Master

Coal Mining Cost Model
Volume 4: Users' Guide for the Surface Coal Mining Cost Model

EA-1273, Volume 4
Research Project 1009-2

Final Report, January 1981
Work Completed, September 1980

Prepared by

NUS CORPORATION
4 Research Place
Rockville, Maryland 20850

Principal Investigators
G. W. Toth
J. R. Annett

Prepared for

Electric Power Research Institute
3412 Hillview Avenue
Palo Alto, California 94304

EPRI Project Manager
T. E. Browne

Supply Program
Energy Analysis and Environment Division

ORDERING INFORMATION

Requests for copies of this report should be directed to Research Reports Center (RRC), Box 50490, Palo Alto, CA 94303, (415) 965-4081. There is no charge for reports requested by EPRI member utilities and affiliates, contributing nonmembers, U.S. utility associations, U.S. government agencies (federal, state, and local), media, and foreign organizations with which EPRI has an information exchange agreement. On request, RRC will send a catalog of EPRI reports.

NOTICE

This report was prepared by the organization(s) named below as an account of work sponsored by the Electric Power Research Institute, Inc. (EPRI). Neither EPRI, members of EPRI, the organization(s) named below, nor any person acting on their behalf: (a) makes any warranty or representation, express or implied, with respect to the accuracy, completeness, or usefulness of the information contained in this report, or that the use of any information, apparatus, method, or process disclosed in this report may not infringe privately owned rights; or (b) assumes any liabilities with respect to the use of, or for damages resulting from the use of, any information, apparatus, method, or process disclosed in this report.

Prepared by
NUS Corporation
Rockville, Maryland

ABSTRACT

The revised EPRI coal mining cost models represent a computerized process engineering approach to the analysis of production costs and mining requirements of either surface or underground mining projects. The models estimate all capital and operating costs typically associated with the preproduction and production phases of a coal mining project, and may be applied either to existing mines or to proposed mine openings.

The models are an updated and computerized version of the original EPRI Coal Mining Cost Models (EA-437, Vols. 1 and 2). In this updated version, data bases have been expanded and now reflect a mid-1980 base year for cost items. The process engineering costing procedure has been improved and an entirely new financial analysis procedure has been developed (P&L statement approach) offering many new financial options to the model user.

The discounted cash flow analysis component of the model solves for the coal value/ton (i.e., production cost/ton F.O.B. mine) or conversely predicts the rate of return on equity when sales revenue/ton is known. Two major financial options allow for the solution of costs in terms of constant or escalating dollars, and in terms of point value or uncertainty estimates. The uncertainty analysis procedure uses a Monte Carlo simulation technique for estimating cost results in terms of frequency distributions.

The models have been designed for use by a variety of technical disciplines ranging from resource planners to mining practicioners. The input parameters have, therefore, been structured to reflect varying degrees of familiarity with mining and cost analysis procedures.

Three levels of input parameters are used in the cost models, -required, default, and override categories. The required category identifies the min-

imum information required to initiate a model run. This category includes basic parameter information describing the physical, operating, and financial aspects of the project. The default category includes more detail or technical parameters which are assigned default values by the model. The override category lists those costs and other values calculated by the model, which may also be input by a model user when detail project information is available.

The models have been designed for use in either a batch or interactive processing mode. The models are documented in four volumes:

Volume 1 - Underground Coal Mining Cost Model
Volume 2 - Users Guide for the Underground Coal Mining Cost Model
Volume 3 - Surface Coal Mining Cost Model
Volume 4 - Users Guide for the Surface Coal Mining Cost Model

Volumes 1 and 3 describe the detail process engineering and financial analysis procedures employed in the underground and surface costing models. Volumes 2 and 4 provide computer application guidance and test cases for both the batch and interactive versions of both models.

EPRI PERSPECTIVE

PROJECT DESCRIPTION

Coal mining costs are key information for utilities using coal and for planners forecasting the future price of coal. Coal mining is a complex process whereby capital and labor are applied to coal reserves in the ground to produce a useful product: coal, ready for shipment to the consumer. In order to gain a better understanding of the factors influencing mining costs and to provide a systematic framework for estimating coal mining costs, a model was developed of the coal mining process. Separate models were developed for underground and surface mines.

These coal mine costing models were originally developed in 1976 and published by EPRI as Final Report EA-437, Coal Mining Cost Models. Volume 1 dealt with underground mines and Volume 2 with surface mines. (Both volumes are out of print.)

PROJECT OBJECTIVES

The objectives of this project under RP1009-2 were (1) to update the data bases in the original models, (2) to build in the capability to provide cost estimates as density functions through the use of Monte Carlo simulation, (3) to provide a more flexible discounted cash flow model, (4) to add the capability to estimate the cost of coal from existing mines, and (5) to computerize the model.

PROJECT RESULTS

A computerized model capable of making estimates of the cost of coal from new and existing coal mines is now available to electric utilities and others. As with any model, the quality of the output is dependent upon the quality of the input and, in the case of this model, upon the user's knowledge of coal mining. In no case are the models a substitute for the detailed geologic and engineering analysis

required prior to signing a large coal contract or opening a mine. EPRI plans to develop or adapt an engineering process model of coal preparation. It will then be integrated into these coal mine costing models. This work should be complete in late 1981.

Thomas E. Browne, Assistant Program Manager
Energy Analysis and Environment Division

ACKNOWLEDGMENTS

The revised EPRI coal mining cost models were completed under the direction of Mr. George W. Toth who served as project manager and principal investigator.

Other staff members, making contributions to this project include Mr. John Annett, who provided computer systems development expertise and Ms. Sylvia Brock, also a systems specialist. Mining engineering support was provided by Mr. Landy Stinnett, who was co-author on the initial version of the coal models.

