# BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

# RECORD

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## DELPHI: A COMPUTER PROGRAM FOR THE SUMMATION OF HYDROCARBON RESOURCES USING MONTE CARLO SIMULATION

by

Eugene L. Smith

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## SUMMARY

DELPHI is designed to summate probability distributions of hydrocarbon resources by Monte Carlo simulation. It is used at BMR to aggregate the estimated undiscovered recoverable hydrocarbon resources of sedimentary basins.

The program produces detailed tabular reports, summary reports, and lineprinter plots of the aggregate probability distributions for oil and gas.

The program is written in extended FORTRAN IV to run on the CSIRO Cyber 76 computer. It uses a system routine to produce the lineprinter plots.

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# METHODOLOGY — CHAPTER 1

DELPHI is designed to summate probability distributions of undiscovered recoverable hydrocarbon resources of sedimentary basins by Monte Carlo simulation.

The Monte Carlo method of simulation is a combination of sampling theory and numerical analysis. The method depends on a large number of repetitive calculations (in this case, simple addition) using values selected at random from probability distributions.

The probability distributions can assume various forms. Figures 1 through 4 illustrate some of the more commonly used distributions and their corresponding cumulative probability distributions. The figures also show how random values are selected from the cumulative distributions using random numbers which are generated by the computer as needed.

However, the existence of recoverable hydrocarbons in any particular basin may be uncertain. This uncertainty is included in the summation by assigning an existence risk (probability of occurrence) to each basin (distribution).

Then, at each pass, and for each distribution, a random number between 0 and 1 is obtained from the computer. If the random number is greater than the existence risk for the basin the resource volume is zero. Otherwise, another random number is obtained, the distribution sampled at random and the values added arithmetically to results from other basins. The solution is retained and the process is repeated. After several thousand passes a probability distribution of all the solutions can be constructed. The process is illustrated in figure 5.

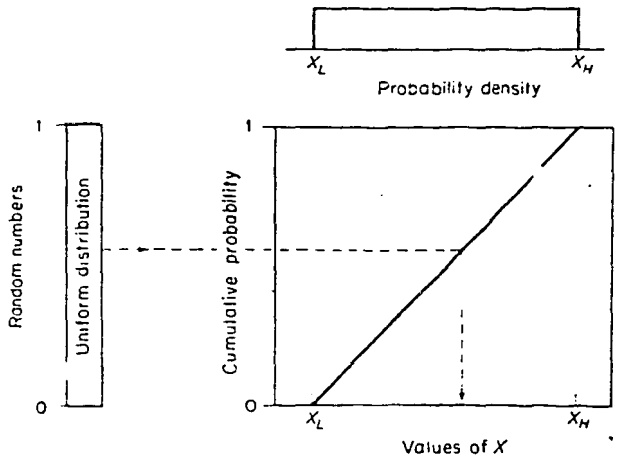



Figure 1 Selecting random values from a uniform distribution.
Source: McCray, 1975

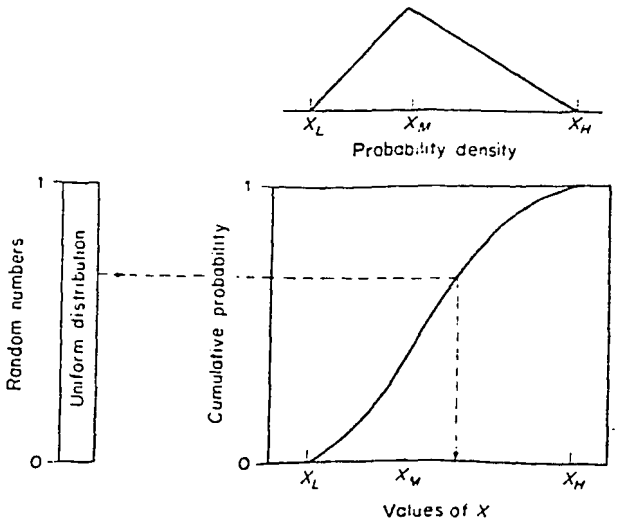



Figure 2 Selecting random values from a triangular distribution.
Source: McCray, 1975

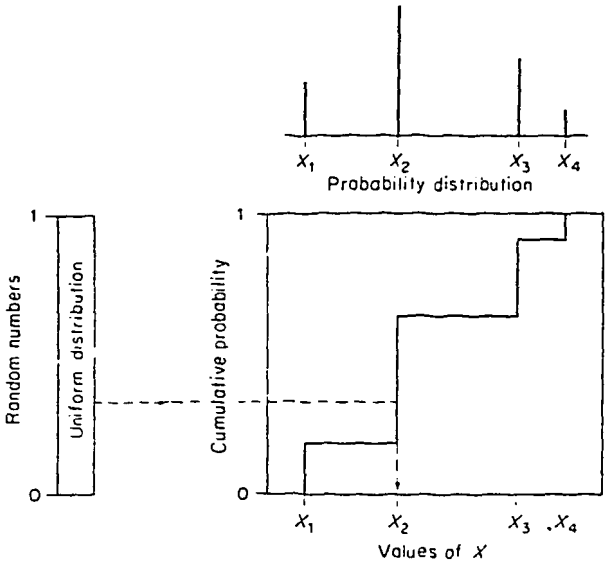



Figure 3 Random selections from a discrete distribution.
Source: McCray, 1975

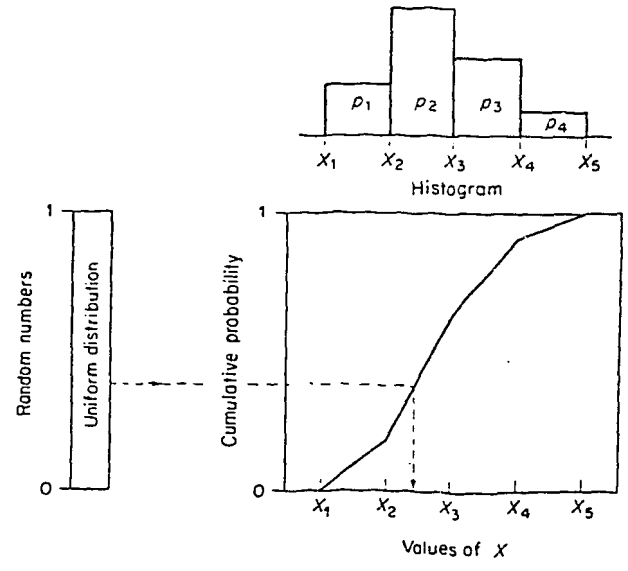
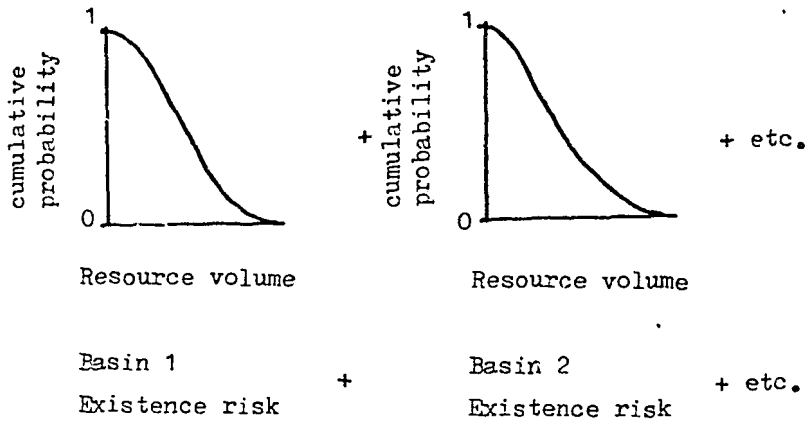



Figure 4 Random selections from a histogram.
Source: McCray, 1975




1. A random number (n) between 0 and 1 is generated by the computer for each basin and compared with the existence risk (e)

2. (n < e: A resource volume is chosen at random from each cumulative probability distribution.) (n > e: 0 is chosen for resource volume)

3. Sum resources obtained from all basins.

4. Repeat process 1. to 3. several thousand times.

5. The summed resource values are used to produce a risked cumulative probability distribution of resources.

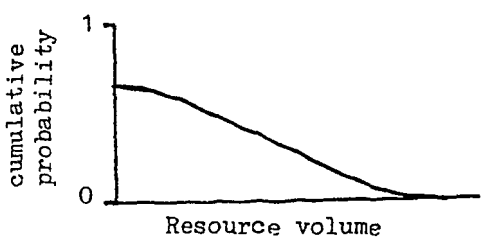



Figure 5. Steps used in adding resources — all existence risk factors independent (After Riesz, 1978).

# PROGRAM DESCRIPTION — CHAPTER 2

## 2.1 Objectives

DELPHI is designed to aggregate probability distributions by Monte Carlo simulation. The program is written for the specific purpose of estimating Australia's total undiscovered recoverable hydrocarbon resources. Because of this the program consists mainly of subroutines to write specific reports in specific formats.

## 2.2 Program Composition

DELPHI consists of a main program and ten subroutines. A system routine, QUIPLOT, is used to produce plotted output.

### 2.2.1 DELPHI - main program

DELPHI reads the input data and controls the calculations and output of reports.

The sequence of operations is:

1. Initialize variables.
2. Read title of study.
3. Read who compiled the data.
4. Read when the data was compiled.
5. Generate the date of the computer run.
6. Read the number of fields to be considered.
7. For each basin (data set) read for oil then gas:

a) Type of distribution

b) Number of data values

c) Magnitude (power of ten) of the values

d) Volumetric units of the input data

e) Probability that hydrocarbons exist in the basin

f) Value for hydrocarbon volume and

g) It's associated probability of occurrence.

8. Schedule TABL1 to write the first report:
Table 1 -- Undiscovered oil.

9. Schedule TABL2 to write the second report:
Table 2 -- Undiscovered gas.

10. Write heading for third report: Cumulative probability distributions for oil in each basin.

11. Select only those data sets where oil resources exist.

12. Schedule OCON to convert volumetric units to metric if necessary.

13. Schedule CPD to construct cumulative probability distributions.

14. Finish writing third report.

15. Write heading for fourth report: Cumulative probability distributions for gas in each basin.

16. Select only those data sets where gas resources exist.

17. Schedule GCON to convert volumetric units to metric if necessary.

18. Schedule CPD to construct cumulative probability distributions for gas.

19. Finish writing fourth report.

20. Schedule RASH to risk and sum oil resources.

21. Write fifth report: Table of cumulative

frequency values for total undiscovered oil.

22. Schedule STAT to calculate statistics to describe the distribution generated by simulation.

23. Convert the units of some statistics from cubic metres to barrels.

24. Write sixth report: Statistics describing the simulated oil distribution.

25. Schedule PERC to construct percent-probability-greater-than curve for the oil distribution.

26. Write seventh report: Table of percent-probability-greater-than values for oil.

27. Schedule QUIPLOT to produce eighth report: A plot of the percent-probability-greater-than curve for oil.

28. Schedule WRITER to produce ninth report: The summary report for oil.

29. Schedule RASH to risk and sum gas resources.

30. Write tenth report: Table of cumulative frequency values for total undiscovered oil.

31. Schedule STAT to calculate statistics to describe gas resources distribution produced by simulation.

32. Convert cubic metres to cubic feet for report.

33. Write eleventh report: Statistics describing the simulated gas distribution.

34. Schedule PERC to construct percent-probability-greater-than curve for gas resources.

35. Write twelfth report: Table of percent-probability-greater-than values for gas.

36. Schedule QUIPLOT to produce thirteenth report: A plot of the percent-probability-greater-than curve for gas.

37. Schedule WRITER to produce fourteenth report: The summary report for gas resources.

38. End.

### 2.2.2 Subroutine CPD

CPD constructs cumulative probability distributions from input da.

The sequence of operations is:

1. Initialize variables
2. Test to determine type of input distribution
3. Construct cumulative probability distribution
4. Return.

### 2.2.3 Subroutine GCON

GCON converts gas data to metric units.

The sequence of operations is:

1. Set loop counter
2. Convert each input value to metric units
3. Return

### 2.2.4 Subroutine MONTE

MONTE performs the simulation process.

The sequence of operations is:

1. Generate a random number.
2. Equate the random number with the cumulative probability
3. Calculate the corresponding value for the variable.
4. Return.

### 2.2.5 Subroutine OCON

OCON converts oil data to metric units.

The sequence of operations is:

1. Set loop counter
2. Convert each input value to metric units.
3. Return.

### 2.2.6 Subroutine PERC

PERC constructs percent-probability-greater-than curves from the simulated distributions.

The sequence of operations is:

1. Initialize arrays
2. Convert frequencies to probabilities
3. Calculate midpoints of class intervals
4. Return.

### 2.2.7 Subroutine RASH

RASH risks and sums hydrocarbon resources.

The sequence of operations is:

1. Initialize arrays
2. Schedule subroutine MONTE to do simulation
3. Construct a cumulative frequency distribution
4. Return

### 2.2.8 Subroutine STAT

STAT calculates statistics describing the simulated distributions.

The sequence of operations is:

1. Initialize variables
2. Calculate total volume and mean volume
3. Calculate variance and standard deviation
4. Calculate median
5. Calculate mode
6. Calculate centile value of the mode
7. Calculate 95th centile value
8. Calculate 80th centile value
9. Calculate 20th centile value
10. Calculate 5th centile value
11. Calculate centile value of the mean.
12. Return.

### 2.2.9 Subroutine TABL1

TABL1 prepares Table 1.

The sequence of operations is:

1. Initialize variables.
2. Write the main heading of the table.
3. Select only those basins (data sets) where oil resources occur.
4. Determine volumetric units of input data and position data in array accordingly.

5. Convert data units.
6. Convert data to integer type.
7. Calculate the mean of each data set in both metric and non-metric units.
8. Multiply each mean by the associated existence risk and sum the 'risked' means.
9. Write the body of the report.
10. Return.

### 2.2.10 Subroutine TABL2

TABL2 prepares Table 2.

The sequence of operations is:

1. Initialize variables.
2. Write the main heading of the table.
3. Select only those basins (data sets) where gas resources occur.
4. Determine volumetric units of input data and position data in array accordingly.
5. Convert data units.
6. Convert data to integer type.
7. Calculate the mean of each data set in both metric and non-metric units.
8. Multiply each mean by the associated existence risk and sum the 'risked' means.
9. Write the body of the report.
10. Return.

### 2.2.11 Subroutine WRITER

WRITER prepares the summary reports.

The sequence of operations is:

1. Convert the probabilities associated with the mean and median to percent probability.
2. Test to see if the report pertains to gas or oil.
3. Convert from metric to U.S. measure for reporting.
4. Write the report.
5. Return.

### 2.2.12 System subroutine QUIPLOT

QUIPLOT produces simple lineprinter plots. Details are available in the CSIRO User Guide.

# INPUT DATA PREPARATION — CHAPTER 3

Input is in card-image format. It can be put in on cards, but it is usually read from a file.

## 3.1 Data format

| | VARIABLE | DESCRIPTION |
|---|---|---|
| Card 1 | | 8A10 |
| cols. 1-80 | TITLE | Title of the study. Up to 80 alphanumeric characters. |
| Card 2 | | 8A10 |
| cols. 1-80 | CB | Identification of person or persons who compiled the data. Up to 80 alphanumeric characters. |
| Card 3 | | 8A10 |
| cols. 1-80 | CD | Compilation date. Up to 80 alphanumeric characters. |
| Card 4 | | I2 |
| cols. 1-2 | NF | Number of data sets (basins). Integer, maximum size 50. |
| **Repeat cards 5 through N, NF times** | | |
| Card 5 | | 8A10 |
| cols. 1-80 | FIELD | Name of data set (basin). Up to 80 alphanumeric characters. |
| Card 6 | | A1,2I2,A1,F4.2,7F10.3,/,8F10.3,/,8F10.3,/,7F10.3 |
| (If there is no oil in the basin, card 6 must be blank) | | |
| col. 1 | TYPO | Type of input data distribution. Single alphabetic character. K=constant, U=uniform, T=triangular, C=cumulative. |
| cols. 2-3 | NUM | Number of pairs of values used to define the distribution. |

| | | |
|---|---|---|
| | | Integer, maximum size 15. |
| cols. 4-5 | MAGO | Magnitude (power of ten) of oil values in distribution. Integer, maximum size 99. |
| col. 6 | UNITO | Volumetric unit of measure for oil. Single alphabetic character. B=barrels, M=cubic metres. |
| cols. 7-10 | ORISK | Existence risk for oil in the basin. |
| cols. 11-20 | OILVAL(1) | Up to 15 pairs of values may be entered |
| 21-30 | OFREQ(1) | to describe the distribution. The first |
| 31-40 | OILVAL(2) | value of each pair (OILVAL) is the volume |
| 41-50 | OFREQ(2) | of oil and the second value (OFREQ) is the associated frequency or probability. If there are 4 or more pairs of values, additional cards are required. |

Card N A1,2I2,A1,F4.2,7F10.3,/,8F10.3,/,8F10.3,/,7F10.3
(The card following the last data card for oil for this basin)
If there is no gas in the basin, insert a blank card.

| | | |
|---|---|---|
| col. 1 | TYPG | Type of input data distribution for gas. A single alphabetic character. K=constant, U=uniform, T=triangular, C=cumulative. |
| cols. 2-3 | NUM | Number of pairs of values used to define the distribution. Integer, maximum size 15. |
| cols. 4-5 | MAGG | Magnitude (power of ten) of oil values in distribution. Integer, maximum size 99. |
| col. 6 | UNITG | Volumetric unit of measure for gas. A single alphabetic character. B=barrels, M=cubic metres. |
| cols. 7-10 | GRISK | Existence risk for gas. |
| cols. 11-20 | GASVAL(1) | Up to 15 pairs of values may be entered |
| cols. 21-30 | GFREQ(1) | to describe the distribution. The first |
| 31-40 | GASVAL(2) | value of each pair (GASVAL) is the volume |
| 41-50 | OFREQ(2) | of oil and second value (GFREQ) is the associated frequency or probability. If there are 4 or more pairs of values, additional cards are required. |

# JOB CONTROL — CHAPTER 4

DELPHI can be run by card input or through the Cyber system editor, ED. An ED library document (DEMODAT) to run DELPHI using the demonstration data exists under PID=DMRXVA, UID=DMRVRA.

The control cards for the job are:

1. DELPHI,P3,T30,MS140000.
2. COMMENT. NAME AND EXTENSION OF PERSON RUNNING THE JOB
3. GETSET,DMR3922.
4. ATTACH,DELPHI,RUNDELPHI,ID=DMRVES,SN=DMR3922.
5. DELPHI.
6. *EOS
7. Followed by the data set as shown in Appendix 3.

