6. Offshore production spills greater than 42,000 gallons

Table 6.1 lists all spills larger than 42,000 gallons emanating from offshore platforms and pipelines in the period 1964 through 1972 of which we are aware.*

To obtain spill frequency and spill volume densities from this data, we will make the same assumptions used earlier in our analysis of tanker spills, including the assumption that the exposure variable in the Poisson process is volume of oil landed. We will do this despite the fact that we have been unable to make a quantitative check on this assumption as we did with tankers. The sample of large spills is simply too small for any test to have any discriminating power. For now, we will simply accept volume landed as the exposure variable as a working hypothesis and although other variables such as number of flowing wells, number of platforms may be at least as good.

Under these assumptions, the densities of the number of platform spills greater than 42,000 gallons for the small, large, and medium find for field life are given in Figures 6.1, 6.2, and 6.3. For the large find, the mean number of such spills is about 4.7 and there is about a 90% chance we will have at least two spills and an 80% chance we will have less than six spills. Remember the amount of oil which the Offshore Development Model estimates will be landed from this find is a little over 2 billion barrels, which is about 50% of all the oil which was produced by U.S. offshore fields in the period 1964 through 1972. For the medium find hypothesis,

*There were several large platform spills prior to 1964 but no quantity data is available.

LOCATION	CAUSE	REPORTED AMOUNT	DATE
OFFSHORE PIPELINES			
LA, West Delta	Anchor dragging	6,600,000	15.10.67
Persian Gulf	Break	4,000,000	20.4.70
LA, coastal channel	Hit by tug prop	1,050,000	18.10.70
Chevron MP 299	Unknown	310,000	11.2.69
LA, Gulf ST 131	Anchor dragging	250,000	12.3.68
LA, coastal channel	Equipment failure	160,000	12.12.72
LA, coastal waters	Leak	155,000	17.3.71
TX, coastal channel	Leak	42,000	30.11.71
LA, coastal channel	Leak	42,000	28.9.71
OFFSHORE PLATFORMS			
Union "A", Santa Barbara	Blowout	3,250,000	28.1.69
LA, Shell ST 26 "B"	Fire	2,200,000	1.12.70
LA, Chevron MP 41 "C"	Fire	1,300,000	10.3.70
LA, MP Gathering net and storage	Storm	512,000	17.8.69
Signal SS 149 "B"	Hurricane	210,000	3.10.64
Platform, 15 mi offshore	-	168,000	20.7172
Continental EI 208 "A"	Collision	108,000	8.4.64
Mobil SS 72	Storm	105,000	16.3.69
Tennico SS 198 "A"	Hurricane	67,000	3.10.64

TABLE 6.1

KNOWN SPILLS OVER 42,000 GALLONS EMANATING FROM

OFFSHORE PRODUCTION FACILITIES THROUGH 1972

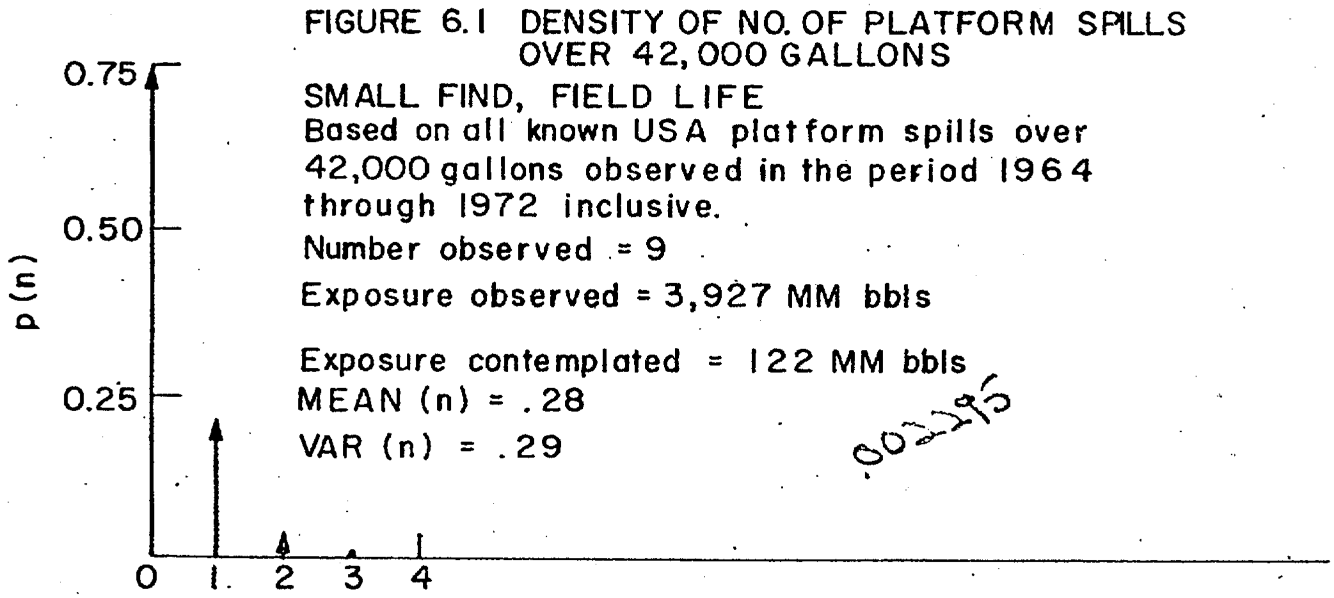

FIGURE 6.1 DENSITY OF NO. OF PLATFORM SPILLS OVER 42,000 GALLONS
SMALL FIND, FIELD LIFE
Based on all known USA platform spills over 42,000 gallons observed in the period 1964 through 1972 inclusive.
Number observed = 9
Exposure observed = 3,927 MM bbls
Exposure contemplated = 122 MM bbls
MEAN (n) = .28
VAR (n) = .29