Testing and review of the completed models were carried out by several utility organizations during the latter part of the study. Mr. Nolan Barker and the staff of the Fossil Fuels Planning Branch of the Tennessee Valley Authority (TVA) deserve particular recognition for their comprehensive evaluation efforts and their many helpful suggestions for improvement to the models.

Mr. Thomas E. Browne, who served as the EPRI project manager, must also be recognized for his direction and constructive involvement throughout the model development effort.

CONTENTS

ILLUSTRATIONS

TABLES

Section 1

INTRODUCTION

This users guide for the Surface Coal Mining Cost Model is designated Volume 4 of the Coal Model report.

The purpose of the program described in this volume is to perform the calculational procedures required to analyze the cost and requirements of proposed coal mining projects in order to determine a value or range of values for either the coal value per ton (minimum acceptable selling price) or rate of return on equity. The program specifications are derived from Volume 3 of this report entitled the Surface Coal Mining Cost Model, also developed by NUS Corporation for the Electric Power Research Institute. This model utilizes an engineering process approach for determining primary requirements and costs, based on the equipment required for each unit operation in the surface mining cycle. Supporting capital item costs are computed on a percentage basis of total capital costs. These cost estimates are used to perform the financial analysis, which computes annual cash flow summaries, based on a profit and loss statement approach, to solve the coal value or rate of return.

The computerized implementation of the model incorporates a randomizing feature for performing an uncertainty analysis using a Monte Carlo technique. By invoking this option, designated input and data base values are randomly selected for each iteration of the model, and results are presented in terms of mean and standard deviation. Alternatively, the user may elect the option to have point valued results generated by the program.

The program is designed for operation in either an interactive or batch mode. The interactive version, which provides a conversational interface between the user and the model, generates immediate results on the user's terminal. This capability facilitates the input procedures required and variation of model parameters to determine the subsequent effect on model results. The batch version, which

can be submitted through an interactive terminal for off-line execution, is more suitable for high speed printing of the financial summary tables available.

This manual describes the use of the computerized surface model, the inputs required, the options available and the output produced. A detailed description of the model specifications implemented by the program is presented in the Volume 3 of this report series.

Section 2

SUMMARY

The Surface Coal Mining Cost program consists of five integrated submodels which provide the basic functional capabilities summarized below.

1) Primary Equipment Selection and Costs

Determines the quantity and size of primary equipment required for each unit operation (e.g. overburden removal and drilling, coal loading, etc.) and the associated costs. The costs for land acquistion and exploration and development drilling are also computed in this submodel.

2) Supporting Capital Item Costs

Calculate cost estimates for support equipment directly associated with the major stripping equipment, auxiliary equipment and capital items, preparation plant and total construction costs.

3) Manpower Requirements and Costs

Compute both hourly and salaried personnel requirements and the corresponding costs.

4) Operating Supplies and Materials Analysis

All direct costs other than labor are derived from cost estimating techniques based on the physical characteristics of the mining operations.

5) Financial Analysis

Using the costs generated by the previous submodels, total capital and operating costs, depreciation, salvage value and investment tax credits are computed on an annual basis and the discounted cash flow

analysis is performed. The coal value/ton (or rate of return) solution can be approximated as the resulting present value approaches zero.

In addition to the basic functional capabilities, the code incorporates the following design features:

- The program may be used to solve either coal value/ton or rate of return on equity, at the option of the user.
- Either point value or uncertainty analysis can be performed; all uncertainty analysis results are presented in terms of mean and standard deviation.
- Financial analysis options allow selection of constant or escalating dollar analysis; discretionary expensing or amortization of major capital costs; and alternative depreciation methods.
- Output tables summarizing intermediate results of each submodel can be generated upon request.
- The program is written entirely in Fortran IV for the IBM 3033, and may be executed in either batch or interactive mode.
- In the interactive mode, a list of input parameters used for any iteration for the uncertainty analysis may be generated upon request.
- Ouput tables presenting results for any coal value/ton (or rate of return) for the uncertainty analysis may be printed.

Section 3

APPLICATION

PROGRAM DESCRIPTION

Two versions of the program have been developed to enhance acessibility of the model in various applications. The interactive version, facilitates the procedure for entering and varying parameter values utilized by the program, and provides immediate results on the user's terminal. The batch version offers the advantage of high speed printing at lower execution cost, and may be accessed when no interactive facilities are available. The two versions are necessary to accomodate variations in the data input procedure and format requirements for printing on two different output devices.

The program structure for both versions consists of the five procedural functions described below. These steps are executed sequentially for each iteration of the model.

1) Process Input Data

Upon initiation of the program, a minimum set of required input data, which define the mining system and the necessary physical, operating, and financial parameters, must be entered by the user. All other input parameters incorporated in the model are optional; values not specified by the user are assigned or evaluated by the program. These values remain in effect for all subsequent cases to be executed, until reassigned by the user or the program is reinitiated.

Two input procedures are incorporated into the interactive version. The required input procedure, which prompts the user for each of the required parameters is entered only once, upon program initiation. Prior to each iteration of the model, the optional input routine is entered, which allows the user to vary any or all

input parameters used by the program, including required parameters entered initially. A partial or complete list of these parameters, indicating the current value assigned, is generated upon request from the user.

In the batch version, all input data is processed by one routine. Input is data directed, that is the user specifies both the variable name and numerical value for each parameter to be assigned, in a free-field format. The user is responsible for ensuring that all required input parameters are assigned in the first set of input data. A complete listing of input parameters is automatically generated for each case submitted.

Any number of cases may be submitted for a single run. After completion of all model calculations, control returns to this step to process the next set of input, until an end-of-file is detected.