If a listing of the program is required with the output reports, the following control cards can be used.

1. DELPHI,P3,T30,MS140000.
2. COMMENT. NAME AND EXTENSION OF PERSON RUNNING THE JOB
3. FTN,SL.
4. LGO.
6. *EOS
7. Followed by the program.
8. Followed by a *EOS card.
9. Followed by the data.

## REFERENCES

MCCRAY, A.W., 1975 - PETROLEUM EVALUATIONS AND ECONOMIC DECISIONS Prentice-Hall, Inc., Englewood Cliffs.

RIESZ, E.J., 1975 - SIMULAT: A COMPUTER PROGRAM FOR THE PROSPECT-BY-PROSPECT METHOD OF ESTIMATING PETROLEUM RESOURCES USING MONTE CARLO SIMULATION. Bureau of Mineral Resources, Australia, Record 1978/2; BMR Microform MF70 (unpubl.)

APPENDIX 1

```
      PROGRAM DELPHI(INPUT,OUTPUT,TAPE61=OUTPUT)
      DIMENSION TITLE(8),FIELD(50,8),OILVAL(50,15),OFREQ(50,15)
      DIMENSION XOIL(100),YOIL(100),XGAS(100),YGAS(100)
      DIMENSION TYPO(50),ORISK(50),NUMO(50),TYPG(50),NUMG(50)
      DIMENSION GRISK(50),GFREQ(50,15),GASVAL(50,15),COVAL(50,22)
      DIMENSION COFREQ(50,22),CGVAL(50,22),CGFREQ(50,22)
      DIMENSION RASOIL(101),NUMOIL(100),RASGAS(101),NUMGAS(100)
      DIMENSION MAGO(50),MAGG(50),UNITO(50),UNITG(50)
      DIMENSION CB(8),CD(8)
      COMMON GCF,OCF
      REAL MEAN,MNA,MD,MDA,MODE,MOA
      INTEGER TYPO,TYPG,RES,UNITO,UNITG
C*****************************************************************
C
C                     VARIABLES
C                     ---------
C
C     BOTM   =  LOCAL VARIABLE -- LOWEST VALUE IN SIMULATED
C               OIL AND GAS DISTRIBUTIONS
C     CB     =  COMPILED BY
C     CD     =  COMPILATION DATE
C     CGFREQ=   CUMULATIVE FREQUENCY IN SIMULATED GAS DISTRIBUTION
C     CGVAL  =  GAS VALUE IN SIMULATED DISTRIBUTION
C     COFREQ=   CUMULATIVE FREQUENCY IN SIMULATED OIL DISTRIBUTION
C     COVAL  =  OIL VALUE IN SIMULATED DISTRIBUTION
C     CR     =  DATE OF COMPUTER RUN
C     C5     =  FIFTH CENTILE
C     C20    =  TWENTIETH CENTILE
C     C80    =  EIGHTIETH CENTILE
C     C95    =  NINETY-FIFTH CENTILE
C     ENSP   =  REAL EQUIVALENT OF NUMBER OF SIMULATION PASSES
C     FIELD  =  FIELD NAME
C     GASVAL=   GAS VOLUME VALUE
C     GCF    =  METRIC CONVERSION FACTOR FOR GAS
C     GFREQ  =  GAS VOLUME FREQUENCY
C     GMGAS  =  MEAN OF UNGROUPED DATA FROM SIMULATED GAS DISTRIBUTION
C     GMGASA=   MEAN OF UNGROUPED DATA FROM SIMULATED GAS DISTRIBUTION
C               IN U.S. UNITS
C     GMOIL  =  MEAN OF UNGROUPED DATA FROM SIMULATED OIL DISTRIBUTION
C     GMOILA=   MEAN OF UNGROUPED DATA FROM SIMULATED OIL DISTRIBUTION
C               IN U.S. UNITS
C     GRISK  =  GAS EXISTENCE RISK
C     I      =  INDEX
C     J      =  INDEX
C     K      =  INDEX
C     MAGG   =  MAGNITUDE (POWER OF TEN) OF GAS INPUT DATA
C     MAGO   =  MAGNITUDE (POWER OF TEN) OF OIL INPUT DATA
C     MD     =  MEDIAN OF SIMULATED DISTRIBUTIONS
C     MDA    =  MEDIAN OF SIMULATED DISTRIBUTIONS IN U.S. UNITS
C     MEAN   =  MEAN OF SIMULATED DISTRIBUTIONS
C     MNA    =  MEAN OF SIMULATED DISTRIBUTIONS IN U.S. UNITS
```

```
C     MOA    =  MODE OF SIMULATED DISTRIBUTIONS IN U.S. UNITS
C     MODE   =  MODE OF SIMULATED DISTRIBUTIONS
C     NF     =  NUMBER OF FIELDS
C     NSP    =  NUMBER OF SIMULATION PASSES
C     NUM    =  NUMBER OF PAIRS OF VALUES TO BE READ
C     NUMG   =  NUMBER OF PAIRS OF VALUES FOR GAS IN INPUT DISTRIBUTION
C     NUMGAS=  GAS FREQUENCY IN RISKED AND SUMMED DISTRIBUTION
C     NUMO   =  NUMBER OF PAIRS OF VALUES FOR OIL
C     NUMOIL=  OIL FREQUENCY IN RISKED AND SUMMED DISTRIBUTION
C     OCF    =  METRIC CONVERSION FACTOR FOR OIL
C     OFREQ  =  OIL VOLUME FREQUENCY
C     OILVAL=  OIL VOLUME VALUE
C     ORISK  =  OIL EXISTENCE RISK
C     PRMN   =  PROBABILITY ASSOCIATED WITH THE MEAN
C     PRMO   =  PROBABILITY ASSOCIATED WITH THE MODE
C     RASGAS=  RISKED AND SUMMED GAS
C     RASOIL=  RISKED AND SUMMED OIL
C     RES    =  RESOURCE IDENTIFICATION
C     STD    =  STANDARD DEVIATION
C     TITLE  =  TITLE
C     TOP    =  LOCAL VARIABLE -- HIGHEST VALUE IN SIMULATED GAS
C               AND OIL DISTRIBUTIONS
C     TOTGAS=  CUMULATIVE TOTAL USED TO CALCULATE MEAN FROM
C               UNGROUPED DATA
C     TOTOIL=  CUMULATIVE TOTAL USED TO CALCULATE MEAN FROM
C               UNGROUPED DATA
C     TYPG   =  TYPE OF DISTRIBUTION FOR GAS
C     TYPO   =  TYPE OF DISTRIBUTION FOR OIL
C     UNITG  =  UNITS OF GAS INPUT DATA
C     UNITO  =  UNITS OF OIL INPUT DATA
C     VAR    =  VARIANCE
C     XGAS   =  X-AXIS GAS VALUES FOR PLOTTING
C     XOIL   =  X-AXIS OIL VALUES FOR PLOTTING
C     YGAS   =  Y-AXIS GAS VALUES FOR PLOTTING
C     YOIL   =  Y-AXIS OIL VALUES FOR PLOTTING
C
C                    EXTERNALS
C                    ---------
C
C
C     CPD       =  SUBROUTINE TO CONSTRUCT CUMULATIVE PROBABILITY
C                  DISTRIBUTIONS FROM INPUT DATA
C     DATE      =  GENERATES DATE OF COMPUTER RUN
C     GCON      =  SUBROUTINE TO CONVERT GAS INPUT DATA TO METRIC UNITS
C     OCON      =  SUBROUTINE TO CONVERT OIL INPUT DATA TO METRIC UNITS
C     PERC      =  SUBROUTINE TO CONSTRUCT PERCENT-PROBABILITY-GREATER-
C                  THAN CURVES FOR SIMULATED DISTRIBUTIONS
C     QUIPLOT   =  CSIRO SYSTEM ROUTINE FOR LINEPRINTER PLOTS
C     RASH      =  SUBROUTINE TO RISK AND SUM HYDROCARBON RESOURCES
C     STAT      =  SUBROUTINE TO CALCULATE STATISTICS OF SIMULATED
C                  DISTRIBUTIONS
C     TABL1     =  SUBROUTINE TO PREPARE TABLE 1
```

```
C     TABL2   =  SUBROUTINE TO PREPARE TABLE 2
C     WRITER  =  SUBROUTINE TO PREPARE SUMMARY REPORT
C
C*****************************************************************
C
C          INITIALIZE VARIABLES
C
      NSP = 10000
      ENSP = NSP
      GCF = 0.035314662
      OCF = 6.28981057
C
C         TITLE
C
      READ 1000,(TITLE(J),J=1,8)
 1000 FORMAT(8A10)
C
C          DATA COMPILED BY
C
      READ 1000,(CB(J),J=1,8)
C
C          COMPILATION DATE
C
      READ 1000,(CD(J),J=1,8)
C
C          GENERATE DATE OF COMPUTER RUN
C
      CALL DATE(CR)
C
C          NUMBER OF FIELDS
C
      READ 1010,NF
 1010 FORMAT(I2)
C
C          OIL & GAS DATA
C
      DO 10 I=1,NF
      READ 1000,(FIELD(I,J),J=1,8)
      READ 1020,TYPO(I),NUM,MAGO(I),UNITO(I),ORISK(I),(OILVAL(I,J),
     +OFREQ(I,J),J=1,NUM)
      NUMO(I)=NUM
 1020 FORMAT(A1,2I2,A1,F4.2,7F10.3,/,8F10.3,/,8F10.3,/,7F10.3)
      READ 1020,TYPG(I),NUM,MAGG(I),UNITG(I),GRISK(I),(GASVAL(I,J),
     +GFREQ(I,J),J=1,NUM)
      NUMG(I)=NUM
   10 CONTINUE
C
C          WRITE FIRST REPORT
C
      CALL TABL1(NF,FIELD,MAGO,UNITO,ORISK,OILVAL,CD,TYPO,
     +NUMO,OFREQ)
```

```
C
C          WRITE SECOND REPORT
C
      CALL TABL2(NF,FIELD,MAGG,UNITG,GRISK,GASVAL,CD,TYPG,
     +NUMG,GFREQ)
C
C          OIL CUMULATIVE PROBABILITY DISTRIBUTIONS
C
C          WRITE HEADING FOR THIRD REPORT
C
      WRITE 1030
 1030 FORMAT(1H1,10X,*UNDISCOVERED OIL RESOURCES OF AUSTRALIA*,/,10X,40(
     +*-*),//)
      DO 20 I=1,NF
C
C          SELECT ONLY THOSE SETS WHERE RESOURCES EXIST
C
      IF(ORISK(I).EQ.0.0) GO TO 20
C
C          CONVERT TO METRIC UNITS IF NECESSARY
C
      IF(UNITO(I).EQ.1HB) CALL OCON(I,NUMO,OILVAL)
C
C          CONSTRUCT CUMULATIVE PROBABILITY DISTRIBUTIONS
C
      CALL CPD(I,TYPO,NUMO,OILVAL,OFREQ,COVAL,COFREQ)
      K=NUMO(I)
C
C          FINISH WRITING THIRD REPORT
C
      WRITE 1055,(FIELD(I,J),J=1,2),(COVAL(I,J),J=1,K)
 1055 FORMAT(/,1X,2A10,11F10.3,/,21X,11F10.3)
      WRITE 1060,(FIELD(I,J),J=3,4),(COFREQ(I,J),J=1,K)
 1060 FORMAT(1X,2A10,11F10.3,/,21X,11F10.3)
   20 CONTINUE
C
C          GAS CUMULATIVE PROBABILITY DISTRIBUTIONS
C
C          WRITE HEADING FOR FOURTH REPORT
C
      WRITE 1070
 1070 FORMAT(1H1,10X,*UNDISCOVERED GAS RESOURCES OF AUSTRALIA*,/,10X,40(
     +*-*),//)
      DO 30 I=1,NF
C
C          SELECT ONLY THOSE SETS WHERE RESOURCES EXIST
C
      IF(GRISK(I).EQ.0.0) GO TO 30
C
C          CONVERT TO METRIC UNITS IF NECESSARY
C
```

```
      IF(UNITG(I).EQ.1HF) CALL GCON(I,NUMG,GASVAL)
C
C          CONSTRUCT CUMULATIVE PROBABILITY DISTRIBUTIONS
C
      CALL CPD(I,TYPG,NUMG,GASVAL,GFREQ,CGVAL,CGFREQ)
      K=NUMG(I)
C
C          FINISH WRITING FOURTH REPORT
C
      WRITE 1055,(FIELD(I,J),J=1,2),(CGVAL(I,J),J=1,K)
      WRITE 1060,(FIELD(I,J),J=3,4),(CGFREQ(I,J),J=1,K)
   30 CONTINUE
C
C          RISK & SUM OIL
C
      CALL RASH(NSP,NF,TYPO,NUMO,ORISK,COVAL,COFREQ,RASOIL,NUMOIL,
     +TOTOIL)
C
C          WRITE FIFTH REPORT
C
      WRITE 1030
      WRITE 1080,(RASOIL(I),NUMOIL(I),RASOIL(I+50),NUMOIL(I+50),I=1,50)
 1080 FORMAT(2(5X,F20.3,5X,I15))
      WRITE 1081,RASOIL(101)
 1081 FORMAT(50X,F20.3,15X,I5)
      GMOIL=TOTOIL/ENSP
      GMOILA=GMOIL*OCF
C
C          CALCULATE STATISTICS TO DESCRIBE THE DISTRIBUTION
C          OF RISKED AND SUMMED OIL RESOURCES
C
      CALL STAT(NSP,RASOIL,NUMOIL,MEAN,MD,MODE,VAR,STD,C5,C20,C80,C95
     +   ,PRMN,PRMO)
C
C          CONVERT CUBIC METRES TO BARRELS
C
      MNA=MEAN*OCF
      MDA=MD*OCF
      MOA=MODE*OCF
C
C          WRITE SIXTH REPORT
C
      WRITE 1030
      WRITE 1090,MEAN,MNA,STD
 1090 FORMAT(5X,*MEAN VALUE    =*,2X,F15.3,25X,F15.3,20X,*STANDARD DEVIAT
     +ION =*,F20.5)
      WRITE 1091,MD,MDA,VAR
 1091 FORMAT(5X,*MEDIAN VALUE =*,2X,F15.3,25X,F15.3,20X,*VARIANCE =*,10X
     +,F20.5)
      WRITE 1092,MODE,MOA
 1092 FORMAT(5X,*MODAL VALUE  =*,2X,F15.3,25X,F15.3,///)
```

```
      WRITE 1093,GMOIL,GMOILA
 1093 FORMAT(///,5X,*MEAN FROM UNGROUPED DATA*,/,5X,24(*-*),//,21X,F15.3
     +,25X,F15.3)
      CALL PERC(NSP,RASOIL,NUMOIL,XOIL,YOIL)
C
C          WRITE SEVENTH REPORT
C
      WRITE 1030
      WRITE 1100,(XOIL(I),YOIL(I),XOIL(I+50),YOIL(I+50),I=1,50)
 1100 FORMAT(4(5X,F20.3))
C
C          PLOT OIL DISTRIBUTION -- EIGHTH REPORT
C
      CALL QUIPLOT(XOIL,YOIL,100,1,12H*RISKED OIL*,7H*CPROB*)
      BOTM=XOIL(1)
      TOP=XOIL(100)
      RES=3HOIL
C
C          WRITE SUMMARY OIL REPORT -- NINTH REPORT
C
      CALL WRITER(MEAN,MNA,MODE,MOA,BOTM,TOP,C95,C80,C20,C5,PRMN,PRMO,
     +RES,MD,MDA,CB,CD,CR)
C
C          RISK & SUM GAS
C
      CALL RASH(NSP,NF,TYPG,NUMG,GRISK,CGVAL,CGFREQ,RASGAS,NUMGAS,
     +TOTGAS)
C
C          WRITE TENTH REPORT
C
      WRITE 1070
      WRITE 1080,(RASGAS(I),NUMGAS(I),RASGAS(I+50),NUMGAS(I+50),I=1,50)
      WRITE 1081,RASGAS(101)
      GMGAS=TOTGAS/ENSP
      GMGASA=GMGAS*GCF
C
C          CALCULATE STATISTICS TO DESCRIBE THE DISTRIBUTION
C          OF RISKED AND SUMMED GAS RESOURCES
C
      CALL STAT(NSP,RASGAS,NUMGAS,MEAN,MD,MODE,VAR,STD,C5,C20,C80,C95
     +   ,PRMN,PRMO)
C
C          CONVERT METRES TO CUBIC FEET
C
      MNA=MEAN*GCF
      MDA=MD*GCF
      MOA=MODE*GCF
C
C          WRITE ELEVENTH REPORT
C
      WRITE 1070
```

```
      WRITE 1090,MEAN,MNA,STD
      WRITE 1091,MD,MDA,VAR
      WRITE 1092,MODE,MOA
      WRITE 1093,GMGAS,GMGASA
      CALL PERC(NSP,RASGAS,NUMGAS,XGAS,YGAS)
C
C          WRITE TWELFTH REPORT
C
      WRITE 1070
      WRITE 1100,(XGAS(I),YGAS(I),XGAS(I+50),YGAS(I+50),I=1,50)
C
C          PLOT GAS DISTRIBUTION -- THIRTEENTH REPORT
C
      CALL QUIPLOT(XGAS,YGAS,100,1,12H*RISKED GAS*,7H*CPROB*)
      BOTM=XGAS(1)
      TOP=XGAS(100)
      RES=3HGAS
C
C          WRITE SUMMARY GAS REPORT -- FOURTEENTH REPORT
C
      CALL WRITER(MEAN,MNA,MODE,MOA,BOTM,TOP,C95,C80,C20,C5,PRMN,PRMO,
     +RES,MD,MDA,CB,CD,CR)
      STOP
      END
```

```
      SUBROUTINE CPD(I,TYPE,NUM,VAL,FREQ,CVAL,CPR)
      DIMENSION VAL(50,15),FREQ(50,15),CVAL(50,22),CPR(50,22)
      DIMENSION NUM(50),TYPE(50),A(21)
      REAL MODE
      INTEGER TYPE
C
C*****************************************************************
C
C          'CPD' CONSTRUCTS CUMULATIVE PROBABILITY DISTRIBUTIONS
C                FROM ORIGINAL DATA.
C
C
C                    VARIABLES
C                    ---------
C
C     A      =  AREA OF SEGMENTS UNDER THE CURVE
C     AREA   =  CUMULATES 'A' TO BECOME TOTAL AREA UNDER THE CURVE
C     CG     =  CENTER OF GRAVITY OF SEGMENTS UNDER THE CURVE
C     CPR    =  CUMULATIVE PROBABILITY
C     CVAL   =  RESOURCE VALUE CORRESPONDING TO CUMULATIVE PROBABILITY
C     EM     =  NEWENDORP'S 'M'
C     FREQ   =  FREQUENCY
C     I      =  FIELD (BASIN) IDENTIFIER
C     IND    =  INDICATES WHETHER INPUT MODE HAS BEEN TREATED
C     J      =  LOOP COUNTER, SUBSCRIPT
C     K      =  LOOP COUNTER
C     MODE   =  MODE
C     NUM    =  NUMBER OF VALUES IN ORIGINAL AND CUMULATIVE DISTRIBUTION
C     NUMB   =  NUMBER OF INTERVALS
C     STEP   =  1/20TH OF RANGE OF ORIGINAL DISTRIBUTION
C     TOTAL  =  CUMULATES PROBABILITY ASSOCIATED WITH 'A'
C     TYPE   =  TYPE OF INPUT DISTRIBUTION
C     VAL    =  VALUE FROM ORIGINAL DISTRIBUTION
C     X      =  NEWENDORP'S X
C     XPRIME=   NEWENDORP'S X PRIME
C
C*****************************************************************
C
      AREA=0.0
      IND=0
C
C          IS IT A CONSTANT?
C
      IF(TYPE(I).EQ.1HK) GO TO 40
C
C          IS IT A UNIFORM DISTRIBUTION?
C
      IF(TYPE(I).EQ.1HU) GO TO 45
C
C          IS IT A CUMULATIVE PROBABILITY DISTRIBUTION?
C
```

```
      IF(TYPE(I).EQ.1HC) GO TO 50
      IF(NUM(I).GE.4) GO TO 70
C
C          IT IS A TRIANGULAR DISTRIBUTION
C
      CPR(I,1)=0.0
      CVAL(I,1)=VAL(I,1)
      X=VAL(I,1)
      STEP=(VAL(I,3)-VAL(I,1))/20.
      EM=(VAL(I,2)-VAL(I,1))/(VAL(I,3)-VAL(I,1))
      J=2
      DO 20 K=2,21
      X=X+STEP
      CVAL(I,J)=X
      XPRIME=(X-VAL(I,1))/(VAL(I,3)-VAL(I,1))
      IF(X.GE.VAL(I,2)) GO TO 30
      CPR(I,J)=(XPRIME**2)/EM
      J=J+1
      GO TO 20
   30 IF(VAL(I,1).EQ.VAL(I,2)) GO TO 35
      IF(IND.GE.1) GO TO 35
      CVAL(I,J)=VAL(I,2)
      CPR(I,J)=EM
      IND=99
      J=J+1
      CVAL(I,J)=X
   35 CPR(I,J)=1.-(((1.-XPRIME)**2)/(1.-EM))
      J=J+1
   20 CONTINUE
      NUM(I)=J-1
      GO TO 1000
C
C          IT'S A CONSTANT
C
   40 CPR(I,1)=1.0
      CVAL(I,1)=VAL(I,1)
      GO TO 1000
C
C          IT'S A UNIFORM DISTRIBUTION
C
   45 CPR(I,1)=0.0
      CPR(I,2)=1.0
      CVAL(I,1)=VAL(I,1)
      CVAL(I,2)=VAL(I,2)
      GO TO 1000
C
C          IT'S A CUMULATIVE PROBABILITY DISTRIBUTION
C
   50 K=NUM(I)
      DO 60 J=1,K
      CVAL(I,J)=VAL(I,J)
```

```
      CPR(I,J)=FREQ(I,J)
   60 CONTINUE
      GO TO 1000
C
C          IT'S A PROBABILITY FUNCTION
C
   70 NUMB=NUM(I)-1
      MODE=VAL(I,1)
C
C          CALCULATE TOTAL AREA UNDER THE CURVE
C
      DO 80 K=1,NUMB
      A(K)=((VAL(I,K+1)-VAL(I,K))*(FREQ(I,K)+FREQ(I,K+1)))/2.0
      AREA=AREA+A(K)
      IF(FREQ(I,K+1).GE.FREQ(I,K)) MODE=VAL(I,K+1)
   80 CONTINUE
      DO 90 K=1,NUMB
      A(K)=A(K)/AREA
   90 CONTINUE
C
C          SET INITIAL VALUES
C
      STEP=(VAL(I,NUMB+1)-VAL(I,1))/20.
      CVAL(I,1)=VAL(I,1)
      CPR(I,1)=0.0
      X=VAL(I,1)
      UL=VAL(I,2)
      TOTAL=0.0
      J=2
      M=2
      IND=0
      DO 400 K=2,21
      X=X+STEP
  340 CVAL(I,M)=X
      IF(IND.GE.1) GO TO 350
      IF(X.GE.MODE) GO TO 370
  350 IF(UL.GT.X) GO TO 360
      TOTAL=TOTAL+A(J-1)
      J=J+1
      UL=VAL(I,J)
  360 TAN=(FREQ(I,J)-FREQ(I,J-1))/(VAL(I,J)-VAL(I,J-1))
      FREQX=FREQ(I,J-1)+(X-VAL(I,J-1))*TAN
      CPR(I,M)=TOTAL+(((FREQX+FREQ(I,J-1))*(X-VAL(I,J-1)))/2.)/AREA
      M=M+1
      GO TO 400
  370 CVAL(I,M)=MODE
      CPR(I,M)=TOTAL+A(J-1)
      M=M+1
      IND=99
      GO TO 340
  400 CONTINUE
```

```
      NUM(I)=22
 1000 RETURN
      END
```

```
      SUBROUTINE MONTE(I,TYPE,NUM,CVAL,CPR,RVAL)
      DIMENSION CVAL(50,22),CPR(50,22)
      DIMENSION TYPE(50),NUM(50)
      INTEGER TYPE
C
C*****************************************************************
C
C                     VARIABLES
C                     ---------
C
C     CPR   =  CUMULATIVE PROBABILITY
C     CVAL  =  VALUE CORRESPONDING TO CUMULATIVE PROBABILITY
C     DUM   =  DUMMY VARIABLE
C     I     =  DATA SET IDENTIFIER
C     J     =  LOOP COUNTER
C     N     =  LOCAL VALUE OF NUM
C     NUM   =  NUMBER OF VALUES IN CUMULATIVE DISTRIBUTION
C     RN    =  RANDOM NUMBER
C     RVAL  =  RANDOM VALUE OBTAINED BY SIMULATION
C     TYPE  =  TYPE OF DISTRIBUTION
C
C                     EXTERNAL
C                     --------
C
C     RANF  =  RANDOM NUMBER FUNCTION
C
C*****************************************************************
C
      RN=RANF(DUM)
      N=NUM(I)
      IF(TYPE(I).EQ.1HK) GO TO 30
      DO 10 J=2,N
      IF(RN.LE.CPR(I,J)) GO TO 20
   10 CONTINUE
   20 RVAL=CVAL(I,J-1)+(((RN-CPR(I,J-1))*(CVAL(I,J)-CVAL(I,J-1)))/
     +   (CPR(I,J)-CPR(I,J-1)))
      GO TO 100
   30 RVAL=CVAL(I,1)
  100 RETURN
      END
```

```
      SUBROUTINE RASH(NSP,NF,TYPE,NUM,ER,CVAL,CPR,SRES,NRES,GTOT)
      DIMENSION ER(50),CVAL(50,22),CPR(50,22),SRES(101),NRES(100)
      DIMENSION NUM(50),TYPE(50),A(10000)
      REAL MAX,MIN
      INTEGER TYPE
C*****************************************************************
C
C                    VARIABLES
C                    ---------
C
C     A     =  ARRAY TO HOLD RESULTS OF EACH SIMULATION PASS
C     CI    =  CLASS INTERVAL
C     CI2   =  ONE-HALF CLASS INTERVAL
C     CPR   =  CUMULATIVE PROBABILITY
C     CVAL  =  VALUE IN CUMLATIVE PROBABILITY DISTRIBUTION
C     DUM   =  DUMMY VARIABLE
C     ER    =  EXISTENCE RISK
C     GTOT  =  GRAND TOTAL
C     I     =  LOOP COUNTER
C     J     =  LOOP COUNTER
C     K     =  LOOP COUNTER
C     M     =  'VARIABLE' SUBSCRIPT
C     MAX   =  MAXIMUM POSSIBLE RESOURCE VOLUME
C     MIN   =  MINIMUM POSSIBLE NON-ZERO RESOURCE VOLUME
C     NF    =  NUMBER OF FIELDS
C     NRES  =  FREQUENCY
C     NSP   =  NUMBER OF SUMULATION PASSES
C     NUM   =  NUMBER OF VALUES IN DISTRIBUTION
C     RN    =  RANDOM NUMBER
C     RVAL  =  RANDOM VALUE
C     SRES  =  VALUE OF SUMMED RESOURCES
C     SUM   =  SUM
C     TYPE  =  TYPE OF DISTRIBUTION
C
C                    EXTERNALS
C                    ---------
C     MONTE =  SUBROUTINE FOR MONTE CARLO SIMULATION
C     RANF  =  RANDOM NUMBER FUNCTION
C*****************************************************************
      DO 5 K=1,100
      SRES(K)=0.0
      NRES(K)=0
    5 CONTINUE
      SRES(101)=0.0
      M=0
C
C          DO THE SIMULATION
C
      DO 200 I=1,NSP
      SUM=0.
      DO 100 J=1,NF
```

```
      RN=RANF(DUM)
      IF(RN.GT.ER(J)) GO TO 100
      CALL MONTE(J,TYPE,NUM,CVAL,CPR,RVAL)
      SUM=SUM+RVAL
  100 CONTINUE
C
C          CUMULATE THE SUM FROM EACH SIMULATION PASS
C         SO THAT A MEAN FROM UNGROUPED DATA CAN BE CALCULATED
C
      GTOT=GTOT+SUM
      IF(SUM.LE.0.0) GO TO 200
      M=M+1
      A(M)=SUM
  200 CONTINUE
      MAX=0.0
      MIN=999999999.
      DO 300 I=1,M
      IF(A(I).GE.MAX) MAX=A(I)
      IF(A(I).LE.MIN) MIN=A(I)
  300 CONTINUE
      CI=(MAX-MIN)/99.
      CI2=CI/2.
      NRES(1)=NSP-M
      SRES(1)=MIN-CI2
      DO 400 I=2,101
      SRES(I)=SRES(I-1)+CI
  400 CONTINUE
      DO 500 I=1,M
      DO 500 J=2,101
      IF(A(I).LE.SRES(J)) NRES(J-1)=NRES(J-1)+1
  500 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE STAT(NSP,SVAL,N,MEAN,MD,MODE,VAR,STD,C5,C20,C80,C95
     +   ,PRMN,PRMO)
      DIMENSION SVAL(101),N(100)
      REAL MEAN,MD,MODE
C
C*****************************************************************
C
C     'STAT' CALCULATES STATISTICS DESCRIBING THE CUMULATIVE
C            FREQUENCY DISTRIBUTION PRODUCED BY SIMULATION.
C
C                    VARIABLES
C                    ---------
C
C   DEV    =  DEVIATION FROM THE MEAN
C   EM     =  LOCAL VALUE OF 'N'
C   EN     =  LOCAL VALUE OF 'N'
C   ENSP   =  REAL EQUIVALENT OF NSP
C   ENSP2  =  ONE-HALF OF ENSP
C   I      =  LOOP COUNTER
C   J      =  INDEX
C   MC     =  ARRAY LOCATION OF THE MODE
C   MD     =  MEDIAN
C   MEAN   =  MEAN
C   MODE   =  MODE
C   N      =  FREQUENCY ASSOCIATED WITH SIMULATED VALUES
C   NSP    =  NUMBER OF SIMULATION PASSES
C   NVIC   =  NUMBER OF VALUES IN A CLASS
C   NVMC   =  NUMBER OF VALUES IN MODAL CLASS
C   PROP   =  PROPORTIONAL PART OF CLASS INTERVAL FOR CALCULATION
C             OF THE MEDIAN
C   STD    =  STANDARD DEVIATION
C   SUM    =  SUM
C   SVAL   =  SIMULATED VALUES
C   VAR    =  VARIANCE
C
C                    EXTERNALS
C                    ---------
C
C     SQRT  =  SQUARE ROOT FUNCTION
C
C*****************************************************************
C
C          INITIALIZE VARIABLES
C
      SUM=0.
      MEAN=0.
      DEV=0.
      VAR=0.
      STD=0.
      MD=0.
      MODE=0.
```

```
      ENSP=NSP
      ENSP2=ENSP/2.
      NSP95=NSP*0.05
      NSP80=NSP*0.2
      NSP20=NSP*0.8
      NSP5=NSP*0.95
C
C           CALCULATE TOTAL VOLUME AND MEAN VOLUME
C
      SUM=SUM+(((SVAL(2)+SVAL(1))/2.)*N(1))
      DO 50 J=2,100
      SUM=SUM+(((SVAL(J+1)+SVAL(J))/2.)*(N(J)-N(J-1)))
   50 CONTINUE
      MEAN=SUM/ENSP
C
C           CALCULATE VARIANCE AND STANDARD DEVIATION
C
      DEV=((((SVAL(1)+SVAL(2))/2.)-MEAN)**2)*N(1)
      VAR=VAR+DEV
      DO 60 J=2,100
      DEV=((((SVAL(J)+SVAL(J+1))/2.)-MEAN)**2)*(N(J)-N(J-1))
      VAR=VAR+DEV
   60 CONTINUE
      VAR=VAR/ENSP
      STD=SQRT(VAR)
C
C           CALCULATE MEDIAN
C
      DO 70 J=1,100
      IF(N(J).LT.ENSP2) GO TO 70
      EN=N(J)
      EM=N(J-1)
      PROP=(ENSP2-EM)/(EN-EM)
      MD=SVAL(J)+(PROP*(SVAL(J+1)-SVAL(J)))
      GO TO 80
   70 CONTINUE
C
C           CALCULATE MODE
C
   80 NVMC=N(1)
      DO 90 I=1,99
      NVIC=N(I+1) - N(I)
      IF(NVMC.GT.NVIC) GO TO 90
      NVMC=NVIC
      MC=I
   90 CONTINUE
      MODE=(SVAL(MC+1) + SVAL(MC+2))/2.
C
C           CALCULATE THE CENTILE VALUE OF THE MODE
C
      EN=N(MC+1)
```

```
      PRMO=1.00-EN/ENSP
C
C          CALCULATE THE 95TH CENTILE VALUE
C
      IF(N(1).GE.NSP95) GO TO 110
      DO 100 J=2,100
      IF(N(J).GE.NSP95) GO TO 120
  100 CONTINUE
  110 C95=SVAL(1)+(NSP95/N(1))*(SVAL(2)-SVAL(1))
      GO TO 130
  120 C95=SVAL(J)+((NSP95-N(J-1))/(N(J)-N(J-1)))*(SVAL(J+1)-SVAL(J))
C
C          CALCULATE THE 80TH CENTILE VALUE
C
  130 IF(N(1).GE.NSP80) GO TO 150
      DO 140 J=2,100
      IF(N(J).GE.NSP80) GO TO 160
  140 CONTINUE
  150 C80=SVAL(1)+(NSP80/N(1))*(SVAL(2)-SVAL(1))
      GO TO 170
  160 C80=SVAL(J)+((NSP80-N(J-1))/(N(J)-N(J-1)))*(SVAL(J+1)-SVAL(J))
C
C          CALCULATE THE 20TH CENTILE VALUE
C
  170 DO 180 J=1,100
      IF(N(J).GE.NSP20) GO TO 190
  180 CONTINUE
  190 C20=SVAL(J)+((NSP20-N(J-1))/(N(J)-N(J-1)))*(SVAL(J+1)-SVAL(J))
C
C          CALCULATE THE 5TH CENTILE VALUE
C
      DO 200 J=1,100
      IF(N(J).GE.NSP5) GO TO 210
  200 CONTINUE