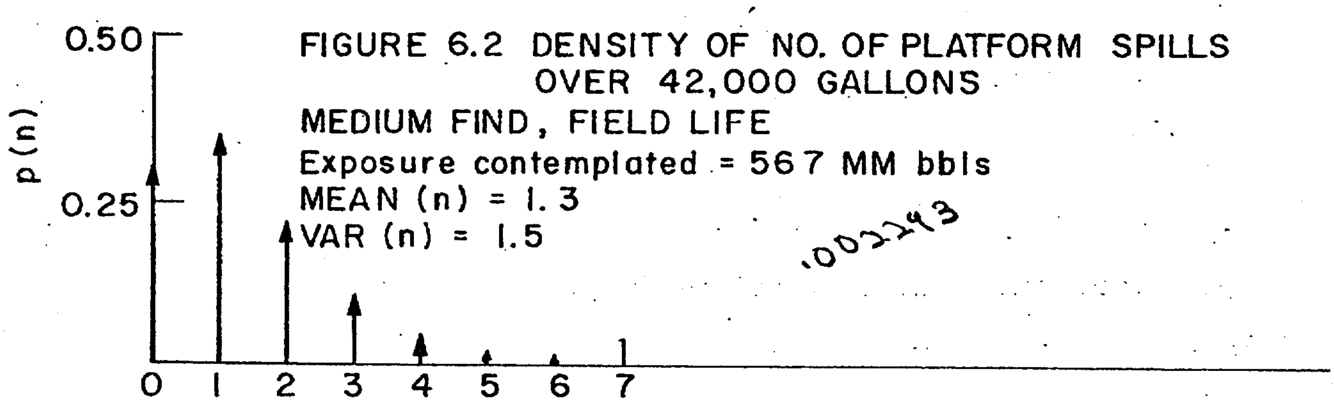

FIGURE 6.2 DENSITY OF NO. OF PLATFORM SPILLS OVER 42,000 GALLONS
MEDIUM FIND, FIELD LIFE
Exposure contemplated = 567 MM bbls
MEAN (n) = 1.3
VAR (n) = 1.5

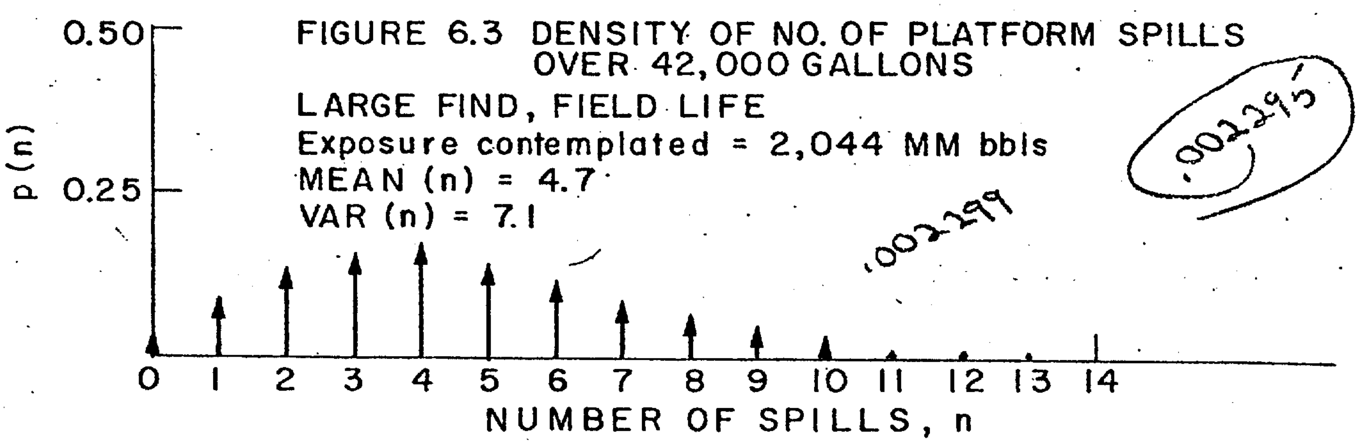

FIGURE 6.3 DENSITY OF NO. OF PLATFORM SPILLS OVER 42,000 GALLONS
LARGE FIND, FIELD LIFE
Exposure contemplated = 2,044 MM bbls
MEAN (n) = 4.7
VAR (n) = 7.1

which lands one-fourth as much oil, there is about a 30% chance we will have no platform spill over 42,000 gallons under our assumptions and about a 90% chance that the number of such spills will be 2 or less. For the small find hypothesis, there is about a .75 chance that we will have no large platform spill, a .2 chance we will have one such spill, and a .03 chance we will have two such spills. Figure 6.4 shows these three densities in terms of volume handled between spills and the equivalent time between spills at peak production.

Figure 6.5 shows the cumulative of the spill size density for these large platform spills. The mean is about one million gallons. There is a .80 chance such a spill if it occurs will be greater than 100,000 gallons, but it is quite unlikely that the spill will be greater than 10 million gallons. Clearly, in this category we are dealing with sizable spills.

When we turn to large spills from offshore pipelines, two important definitional problems arise. One, it is important to know whether a pipeline spill emanated from a transmission line (large diameter lines, often common carrier, which carry the production from a central processing facility in the field to shore) or from a gathering net line (generally smaller lines used to carry production from an individual platform to the central processing platform). This distinction is important to our comparison of tanker versus transmission lines for field-to-shore transport for the gathering net will be in place no matter which transport mode we use. Unfortunately, from the data there is no way of telling for