2) Assign Randomized Variables

To allow for some uncertainty in input parameters which may not be known exactly, the user may specify designated parameters as a range of values (low and high) or as a mean and standard deviation. To further control these variables, the user may specify equipment and construction parameters should be selected from within the low, high, or total range. Based on these restrictions, this routine will then assign parameter values, prior to each iteration of the model calculations.

For the point value analysis, values are determined as follows:

Cost Range Applicable	Range of Values	Mean/Std. Dev.
Low	$x = x_1 + 1/4(x_2 - x_1)$	$x = \bar{x} - s$
Total	$x = x_1 + 1/2(x_2 - x_1)$	$x = \bar{x}$
High	$x = x_1 + 3/4\ (x_2 - x_1)$	$x = \bar{x} + s$

Where x_1 = low value
x_2 = high value
$\bar{x}$ = mean
s = standard deviation

For the uncertainty analysis, a standard pseudo random number generator is invoked to generate uniformly distributed numbers between 0 and 1. If a range of values (x_1 , x_2) has been specified, a value is assigned as follows:

$$x = x_1 + R\,(x_2 - x_1)$$

where R is a random number ϵ

$0 \le R \le .5$ for LOW cost range,

$0 \le R \le 1.0$ for TOTAL cost range,

and $.5 < R \le 1.0$ for HIGH cost range.

To implement this algorithm, if the random number generator produces a number R outside the range indicated, the complement (1.0 - R) is used.

If the mean and standard deviation ($\bar{x}$, s) have been specified, a random number is generated to represent the standard normal distribution function.

$$R = \int_{-\infty}^{z} \frac{1}{\sqrt{2\pi}}\, e^{-u2/2}\, du = P\,(Z \le z).$$

The deviation z is determined by table lookup of the distribution function and the parameter value is assigned as follows:

$$x = \bar{x} + z\,s$$

where $-2 \le z \le 0$ for LOW cost range,

$-2 \le z \le 2$ for TOTAL cost range,

$0 \le z \le 2$ for HIGH cost range.

Control returns to this step of the procedure to randomize imput variables prior to each iteration of the uncertainty analysis.

3) Perform Mining Submodel Calculations

Within this procedure, mining requirements and associated costs for the following four submodels are calculated.

- Primary Equipment Selection
- Supporting Capital Items Costs
- Manpower Requirements
- Operating Supplies and Materials

Complete specifications for the calculations performed by each of these submodels are presented in Volume 3 of this report and are not repeated here.

Costs derived from data base values established by the model are subjected to the same randomizing procedure described in step 2. Values of all parameters shown in the summary tables for these submodels are accumulated for each iteration of the uncertainty analysis. Upon completion of the specified number of iterations, n, the mean and standard deviation of each parameter is calculated as

$$\bar{x} = \frac{1}{n} \Sigma_i x_i$$

$$s = \frac{1}{n} \left\{ \Sigma x_i^2 - \frac{1}{n} (\Sigma x_i)^2 \right\}^{\frac{1}{2}}.$$

This formulation for standard deviation minimizes the amount of storage required during processing.

4) Perform Financial Analysis

The first phase of the financial analysis structures the cost developed in the previous submodels for the following three categories:

- Total capital cost analysis
- Depreciation, salvage value, investment tax credit
- Operating cost analysis

The result of these analyses is the allocation and scheduling of all costs and expenses into the appropriate project year in a form amenable to the cash flow analysis. For each iteration of the program, output from each procedure is written to a temporary external file for subsequent generation of the corresponding summary report.

Using the annual costs established in the first phase, a cash flow statement of accounts can be generated for a given dollar value per ton of clean coal. Present value can then be calculated as a function of the annual net cash flow and rate of return.

The objective of this procedure is to solve for coal value or rate or return such that the present value of receipts equate to disbursements (PV = O). This is accomplished by the method of regula falsi (linear interpolation) which is formulated as

$$x_{n+1} = x_n - \frac{(x_n - x_{n-1})\, PV(x_n)}{PV(x_n) - PV(x_{n-1})}$$

Implementation of this algorithm requires two starting values and some convergence criteria, which have been chosen as follows:

	starting values	convergence
coal value:	$x_o = 25,\ x_1 = 50$	$\lvert PV(x_{n+1}) \rvert < 1000$, or $\lvert x_{n+1} - x_n \rvert < .01$
rate of return:	$x_o = 10\%,\ x_2 = 30\%$	$\lvert PV(x_{n+1}) \rvert < 1000$, or $\lvert x_{n+1} - x_n \rvert < .05\%$

To solve for coal value, function evaluation necessitates regeneration of the entire cash flow table for each iteration. However, to solve for rate of return, only the present value calculation must be reevaluated.

In solving for either variable, a maximum of 15 itererations is performed by the program. If the algorithm has not converged when this limit is reached, a message is printed indicating the current values of the variable and present value function, and the case is terminated. Summary tables are printed as requested, presenting the results accumulated to this stage.

The cash flow summary table is recorded on a temporary output file for each iteration for which a solution is found. These individual tables can be printed upon request, in addition to the table summarizing all iterations of the uncertainty case.

5) Print Output Tables

Upon completion of all model calculations, a summary table is printed presenting the coal value/ton or rate of return solution, some basic information regarding the mine situation under analysis, and for the uncertainty option, the cost values by probability ranges. Nine other output tables are available, as described in Section 4, to summarize the results of each submodel and each phase of the financial analysis. All of these tables are optional, and are printed only upon request by the user.

The interactive version of the program allows the user to optionally request output tables corresponding to any value of coal value/ton or (rate of return) calculated during the uncertainty analysis.