  210 C5=SVAL(J)+((NSP5-N(J-1))/(N(J)-N(J-1)))*(SVAL(J+1)-SVAL(J))
C
C          CALCULATE THE CENTILE OF THE MEAN VALUE
C
      DO 220 J=1,100
      IF(SVAL(J).GE.MEAN) GO TO 230
  220 CONTINUE
  230 PRMN=N(J-2)+((MEAN-SVAL(J-1))/(SVAL(J)-SVAL(J-1))*(N(J-1)-N(J-2)
     +))
      PRMN=1.00-PRMN/ENSP
      RETURN
      END
```

```
      SUBROUTINE PERC(NSP,SMV,NMV,XSIM,YSIM)
C*************************************************************************
C
C        'PERC' CONSTRUCTS PERCENT-PROBABILITY-GREATER-
C        THAN CURVES FROM THE CUMULATIVE FREQUENCY DISTRIBUTIONS
C        PRODUCED BY SIMULATION.
C
C          VARIABLES
C          ---------
C
C     ENSP  =  REAL EQUIVALENT OF NSP
C     J     =  LOOP COUNTER
C     NMV   =  CUMULATIVE FREQUENCY
C     NSM   =  REAL EQUIVALENT OF NMV
C     NSP   =  NUMBER OF SIMULATION PASSES
C     SMV   =  RESOURCE VOLUME CLASS BOUNDS
C     XSIM  =  RESOURCE VOLUME CLASS MIDPOINTS
C     YSIM  =  CUMULATIVE PROBABILITY
C
C*************************************************************************
C
      DIMENSION SMV(101),NMV(100),NSM(100),XSIM(100),YSIM(100)
      REAL NSM
C
      ENSP=NSP
C
C
C          INITIALIZE ARRAYS
C
      DO 10 J=1,100
      XSIM(J) = 0.
      YSIM(J) = 0.
      NSM(J)=NMV(J)
   10 CONTINUE
      IF(SMV(2).NE.0.0) GO TO 30
      YSIM(1)=1.0-NSM(1)/ENSP
      XSIM(1)=0.0
      DO 20 J=2,100
      YSIM(J)=1.-NSM(J+1)/ENSP
      XSIM(J)=(SMV(J+1)+SMV(J+2))/2.
   20 CONTINUE
   30 DO 40 J=1,100
      YSIM(J)=1.0-NSM(J)/ENSP
      XSIM(J)=(SMV(J)+SMV(J+1))/2.
   40 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE WRITER(MEAN,MNA,MODE,MOA,BOTM,TOP,C95,C80,C20,C5,
     +PRMN,PRMO,RES,MD,MDA,CB,CD,CR)
      COMMON GCF,OCF
      DIMENSION AU(2),U(2),CB(8),CD(8)
      REAL MEAN,MNA,MODE,MOA,MD,MDA
      INTEGER RES
C
C*****************************************************************
C
C          'WRITER' PRODUCES A SUMMARIZED ANALYSIS OF THE JOINT
C                   PROBABILITY DISTRIBUTION PRODUCED BY SIMULATION.
C
C                    VARIABLES
C                    ---------
C
C     AU     =  TEXT DESCRIPTION OF UNITS
C     BOTM   =  LOWEST VALUE IN ARRAY
C     BOTMA  =  LOWEST VALUE IN ARRAY IN U.S. UNITS
C     CB     =  COMPILED BY
C     CD     =  COMPILATION DATE
C     CR     =  DATE OF COMPUTER RUN
C     C20    =  20TH CENTILE
C     C20A   =  20TH CENTILE VALUE IN U.S. UNITS
C     C5     =  5TH CENTILE
C     C5A    =  5TH CENTILE VALUE IN U.S. UNITS
C     C80    =  80TH CENTILE
C     C80A   =  80TH CENTILE VALUE IN U.S. UNITS
C     C95    =  95TH CENTILE
C     C95A   =  95TH CENTILE VALUE IN U.S. UNITS
C     GCF    =  GAS CONVERSION FACTOR
C     J      =  SUBSCRIPT
C     MD     =  MEDIAN
C     MDA    =  MEDIAN IN U.S. UNITS
C     MEAN   =  MEAN
C     MNA    =  MEAN IN U.S. UNITS
C     MNP    =  INTEGER EQUIVALENT OF THE PROBABILITY ASSOCIATED WITH THE MEAN
C     MOA    =  MODE IN U.S. UNITS
C     MODE   =  MODE
C     MOP    =  INTEGER EQUIVALENT OF THE PROBABILITY ASSOCIATED WITH THE MODE
C     OCF    =  OIL CONVERSION FACTOR
C     PRMN   =  PROBABILITY ASSOCIATED WITH THE MEAN
C     PRMO   =  PROBABILITY ASSOCIATED WITH THE MODE
C     RES    =  TEXT --- RESOURCE NAME
C     TOP    =  HIGHEST VALUE IN ARRAY
C     TOPA   =  HIGHEST VALUE IN U.S. UNITS
C     U      =  TEXT --- DESCRIPTION OF UNITS
C
C*****************************************************************
C
C          CONVERT PROBABILITIES ASSOCIATED WITH THE
C          MEAN AND MEDIAN TO PERCENT PROBABILITY
```

```
C
      MNP=PRMN*100.0
      MOP=PRMO*100.0
      PRMN=MNP
      PRMO=MOP
C
C          IS THE REPORT FOR OIL OR GAS?
C
      IF(RES.EQ.3HOIL) GO TO 10
C
C          IT'S GAS -- CONVERT METRIC TO U.S. MEASURE
C
      BOTMA=BOTM*GCF
      TOPA=TOP*GCF
      C95A=C95*GCF
      C80A=C80*GCF
      C20A=C20*GCF
      C5A=C5*GCF
      U(1)=10HBILLION CU
      U(2)=10HBIC METRES
      AU(1)=10HTRILLION C
      AU(2)=9HUBIC FEET
      GO TO 20
C
C          IT'S OIL -- CONVERT METRIC TO U.S. MEASURE
C
   10 BOTMA=BOTM*OCF
      TOPA=TOP*OCF
      C95A=C95*OCF
      C80A=C80*OCF
      C20A=C20*OCF
      C5A=C5*OCF
      U(1)=10HMILLION CU
      U(2)=10HBIC METRES
      AU(1)=10HMILLION BA
      AU(2)=5HRRELS
C
C          WRITE A REPORT
C
   20 WRITE 2000
 2000 FORMAT(1H1)
      WRITE 2010
 2010 FORMAT(19X,43H* * * * * C O N F I D E N T I A L * * * * *,//)
      WRITE 2020,RES
 2020 FORMAT(19X,*AUSTRALIA'S UNDISCOVERED PETROLEUM RESOURCES*,/,19X,43
     +(*-*),//,30X,*SUMMARY REPORT FOR *,A3,/,30X,22(*-*))
      WRITE 2022,(CB(J),J=1,8)
 2022 FORMAT(//,1X,*DATA COMPILED BY:  *,8A10,/,1X,16(*-*))
      WRITE 2024,(CD(J),J=1,8)
 2024 FORMAT(1X,*COMPILATION DATE:  *,8A10,/,1X,16(*-*))
      WRITE 2026,CR
```

```
 2026 FORMAT(1X,*DATE OF COMPUTER RUN:  *,A10,/,1X,20(*-*))
      WRITE 2030
 2030 FORMAT(//)
      WRITE 2040,RES,BOTM,U(1),U(2),BOTMA,AU(1),AU(2)
 2040 FORMAT(//,1X,*THE ESTIMATED POTENTIAL UNDISCOVERED RECOVERABLE *,A
     +3,* RESOURCES OF AUSTRALIA,*,/,1X,*SUMMARIZED IN THE TABLE BELOW,
     +RANGE FROM A MINIMUM OF*,/,41X,,F15.3,1X,2A10,/,39X,*[ *,F15.3,1X,
     +2A10,*]*)
      WRITE 2045,TOP,U(1),U(2),TOPA,AU(1),AU(2)
 2045 FORMAT(/,1X,*TO A MAXIMUM OF*,25X,F15.3,1X,2A10,/,39X,*[ *,F15.3,1
     +X,2A10,*].*)
      WRITE 2050,RES,MODE,U(1),U(2),MOA,AU(1),AU(2)
 2050 FORMAT(/,1X,*THE MOST LIKELY VOLUME OF UNDISCOVERED *,A3,* IS ESTI
     +MATED TO BE*,/,41X,F15.3,1X,2A10,/,39X,*[ *,F15.3,1X,2A10,*]*)
      WRITE 3000,U(1),U(2),AU(1),AU(2)
 3000 FORMAT(//,7X,*PERCENT*,/,5X,*PROBABILITY*,/,5X,*GREATER THAN*,9X
     +,2A10,10X,2A10,/,5X,12(*-*),9X,20(*-*),8X,20(*-*),/)
      WRITE 3010,BOTM,BOTMA
 3010 FORMAT(8X,*100%*,18X,F15.3,11X,F15.3)
      IF(PRMO.LE.100..AND.PRMO.GE.95.) WRITE 4000,MOP,MODE,MOA
      IF(PRMN.LE.100..AND.PRMN.GE.95.) WRITE 4010,MNP,MEAN,MNA
 4000 FORMAT(2X,*MODE*,3X,I2,*%*,18X,F15.3,11X,F15.3)
 4010 FORMAT(2X,*MEAN*,3X,I2,*%*,18X,F15.3,11X,F15.3)
      WRITE 3020,C95,C95A
 3020 FORMAT(9X,*95%*,18X,F15.3,11X,F15.3)
      IF(PRMO.LE.95..AND.PRMO.GE.80.) WRITE 4000,MOP,MODE,MOA
      IF(PRMN.LE.95..AND.PRMN.GE.80.) WRITE 4010,MNP,MEAN,MNA
      WRITE 3030,C80,C80A
 3030 FORMAT(9X,*80%*,18X,F15.3,11X,F15.3)
      IF(PRMO.LE.80..AND.PRMO.GE.50.) WRITE 4000,MOP,MODE,MOA
      IF(PRMN.LE.80..AND.PRMN.GE.50.) WRITE 4010,MNP,MEAN,MNA
      WRITE 3040,MD,MDA
 3040 FORMAT(9X,*50%*,18X,F15.3,11X,F15.3)
      IF(PRMO.LE.50..AND.PRMO.GE.20.) WRITE 4000,MOP,MODE,MOA
      IF(PRMN.LE.50..AND.PRMN.GE.20.) WRITE 4010,MNP,MEAN,MNA
      WRITE 3050,C20,C20A
 3050 FORMAT(9X,*20%*,18X,F15.3,11X,F15.3)
      IF(PRMO.LE.20..AND.PRMO.GE.5.) WRITE 4000,MOP,MODE,MOA
      IF(PRMN.LE.20..AND.PRMN.GE.5.) WRITE 4010,MNP,MEAN,MNA
      WRITE 3060,C5,C5A
 3060 FORMAT(10X,*5%*,18X,F15.3,11X,F15.3)
      IF(PRMO.LE.5.) WRITE 4000,MOP,MODE,MOA
      IF(PRMN.LE.5.) WRITE 4010,MNP,MEAN,MNA
      WRITE 3070,TOP,TOPA
 3070 FORMAT(10X,*0%*,18X,F15.3,11X,F15.3)
      WRITE 2030
      WRITE 2010
      RETURN
      END
```

```
      SUBROUTINE TABL1(NF,FIELD,MAGO,UNITO,ORISK,OILVAL,CD,TYPO,
     +NUMO,OFREQ)
      COMMON GCF,OCF
      DIMENSION FIELD(50,8),ORISK(50),OILVAL(50,15),TYPO(50)
      DIMENSION IOIL(6),CD(8),A(6),MAGO(50),UNITO(50)
      DIMENSION NUMO(50),OFREQ(50,15),D(15),F(15)
      REAL MODE,MEAN
      INTEGER SUM1,SUM2,UNITO
C
C*************************************************************
C
C      'TABL1' PRODUCES A TABLE OF VALUES FROM THE ORIGINAL INPUT
C              DATA.  RESOURCE FIGURES ARE CONVERTED FROM BARRELS TO
C              CUBIC METRES, OR VICE VERSA, AND EXPRESSED AS ROUNDED
C              INTEGERS.  THE MEAN OF EACH DISTRIBUTION IS THEN CALCULATED
C              AND MULTIPLIED BY THE APPROPRIATE EXISTENCE RISK.  THE
C              'RISKED' MEANS ARE THEN SUMMED AND REPORTED.
C
C                    VARIABLES
C                    ---------
C
C     A      =  OIL VOLUMES IN AMERICAN UNITS
C     B      =  RISKED DISTRIBUTION MEAN
C     CD     =  COMPILATION DATE
C     CG     =  CENTER OF GRAVITY OF DISTRIBUTION SEGMENT
C     D      =  STANDARDIZED DENSITY OF CURVE SEGMENT
C     F      =  TEMPORARY HOLDER FOR OFREQ
C     FIELD  =  FIELD OR BASIN NAME
C     GCF    =  GAS CONVERSION FACTOR
C     I      =  LOOP COUNTER, SUBSCRIPT
C     IOIL   =  INTEGER EQUIVALENT OF 'A'
C     J      =  SUBSCRIPT
C     K      =  SUBSCRIPT
C     L      =  SUBSCRIPT
C     MAGO   =  ORDER OF MAGNITUDE OF INPUT DATA
C     MEAN   =  MEAN
C     MODE   =  MODE
C     M1     =  INTEGER EQUIVALENT OF 'B'
C     M2     =  INTEGER EQUIVALENT OF 'B' CONVERTED TO AMERICAN UNITS
C     NF     =  NUMBER OF BASINS
C     NUMO   =  NUMBER OF VALUES IN OIL DISTRIBUTION
C     OCF    =  OIL CONVERSION FACTOR
C     OFREQ  =  OIL PROBABILITY
C     OILVAL=  OIL VOLUME VALUE
C     ORISK  =  OIL EXISTENCE RISK
C     SUM    =  TOTAL DENSITY OF CURVE
C     SUM1   =  SUM OF THE M1'S
C     SUM2   =  SUM OF THE M2'S
C     TYPE   =  TYPE OF INPUT DISTRIBUTION
C     UNITO  =  UNIT OF VOLUMETRIC MEASURE
C
```

```
C*************************************************************************
C
C          INITIALIZE VARIABLES
C
      SUM1=0
      SUM2=0
      MEAN=0.0
C
C          WRITE MAIN HEADING
C
      WRITE 3000,(CD(J),J=1,5)
 3000 FORMAT(1H1,44X,*TABLE 1 -- UNDISCOVERED OIL, *,5A10,//,1X,
     +134(*-*))
      WRITE 3010
 3010 FORMAT(21X,*EXISTENCE*,81X,*EXISTENCE RISK X*)
      WRITE 3020
 3020 FORMAT(8X,*BASIN*,10X,*RISK*,11X,*MINIMUM*,16X,*MOST LIKELY*,18X,
     + *MAXIMUM*,15X,*MEAN ESTIMATE*)
      WRITE 3030
 3030 FORMAT(7X,7(*-*),7X,9(*-*),1X,23(*-*),3X,21(*-*),5X,23(*-*),3X,
     +  22(*-*))
      WRITE 3040
 3040 FORMAT(25X,4(9X,*6*,12X,*6  3*),/,24X,4(8X,*10  BBL*,6X,*10  M*))
      WRITE 3050
 3050 FORMAT(1X,134(*-*))
C
C          SELECT ONLY THOSE DATA SETS WHERE OIL RESOURCES OCCUR.
C          FIND OUT WHAT UNITS THE INPUT DATA ARE IN AND POSITION
C          THE DATA ACCORDINGLY.
C          CONVERT DATA UNITS AND CONVERT DATA TO INTEGER TYPE
C          ROUNDING UP IF THE DECIMAL PART IS GREATER THAN 0.5.
C          CALCULATE THE MEAN OF EACH DATA SET IN BOTH METRIC AND
C          NON-METRIC UNITS.
C          MULTIPLY EACH MEAN BY THE ASSOCIATED EXISTENCE RISK AND
C          SUM THE 'RISKED' MEANS.
C
      DO 2000 I=1,NF
      IF(ORISK(I).LE.0.0) GO TO 2000
      IF(UNITO(I).EQ.1HM) GO TO 1000
      IF(TYPO(I).EQ.1HK) GO TO 10
      IF(TYPO(I).EQ.1HU) GO TO 30
      IF(TYPO(I).EQ.1HT) GO TO 40
      IF(TYPO(I).EQ.1HC) GO TO 60
      GO TO 80
C
C          CONSTANT
C
   10 DO 20 J=1,5,2
      A(J)=OILVAL(I,1)
      A(J+1)=A(J)/OCF
   20 CONTINUE
```

```
      DO 25 J=1,6
      IOIL(J)=A(J)+0.5
   25 CONTINUE
      GO TO 1900
C
C          UNIFORM DISTRIBUTION
C
   30 A(1)=OILVAL(I,1)
      A(2)=A(1)/OCF
      A(3)=(OILVAL(I,1)+OILVAL(I,2))/2.
      A(4)=A(3)/OCF
      A(5)=OILVAL(I,2)
      A(6)=A(5)/OCF
      DO 35 J=1,6
      IOIL(J)=A(J)+0.5
   35 CONTINUE
      GO TO 1900
C
C          TRIANGULAR DISTRIBUTION
C
   40 K=0
      DO 50 J=1,5,2
      K=K+1
      A(J)=OILVAL(I,K)
      A(J+1)=A(J)/OCF
   50 CONTINUE
      DO 55 J=1,6
      IOIL(J)=A(J)+0.5
   55 CONTINUE
      GO TO 1900
C
C          CUMULATIVE PROBABILITY DISTRIBUTION
C
   60 K=NUMO(I)
      J=K
      F(1)=OFREQ(I,1)
      DO 70 L=2,K
      F(J)=OFREQ(I,J)-OFREQ(I,J-1)
      J=J-1
   70 CONTINUE
      GO TO 100
C
C          FREQUENCY OR PROBABILITY DISTRIBUTION
C
   80 K=NUMO(I)
      DO 90 L=1,K
      F(L)=OFREQ(I,L)
   90 CONTINUE
  100 SUM=0.0
      DO 110 J=2,K
      IF(F(J).GE.F(J-1)) MODE=OILVAL(I,J)
```

```
      D(J-1)=((F(J-1)+F(J))/2.)*(OILVAL(I,J)-OILVAL(I,J-1))
      SUM=SUM+D(J-1)
  110 CONTINUE
      DO 120 L=2,K
      IF(F(L-1).LE.F(L)) GO TO 130
      CG=(2*OILVAL(I,L-1)+OILVAL(I,L))/3.
      GO TO 150
  130 IF(F(L-1).EQ.F(L)) GO TO 140
      CG=(2*OILVAL(I,L)+OILVAL(I,L-1))/3.
      GO TO 150
  140 CG=(OILVAL(I,L-1)+OILVAL(I,L))/2.
  150 MEAN=MEAN+(CG*D(L-1)/SUM)
  120 CONTINUE
      IF(UNITO(I).EQ.1HM) GO TO 1090
      B=MEAN*ORISK(I)
      M1=B+0.5
      SUM1=SUM1+M1
      M2=B/OCF+0.5
      SUM2=SUM2+M2
      A(1)=OILVAL(I,1)
      A(3)=MODE
      A(5)=OILVAL(I,K)
      DO 125 J=1,5,2
      A(J+1)=A(J)/OCF
      IOIL(J)=A(J)+0.5
      IOIL(J+1)=A(J+1)+0.5
  125 CONTINUE
      GO TO 1950
C
C          RESOURCES ARE IN METRIC UNITS
C
 1000 IF(TYPO(I).EQ.1HK) GO TO 1010
      IF(TYPO(I).EQ.1HU) GO TO 1030
      IF(TYPO(I).EQ.1HT) GO TO 1040
      IF(TYPO(I).EQ.1HC) GO TO 60
      GO TO 80
C
C          CONSTANT
C
 1010 DO 1020 J=1,5,2
      A(J+1)=OILVAL(I,1)
      A(J)=A(J+1)*OCF
 1020 CONTINUE
      DO 1025 J=1,6
      IOIL(J)=A(J)+0.5
 1025 CONTINUE
      GO TO 1900
C
C          UNIFORM DISTRIBUTION
C
 1030 A(2)=OILVAL(I,1)
```

```
      A(1)=A(2)*OCF
      A(4)=(OILVAL(I,1)+OILVAL(I,2))/2.
      A(3)=A(4)*OCF
      A(6)=OILVAL(I,2)
      A(5)=A(6)*OCF
      DO 1035 J=1,6
      IOIL(J)=A(J)+0.5
 1035 CONTINUE
      GO TO 1900
C
C          TRIANGULAR DISTRIBUTION
C
 1040 K=0
      DO 1050 J=1,5,2
      K=K+1
      A(J+1)=OILVAL(I,K)
      A(J)=A(J+1)*OCF
 1050 CONTINUE
      DO 1055 J=1,6
      IO1L(J)=A(J)+0.5
 1055 CONTINUE
      GO TO 1900
 1090 B=MEAN*ORISK(I)
      M1=B+0.5
      SUM1=SUM1+M1
      M2=B*OCF+0.5
      SUM2=SUM2+M2
      A(2)=OILVAL(I,1)
      A(4)=MODE
      A(6)=OILVAL(I,K)
      DO 1095 J=1,5,2
      A(J)=A(J+1)*OCF
 1095 CONTINUE
      DO 1100 J=1,6
      IOIL(J)=A(J)+0.5
 1100 CONTINUE
      GO TO 1950
 1900 B=((A(1)+A(3)+A(5))/3.)*ORISK(I)
      IF(B.LT.0.5) GO TO 1910
      M1=B+0.5
      GO TO 1920
 1910 M1=B
 1920 SUM1=SUM1+M1
      B=((A(2)+A(4)+A(6))/3.)*ORISK(I)
      IF(B.LT.0.5) GO TO 1930
      M2=B+0.5
      GO TO 1940
 1930 M2=B
 1940 SUM2=SUM2+M2
 1950 WRITE 3060,(FIELD(I,J),J=1,2),ORISK(I),(IOIL(J),J=1,6),M1,M2
 3060 FORMAT(1X,2A10,2X,F4.2,5X,8(I5,3X))
```

```
      WRITE 3070,(FIELD(I,J),J=3,4)
 3070 FORMAT(1X,2A10)
 2000 CONTINUE
C
      WRITE 3050
      WRITE 3080,SUM1,SUM2
 3080 FORMAT(109X,I6,7X,I6)
      WRITE 3050
      RETURN
      END
```

```
      SUBROUTINE TABL2(NF,FIELD,MAGG,UNITG,GRISK,GASVAL,CD,TYPG,
     +NUMG,GFREQ)
      COMMON GCF,OCF
      DIMENSION FIELD(50,8),MAGG(50),UNITG(50),GRISK(50),GASVAL(50,15)
      DIMENSION IGAS(6),CD(8),A(6),TYPG(50)
      DIMENSION NUMG(50),GFREQ(50,15),D(15),F(15)
      REAL M1,MODE,MEAN
      INTEGER SUM2,UNITG
C
C*************************************************************************
C
C     'TABL2' PRODUCES A TABLE OF VALUES FROM THE ORIGINAL INPUT
C             DATA.  RESOURCE FIGURES ARE CONVERTED FROM CUBIC FEET TO
C             METRES, OR VICE VERSA, WITH VALUES IN CUBIC FEET EXPRESSED
C             AS FLOATING POINT NUMBERS TO ONE DECIMAL PLACE AND VALUES
C             IN CUBIC METRES EXPRESSED AS ROUNDED INTEGERS.  THE MEAN
C             OF EACH DISTRIBUTION IS THEN CALCULATED AND MULTIPLIED BY
C             THE APPROPRIATE EXISTENCE RISK.  THE 'RISKED' MEANS ARE
C             THEN SUMMED AND REPORTED.
C
C                    VARIABLES
C                    ---------
C
C     A      =  GAS VOLUMES IN AMERICAN UNITS
C     B      =  RISKED DISTRIBUTION MEAN
C     CD     =  COMPILATION DATE
C     CG     =  CENTER OF GRAVITY OF DISTRIBUTION SEGMENTS
C     D      =  STANDARDIZED DENSITY OF CURVE SEGMENT
C     F      =  TEMPORARY HOLDER FOR GFREQ
C     FIELD  =  FIELD OR BASIN NAME
C     GASVAL=  GAS VOLUME VALUE
C     GCF    =  GAS CONVERSION FACTOR
C     GFREQ  =  GAS PROBABILITY
C     GRISK  =  GAS EXISTENCE RISK
C     I      =  LOOP COUNTER, SUBSCRIPT
C     IGAS   =  INTEGER EQUIVALENT OF 'A'
C     J      =  SUBSCRIPT
C     K      =  SUBSCRIPT
C     L      =  SUBSCRIPT
C     MAGG   =  ORDER OF MAGNITUDE OF INPUT DATA
C     MEAN   =  MEAN
C     MODE   =  MODE
C     M1     =  INTEGER EQUIVALENT OF 'B'
C     M2     =  INTEGER EQUIVALENT OF 'B' CONVERTED TO AMERICAN UNITS
C     NF     =  NUMBER OF BASINS
C     NUMG   =  NUMBER OF GAS VALUES
C     OCF    =  OIL CONVERSION FACTOR
C     SUM    =  TOTAL DENSITY OF CURVE
C     SUM1   =  SUM OF THE M1'S
C     SUM2   =  SUM OF THE M2'S
C     TYPG   =  TYPE OF INPUT DISTRIBUTION
```

```
C     UNITG =  UNIT OF VOLUMETRIC MEASURE
C
C*****************************************************************
C
      MEAN=0.0
      SUM1=0.0
      SUM2=0
      WRITE 3000,(CD(J),J=1,5)
 3000 FORMAT(1H1,44X,*TABLE 2 -- UNDISCOVERED GAS, *,5A10,//,1X,
     +134(*-*))
      WRITE 3010
 3010 FORMAT(21X,*EXISTENCE*,81X,*EXISTENCE RISK X*)
      WRITE 3020
 3020 FORMAT(8X,*BASIN*,10X,*RISK*,11X,*MINIMUM*,16X,*MOST LIKELY*,18X,
     + *MAXIMUM*,15X,*MEAN ESTIMATE*)
      WRITE 3030
 3030 FORMAT(7X,7(*-*),7X,9(*-*),1X,23(*-*),3X,21(*-*),5X,23(*-*),3X,
     + 22(*-*))
      WRITE 3040
 3040 FORMAT(25X,4(22X,*9  3*),/,24X,4(10X,*TCF*,8X,*10  M*))
      WRITE 3050
 3050 FORMAT(1X,134(*-*))
      DO 2000 I=1,NF
C
C          SKIP DATA SETS WHERE RESOURCE IS NONEXISTENT
C
      IF(GRISK(I).LE.0.0) GO TO 2000
C
C          ARE RESOURCE FIGURES IN METRIC UNITS?
C
      IF(UNITG(I).EQ.1HM) GO TO 1000
C
C          RESOURCE FIGURES ARE IN CUBIC FEET
C
      IF(TYPG(I).EQ.1HK) GO TO 10
      IF(TYPG(I).EQ.1HU) GO TO 30
      IF(TYPG(I).EQ.1HT) GO TO 40
      IF(TYPG(I).EQ.1HC) GO TO 60
      GO TO 80
C
C          CONSTANT
C
   10 DO 20 J=1,5,2
      A(J)=GASVAL(I,1)
      A(J+1)=A(J)/GCF
      IGAS(J+1)=A(J+1)+0.5
   20 CONTINUE
      GO TO 1900
C
C          UNIFORM DISTRIBUTION
C
```

```
     30 A(1)=GASVAL(I,1)
        A(2)=A(1)/GCF
        IGAS(2)=A(2)+0.5
        A(3)=(GASVAL(I,1)+GASVAL(I,2))/2.
        A(4)=A(3)/GCF
        IGAS(4)=A(4)+0.5
        A(5)=GASVAL(I,2)
        A(6)=A(5)/GCF
        IGAS(6)=A(6)+0.5
        GO TO 1900
C
C            TRIANGULAR DISTRIBUTION
C
     40 K=0
        DO 50 J=1,5,2
        K=K+1
        A(J)=GASVAL(I,K)
        A(J+1)=A(J)/GCF
        IGAS(J+1)=A(J+1)+0.5
     50 CONTINUE
        GO TO 1900
C
C            CUMULATIVE PROBABILITY DISTRIBUTION
C
     60 K=NUMG(I)
        J=K
        F(1)+GFREQ(I,1)
        DO 70 L=2,K
        F(J)=GFREQ(I,J)-GFREQ(I,J-1)
        J=J-1
     70 CONTINUE
        GO TO 100
     80 K=NUMG(I)
        DO 90 L=1,K
        F(L)=GFREQ(I,L)
     90 CONTINUE
    100 SUM=0.0
        DO 110 J=2,K
        IF(F(J).GE.F(J-1)) MODE=GASVAL(I,J)
        D(J-1)=((F(J-1)+F(J))/2.)*(GASVAL(I,J)-GASVAL(I,J-1))
        SUM=SUM+D(J-1)
    110 CONTINUE
        DO 120 L=2,K
        IF(F(L-1).LE.F(L)) GO TO 130
        CG=(2*GASVAL(I,L-1)+GASVAL(I,L))/3.
        GO TO 150
    130 IF(F(L-1).EQ.F(L)) GO TO 140
        CG=(2*GASVAL(I,L)+GASVAL(I,L-1))/3.
        GO TO 150
    140 CG=(GASVAL(I,L-1)+GASVAL(L))/2.
    150 MEAN=MEAN+(CG*D(L-1)/SUM)
```

```
  120 CONTINUE
      IF(UNITG(I).EQ.1HM) GO TO 1090
      M1=MEAN*GRISK(I)
      SUM1=SUM1+M1
      M2=(M1/GCF)+0.5
      SUM2=SUM2+M2
      A(1)=GASVAL(I,1)
      IGAS(2)=(A(1)/GCF)+0.5
      A(3)=MODE
      IGAS(4)=(A(3)/GCF)+0.5
      A(5)=GASVAL(I,K)
      IGAS(6)=(A(5)/GCF)+0.5
      GO TO 1950
C
C          RESOURCE FIGURES ARE METRIC
C
 1000 IF(TYPG(I).EQ.1HK) GO TO 1010
      IF(TYPG(I).EQ.1HU) GO TO 1030
      IF(TYPG(I).EQ.1HT) GO TO 1040
      IF(TYPG(I).EQ.1HC) GO TO 60
      GO TO 80
C
C          CONSTANT
C
 1010 DO 1020 J=1,5,2
      A(J+1)=GASVAL(I,1)
      A(J)=A(J+1)*GCF
      IGAS(J+1)=A(J)+0.5
 1920 CONTINUE
      GO TO 1900
C
C          UNIFORM DISTRIBUTION
C
 1030 A(2)= GASVAL(I,1)
      A(1)=A(2)*GCF
      IGAS(2)=A(1)+0.5
      A(4)=(GASVAL(I,1)+GASVAL(I,2))/2.
      A(3)=A(4)*GCF
      IGAS(4)=A(3)*GCF
      A(6)=GASVAL(I,2)
      A(5)=A(6)*GCF
      IGAS(6)=A(6)*GCF
      GO TO 1900
C
C          TRIANGULAR DISTRIBUTION
C
 1040 K=0
      DO 1050 J=1,5,2
      K=K+1
      A(J+1)=GASVAL(I,K)
      A(J)=A(J+1)*GCF
```

```
      IGAS(J+1)=A(J+1)*GCF
 1050 CONTINUE
      GO TO 1900
 1090 M1=SUM*GRISK(I)
      SUM1=SUM1+M1
      M2=(M1*GCF)+0.5
      SUM2=SUM2+M2
      A(1)=GASVAL(I,1)*GCF
      IGAS(2)=A(1)+0.5
      A(3)=MODE*GCF
      IGAS(4)=A(3)+0.5
      A(5)=GASVAL(I,K)*GCF
      IGAS(6)=A(5)+0.5
      GO TO 1950
C
C          CALCULATE INDIVIDUAL RISKED MEANS AND SUM
C
1900 M1=((A(1)+A(3)+A(5))/3.)*GRISK(1)
      SUM1=SUM1+M1
      B=((A(2)+A(4)+A(6))/3.)*GRISK(I)
      IF(B.LT.0.5) GO TO 1910
      M2=B+0.5
      GO TO 1920
 1910 M2=B
 1920 SUM2=SUM2+M2
C
C          WRITE THE BODY OF THE TABLE
C
 1950 WRITE 3060,(FIELD(I,J),J=1,2),GRISK(I),A(1),IGAS(2),A(3),
     +IGAS(4),A(5),IGAS(6),M1,M2
 3060 FORMAT(1X,2A10,2X,F4.2,5X,3(F5.1,8X,I5,8X),F5.1,8X,I5)
      WRITE 3070,(FIELD(I,J),J=3,4)
 3070 FORMAT(1X,2A10)
 2000 CONTINUE
C
C          FINISH THE TABLE
C
      WRITE 3050
      WRITE 3080,SUM1,SUM2
 3080 FORMAT(109X,F6.1,7X,I6)
      WRITE 3050
      RETURN
      END
```

```
      SUBROUTINE OCON(I,N,VAL)
      COMMON GCF,OCF
      DIMENSION N(50),VAL(50,15)
C
C*****************************************************************
C
C          'OCON' CONVERTS OIL VALUES FROM BARRELS TO CUBIC
C                 METRES
C
C                    VARIABLES
C                    ---------
C
C     GCF    =  GAS CONVERSION FACTOR
C     I      =  SUBSCRIPT
C     J      =  LOOP COUNTER AND SUBSCRIPT
C     M      =  NUMBER OF VALUES
C     N      =  NUMBER OF VALUES
C     OCF    =  OIL CONVERSION FACTOR
C     VAL    =  VALUE
C
C*****************************************************************
C
      M=N(I)
      DO 10 J=1,M
      VAL(I,J)=VAL(I,J)/OCF
   10 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE GCON(I,N,VAL)
      COMMON GCF,OCF
      DIMENSION N(50),VAL(50,15)
C
C*****************************************************************
C
C          'GCON' CONVERTS GAS VALUES FROM CUBIC FEET TO CUBIC
C                 METRES
C
C                    VARIABLES
C                    ---------
C
C     GCF   = GAS CONVERSION FACTOR
C     I     =  BASIN IDENTIFIER
C     J     =  LOOP COUNTER AND SUBSCRIPT
C     M     =  LOCAL VALUE OF 'N'
C     N     =  NUMBER OF VALUES
C     OCF   =  OIL CONVERSION FACTOR
C     VAL   =  GAS VALUE
C
C*****************************************************************
C
      M=N(I)
      DO 10 J=1,M
      VAL(I,J)=VAL(I,J)/GCF
   10 CONTINUE
      RETURN
      END
```

