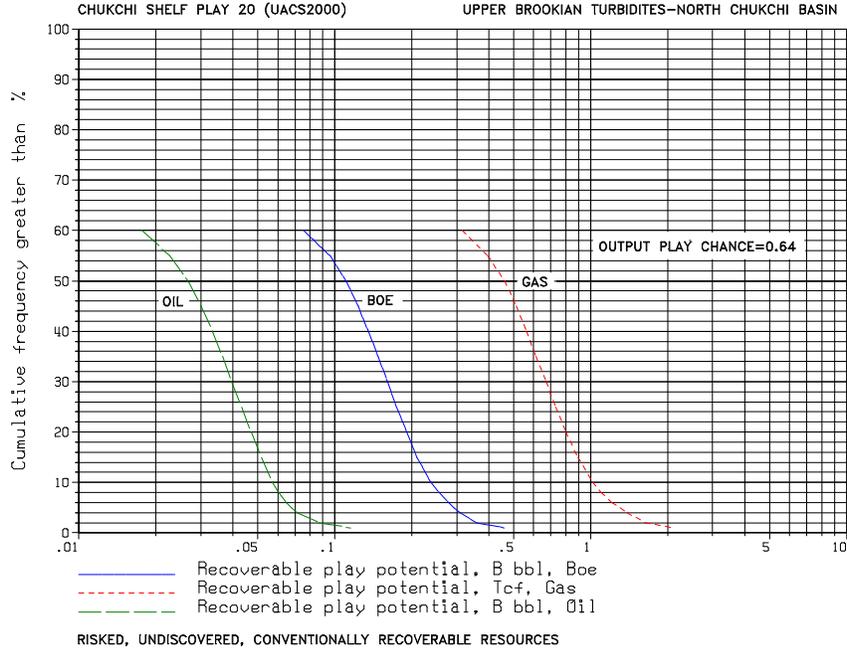
CHUKCHI SHELF PLAY 18 (UACS1800)			
FRACTILES	F95	MEAN	F05
GAS (TCFG)	0.000	0.034	0.121
OIL (BBO)	0.000	0.045	0.173
BOE (BBO)	0.000	0.051	0.194



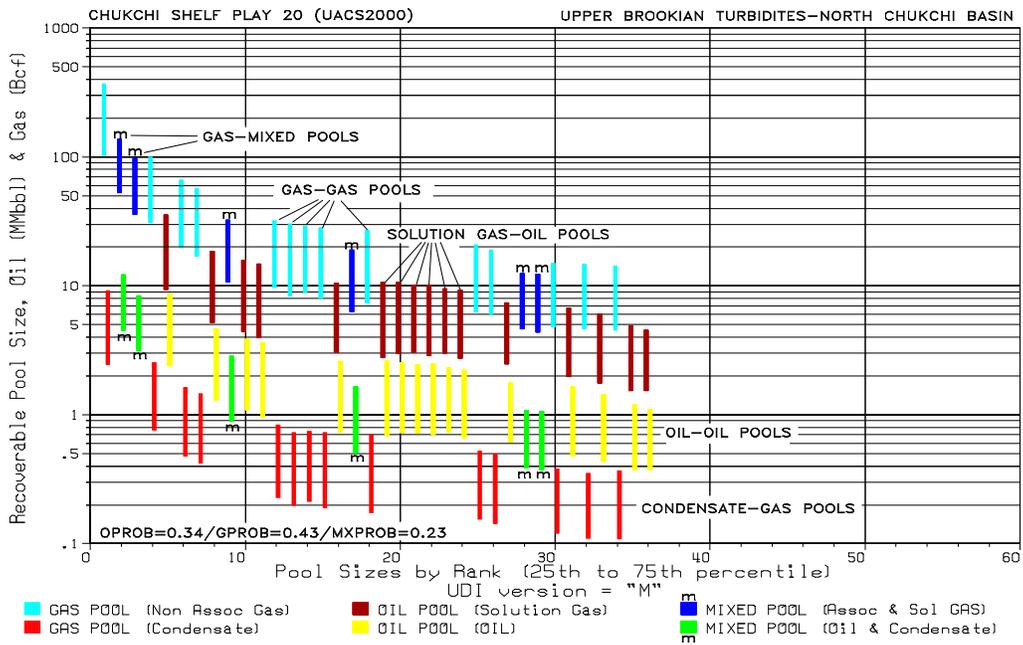


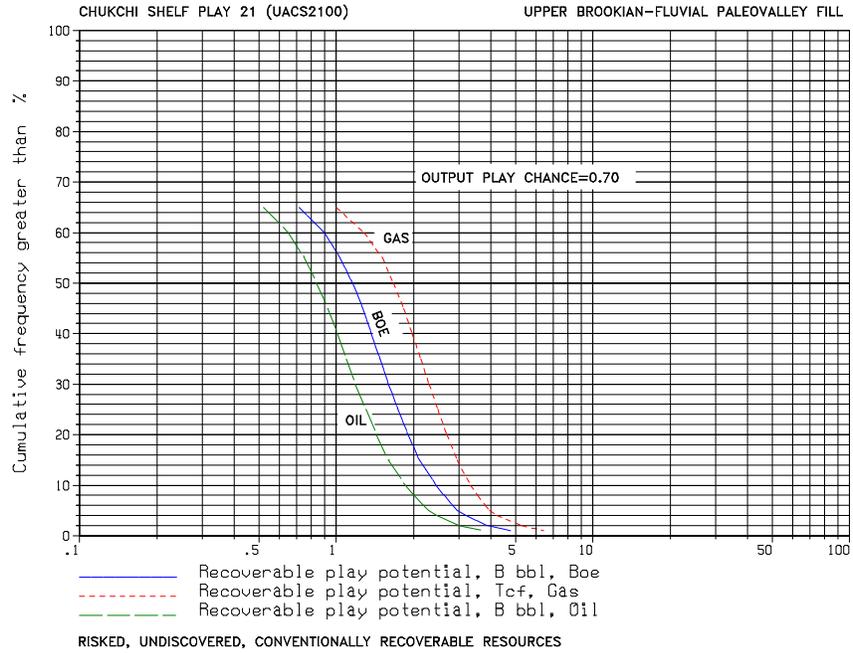
CHUKCHI SHELF PLAY 19 (UACS1900)			
FRACTILES	F95	MEAN	F05
GAS (TCFG)	0.000	0.038	0.171
OIL (BBO)	0.000	0.002	0.012
BOE (BBO)	0.000	0.009	0.042