OPERATING ENVIRONMENT

The Surface Coal Mining Cost program has been implemented on the IBM 3033 computer system under the OS/VS2 operating environment. The code is written entirely in Fortran IV using the G1 level compiler and stored in load module form in an on-line program library.

The interactive version is accessed through TSO (Time Sharing Option) using an interactive terminal with keyboard and printer (or CRT). All input to and output from the program is directed through the user's terminal. The financial summary tables generated by the program (Tables V, VI, VII and VIII) have been designed for output on a full carriage length (132 character) terminal. These reports will not be formatted properly if printing is requested from a standard 80 character carriage length terminal.

User input to the batch version is entered in the standard system input SYSIN file, as illustrated in Section 4. All output from the program is directed to the printer assigned to SYSOUT.

Both versions of the program use temporary external files for storing report information during execution. These files are allocated when the program is initiated and are deleted upon termination.

CPU time to process one set of inputs for a typical uncertainty analysis is approximately 1.1 seconds under this operating environment. A maximum of 204K bytes of virtual storage is required for program execution.

DATA FILES

During batch execution of the Coal mining Cost program, four temporary external data sets are allocated for storing the financial data presented in the printed summary tables. One unformatted data record containing this information is written to the appropriate data set, for each iteration of the program. Upon completion

of the model calculations for a given set of input, the requested output tables are generated by reading the corresponding data set. All file access is sequential. These files, as identified below, are allocated during execution, and deleted from the system upon termination of the program.

Temporary File Requirements
Batch Mode

Logical Unit	Content	Records Length	Format
15	Table V - Total Capital Analysis	1840	VS
16	Table VI - Depreciation, Salvage Value, Investment Tax Credit	6488	VS
17	Table VII - Direct Operating Cost	260	VS
18	Table VIII - Cash Flow Summary Table	7780	VS

For a typical run of the uncertainty analysis, approximately 20 tracks of 3330 on-line disc storage is required. By storing this data externally, the amount of real memory alloted to the code is minimized, and no limitations are imposed on the number of iterations which may be requested.

During interactive execution of the Coal Mining Cost Program, six temporary external data sets are allocated for storing the financial data input parameters and table output information for each iteration of the model. One unformatted data record containing this data is written to the appropriate data set, for each iteration of the program.

Temporary File Requirements
Interactive Mode

Logical Unit	Content	Records Length	Format
14	Input parameters for each iteration-Uncertainty Analysis only	188	VS
15	Table V - Total Capital Analysis	1840	VS
16	Table VI - Depreciation, Salvage Value, Investment Tax Credit	6488	VS
17	Table VII - Direct Operating Cost	260	VS
18	Table VIII - Cash Flow Summary Table	7780	VS
19	Tables I-VI - Table output for each iteration	212	VS

Two permanent data sets must be maintained in on-line disc storage for execution of the interactive version. The command list (CLIST) contains the TSO commands used to allocate all data files required for execution and to invoke the program load module. The program itself is stored in a partitioned data set in load module form. Storage requirements for these data sets is approximately 23 tracks of 3330 disc pack.

CONVERSION CONSIDERATIONS

The Surface Coal Mining Cost program is a self-contained code written entirely in Fortran IV. External references are made only to mathematical functions provided by standard Fortran supplied procedures. To facilitate development and simplify subsequent operation of the code, certain IBM extensions to ANS Fortran (X 3.9 - 1966 standard) have been incorporated. Although these features are available on most computer systems, usage as noted below should be recognized and reviewed prior to converting the code to a different system.

- List directed I/O statements
  The interactive version uses this feature to read all numeric data which is processed by the input routine.

- NAMELIST input procedure
  The input routine in the batch version uses the NAMELIST statement for reading all numeric data, to simplify the input procedure and eliminate format requirements.

- END option in READ statement
  This option is implemented in the input routine of the batch version to automatically effect a transfer upon encountering an end-of-file on the user input SYSIN file.

- ENTRY statements
  The discounted cash flow subroutine used one alternate entry point to omit the initial cost calculations and regenerate the cash flow summary table, when solving for coal value/ton. A second alternate entry point is provided for repeating only present value function evaluations when solving for rate of return.

TABLE 1, TABLE 2, TABLE 3, TABLE 4, TABLE 5, TABLE 6, TABLE 7, and TABLE 8 each contain an ENTRY statement for printing tables for any iteration of all uncertainty analysis.

- **Statement number as actual argument in CALL**
  Asterisk as dummy argument in subroutine
  The program driver, which calls all submodel calculational routines sequentially, makes two uses of this feature: Submodel 1, Production Sizing, uses an alternate return to terminate the case being processed, if zero production sections per shift have been computed, making further calculations impossible. Submodel 6, Financial Analysis, also uses an alternate return to terminate processing, if this iterative procedure fails to converge or provide a solution for any iteration.

Two further items external to the syntax and semantics of the code require consideration for the conversion effort: the random number generator will operate only on 32 bit machines; and the record format and size used for the temporary data files may not be compatible with the file management system implemented on many minicomputers.

Section 4

PROCEDURES AND REQUIREMENTS

INITIATION

To access the interactive version of the Coal Mining Cost program, the user must log on to TSO through an interactive terminal. Execution of the program load module is invoked from the user's terminal by entering an EXEC command to initiate the required command list (CLIST). This CLIST sets the appropriate TSO options, ensures that the input/output files are directed to the user's terminal, allocates the temporary external files, and calls the program into execution.