APPENDIX 2

```
DEMONSTRATION AND TEST DATA ONLY
E.L. SMITH, DEMONSTRATION AND TEST DATA ONLY
14 SEPTEMBER 1981
25
FIRST BASIN
T 3 6B0.10 30.0          50.0          110.0
T 3 9F0.80 0.15          0.25          0.8
SECOND BASIN
T 3 6B0.20 40.0          70.0          385.0.
T 3 9F0.20 0.3           0.5           2.15
THIRD BASIN

T 3 9F0.10 0.2           0.3           0.6
FOURTH BASIN
T 3 6B0.10 20.0          70.0          150.0
T 3 9F0.05 0.1           0.3           0.6
FIFTH BASIN
T 3 6B0.05 40.0          50.0          80.0
T 3 9F0.80 0.2           0.4           1.5
SIXTH BASIN
T 3 6B0.40 100.0         300.0         5750.0
T 3 9F1.00 2.0           7.0           24.8
SEVENTH BASIN
T 3 6B0.50 20.0          70.0          150.0.
T 3 9F1.00 0.2           0.5           1.0
EIGHTH BASIN
T 3 6B0.01 50.0          60.0          70.0
T 3 9F0.10 0.2           0.3           1.0
NINTH BASIN
T 3 6B0.10 290.0         399.0         1912.0

TENTH BASIN
T 3 6B0.10 75.0          120.0         300.0
T 3 9F0.20 0.2           1.8           4.83
ELEVENTH BASIN
T 3 6B0.10 50.0          100.0         30
T 3 9F0.10 0.3           0.5           2.(
TWELFTH BASIN
T 3 6B0.80 100.0         300.0         1000.0
T 3 9F1.00 2.0           5.0           8.0
THIRTEENTH BASIN
T 3 6B0.10 50.0          500.0         1000.0

FOURTEENTH BASIN

T 3 9F0.50 0.2           0.3           0.5
FIFTEENTH BASIN
T 3 6B1.00 12.0          27.0          54.0
T 3 9F1.00 0.51          2.0           4.98
```

```
SIXTEENTH BASIN

T 3 9F0.05 0.1                  0.3                     0.5
SEVENTEENTH BASIN
T 3 6B0.01 20.0                 30.0                    50.0
T 3 9F0.10 0.1                  0.3                     0.5
EIGHTEENTH BASIN
  4 6B0.45 20.      0.0         100.0       1.0         300.0       0.2         1000.
0.0
T 3 9F0.20 0.5                  1.0                     3.0
NINETEENTH BASIN
T 3 6B0.10 30.0                 300.0                   100.0

TWENTIETH BASIN
T 3 6B0.10 30.0                 80.0                    200.0
T 3 9F0.10 0.2                  0.3                     0.8
TWENTY-FIRST BASIN
T 3 6B0.01 40.0                 50.0                    60.0
T 3 9F0.20 0.2                  1.3                     3.2
TWENTY-SECOND BASIN
T 3 6B1.00 30.0                 100.0                   200.0
T 3 9F1.00 0.5                  1.2                     4.0
TWENTY-THIRD BASIN
T 3 6B0.01 50.0                 70.0                    100.0
T 3 9F0.10 0.2                  0.5                     2.0
TWENTY-FOURTH BASIN
T 3 6B0.05 50.0                 100.0                   300.0
T 3 9F0.05 0.2                  1.0                     2.5
TWENTY-FIFTH BASIN
T 3 6B0.05 50.0                 60.0                    100.0
T 3 9F0.05 0.2                  0.4                     0.6
```