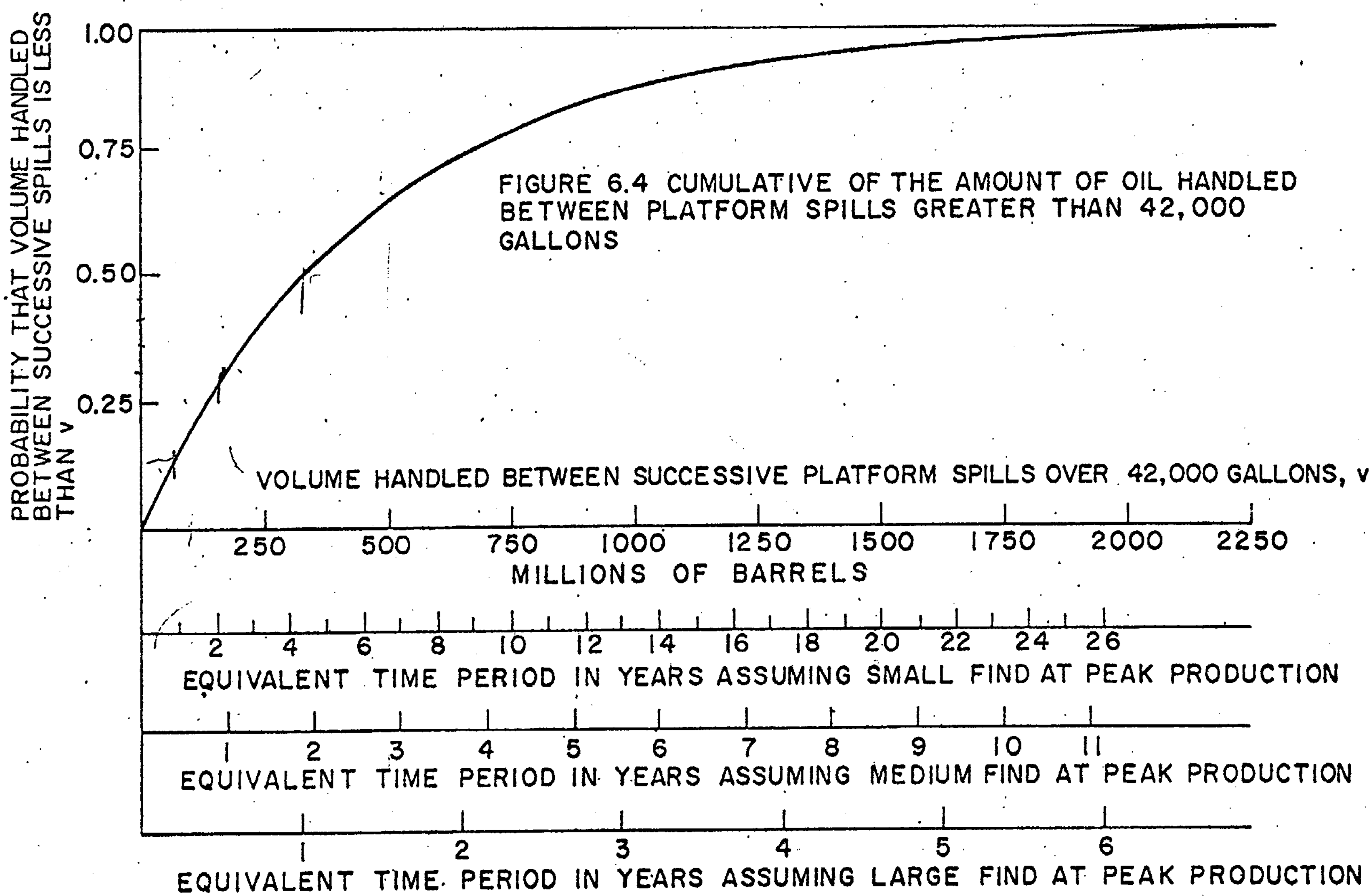

FIGURE 6.4 CUMULATIVE OF THE AMOUNT OF OIL HANDLED BETWEEN PLATFORM SPILLS GREATER THAN 42,000 GALLONS

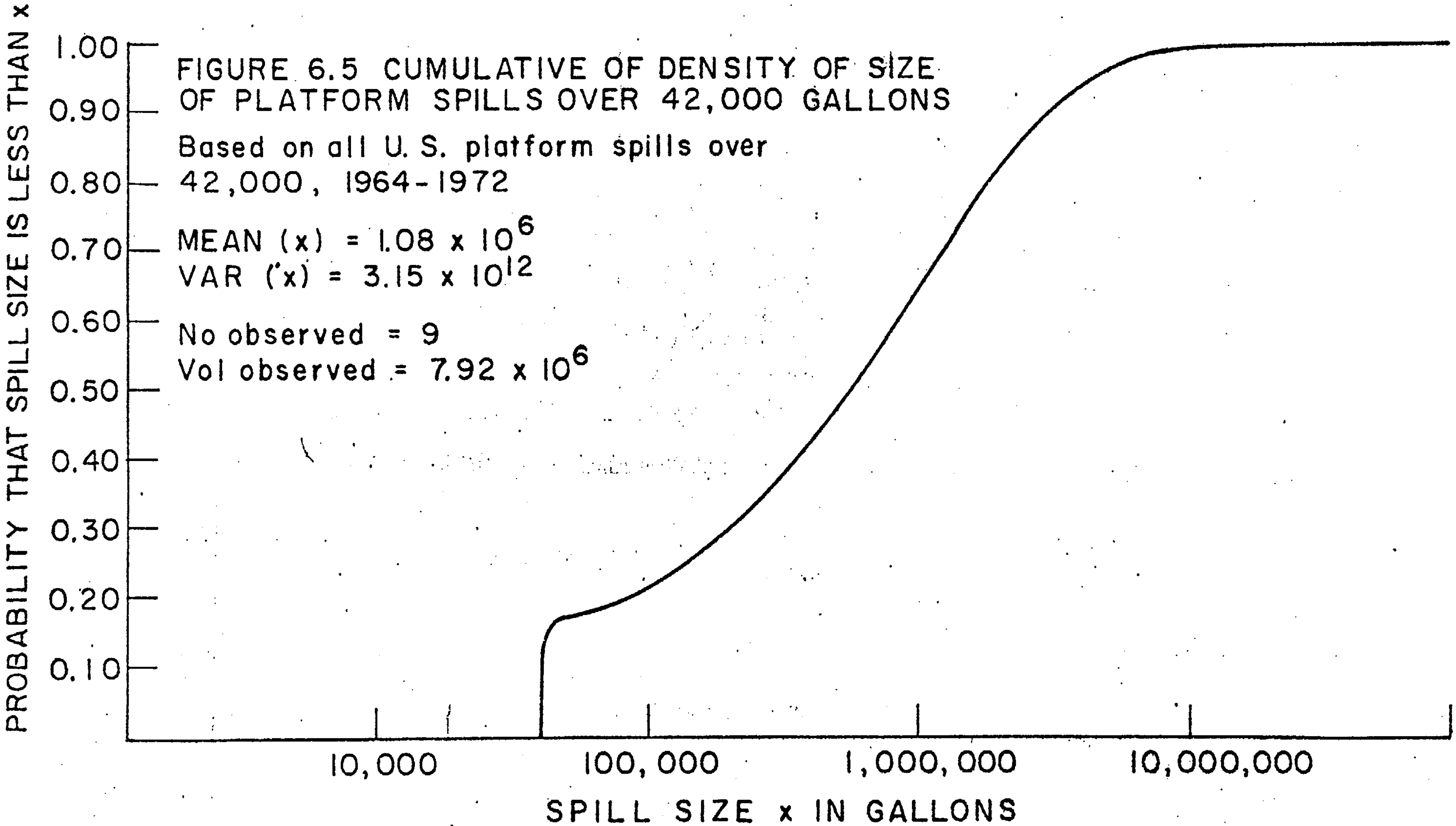

FIGURE 6.5 CUMULATIVE OF DENSITY OF SIZE OF PLATFORM SPILLS OVER 42,000 GALLONS

sure whether a spill involves a transmission line or a gathering net line.