Contents of the CLIST used at a local installation are listed below.

```
00010 TERM LINESIZE(132)
00020 ATTR DCB14 LRECL(188) RECFM(V,S)
00030 ATTR DCB15 LRECL(1840) RECFM(V,S)
00040 ATTR DCB16 LRECL(6488) RECFM(V,S)
00050 ATTR DCB17 LRECL(260) RECFM(V,S)
00060 ATTR DCB18 LRECL(7780) RECFM(V,S)
00070 ATTR DCB19 LRECL(212) RECFM(V,S)
00080 ALLOC FILE(FT14F001) USING(DCB14) NEW
00090 ALLOC FILE(FT15F001) USING(DCB15) NEW
00100 ALLOC FILE(FT16F001) USING(DCB16) NEW
00110 ALLOC FILE(FT17F001) USING(DCB17) NEW
00120 ALLOC FILE(FT18F001) USING(DCB18) NEW
00130 ALLOC FILE(FT19F001) USING(DCB19) NEW
00140 CALL COALIB.LOAD(SURFACE1)
00150 FREEALL
END OF DATA
```

The abbreviated form of the EXEC command used to invoke this CLIST is

EXEC SURFACE COAL.

After entering this command, the user will enter the input phase of the model which is described in the next section.

Upon termination of the program, the CLIST frees all files allocated to the user's terminals and returns the system to READY mode.

The batch version of the Coal Mining Cost program may be submitted through either an interactive terminal or a card input deck. The job submission shown below assumes that the program has been compiled and stored in an on-line program library.

```
SURFACE.CNTL
      //        JOB
      //  EXEC  PGM=SURFACE,REGION=200K
      //STEPLIB DD DSN=B57I.COALIB.LOAD,DISP=OLD
      //FT06F001 DD SYSOUT=A
      //FT15F001 DD DSN=B57I.DS15.DATA,DISP=(NEW,DELETE),UNIT=PUBLIC,
      //            DCB=(RECFM=VS,LRECL=1840),SPACE=(TRK,(5,2))
      //FT16F001 DD DSN=B57I.DS16.DATA,DISP=(NEW,DELETE),UNIT=PUBLIC,
      //            DCB=(RECFM=VS,LRECL=6488),SPACE=(TRK,(5,2))
      //FT17F001 DD DSN=B57I.DS17.DATA,DISP=(NEW,DELETE),UNIT=PUBLIC,
      //            DCB=(RECFM=VS,LRECL=260),SPACE=(TRK,(5,2))
      //FT18F001 DD DSN=B57I.DS18.DATA,DISP=(NEW,DELETE),UNIT=PUBLIC,
      //            DCB=(RECFM=VS,LRECL=7780),SPACE=(TRK,(5,2))
      //FT05F001 DD *

            (INSERT USER INPUT HERE)

      /*EOF
```

To execute this procedure, an installation dependent job statement must be provided and all JCL statements reviewed for compatibility and modified as necessary.

Any number of input data sets may be submitted for a single run. Processing continues until an end of file is detected on the SYSIN file. Content and format of the input data is discussed in the following section.

INPUT REQUIREMENTS

To facilitate operation of the computerized model, the amount of mandatory input data has been limited to only general information concerning the coal mining project. All other input parameters are assigned or calculated by the program. To obtain greater flexability and user control, optional input

parameters may be entered to override these values. Input parameters have therefore been categorized as follows:

Category 1 - Required input parameters
Category 2 - Optional input parameters (default assigned)
Category 3 - Parameters which override calculated values

The parameters included in each category, designated acronyms required for user reference and valid ranges of data values are presented in Tables 4-1, 4-2, and 4-3 respectively.

Category 1 is the minimum amount of information necessary to run the model These data must be supplied by the user for the first case run by the program. Category 2 parameters are automatically assigned the default values, as noted in Table 4-2, when the program is initiated. Category 3 parameters are calculated by the program based on the previous input and model formulation, unless otherwise specified by the user.

All parameters assigned on input remain in effect for the duration of the run, until the value is changed by the user or the program is reinitialized.

The program verifies that all input values are within the valid ranges indicated on each of the tables. The interactive version issues an error message and reentry request for each parameter which exceeds the acceptable range. In the batch version, error messages are issued for all invalid parameters which occurred in one input set, the input summary list is generated and the case is terminated.

CATEGORY 1 - REQUIRED INPUT PARAMETERS

Table 4-1 presents a list of all possible required input parameters. Not all of these parameters will be required for every case, as noted below. However, if these conditions are altered for subsequent cases, the user is responsible for providing the necessary information.

- If the portion of capital borrowed is zero (DER=0), the debt servicing rate (DSR) and the length of loan payback period (LL) need not be entered for the batch version; prompting messages are suppressed for the interactive version. All three parameters must be assigned if debt occurs in succeeding cases.

- Applicable cost ranges for equipment and construction (REQ, RCON) default to TOT for the batch version; values must be assigned for the interactive version.

- BASE year is required for the constant dollar analysis only. If this value is not set for succeeding cases which change from escalating to constant, 1980 is assigned to BASE.

- Coal value/ton and rate of return are mutually exclusive parameters; only one parameter may be assigned by the user. In the batch version, to change this selection for subsequent cases, the user must set the original variable assigned to zero. This is done automatically in the interactive version.

- The escalation factor for coal value (ECVT) is required for the escalating dollar analysis only.

- All update factors must be assigned for the interactive version. These factors default to zero for the batch version.

For the constant dollar analysis, these factors are used to update the corresponding costs from the 1980 data base values stored in the program to the base year specified by the user. For the escalating dollar analysis, these values represent escalation factors which are applied to the appropriate costs for each year of the project.