APPENDIX 3

TABLE 1 -- UNDISCOVERED OIL, 14 SEPTEMBER 1981

| BASIN | EXISTENCE RISK | MINIMUM | | MOST LIKELY | | MAXIMUM | | EXISTENCE RISK X MEAN ESTIMATE | |
|---|---|---|---|---|---|---|---|---|---|
| | | $10^6$ BBL | $10^3$ M | $10^6$ BBL | $10^3$ M | $10^6$ BBL | $10^3$ M | $10^6$ BBL | $10^3$ M |
| FIRST BASIN | .10 | 30 | 5 | 50 | 8 | 110 | 17 | 6 | 1 |
| SECOND BASIN | .20 | 40 | 6 | 70 | 11 | 385 | 61 | 33 | 5 |
| FOURTH BASIN | .10 | 20 | 3 | 70 | 11 | 150 | 24 | 8 | 1 |
| FIFTH BASIN | .05 | 40 | 6 | 50 | 8 | 80 | 13 | 3 | 0 |
| SIXTH BASIN | .40 | 100 | 16 | 300 | 48 | 5750 | 914 | 820 | 130 |
| SEVENTH BASIN | .50 | 20 | 3 | 70 | 11 | 150 | 24 | 40 | 6 |
| EIGHTH BASIN | .01 | 50 | 8 | 60 | 10 | 70 | 11 | 1 | 0 |
| NINTH BASIN | .10 | 290 | 46 | 399 | 63 | 1912 | 304 | 87 | 14 |
| TENTH BASIN | .10 | 75 | 12 | 120 | 19 | 300 | 48 | 17 | 3 |
| ELEVENTH BASIN | .10 | 50 | 8 | 100 | 16 | 300 | 48 | 15 | 2 |
| TWELFTH BASIN | .80 | 100 | 16 | 300 | 48 | 1000 | 159 | 373 | 59 |
| THIRTEENTH BASIN | .10 | 50 | 8 | 500 | 79 | 1000 | 159 | 52 | 8 |
| FIFTEENTH BASIN | 1.00 | 12 | 2 | 27 | 4 | 54 | 9 | 31 | 5 |
| SEVENTEENTH BASIN | .01 | 20 | 3 | 30 | 5 | 50 | 8 | 0 | 0 |
| EIGHTEENTH BASIN | .45 | 20 | 3 | 100 | 16 | 1000 | 159 | 118 | 19 |
| NINETEENTH BASIN | .10 | 30 | 5 | 300 | 48 | 100 | 16 | 14 | 2 |
| TWENTIETH BASIN | .10 | 30 | 5 | 80 | 13 | 200 | 32 | 10 | 2 |
| TWENTY-FIRST BASIN | .01 | 40 | 6 | 50 | 8 | 60 | 10 | 1 | 0 |
| TWENTY-SECOND BASIN | 1.00 | 30 | 5 | 100 | 16 | 200 | 32 | 110 | 17 |
| TWENTY-THIRD BASIN | .01 | 50 | 8 | 70 | 11 | 100 | 16 | 1 | 0 |
| TWENTY-FOURTH BASIN | .05 | 50 | 8 | 100 | 16 | 300 | 48 | 8 | 1 |
| TWENTY-FIFTH BASIN | .05 | 50 | 8 | 60 | 10 | 100 | 16 | 4 | 1 |
| | | | | | | | | 1752 | 276 |