The second definitional problem involves coastal pipeline spills. All but three of the large pipeline spills in Table 6.1 were in shallow coastal channels in which a large portion of the Gulf Coast pipeline network is laid. It is not at all obvious that spills generated by these lines would occur in a development in which all the production was well offshore. For example, the largest coastal pipeline spill was caused by a tug's propellor cutting a line in 10 ft of water. Assuming that the transmission lines were well buried when they came ashore, this type of accident would be hard to come by.

In the face of these uncertainties, we have chosen to display two sets of large pipeline incidence densities. Figures 6.6, 6.7, and 6.8 show the density of the number of pipeline spills over 42,000 gallons, using all known U.S. large offshore pipeline spills for the period 1967-1972 as a basis for our three hypotheses. Figure 6.9 puts these densities in terms of time between large pipeline spills at peak production. Figures 6.10, 6.11, and 6.12 show the similar densities based on all large, non-coastal U.S. pipeline spills in this period as the data base. For the non-coastal densities, the exposure used was all OCS production over the period 1967-1972, about 2 billion barrels, while for the all large offshore pipeline spills case, the exposure used was all U.S. offshore production 1967-1972, about 3.2 billion barrels. In general, both the mean and the variances under

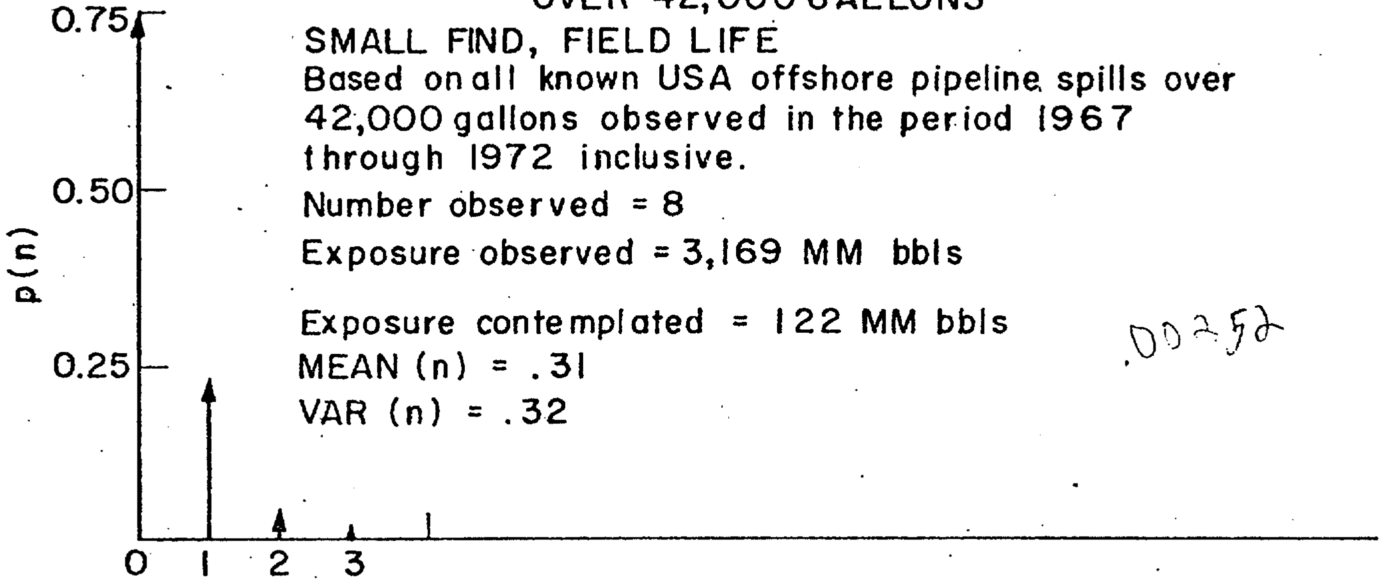

FIGURE 6.6 DENSITY OF NO. OF PIPELINE SPILLS OVER 42,000 GALLONS

SMALL FIND, FIELD LIFE

Based on all known USA offshore pipeline spills over 42,000 gallons observed in the period 1967 through 1972 inclusive.