Table 4-1

CATEGORY 1 - REQUIRED INPUT PARAMETERS

Parameter	Acronym	Data Type*	Valid Range	Notes
Physical				
Seam thickness (ft)	ST	R	0-1000	(L,H) or (X,S)**
Overburden thickness (ft)	OT	R	0-1000	(L,H) or (X,S)
Topsoil thickness (ft)	TST	R	0-500	(L,H) or (X,S)
Multiple seams	MS	I	0,1	0-no, 1-yes
Operating				
Mining system	MINE	A	AREA,OPEN,CONT	AREA - area mine OPEN - open-pit mine CONT - contour
Annual production (tons)	YDC	R	>0	
Mine life (years)	LIFE	I	1-50	
Coal region	LOC	A	EAST,MIDW,WEST	
Financial				
Length of loan payback period (years)	LL	I	1-50	required if DER > 0
Portion of initial capital borrowed (%)	DER	R	0-100	
Debt servicing rate (%)	DSR	R	0-100	required if DSR > 0
Acquisition cost ($/acre)	CPA	R	0-2000	
Project year	PYR	I		4 digit calendar year
Type of analysis	TYPE	A	UNC,PV	UNC - uncertainty PV - point value
Dollar analysis	$A	A	CON,ESC	CON - constant dollars ESC - escalating dollars
Base year	BASE	I		4 digit calendar year required for constant dollar case only
Labor factor (%)	LF	R	0-100	For constant dollar analysis, enter cost update factors
Primary equipment factor (%)	PF	R	0-100	
Supporting equipment factor (%)	SF	R	0-100	
Operating factor (%)	OF	R	0-100	For escalating dollar analysis, enter escalation factors
Construction factor (%)	CF	R	0-100	
Coal value/ton ($)	CVT	R	>0	Required to solve for rate of return
Escalation factor for CVT (%)	ECVT	R	0-100	Required for escalating dollar analysis only
Rate of return (%)	ROR	R	0-100	Required to solve for coal value/ton

* A - alphameric
R - real (decimal required)
I - integer value

** Randomized values are entered as a range (low value, high value) or mean and standard deviation (X,S). Second value is ignored for point value analysis.

When solving for rate of return, the users must specify the coal value/ton. This value should be entered in terms of 1980 dollars for the escalating dollar analysis. For the constant dollar analysis, this amount should be in terms of base year dollars.

Input parameters which may be randomized for the uncertainty analysis are indicated in Table 4-1. For the point value case, the program calculates the mean value if a range of values has been entered, or a single value, the first value entered, if a mean and standard deviation has been indicated.

CATEGORY 2 - OPTIONAL INPUT PARAMETERS (DEFAULT ASSIGNED)

All input parameters listed in Table 4-2 are optional. These parameters assume the default values indicated, unless otherwise specified by the user.

Based on the mining system requested by the user, the program selects the type of primary equipment to be used for overburden excavation as follows:

Area	-	draglines
Open-pit	-	shovels and trucks
Contour	-	dozers and scrapers

Reclamation of spoil material assumes the usage of dozers and/or scrapers.

In the contour mining system, however, dozers and scrapers purchased for overburden excavation, are assumed to also perfrom reclamation.

All parameters which appertain to each type of equipment are listed in Table 4-2. However, only the appropriate parameters for a given mining system can be applied.

Table 4-2

CATEGORY 2 - OPTIONAL INPUT PARAMETERS

Parameter	Acronym	Data Type*	Valid Range	Default	Notes
Physical					
Degree of coal preparation	PREP	A	NONE, BREA, CORS, FINE	NONE	BREA-breaking (top sizing) CORS-coarse beneficiation FINE-fine beneficiation
Reject %	REJ	R	0-100	0-NONE 0-2 BREA 15-25 CORS 20-40 FINE	(L, H) or ($\bar{X}$, S)**
Recovery %	REC	R	0-100	90,0	(L, H) or ($\bar{X}$, S)**
Dilution factor (%)	DIL	R	0-100	.25/ST	
Coal density	CD	A	LIG, BIT	BIT	LIG - lignite, BIT - bituminous
Exploratory required (acres/hole)	EXR	R	1-100	40-west 288-EAST, MIDW	
Operating					
Drilling Overburden					
# drills/working place	NDPO	I	1-100	1	
degree of consolidation	OVCN	A	LOW, MOD, HIGH	MOD	
Overburden excavation					
Dragline					Area Mine only
# of working places	NWPO	I	1-100		
maximum bucket size (ar yds)	BCMX	R	1-200	110	
bucket fill factor (%)	BFFO	R	0-100	80,0	(L, H) or ($\bar{X}$), S)**
operator efficiency factor (%)	OEFO	R	0-100	75,0	(L, H) or ($\bar{X}$), S)**
scheduled monthly operating hours	MOHO	I	0-744	720	
cycle time (sec)	CYCO	R	0-100	60,0	(L, H) or ($\bar{X}$, S)**

Table 4-2
(Continued)