TABLE 2 -- UNDISCOVERED GAS, 14 SEPTEMBER 1981

| BASIN | EXISTENCE RISK | MINIMUM | | MOST LIKELY | | MAXIMUM | | EXISTENCE RISK X MEAN ESTIMATE | |
|---|---|---|---|---|---|---|---|---|---|
| | | TCF | $10^9$ M$^3$ | TCF | $10^9$ M$^3$ | TCF | $10^9$ M$^3$ | TCF | $10^9$ M$^3$ |
| FIRST BASIN | .80 | .2 | 4 | .3 | 7 | .8 | 23 | .3 | 9 |
| SECOND BASIN | .20 | .3 | 8 | .5 | 14 | 2.2 | 61 | .2 | 6 |
| THIRD BASIN | .10 | .2 | 6 | .3 | 8 | .6 | 17 | .0 | 1 |
| FOURTH BASIN | .05 | .1 | 3 | .3 | 8 | .6 | 17 | .0 | 0 |
| FIFTH BASIN | .80 | .2 | 6 | .4 | 11 | 1.5 | 42 | .6 | 16 |
| SIXTH BASIN | 1.00 | 2.0 | 57 | 7.0 | 198 | 24.8 | 702 | 11.3 | 319 |
| SEVENTH BASIN | 1.00 | .2 | 6 | .5 | 14 | 1.0 | 28 | .6 | 16 |
| EIGHTH BASIN | .10 | .2 | 6 | .3 | 8 | 1.0 | 28 | .1 | 1 |
| TENTH BASIN | .20 | .2 | 6 | 1.8 | 51 | 4.8 | 137 | .5 | 13 |
| ELEVENTH BASIN | .10 | .3 | 8 | .5 | 14 | 2.0 | 57 | .1 | 3 |
| TWELFTH BASIN | 1.00 | 2.0 | 57 | 5.0 | 142 | 8.0 | 227 | 5.0 | 142 |
| FOURTEENTH BASIN | .50 | .2 | 6 | .3 | 8 | .5 | 14 | .2 | 5 |
| FIFTEENTH BASIN | 1.00 | .5 | 14 | 2.0 | 57 | 5.0 | 141 | 2.5 | 71 |
| SIXTEENTH BASIN | .05 | .1 | 3 | .3 | 8 | .5 | 14 | .0 | 0 |
| SEVENTEENTH BASIN | .10 | .1 | 3 | .3 | 8 | .5 | 14 | .0 | 1 |
| EIGHTEENTH BASIN | .20 | .5 | 14 | 1.0 | 28 | 3.0 | 85 | .3 | 8 |
| TWENTIETH BASIN | .10 | .2 | 6 | .3 | 8 | .8 | 23 | .0 | 1 |
| TWENTY-FIRST BASIN | .20 | .2 | 6 | 1.3 | 37 | 3.2 | 91 | .3 | 9 |
| TWENTY-SECOND BASIN | 1.00 | .5 | 14 | 1.2 | 34 | 4.0 | 113 | 1.9 | 54 |
| TWENTY-THIRD BASIN | .10 | .2 | 6 | .5 | 14 | 2.0 | 57 | .1 | 3 |
| TWENTY-FOURTH BASIN | .05 | .2 | 6 | 1.0 | 28 | 2.5 | 71 | .1 | 2 |
| TWENTY-FIFTH BASIN | .05 | .2 | 6 | .4 | 11 | .6 | 17 | .0 | 1 |
| | | | | | | | | 24.0 | 681 |

UNDISCOVERED OIL RESOURCES OF AUSTRALIA

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FIRST BASIN | 4.770 | 5.406 | 6.042 | 6.677 | 7.313 | 7.949 | 7.949 | 8.585 | 9.221 | 9.857 | 10.493 |
| | 11.129 | 11.765 | 12.401 | 13.037 | 13.673 | 14.309 | 14.945 | 15.581 | 16.217 | 16.853 | 17.489 |
| | 0.000 | .010 | .040 | .090 | .160 | .250 | .250 | .347 | .437 | .520 | .597 |
| | .667 | .730 | .787 | .837 | .880 | .917 | .947 | .970 | .987 | .997 | 1.000 |
| SECOND BASIN | 6.359 | 9.102 | 11.129 | 11.845 | 14.587 | 17.330 | 20.072 | 22.815 | 25.557 | 28.300 | 31.042 |
| | 33.785 | 36.527 | 39.270 | 42.012 | 44.755 | 47.497 | 50.240 | 52.983 | 55.725 | 58.468 | 61.210 |
| | 0.000 | .029 | .087 | .113 | .209 | .299 | .384 | .463 | .537 | .606 | .669 |
| | .726 | .778 | .825 | .866 | .901 | .932 | .956 | .975 | .989 | .997 | 1.000 |
| FOURTH BASIN | 3.180 | 4.213 | 5.247 | 6.280 | 7.313 | 8.347 | 9.380 | 10.414 | 11.129 | 11.447 | 12.481 |
| | 13.514 | 14.547 | 15.581 | 16.614 | 17.648 | 18.681 | 19.714 | 20.748 | 21.781 | 22.815 | 23.848 |
| | 0.000 | .006 | .026 | .058 | .104 | .163 | .234 | .318 | .385 | .415 | .508 |
| | .594 | .671 | .740 | .801 | .854 | .898 | .935 | .963 | .984 | .996 | 1.000 |
| FIFTH BASIN | 6.359 | 6.677 | 6.995 | 7.313 | 7.631 | 7.949 | 7.949 | 8.267 | 8.585 | 8.903 | 9.221 |
| | 9.539 | 9.857 | 10.175 | 10.493 | 10.811 | 11.129 | 11.447 | 11.765 | 12.083 | 12.401 | 12.719 |
| | 0.000 | .010 | .040 | .090 | .160 | .250 | .250 | .347 | .437 | .520 | .597 |
| | .667 | .730 | .787 | .837 | .880 | .917 | .947 | .970 | .987 | .997 | 1.000 |
| SIXTH BASIN | 15.899 | 47.696 | 60.813 | 105.727 | 150.640 | 195.554 | 240.468 | 285.382 | 330.296 | 375.210 | 420.124 |
| | 465.038 | 509.952 | 554.866 | 599.780 | 644.694 | 689.607 | 734.521 | 779.435 | 824.349 | 869.263 | 914.177 |
| | 0.000 | .035 | .064 | .160 | .251 | .337 | .417 | .492 | .562 | .627 | .686 |
| | .741 | .790 | .834 | .873 | .907 | .935 | .959 | .977 | .990 | .997 | 1.000 |
| SEVENTH BASIN | 3.180 | 4.213 | 5.247 | 6.280 | 7.313 | 8.347 | 9.380 | 10.414 | 11.129 | 11.447 | 12.481 |
| | 13.514 | 14.547 | 15.581 | 16.614 | 17.648 | 18.681 | 19.714 | 20.748 | 21.781 | 22.815 | 23.848 |
| | 0.000 | .006 | .026 | .058 | .104 | .163 | .234 | .318 | .385 | .415 | .508 |
| | .594 | .671 | .740 | .801 | .854 | .898 | .935 | .963 | .984 | .996 | 1.000 |
| EIGHTH BASIN | 7.949 | 8.108 | 8.267 | 8.426 | 8.585 | 8.744 | 8.903 | 9.062 | 9.221 | 9.380 | 9.539 |
| | 9.539 | 9.698 | 9.857 | 10.016 | 10.175 | 10.334 | 10.493 | 10.652 | 10.811 | 10.970 | 11.129 |
| | 0.000 | .005 | .020 | .045 | .080 | .125 | .180 | .245 | .320 | .405 | .500 |
| | .500 | .595 | .680 | .755 | .820 | .875 | .920 | .955 | .980 | .995 | 1.000 |
| NINTH BASIN | 46.106 | 59.000 | 63.436 | 71.894 | 84.788 | 97.682 | 110.576 | 123.470 | 136.363 | 149.257 | 162.151 |
| | 175.045 | 187.939 | 200.833 | 213.727 | 226.620 | 239.514 | 252.408 | 265.302 | 278.196 | 291.090 | 303.984 |
| | 0.000 | .037 | .067 | .132 | .225 | .314 | .397 | .475 | .547 | .614 | .676 |
| | .732 | .783 | .828 | .869 | .904 | .933 | .957 | .976 | .989 | .997 | 1.000 |
| TENTH BASIN | 11.924 | 13.713 | 15.501 | 17.290 | 19.078 | 19.078 | 20.867 | 22.656 | 24.444 | 26.233 | 28.022 |
| | 29.810 | 31.599 | 33.387 | 35.176 | 36.965 | 38.753 | 40.542 | 42.330 | 44.119 | 45.908 | 47.696 |
| | 0.000 | .013 | .050 | .113 | .200 | .200 | .297 | .388 | .472 | .550 | .622 |
| | .687 | .747 | .800 | .847 | .887 | .922 | .950 | .972 | .987 | .997 | 1.000 |
| ELEVENTH BASIN | 7.949 | 9.937 | 11.924 | 13.911 | 15.899 | 15.899 | 17.886 | 19.873 | 21.861 | 23.848 | 25.835 |
| | 27.823 | 29.810 | 31.797 | 33.785 | 35.772 | 37.759 | 39.747 | 41.734 | 43.722 | 45.709 | 47.696 |
| | 0.000 | .013 | .050 | .113 | .200 | .200 | .297 | .388 | .472 | .550 | .622 |
| | .688 | .747 | .800 | .847 | .888 | .922 | .950 | .972 | .988 | .997 | 1.000 |
| TWELFTH BASIN | 15.899 | 23.053 | 30.208 | 37.362 | 44.516 | 47.696 | 51.671 | 58.825 | 65.980 | 73.134 | 80.289 |
| | 87.443 | 94.597 | 101.752 | 108.906 | 116.061 | 123.215 | 130.370 | 137.524 | 144.678 | 151.833 | 158.987 |
| | 0.000 | .011 | .045 | .101 | .180 | .222 | .277 | .370 | .457 | .537 | .611 |
| | .679 | .740 | .794 | .842 | .884 | .920 | .949 | .971 | .987 | .997 | 1.000 |
| THIRTEENTH BASIN | 7.949 | 15.501 | 23.053 | 30.605 | 38.157 | 45.709 | 53.261 | 60.813 | 68.365 | 75.916 | 79.494 |
| | 83.468 | 91.020 | 98.572 | 106.124 | 113.676 | 121.228 | 128.780 | 136.332 | 143.884 | 151.435 | 158.987 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0.000 | .005 | .021 | .048 | .084 | .132 | .190 | .259 | .338 | .427 | .474 |
| | .525 | .615 | .696 | .767 | .829 | .881 | .924 | .957 | .981 | .995 | 1.000 |
| FIFTEENTH BASIN | 1.908 | 2.242 | 2.576 | 2.909 | 3.243 | 3.577 | 3.911 | 4.245 | 4.293 | 4.579 | 4.913 |
| | 5.247 | 5.580 | 5.914 | 6.248 | 6.582 | 6.916 | 7.250 | 7.584 | 7.918 | 8.251 | 8.585 |
| | 0.000 | .007 | .028 | .063 | .112 | .175 | .252 | .343 | .357 | .440 | .529 |
| | .611 | .685 | .751 | .809 | .860 | .903 | .938 | .965 | .984 | .996 | 1.000 |
| SEVENTEENTH BASIN | 3.180 | 3.418 | 3.657 | 3.895 | 4.134 | 4.372 | 4.611 | 4.770 | 4.849 | 5.088 | 5.326 |
| | 5.565 | 5.803 | 6.042 | 6.280 | 6.518 | 6.757 | 6.995 | 7.234 | 7.472 | 7.711 | 7.949 |
| | 0.000 | .008 | .030 | .068 | .120 | .188 | .270 | .333 | .366 | .460 | .546 |
| | .625 | .696 | .760 | .816 | .865 | .906 | .940 | .966 | .985 | .996 | 1.000 |
| EIGHTEENTH BASIN | 3.180 | 10.970 | 15.899 | 18.761 | 26.551 | 34.341 | 42.132 | 49.922 | 57.712 | 65.503 | 73.293 |
| | 81.084 | 88.874 | 96.664 | 104.455 | 112.245 | 120.035 | 127.826 | 135.616 | 143.407 | 151.197 | 158.987 |
| | 0.000 | .065 | .174 | .249 | .426 | .561 | .655 | .708 | .748 | .785 | .820 |
| | .851 | .879 | .905 | .927 | .946 | .963 | .976 | .987 | .994 | .999 | 1.000 |
| NINETEENTH BASIN | 4.770 | 5.326 | 5.883 | 6.439 | 6.995 | 7.552 | 8.108 | 8.665 | 9.221 | 9.778 | 10.334 |
| | 10.891 | 11.447 | 12.004 | 12.560 | 13.116 | 13.673 | 14.229 | 14.786 | 15.342 | 15.899 | |
| | 0.000 | .001 | .003 | .006 | .010 | .016 | .023 | .032 | .041 | .052 | .065 |
| | .078 | .093 | .110 | .127 | .146 | .166 | .187 | .210 | .234 | .259 | |
| TWENTIETH BASIN | 4.770 | 6.121 | 7.472 | 8.824 | 10.175 | 11.527 | 12.719 | 12.878 | 14.229 | 15.581 | 16.932 |
| | 18.284 | 19.635 | 20.986 | 22.338 | 23.689 | 25.040 | 26.392 | 27.743 | 29.095 | 30.446 | 31.797 |
| | 0.000 | .008 | .034 | .076 | .136 | .213 | .294 | .306 | .401 | .490 | .571 |
| | .646 | .713 | .773 | .826 | .872 | .911 | .943 | .968 | .986 | .996 | 1.000 |
| TWENTY-FIRST BASIN | 6.359 | 6.518 | 6.677 | 6.836 | 6.995 | 7.154 | 7.313 | 7.472 | 7.631 | 7.790 | 7.949 |
| | 7.949 | 8.108 | 8.267 | 8.426 | 8.585 | 8.744 | 8.903 | 9.062 | 9.221 | 9.380 | 9.539 |
| | 0.000 | .005 | .020 | .045 | .080 | .125 | .180 | .245 | .320 | .405 | .500 |
| | .500 | .595 | .680 | .755 | .820 | .875 | .920 | .955 | .980 | .995 | 1.000 |
| TWENTY-SECOND BASIN | 4.770 | 6.121 | 7.472 | 8.824 | 10.175 | 11.527 | 12.878 | 14.229 | 15.581 | 15.899 | 16.932 |
| | 18.284 | 19.635 | 20.986 | 22.338 | 23.689 | 25.040 | 26.392 | 27.743 | 29.095 | 30.446 | 31.797 |
| | 0.000 | .006 | .024 | .055 | .097 | .152 | .219 | .297 | .389 | .412 | .486 |
| | .575 | .656 | .728 | .792 | .847 | .894 | .932 | .962 | .983 | .996 | 1.000 |
| TWENTY-THIRD BASIN | 7.949 | 8.347 | 8.744 | 9.142 | 9.539 | 9.937 | 10.334 | 10.732 | 11.129 | 11.129 | 11.527 |
| | 11.924 | 12.322 | 12.719 | 13.116 | 13.514 | 13.911 | 14.309 | 14.706 | 15.104 | 15.501 | 15.899 |
| | 0.000 | .006 | .025 | .056 | .100 | .156 | .225 | .306 | .400 | .400 | .496 |
| | .583 | .662 | .733 | .796 | .850 | .896 | .933 | .962 | .983 | .996 | 1.000 |
| TWENTY-FOURTH BASIN | 7.949 | 9.937 | 11.924 | 13.911 | 15.899 | 15.899 | 17.886 | 19.873 | 21.861 | 23.848 | 25.835 |
| | 27.823 | 29.810 | 31.797 | 33.785 | 35.772 | 37.759 | 39.747 | 41.734 | 43.722 | 45.709 | 47.696 |
| | 0.000 | .013 | .050 | .113 | .200 | .200 | .297 | .388 | .472 | .550 | .622 |
| | .688 | .747 | .800 | .847 | .888 | .922 | .950 | .972 | .988 | .997 | 1.000 |
| TWENTY-FIFTH BASIN | 7.949 | 8.347 | 8.744 | 9.142 | 9.539 | 9.539 | 9.937 | 10.334 | 10.732 | 11.129 | 11.527 |
| | 11.924 | 12.322 | 12.719 | 13.116 | 13.514 | 13.911 | 14.309 | 14.706 | 15.104 | 15.501 | 15.899 |
| | 0.000 | .012 | .050 | .112 | .200 | .200 | .297 | .387 | .472 | .550 | .622 |
| | .687 | .747 | .800 | .847 | .887 | .922 | .950 | .972 | .987 | .997 | 1.000 |