Number observed = 8

Exposure observed = 3,169 MM bbls

Exposure contemplated = 122 MM bbls

MEAN (n) = .31

VAR (n) = .32

.00252

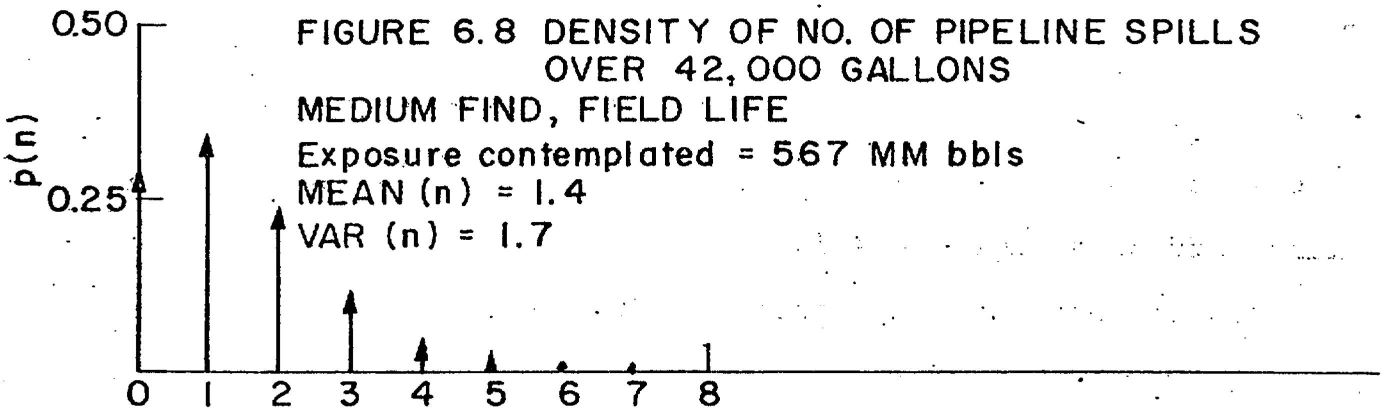

FIGURE 6.8 DENSITY OF NO. OF PIPELINE SPILLS OVER 42,000 GALLONS

MEDIUM FIND, FIELD LIFE

Exposure contemplated = 567 MM bbls

MEAN (n) = 1.4

VAR (n) = 1.7

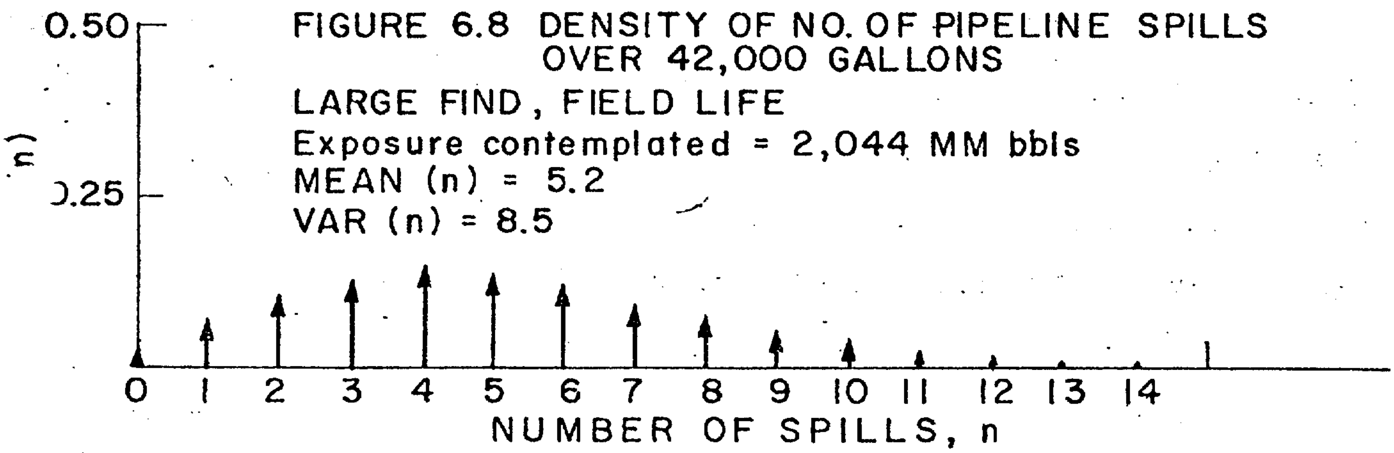

FIGURE 6.8 DENSITY OF NO. OF PIPELINE SPILLS OVER 42,000 GALLONS

LARGE FIND, FIELD LIFE

Exposure contemplated = 2,044 MM bbls

MEAN (n) = 5.2

VAR (n) = 8.5

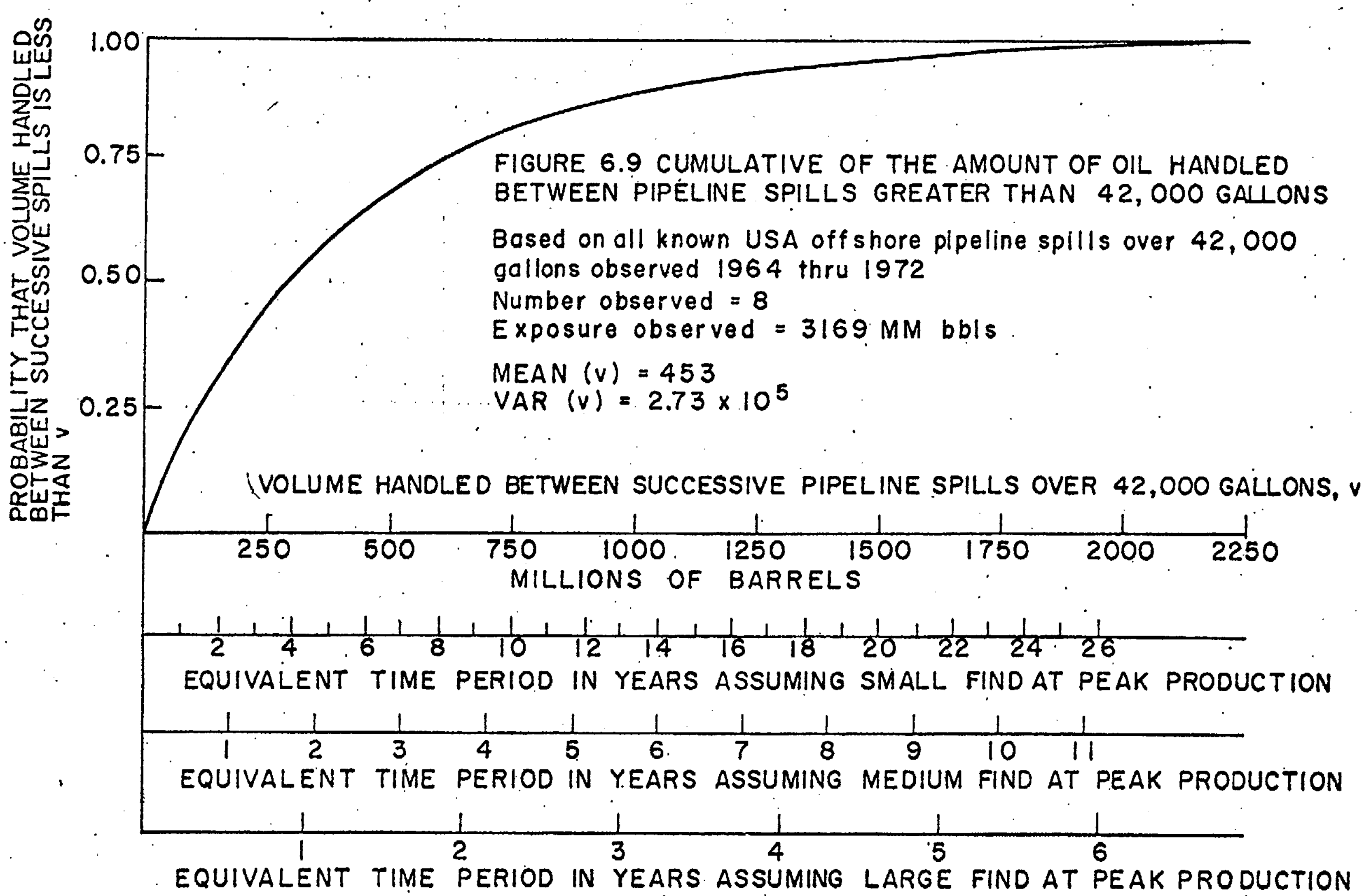