Parameter	Acronym	Data Type*	Valid Range	Default	Notes
Shovel operation					Open-pit mine only
# of working places	NWPO	I	1-100		
maximum bucket size (Cu. yds.)	BCMX	R	1-200	20	
bucket fill factor (%)	BFFO	R	0-100	80,0	(L,H) or $(\bar{X},S)$**
operator efficiency factor (%)	OEFO	R	0-100	75,0	(L,H) or (X,S)**
scheduled monthly operating hours	MOHO	I	0-744	480	
cycle time (sec)	CYCO	R	0-1000	35,0	(L,H) or (X,S)**
Truck operation					Open-pit mine only
# of loading passes	NLPO	I	1-100	7	
truck travel time loaded (sec)	TTLO	R	0-1000	135,0	(L,H) or (X,S)**
truck travel time empty (sec)	TTEO	R	0-1000	81,0	(L,H) or (X,S)**
turn, spot, dump time (sec)	TSDO	R	0-1000	200,0	(L,H) or (X,S)**
truck capacity (tons)	TCO	R	0-1000	0	
Dozer Operation					Countour mine only
scheduled monthly operating hours	MOHD	I	0-744	336	
average haul distance (ft.)	AVHD	R	0-1000	120,0	(L,H) or (X,S)**
maximum blade capacity (cu. yds)	BDMX	R	4,9,13,19, 23	19	
operator efficiency factor (%)	OEFO	R	0-100	75,0	(L,H) or (X,S)**
operating efficiency factor (%)	OGFO	R	0-100	80,0	(L,H) or (X,S)**
swell factor (%)	SWD	R	0-100	25,0	(L,H) or (X,S)**
material factor (%)	MFD	R	0-100	80,0	(L,H) or (X,S)**
weather factor (%)	WFD	R	0-100	80,0	(L,H) or (X,S)**
Scraper operation					Contour mine only
scheduled monthly operating hours	MOHS	I	0-744	168	
average haul distance (ft)	AVHS	R	0-1000	600.0	(L,H) or (X,S)**
maximum scraper capacity (cu. yds.)	SCMX	R	14,21,32	21	
operator efficiency factor (%)	OEFS	R	0-100	75,0	(L,H) or (X,S)**
operating efficiency factor (%)	OGFS	R	0-100	80,0	(L,H) or (X,S)**
swell factor (%)	SWS	R	0-100	25,0	(L,H) or (X,S)**
load time in overburden (sec)	LT	R	0-1000	60,0	(L,H) or (X,S)**
maneuver + spread time (sec)	MST	R	0-1000	40,0	(L,H) or (X,S)**
material factor (%)	MFS	R	0-100	80,0	(L,H) or (X,S)**
weather factor (%)	WFS	R	0-100	80,0	(L,H) or (X,S)**

Table 4-2
(Continued)

Parameter	Acronym	Data Type*	Valid Range	Default	Notes
Coal drilling					
# drills/working place	NDPC	I	1-100	1	
drilling required	DREQ	I	0,1	1	0 - no, 1 - yes
Coal loading					
# of working places	NWPC	I	1-100		
scheduled monthly operating hours	MOHC	I	0-744	336	
bucket fill factor (%)	BFFC	R	0-100	75,0	(L,H) or (X,S)**
coal load cycle time (sec)	CYCC	R	0-1000	35,0	(L,H) or (X,S)**
Coal hauling					
# of loading passes	NLPC	I	1-100	7	
truck travel time loaded (sec)	TTLC	R	0-1000	800,0	(L,H) or (X,S)**
truck travel time empty (sec)	TTEC	R	0-1000	480,0	(L,H) or (X,S)**
turn, spot dump time (sec)	TSDC	R	0-1000	200,0	(L,H) or (X,S)**
truck capacity	TCC	R	0-1000	0	
Reclamation					Area and Open-Pit only
Spoil handling					
width of pit/windrow	WID	R	0-1000	100,0 area 20,0 open-pit	(L,H) or (X,S)**
scheduled monthly operating hours	MOHD	I	0-744	336	
angle of spoil (degrees)	ANGL	R	0-360	36,0	(L,H) or (X,S)**
maximum blade capacity	BDMX	R	4,9,13,19 23	19	
operator efficiency factor (%)	OEFR	R	0-100	75,0	(L,H) or (X,S)**
operating efficiency factor (%)	OGFR	R	0-100	80,0	(L,H) or (X,S)**
swell facotr (%)	SWR	R	0-100	25,0	(L,H) or (X,S)**
material factor (%)	MFR	R	0-100	80,0	(L,H) or (X,S)**
weather factor (%)	WFR	R	0-100	80,0	(L,H) or (X,S)**

Table 4-2
(Continued)

Parameter	Acronym	Data Type*	Valid Range	Default	Notes
Topsoil handling					
scheduled monthly operating hours	MOHS	I	0-744	168	
maximum scraper capacity (cu. yds)	SCMX	R	14,21,32	21	
loading time in topsoil (sec)	LT	R	0-1000	50,0	(L,H) or (X,S)**
maneuver + spread time (sec)	MST	R	0-1000	42,0	(L,H) or (X,S)**
truck travel time loaded (sec)	TTLT	R	0-1000	410,0	(L,H) or (X,S)**
truck travel time empty (sec)	TTET	R	0-1000	246,0	(L,H) or (X,S)**
Financial					
Cost treatment	COST	A	EXP,DEF	DEF	EXP - expensed, DEF - deferred
Applicable cost range					
- equipment	REQ	A	LOW,HIGH, TOT	TOT	
- construction	RCON	A	LOW,HIGH, TOT	TOT	
Union welfare fund payments (/man-hr)	VWRM	R	0-100	1.385	
Union welfare fund payments (/ton)	UWRT	R	0-100	1.64	
Labor overhead (%)	OVHP	R	0-100	40.	Percent of direct labor
Indirect capital (%)	ICP	R	0-100	15.	Percent of primary capital
Drilling cost per foot ($)	DCF	R	0-1000	15.	
Royalty payment (percentage)	ROYP	R	0-100	12.5	
Royalty payment (per ton)	ROYT	R	0-100	0.	
Severance tax (percentage)	SEVP	R	0-100	0.	
Severance tax (per ton)	SEVT	R	0-100	0.	
State + local tax (%)	STAX	R	0-100	2.	
Black lung tax ($)	BLT	R	0-100	.25	
Abandoned mine reclamation fund ($)	AMRF	R	0-100	.35	
Depreciation method					
dragline (area)/shovel (open-pit)	DMO	I	1-3	1	
bucket	DMB	I	1-3	1	
dozer scraper (contour)/haul truck (open)	DMT	I	1-3	1	1 - straight line
drills	DMD	I	1-3	1	2 - sum of years
coal loaders/shovels	DML	I	1-3	1	3 - double declining balance
haul trucks	DMH	I	1-3	1	
reclamation equipment (area + open-pit only)	DMR	I	1-3	1	