## UNDISCOVERED GAS RESOURCES OF AUSTRALIA

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FIRST BASIN | 4.248 | 5.168 | 6.088 | 7.008 | 7.079 | 7.929 | 8.849 | 9.769 | 10.690 | 11.610 | 12.530 |
| | 13.451 | 14.371 | 15.291 | 16.211 | 17.132 | 18.052 | 18.972 | 19.893 | 20.813 | 21.733 | 22.653 |
| | 0.000 | .016 | .065 | .146 | .154 | .244 | .335 | .421 | .501 | .575 | .643 |
| | .705 | .761 | .811 | .855 | .894 | .926 | .953 | .973 | .988 | .997 | 1.000 |
| SECOND BASIN | 8.495 | 11.114 | 13.734 | 14.158 | 16.353 | 18.972 | 21.592 | 24.211 | 26.830 | 29.450 | 32.069 |
| | 34.688 | 37.307 | 39.927 | 42.546 | 45.165 | 47.785 | 50.404 | 53.023 | 55.643 | 58.262 | 60.881 |
| | 0.000 | .023 | .092 | .108 | .190 | .282 | .369 | .451 | .526 | .596 | .661 |
| | .720 | .773 | .821 | .863 | .899 | .930 | .955 | .975 | .989 | .997 | 1.000 |
| THIRD BASIN | 5.663 | 6.230 | 6.796 | 7.362 | 7.929 | 8.495 | 8.495 | 9.061 | 9.628 | 10.194 | 10.760 |
| | 11.327 | 11.893 | 12.459 | 13.026 | 13.592 | 14.158 | 14.725 | 15.291 | 15.857 | 16.424 | 16.990 |
| | 0.000 | .010 | .040 | .090 | .160 | .250 | .250 | .347 | .437 | .520 | .597 |
| | .667 | .730 | .787 | .837 | .880 | .917 | .947 | .970 | .987 | .997 | 1.000 |
| FOURTH BASIN | 2.832 | 3.540 | 4.248 | 4.955 | 5.663 | 6.371 | 7.079 | 7.787 | 8.495 | 8.495 | 9.203 |
| | 9.911 | 10.619 | 11.327 | 12.035 | 12.743 | 13.451 | 14.158 | 14.866 | 15.574 | 16.282 | 16.990 |
| | 0.000 | .006 | .025 | .056 | .100 | .156 | .225 | .306 | .400 | .400 | .496 |
| | .583 | .662 | .733 | .796 | .850 | .896 | .933 | .962 | .983 | .996 | 1.000 |
| FIFTH BASIN | 5.663 | 7.504 | 9.345 | 11.185 | 11.327 | 13.026 | 14.866 | 16.707 | 18.548 | 20.388 | 22.229 |
| | 24.069 | 25.910 | 27.751 | 29.591 | 31.432 | 33.272 | 35.113 | 36.953 | 38.794 | 40.635 | 42.475 |
| | 0.000 | .016 | .065 | .146 | .154 | .244 | .335 | .421 | .501 | .575 | .643 |
| | .705 | .761 | .811 | .855 | .894 | .926 | .953 | .973 | .988 | .997 | 1.000 |
| SIXTH BASIN | 56.634 | 88.915 | 121.196 | 153.477 | 185.759 | 198.218 | 218.040 | 250.321 | 282.602 | 314.883 | 347.165 |
| | 379.446 | 411.727 | 444.008 | 476.289 | 508.571 | 540.852 | 573.133 | 605.414 | 637.695 | 669.977 | 702.258 |
| | 0.000 | .011 | .046 | .103 | .182 | .219 | .279 | .372 | .459 | .539 | .613 |
| | .680 | .741 | .795 | .843 | .885 | .920 | .949 | .971 | .987 | .997 | 1.000 |
| SEVENTH BASIN | 5.663 | 6.796 | 7.929 | 9.061 | 10.194 | 11.327 | 12.459 | 13.592 | 14.158 | 14.725 | 15.857 |
| | 16.990 | 18.123 | 19.255 | 20.388 | 21.521 | 22.653 | 23.786 | 24.919 | 26.052 | 27.184 | 28.317 |
| | 0.000 | .007 | .027 | .060 | .107 | .167 | .240 | .327 | .375 | .424 | .516 |
| | .600 | .676 | .744 | .804 | .856 | .900 | .936 | .964 | .984 | .996 | 1.000 |
| EIGHTH BASIN | 5.663 | 6.796 | 7.929 | 8.495 | 9.061 | 10.194 | 11.327 | 12.459 | 13.592 | 14.725 | 15.857 |
| | 16.990 | 18.123 | 19.255 | 20.388 | 21.521 | 22.653 | 23.786 | 24.919 | 26.052 | 27.184 | 28.317 |
| | 0.000 | .020 | .080 | .125 | .174 | .269 | .357 | .440 | .517 | .589 | .654 |
| | .714 | .769 | .817 | .860 | .897 | .929 | .954 | .974 | .989 | .997 | 1.000 |
| TENTH BASIN | 5.663 | 12.219 | 18.774 | 25.329 | 31.885 | 38.440 | 44.995 | 50.970 | 51.551 | 58.106 | 64.662 |
| | 71.217 | 77.772 | 84.328 | 90.883 | 97.438 | 103.994 | 110.549 | 117.104 | 123.660 | 130.215 | 136.770 |
| | 0.000 | .007 | .029 | .065 | .116 | .181 | .260 | .346 | .354 | .450 | .538 |
| | .618 | .691 | .756 | .813 | .862 | .904 | .939 | .966 | .985 | .996 | 1.000 |
| ELEVENTH BASIN | 8.495 | 10.902 | 13.309 | 14.158 | 15.716 | 18.123 | 20.530 | 22.937 | 25.344 | 27.751 | 30.157 |
| | 32.564 | 34.971 | 37.378 | 39.785 | 42.192 | 44.599 | 47.006 | 49.413 | 51.820 | 54.227 | 56.634 |
| | 0.000 | .021 | .085 | .118 | .181 | .275 | .363 | .445 | .521 | .592 | .657 |
| | .717 | .770 | .819 | .861 | .898 | .929 | .955 | .974 | .989 | .997 | 1.000 |
| TWELFTH BASIN | 56.634 | 65.129 | 73.624 | 82.119 | 90.614 | 99.109 | 107.604 | 116.099 | 124.594 | 133.089 | 141.584 |
| | 141.584 | 150.079 | 158.574 | 167.069 | 175.564 | 184.060 | 192.555 | 201.050 | 209.545 | 218.040 | 226.535 |
| | 0.000 | .005 | .020 | .045 | .080 | .125 | .180 | .245 | .320 | .405 | .500 |
| | .500 | .595 | .680 | .755 | .820 | .875 | .920 | .955 | .980 | .995 | 1.000 |
| FOURTEENTH BASIN | 5.663 | 6.088 | 6.513 | 6.938 | 7.362 | 7.787 | 8.212 | 8.495 | 8.637 | 9.061 | 9.486 |
| | 9.911 | 10.336 | 10.760 | 11.185 | 11.610 | 12.035 | 12.459 | 12.884 | 13.309 | 13.734 | 14.158 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.000 | .007 | .030 | .067 | .120 | .187 | .270 | .333 | .366 | .460 | .546 |
| | .625 | .696 | .760 | .816 | .865 | .906 | .940 | .966 | .985 | .996 | 1.000 |
| FIFTEENTH BASIN | 14.442 | 20.770 | 27.099 | 33.428 | 39.757 | 46.086 | 52.414 | 56.634 | 58.743 | 65.072 | 71.401 |
| | 77.730 | 84.059 | 90.387 | 96.716 | 103.045 | 109.374 | 115.703 | 122.031 | 128.360 | 134.689 | 141.018 |
| | 0.000 | .007 | .030 | .067 | .120 | .188 | .270 | .333 | .366 | .460 | .546 |
| | .625 | .696 | .760 | .816 | .865 | .906 | .940 | .966 | .985 | .996 | 1.000 |
| SIXTEENTH BASIN | 2.832 | 3.398 | 3.964 | 4.531 | 5.097 | 5.663 | 6.230 | 6.796 | 7.362 | 7.929 | 8.495 |
| | 8.495 | 9.061 | 9.628 | 10.194 | 10.760 | 11.327 | 11.893 | 12.459 | 13.026 | 13.592 | 14.158 |
| | 0.000 | .005 | .020 | .045 | .080 | .125 | .180 | .245 | .320 | .405 | .500 |
| | .500 | .595 | .680 | .755 | .820 | .875 | .920 | .955 | .980 | .995 | 1.000 |
| SEVENTEENTH BASIN | 2.832 | 3.398 | 3.964 | 4.531 | 5.097 | 5.663 | 6.230 | 6.796 | 7.362 | 7.929 | 8.495 |
| | 8.495 | 9.061 | 9.628 | 10.194 | 10.760 | 11.327 | 11.893 | 12.459 | 13.026 | 13.592 | 14.158 |
| | 0.000 | .005 | .020 | .045 | .080 | .125 | .180 | .245 | .320 | .405 | .500 |
| | .500 | .595 | .680 | .755 | .820 | .875 | .920 | .955 | .980 | .995 | 1.000 |
| EIGHTEENTH BASIN | 14.158 | 17.698 | 21.238 | 24.777 | 28.317 | 28.317 | 31.856 | 35.396 | 38.936 | 42.475 | 46.015 |
| | 49.554 | 53.094 | 56.634 | 60.173 | 63.713 | 67.253 | 70.792 | 74.332 | 77.871 | 81.411 | 84.951 |
| | 0.000 | .013 | .050 | .113 | .200 | .200 | .297 | .387 | .472 | .550 | .622 |
| | .687 | .747 | .800 | .847 | .887 | .922 | .950 | .972 | .987 | .997 | 1.000 |
| TWENTIETH BASIN | 5.663 | 6.513 | 7.362 | 8.212 | 8.495 | 9.061 | 9.911 | 10.760 | 11.610 | 12.459 | 13.309 |
| | 14.158 | 15.008 | 15.857 | 16.707 | 17.556 | 18.406 | 19.255 | 20.105 | 20.954 | 21.804 | 22.653 |
| | 0.000 | .015 | .060 | .135 | .167 | .232 | .325 | .412 | .493 | .568 | .637 |
| | .700 | .757 | .808 | .853 | .892 | .925 | .952 | .973 | .988 | .997 | 1.000 |
| TWENTY-FIRST BASIN | 5.663 | 9.911 | 14.158 | 18.406 | 22.653 | 26.901 | 31.149 | 35.396 | 36.812 | 39.644 | 43.891 |
| | 48.139 | 52.386 | 56.634 | 60.881 | 65.129 | 69.376 | 73.624 | 77.871 | 82.119 | 86.366 | 90.614 |
| | 0.000 | .007 | .027 | .061 | .109 | .170 | .245 | .334 | .367 | .432 | .522 |
| | .605 | .680 | .747 | .807 | .858 | .901 | .937 | .964 | .984 | .996 | 1.000 |
| TWENTY-SECOND BASIN | 14.158 | 19.114 | 24.069 | 29.025 | 33.980 | 33.980 | 38.936 | 43.891 | 48.847 | 53.802 | 58.757 |
| | 63.713 | 68.668 | 73.624 | 78.579 | 83.535 | 88.490 | 93.446 | 98.401 | 103.357 | 108.312 | 113.267 |
| | 0.000 | .013 | .050 | .113 | .200 | .200 | .297 | .388 | .472 | .550 | .622 |
| | .687 | .747 | .800 | .847 | .887 | .922 | .950 | .972 | .987 | .997 | 1.000 |
| TWENTY-THIRD BASIN | 5.663 | 8.212 | 10.760 | 13.309 | 14.158 | 15.857 | 18.406 | 20.954 | 23.503 | 26.052 | 28.600 |
| | 31.149 | 33.697 | 36.246 | 38.794 | 41.343 | 43.891 | 46.440 | 48.988 | 51.537 | 54.085 | 56.634 |
| | 0.000 | .015 | .060 | .135 | .167 | .232 | .325 | .412 | .493 | .568 | .637 |
| | .700 | .757 | .808 | .853 | .892 | .925 | .952 | .973 | .988 | .997 | 1.000 |
| TWENTY-FOURTH BASIN | 5.663 | 8.920 | 12.176 | 15.433 | 18.689 | 21.946 | 25.202 | 28.317 | 31.458 | 31.715 | 34.971 |
| | 38.228 | 41.484 | 44.741 | 47.997 | 51.253 | 54.510 | 57.766 | 61.023 | 64.279 | 67.536 | 70.792 |
| | 0.000 | .007 | .029 | .065 | .115 | .180 | .259 | .348 | .352 | .448 | .536 |
| | .617 | .689 | .755 | .812 | .862 | .904 | .939 | .965 | .985 | .996 | 1.000 |
| TWENTY-FIFTH BASIN | 5.663 | 6.230 | 6.796 | 7.362 | 7.929 | 8.495 | 9.061 | 9.628 | 10.194 | 10.760 | 11.327 |
| | 11.327 | 11.893 | 12.459 | 13.026 | 13.592 | 14.158 | 14.725 | 15.291 | 15.857 | 16.424 | 16.990 |
| | 0.000 | .005 | .020 | .045 | .080 | .125 | .180 | .245 | .320 | .405 | .500 |
| | .500 | .595 | .680 | .755 | .820 | .875 | .920 | .955 | .980 | .995 | 1.000 |

| | | | |
|---|---|---|---|
| 2.762 | 12 | 633.004 | 9031 |
| 15.367 | 116 | 645.609 | 9093 |
| 27.972 | 258 | 658.214 | 9142 |
| 40.577 | 423 | 670.819 | 9197 |
| 53.182 | 651 | 683.423 | 9259 |
| 65.786 | 942 | 696.028 | 9308 |
| 78.391 | 1332 | 708.633 | 9358 |
| 90.996 | 1758 | 721.238 | 9407 |
| 103.601 | 2230 | 733.843 | 9448 |
| 116.206 | 2713 | 746.448 | 9478 |
| 128.811 | 3189 | 759.053 | 9516 |
| 141.415 | 3657 | 771.657 | 9557 |
| 154.020 | 4074 | 784.262 | 9595 |
| 166.625 | 4452 | 796.867 | 9626 |
| 179.230 | 4826 | 809.472 | 9663 |
| 191.835 | 5122 | 822.077 | 9689 |
| 204.440 | 5409 | 834.682 | 9717 |
| 217.044 | 5671 | 847.286 | 9752 |
| 229.649 | 5899 | 859.891 | 9775 |
| 242.254 | 6104 | 872.496 | 9796 |
| 254.859 | 6294 | 885.101 | 9815 |
| 267.464 | 6450 | 897.706 | 9838 |
| 280.069 | 6587 | 910.311 | 9856 |
| 292.673 | 6730 | 922.915 | 9878 |
| 305.278 | 6873 | 935.520 | 9892 |
| 317.883 | 6994 | 948.125 | 9909 |
| 330.488 | 7116 | 960.730 | 9927 |
| 343.093 | 7232 | 973.335 | 9936 |
| 355.698 | 7340 | 985.940 | 9945 |
| 368.303 | 7442 | 998.544 | 9959 |
| 380.907 | 7546 | 1011.149 | 9968 |
| 393.512 | 7652 | 1023.754 | 9971 |
| 406.117 | 7750 | 1036.359 | 9976 |
| 418.722 | 7833 | 1048.964 | 9979 |
| 431.327 | 7914 | 1061.569 | 9983 |
| 443.932 | 7999 | 1074.173 | 9986 |
| 456.536 | 8080 | 1086.778 | 9988 |
| 469.141 | 8173 | 1099.383 | 9989 |
| 481.746 | 8237 | 1111.988 | 9993 |
| 494.351 | 8327 | 1124.593 | 9996 |
| 506.956 | 8396 | 1137.198 | 9998 |
| 519.561 | 8474 | 1149.803 | 9998 |
| 532.165 | 8532 | 1162.407 | 9998 |
| 544.770 | 8603 | 1175.012 | 9998 |
| 557.375 | 8680 | 1187.617 | 9998 |
| 569.980 | 8765 | 1200.222 | 9999 |
| 582.585 | 8820 | 1212.827 | 9999 |
| 595.190 | 8867 | 1225.432 | 9999 |
| 607.794 | 8916 | 1238.036 | 9999 |
| 620.399 | 8976 | 1250.641 | 10000 |
| | | 1263.246 | |

UNDISCOVERED OIL RESOURCES OF AUSTRALIA

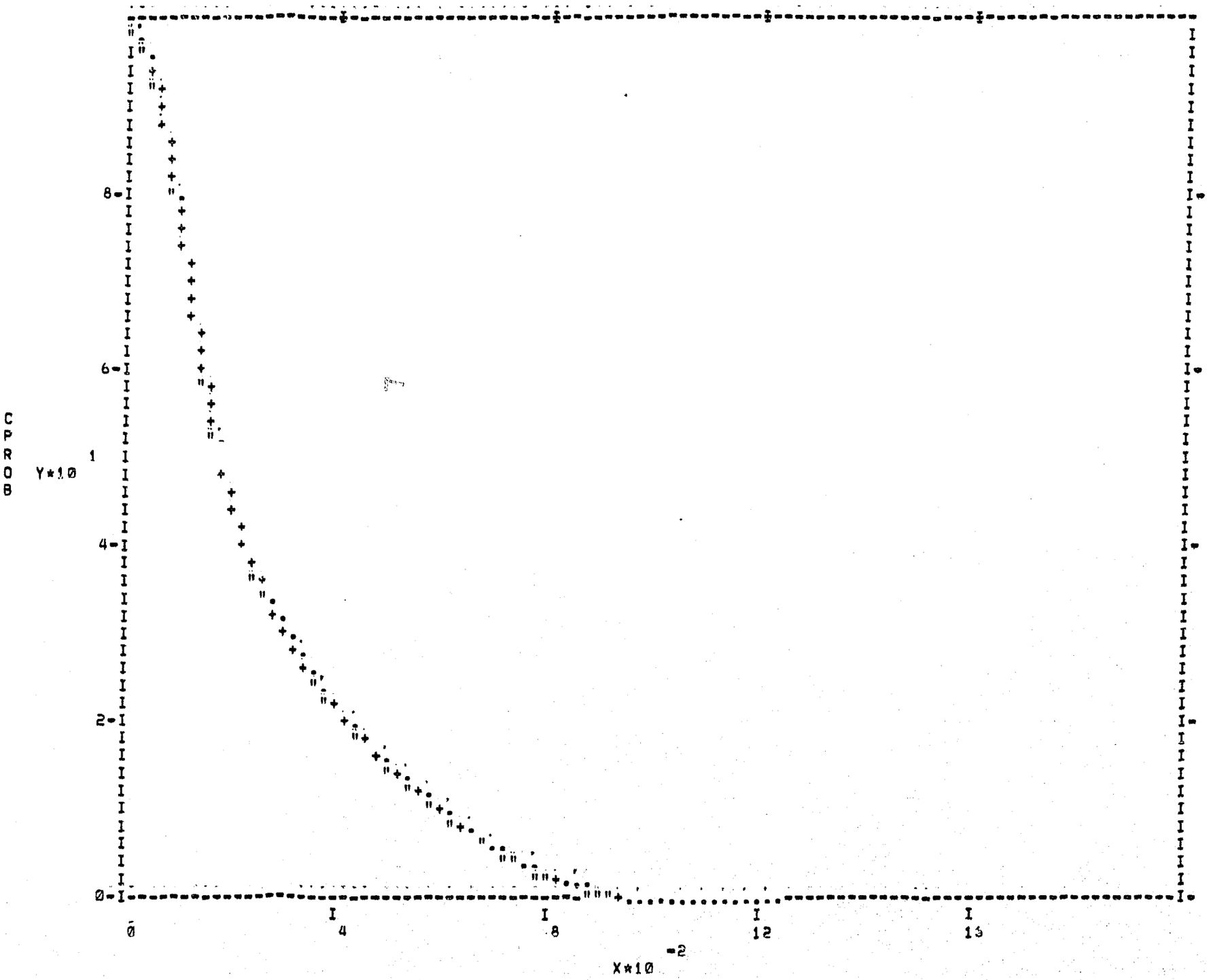
| | | | | |
|---|---|---|---|---|
| MEAN VALUE = | 283.077 | 1780.503 | STANDARD DEVIATION = | 222.69430 |
| MEDIAN VALUE = | 199.244 | 1253.209 | VARIANCE = | 49592.75102 |
| MODAL VALUE = | 122.508 | 770.553 | | |