FIGURE 6.9 CUMULATIVE OF THE AMOUNT OF OIL HANDLED BETWEEN PIPELINE SPILLS GREATER THAN 42,000 GALLONS

Based on all known USA offshore pipeline spills over 42,000 gallons observed 1964 thru 1972
Number observed = 8
Exposure observed = 3169 MM bbls

MEAN (v) = 453
VAR (v) = 2.73×10^5

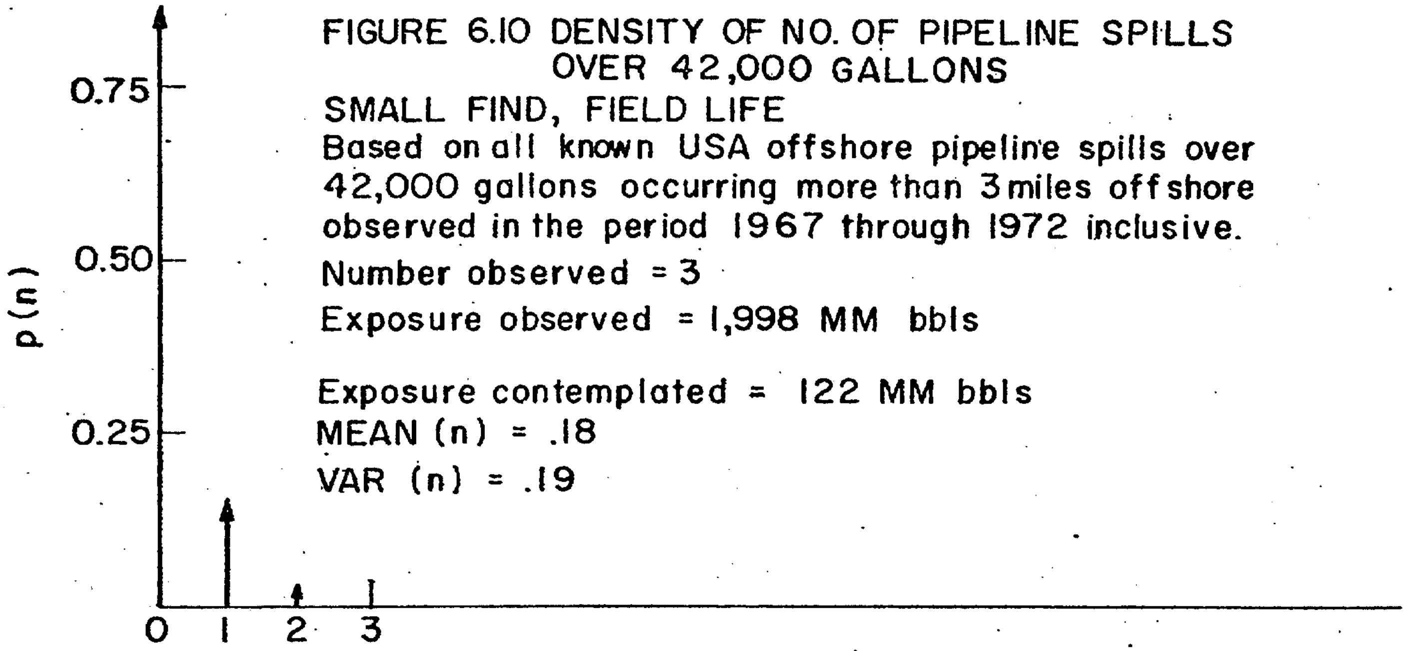

FIGURE 6.10 DENSITY OF NO. OF PIPELINE SPILLS OVER 42,000 GALLONS

SMALL FIND, FIELD LIFE

Based on all known USA offshore pipeline spills over 42,000 gallons occurring more than 3 miles offshore observed in the period 1967 through 1972 inclusive.