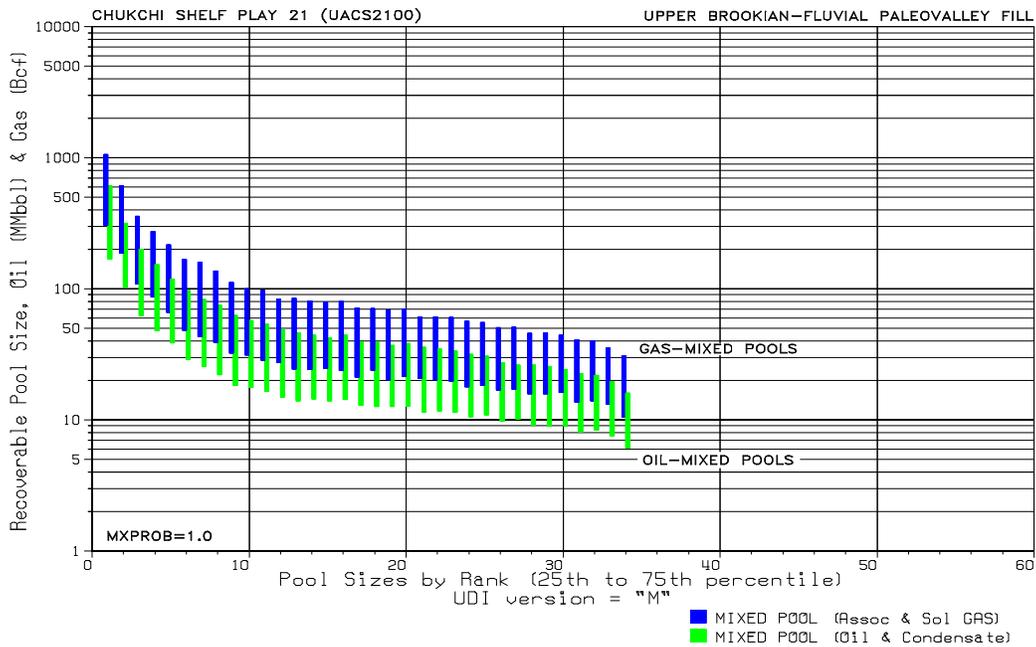


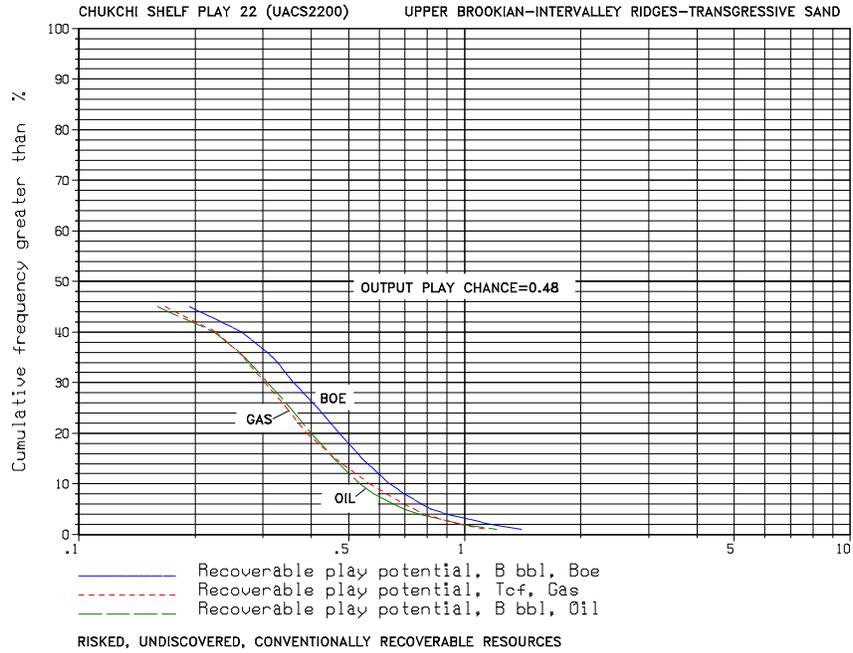
CHUKCHI SHELF PLAY 20 (UACS2000)			
FRACTILES	F95	MEAN	F05
GAS (TCFG)	0.000	0.484	1.306
OIL (BBO)	0.000	0.027	0.068
BOE (BBO)	0.000	0.113	0.293





CHUKCHI SHELF PLAY 21 (UACS2100)			
FRACTILES	F95	MEAN	F05
GAS (TCFG)	0.000	1.637	3.961
OIL (BBO)	0.000	0.886	2.283
BOE (BBO)	0.000	1.177	2.953





CHUKCHI SHELF PLAY 22 (UACS2200)			
FRACTILES	F95	MEAN	F05
GAS (TCFG)	0.000	0.203	0.740
OIL (BBO)	0.000	0.204	0.697
BOE (BBO)	0.000	0.240	0.816