MEAN FROM UNGROUPED DATA

| | |
|---|---|
| 283.115 | 1780.738 |

| | | | |
|---|---|---|---|
| 9.065 | .999 | 639.307 | .097 |
| 21.669 | .988 | 651.911 | .091 |
| 34.274 | .974 | 664.516 | .086 |
| 46.879 | .958 | 677.121 | .080 |
| 59.484 | .935 | 689.726 | .074 |
| 72.089 | .906 | 702.331 | .069 |
| 84.694 | .867 | 714.936 | .064 |
| 97.298 | .824 | 727.540 | .059 |
| 109.903 | .777 | 740.145 | .055 |
| 122.508 | .729 | 752.750 | .052 |
| 135.113 | .681 | 765.355 | .048 |
| 147.718 | .634 | 777.960 | .044 |
| 160.323 | .593 | 790.565 | .041 |
| 172.928 | .555 | 803.169 | .037 |
| 185.532 | .517 | 815.774 | .034 |
| 198.137 | .488 | 828.379 | .031 |
| 210.742 | .459 | 840.984 | .028 |
| 223.347 | .433 | 853.589 | .025 |
| 235.952 | .410 | 866.194 | .023 |
| 248.557 | .390 | 878.798 | .020 |
| 261.161 | .371 | 891.403 | .019 |
| 273.766 | .355 | 904.008 | .016 |
| 286.371 | .341 | 916.613 | .014 |
| 298.976 | .327 | 929.218 | .012 |
| 311.581 | .313 | 941.823 | .011 |
| 324.186 | .301 | 954.428 | .009 |
| 336.790 | .288 | 967.032 | .007 |
| 349.395 | .277 | 979.637 | .006 |
| 362.000 | .266 | 992.242 | .005 |
| 374.605 | .256 | 1004.847 | .004 |
| 387.210 | .245 | 1017.452 | .003 |
| 399.815 | .235 | 1030.057 | .003 |
| 412.419 | .225 | 1042.661 | .002 |
| 425.024 | .217 | 1055.266 | .002 |
| 437.629 | .209 | 1067.871 | .002 |
| 450.234 | .200 | 1080.476 | .001 |
| 462.839 | .192 | 1093.081 | .001 |
| 475.444 | .183 | 1105.686 | .001 |
| 488.048 | .176 | 1118.290 | .001 |
| 500.653 | .167 | 1130.895 | .000 |
| 513.258 | .160 | 1143.500 | .000 |
| 525.863 | .153 | 1156.105 | .000 |
| 538.468 | .147 | 1168.710 | .000 |
| 551.073 | .140 | 1181.315 | .000 |
| 563.678 | .132 | 1193.919 | .000 |
| 576.282 | .124 | 1206.524 | .000 |
| 588.887 | .118 | 1219.129 | .000 |
| 601.492 | .113 | 1231.734 | .000 |
| 614.097 | .108 | 1244.339 | .000 |
| 626.702 | .102 | 1256.944 | 0.000 |

RISKED OIL



* * * * * C O N F I D E N T I A L * * * * *

# AUSTRALIA'S UNDISCOVERED PETROLEUM RESOURCES

## SUMMARY REPORT FOR OIL

DATA COMPILED BY: E.L. SMITH, DEMONSTRATION AND TEST DATA ONLY

COMPILATION DATE: 14 SEPTEMBER 1981

DATE OF COMPUTER RUN: 12/10/81

THE ESTIMATED POTENTIAL UNDISCOVERED RECOVERABLE OIL RESOURCES OF AUSTRALIA, SUMMARIZED IN THE TABLE BELOW, RANGE FROM A MINIMUM OF

9.065 MILLION CUBIC METRES
[ 57.015 MILLION BARRELS ]

TO A MAXIMUM OF

1256.944 MILLION CUBIC METRES
[ 7905.937 MILLION BARRELS ].

THE MOST LIKELY VOLUME OF UNDISCOVERED OIL IS ESTIMATED TO BE

122.508 MILLION CUBIC METRES
[ 770.553 MILLION BARRELS ]

| | PERCENT PROBABILITY GREATER THAN | MILLION CUBIC METRES | MILLION BARRELS |
|---|---|---|---|
| | 100% | 9.065 | 57.015 |
| | 95% | 53.182 | 334.502 |
| | 80% | 103.601 | 651.630 |
| MODE | 72% | 122.508 | 770.553 |
| | 50% | 199.244 | 1253.209 |
| MEAN | 35% | 283.077 | 1780.503 |
| | 20% | 456.536 | 2871.527 |
| | 5% | 759.053 | 4774.297 |
| | 0% | 1256.944 | 7905.937 |

* * * * * C O N F I D E N T I A L * * * * *

| | |
|---|---|
| 262.625 | 1 |
| 271.903 | 2 |
| 281.181 | 2 |
| 290.459 | 2 |
| 299.737 | 4 |
| 309.015 | 6 |
| 318.293 | 8 |
| 327.570 | 13 |
| 336.848 | 18 |
| 346.126 | 35 |
| 355.404 | 50 |
| 364.682 | 65 |
| 373.960 | 91 |
| 383.238 | 126 |
| 392.516 | 151 |
| 401.793 | 188 |
| 411.071 | 248 |
| 420.349 | 315 |
| 429.627 | 377 |
| 438.905 | 449 |
| 448.183 | 546 |
| 457.461 | 678 |
| 466.739 | 784 |
| 476.016 | 921 |
| 485.294 | 1076 |
| 494.572 | 1255 |
| 503.850 | 1418 |
| 513.128 | 1595 |
| 522.406 | 1783 |
| 531.684 | 1958 |
| 540.962 | 2168 |
| 550.239 | 2403 |
| 559.517 | 2638 |
| 568.795 | 2867 |
| 578.073 | 3093 |
| 587.351 | 3335 |
| 596.629 | 3541 |
| 605.907 | 3775 |
| 615.185 | 4026 |
| 624.463 | 4256 |
| 633.740 | 4467 |
| 643.018 | 4686 |
| 652.296 | 4916 |
| 661.574 | 5153 |
| 670.852 | 5377 |
| 680.130 | 5602 |
| 689.408 | 5828 |
| 698.686 | 6039 |
| 707.963 | 6237 |
| 717.241 | 6415 |
| 726.519 | 6624 |
| 735.797 | 6821 |
| 745.075 | 6998 |
| 754.353 | 7184 |
| 763.631 | 7338 |
| 772.909 | 7494 |
| 782.186 | 7674 |
| 791.464 | 7829 |
| 800.742 | 7981 |
| 810.020 | 8124 |
| 819.298 | 8271 |
| 828.576 | 8403 |
| 837.854 | 8520 |
| 847.132 | 8630 |
| 856.409 | 8747 |
| 865.687 | 8857 |
| 874.965 | 8956 |
| 884.243 | 9037 |
| 893.521 | 9116 |
| 902.799 | 9194 |
| 912.077 | 9282 |
| 921.355 | 9355 |
| 930.632 | 9423 |
| 939.910 | 9486 |
| 949.188 | 9548 |
| 958.466 | 9598 |
| 967.744 | 9658 |
| 977.022 | 9700 |
| 986.300 | 9738 |
| 995.578 | 9777 |
| 1004.855 | 9811 |
| 1014.133 | 9840 |
| 1023.411 | 9868 |
| 1032.689 | 9896 |
| 1041.967 | 9911 |
| 1051.245 | 9927 |
| 1060.523 | 9941 |
| 1069.801 | 9958 |
| 1079.079 | 9974 |
| 1088.356 | 9977 |
| 1097.634 | 9980 |
| 1106.912 | 9984 |
| 1116.190 | 9988 |
| 1125.468 | 9989 |
| 1134.746 | 9992 |
| 1144.024 | 9993 |
| 1153.302 | 9996 |
| 1162.579 | 9998 |
| 1171.857 | 9999 |
| 1181.135 | 10000 |
| 1190.413 | |

## UNDISCOVERED GAS RESOURCES OF AUSTRALIA

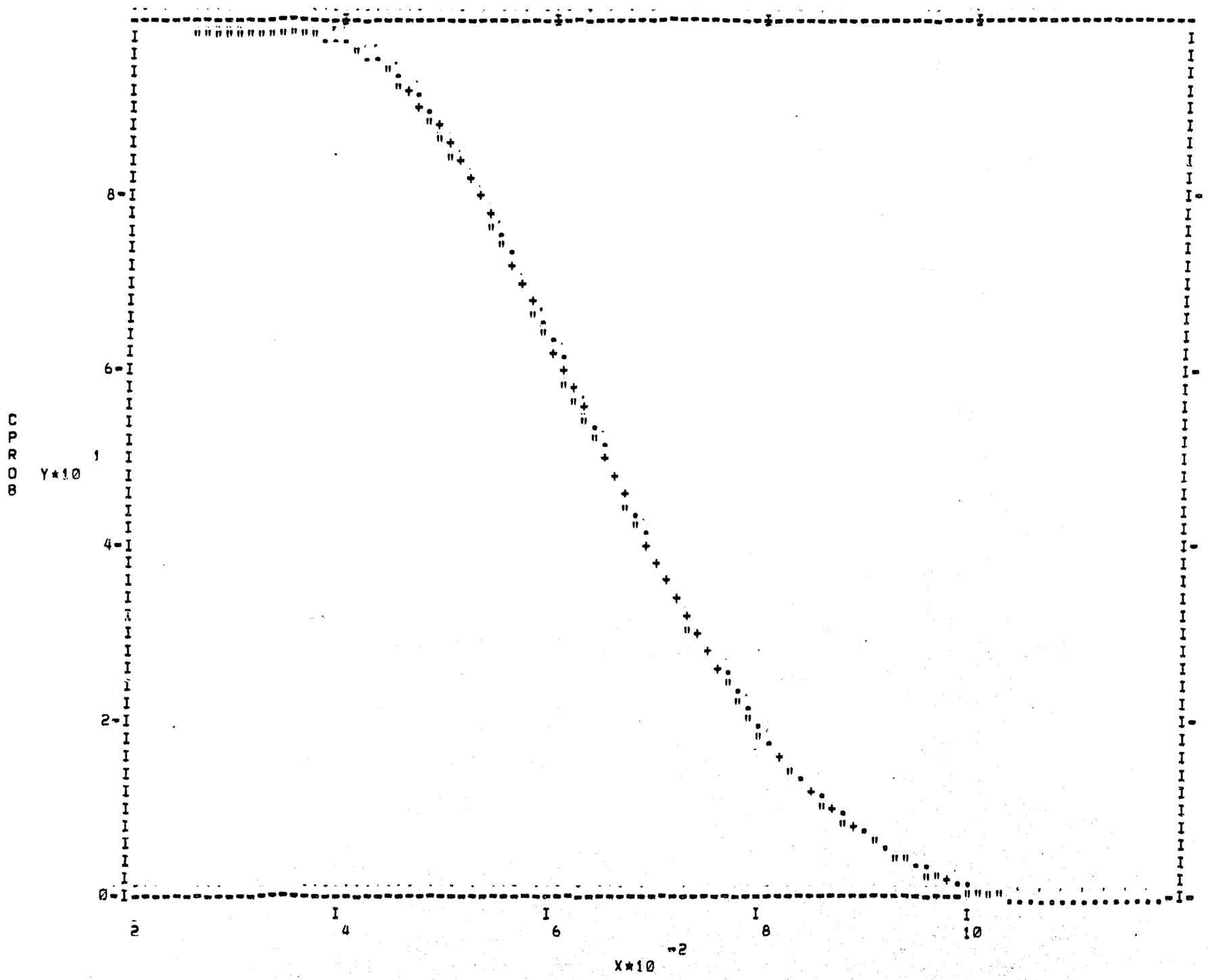
| | | | | |
|---|---|---|---|---|
| MEAN VALUE = | 677.929 | 23.941 | STANDARD DEVIATION = | 152.11932 |
| MEDIAN VALUE = | 664.862 | 23.479 | VARIANCE = | 23140.28836 |
| MODAL VALUE = | 619.824 | 21.889 | | |

## MEAN FROM UNGROUPED DATA

| | |
|---|---|
| 677.931 | 23.941 |

| | |
|---|---|
| 267.264 | 1.000 |
| 276.542 | 1.000 |
| 285.820 | 1.000 |
| 295.098 | 1.000 |
| 304.376 | 1.000 |
| 313.654 | .999 |
| 322.931 | .999 |
| 332.209 | .999 |
| 341.487 | .998 |
| 350.765 | .997 |
| 360.043 | .995 |
| 369.321 | .994 |
| 378.599 | .991 |
| 387.877 | .987 |
| 397.155 | .985 |
| 406.432 | .981 |
| 415.710 | .975 |
| 424.988 | .969 |
| 434.266 | .962 |
| 443.544 | .955 |
| 452.822 | .945 |
| 462.100 | .932 |
| 471.378 | .922 |
| 480.655 | .908 |
| 489.933 | .892 |
| 499.211 | .875 |
| 508.489 | .858 |
| 517.767 | .841 |
| 527.045 | .822 |
| 536.323 | .804 |
| 545.601 | .783 |
| 554.878 | .760 |
| 564.156 | .736 |
| 573.434 | .713 |
| 582.712 | .691 |
| 591.990 | .667 |
| 601.268 | .646 |
| 610.546 | .623 |
| 619.824 | .597 |
| 629.101 | .574 |
| 638.379 | .553 |
| 647.657 | .531 |
| 656.935 | .508 |
| 666.213 | .485 |
| 675.491 | .462 |
| 684.769 | .440 |
| 694.047 | .417 |
| 703.324 | .396 |
| 712.602 | .376 |
| 721.880 | .359 |
| 731.158 | .338 |
| 740.436 | .318 |
| 749.714 | .300 |
| 758.992 | .282 |
| 768.270 | .266 |
| 777.547 | .251 |
| 786.825 | .233 |
| 796.103 | .217 |
| 805.381 | .202 |
| 814.659 | .188 |
| 823.937 | .173 |
| 833.215 | .160 |
| 842.493 | .148 |
| 851.771 | .137 |
| 861.048 | .125 |
| 870.326 | .114 |
| 879.604 | .104 |
| 888.882 | .096 |
| 898.160 | .088 |
| 907.438 | .081 |
| 916.716 | .072 |
| 925.994 | .065 |
| 935.271 | .058 |
| 944.549 | .051 |
| 953.827 | .045 |
| 963.105 | .040 |
| 972.383 | .034 |
| 981.661 | .030 |
| 990.939 | .026 |
| 1000.217 | .022 |
| 1009.494 | .019 |
| 1018.772 | .016 |
| 1028.050 | .013 |
| 1037.328 | .010 |
| 1046.606 | .009 |
| 1055.884 | .007 |
| 1065.162 | .006 |
| 1074.440 | .004 |
| 1083.717 | .003 |
| 1092.995 | .002 |
| 1102.273 | .002 |
| 1111.551 | .002 |
| 1120.829 | .001 |
| 1130.107 | .001 |
| 1139.385 | .001 |
| 1148.663 | .001 |
| 1157.940 | .000 |
| 1167.218 | .000 |
| 1176.496 | .000 |
| 1185.774 | 0.000 |

RISKED GAS



* * * * * C O N F I D E N T I A L * * * * *

# AUSTRALIA'S UNDISCOVERED PETROLEUM RESOURCES

## SUMMARY REPORT FOR GAS

DATA COMPILED BY: E.L. SMITH, DEMONSTRATION AND TEST DATA ONLY

COMPILATION DATE: 14 SEPTEMBER 1981

DATE OF COMPUTER RUN: 12/10/81

THE ESTIMATED POTENTIAL UNDISCOVERED RECOVERABLE GAS RESOURCES OF AUSTRALIA, SUMMARIZED IN THE TABLE BELOW, RANGE FROM A MINIMUM OF

267.264 BILLION CUBIC METRES
[ 9.438 TRILLION CUBIC FEET ]

TO A MAXIMUM OF

1185.774 BILLION CUBIC METRES
[ 41.875 TRILLION CUBIC FEET ].

THE MOST LIKELY VOLUME OF UNDISCOVERED GAS IS ESTIMATED TO BE

619.824 BILLION CUBIC METRES
[ 21.889 TRILLION CUBIC FEET ]

| | PERCENT PROBABILITY GREATER THAN | BILLION CUBIC METRES | TRILLION CUBIC FEET |
|---|---|---|---|
| | 100% | 267.264 | 9.438 |
| | 95% | 448.183 | 15.827 |
| | 80% | 540.962 | 19.104 |
| MODE | 59% | 619.824 | 21.889 |
| | 50% | 664.862 | 23.479 |
| MEAN | 46% | 677.929 | 23.941 |
| | 20% | 810.020 | 28.606 |
| | 5% | 949.188 | 33.520 |
| | 0% | 1185.774 | 41.875 |

* * * * * C O N F I D E N T I A L * * * * *