Number observed = 3

Exposure observed = 1,998 MM bbls

Exposure contemplated = 122 MM bbls

MEAN (n) = .18

VAR (n) = .19

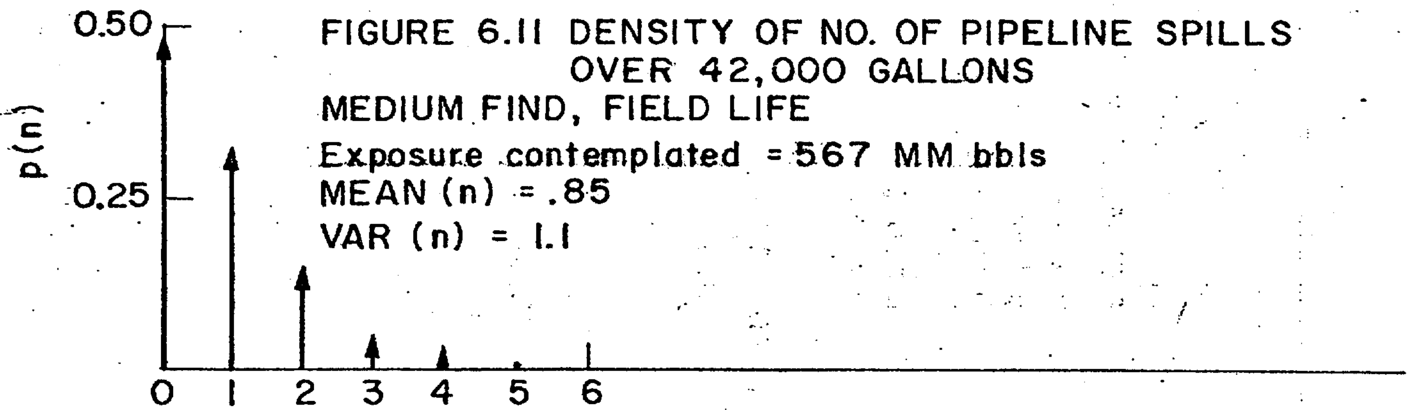

FIGURE 6.11 DENSITY OF NO. OF PIPELINE SPILLS OVER 42,000 GALLONS

MEDIUM FIND, FIELD LIFE

Exposure contemplated = 567 MM bbls

MEAN (n) = .85

VAR (n) = 1.1

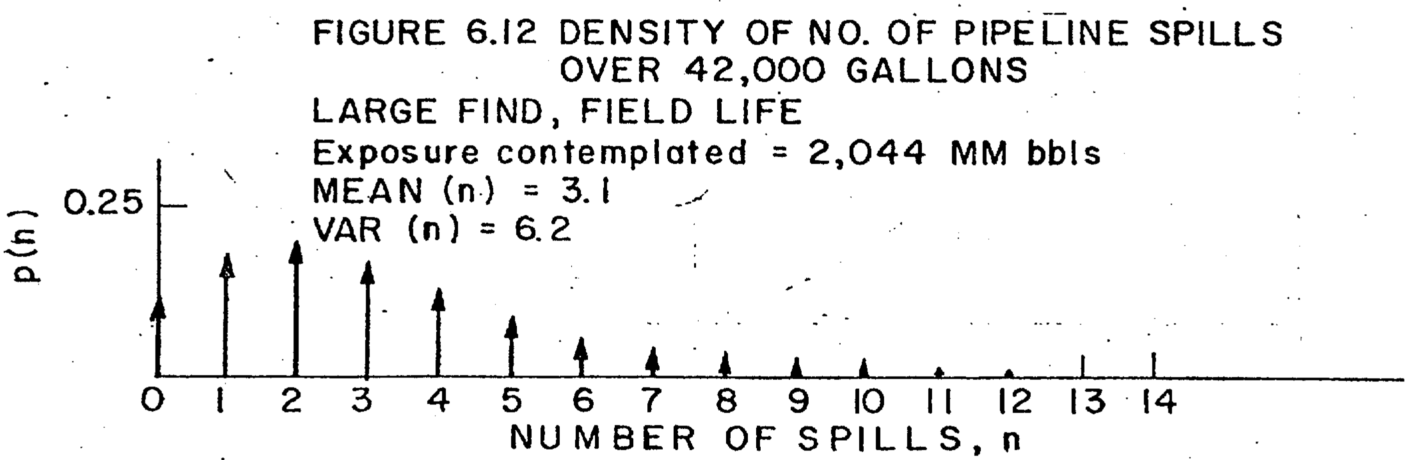

FIGURE 6.12 DENSITY OF NO. OF PIPELINE SPILLS OVER 42,000 GALLONS

LARGE FIND, FIELD LIFE

Exposure contemplated = 2,044 MM bbls

MEAN (n) = 3.1

VAR (n) = 6.2

the non-coastal hypothesis are about 30% less than the means and variances using all large offshore pipeline spills. Under the non-coastal assumption, we would expect to have somewhat smaller number of large spills from pipelines than from platforms; under the all offshore assumption, the number of large pipeline spills tends to be somewhat larger than large platform spills, but once again, it is in the same ballpark.

Figures 6.13 and 6.14 show the large pipeline spill size densities under the all-U.S. offshore and non-coastal hypotheses respectively. In both cases, the mean of the large pipeline spill density is considerably larger than the mean of the platform spills and in both cases, but especially under the non-coastal hypothesis, the density is very widely distributed. The variances are massive and there is a small, but not necessarily insignificant chance that such a spill would be greater than 10 million gallons. Notice that dropping the coastal spills is not all to the benefit of pipelines. For while it decreases the number of spills roughly speaking by 30%, it increases the mean of the size of a spill, if it occurs, by about 25%. Interestingly enough, despite the smaller sample, the variance of the non-coastal spills is lower than that of all large spills. The non-coastal spills exhibit slightly less variability. The smallest non-coastal spill is almost an order of magnitude larger than the smallest of all the large pipeline spills.

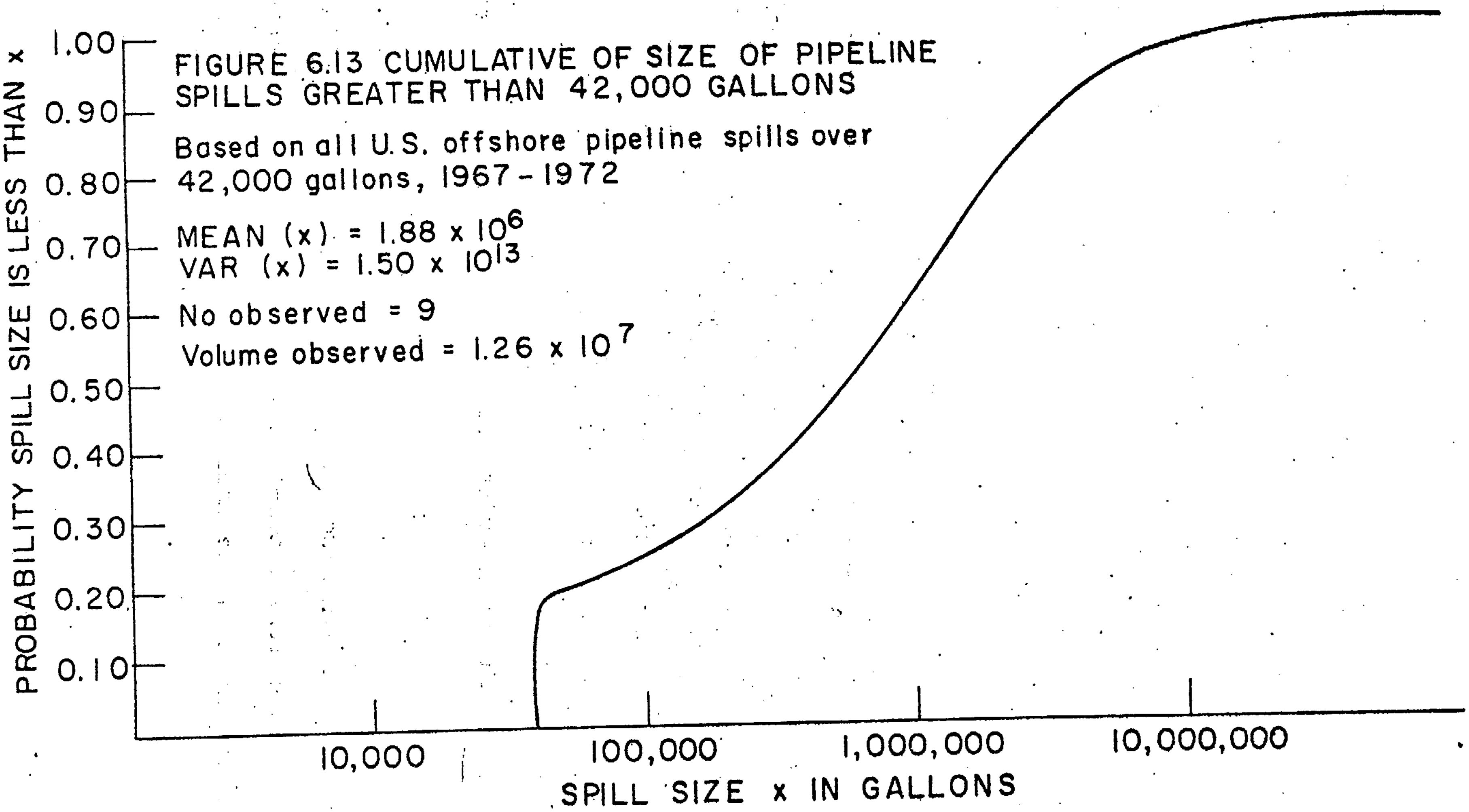

FIGURE 6.13 CUMULATIVE OF SIZE OF PIPELINE SPILLS GREATER THAN 42,000 GALLONS

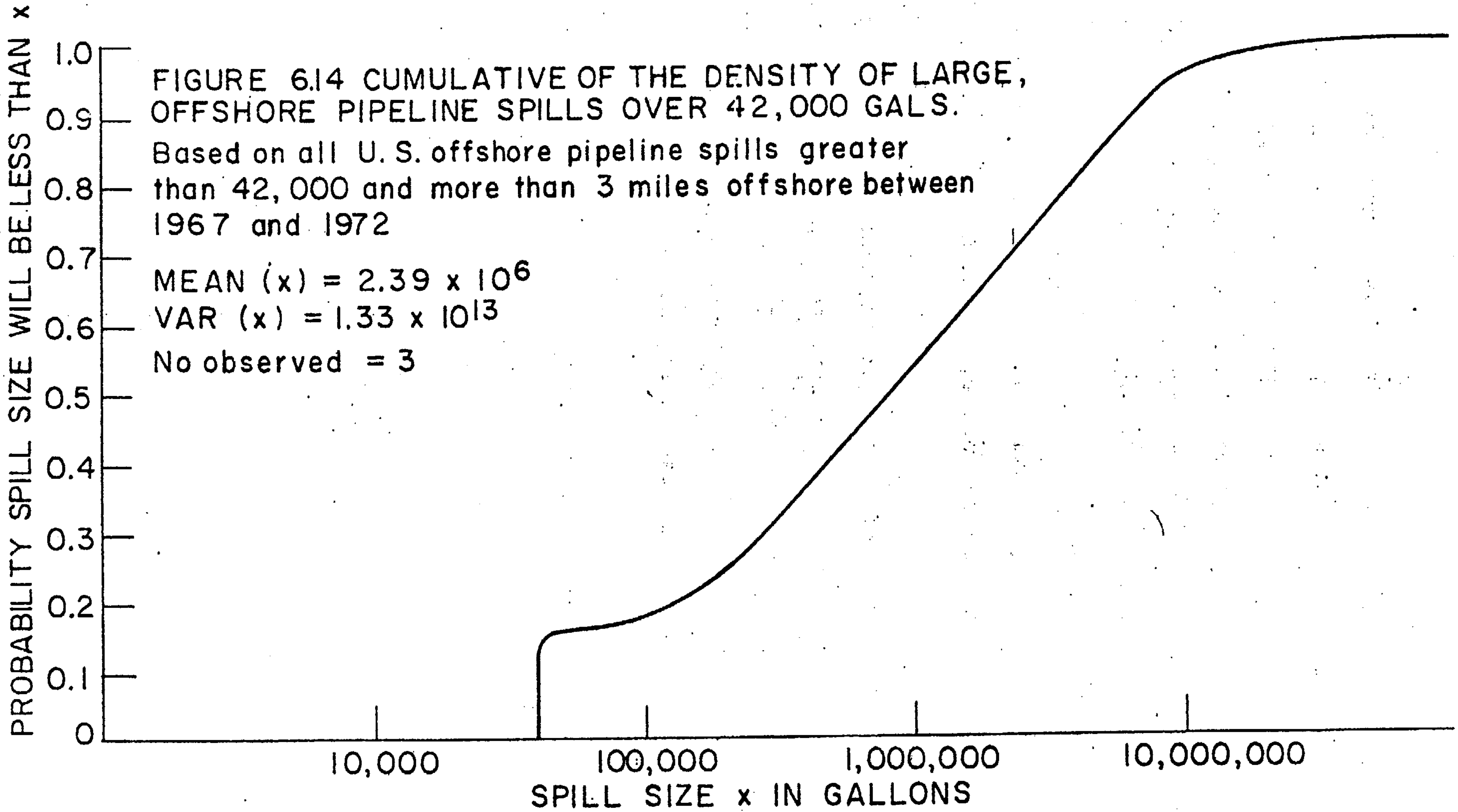

FIGURE 6.14 CUMULATIVE OF THE DENSITY OF LARGE, OFFSHORE PIPELINE SPILLS OVER 42,000 GALS.

Based on all U. S. offshore pipeline spills greater than 42,000 and more than 3 miles offshore between 1967 and 1972

MEAN (x) = 2.39×10^6

VAR (x) = 1.33×10^{13}

No observed = 3