Table 4-2
(Continued)

Parameter	Acronym	Data Type*	Valid Range	Default	Notes
Depreciable Life					
dragline (area)/shovel (open-pit)	DLO	I	0-50	LIFE	
bucket	DLB	I	0-50	10	
dozer scraper (contour)/haul trucks (open)	DLT	I	0-50	10 - open 5 - contour	
drills	DLD	I	0-50	10	
coal loaders/shovels	DLL	I	0-50		
haul trucks	DLH	I	0-50	10	
reclamation equipment (area + open-pit only)	DLR	I	0-50	5	
Salvage Value (%)					
dragline (area)/shovel (open-pit)	SVO	R	0-100	10	
bucket	SVB	R	0-100	5	
dozer scraper (contour)/haul trucks (open)	SVT	R	0-100	5	
drills	SVD	R	0-100	10	
coal loaders/shovels	SVL	R	0-100	10	
haul trucks	SVH	R	0-100	5	
reclamation equipment (area + open-pit only)	SVR	R	0-100	10	

Rates for royalty payments are expressed as a cost per ton (ROYT) or as a percentage of sales revenue (ROYP). If both variables are assigned non-zero values, royalty payments are calculated as the sum of both factors.

Similarly, the severance tax rate may be expressed as a cost per ton (SEVT) or as a percentage of gross profit (SEVP). Total severance tax is the sum of these terms, if both variables are non-zero.

All parameters which may be randomized for the uncertainty analysis are indicated in Table 4-2. If two values are assigned for the point value case, the mean value will be used for computation.

CATEGORY 3 - PARAMETERS WHICH OVERRIDE CALCULATED VALUES

All input parameters in this category, as presented in Table 4-3, are initialyzed to zero to indicate values should be calculated by the program. To override the program calculations, the user assigns a nonzero value to the appropriate parameter. After a parameter has been assigned by a previous case, it must be reset to zero by the user to resume calculation by the program.

CONTROL VARIABLES

Four additional parameters provide further user control over the program functions. The number of iterations performed by the uncertainty analysis (NIT = 20 default) may be overridden by the user. A minimum of six iterations are required to properly calculate the mean delta variance.

The printing of eight output tables summarizing the results of each submodel, is requested by assigning the appropriate table numbers to the PRNT parameter. The cash flow summary table (Table VIII) generated for each iteration of the uncertainty analysis may be printed by setting the P8 parameter.

TABLE 4-3

CATEGORY 3 - PARAMETERS WHICH OVERRIDE CALCULATED VALUES

Parameter	Acronym	Data Type*	Valid Range	Notes
Physical				
Land area Requirements	LAR	R	> 0	
Operating				
Total hourly labor cost	HLC	R	> 0	(L,H) or (X,S) enter PYR or BASE year dollars
Total salaried personnel cost	SPC	R	> 0	(L,H) or (X,S) enter PYR or BASE year dollars
Financial				
Exploration & development cost	EDC	R	> 0	(L,H) or (X,S)**
Support capital (% total capital)	SCP	R	0-100	
Annual supplies + material cost	SMC	R	> 0	(L,H) or (X,S)**
Annual operating cost	AOC	R	> 0	(L,H) or (X,S)
Preproduction development cost	PDC	R	> 0	(L,H) or (X,S)
Working capital	WC	R	> 0	(L,H) or (X,S)
Control Valuables				
Number of iterations	NIT	I	1-100	default 1 - PV analysis 20 - UNC analysis
Print tables	PRNT	I	1-8	array contains list of tables by number to be printed
Print VIII	P8	I	0,1	P8=1 indicates Table VIII is printed for each uncertainty iteration
Point value costs	PVC	I	0,1	PVC=1 indicates point values are to be used for all data base costs.

* A - alphameric
R - real (decimal required)
I - integer value

** Randomized values are entered as a range (low value, High value) or mean and standard deviation (X,S)
Second value is ignored for point value analysis.

The default value (1) assigned to the PVC parameter indicates point values should be used for construction and equipment costs determined by the program. If this indicator is overridden by the user, random values, under the control of the REQ and RCON parameters, will be generated and assigned.

BATCH INPUT FORMAT

The batch input data set consists of two types of input. The first type contains all alphameric parameters to be assigned which must be formatted on the first two lines of each input set. The second type consists of a namelist, which is used to enter all parameters which are assigned numeric values.

Table 4-4 presents a list of all alphameric parameters and the corresponding input format required. The program default values can be specified by leaving the indicated parameter position blank.

The required input format is summarized below.

Column	1	6	11	16	21
line 1	TYPE	$A	COST	REQ	RCON
line 2	MINE	LOC	CD	OVCN	PREP

This group of input is followed by a namelist, which is used to enter parameters from all three categories to be assigned numerical values, in the form

```
$ DATA
     symbolic name = constant
$ END
```

TABLE 4-4

BATCH INPUT
ALPHAMERIC INPUT FORMAT

Acronym	Category	Description	Valid Values*	Line	Column	Format
TYPE	1	Type of analysis	PV, UNC	1	1	A4
$A	1	Dollar analysis	CON, ESC	1	6	A4
COST	2	Cost treatment	EXP, DEF	1	11	A4
REQ	2	Applicable equipment cost range	LOW,TOT,HIGH	1	16	A4
RCON	2	Applicable construction cost range	LOW,TOT,HIGH	1	21	A4
MINE	1	Mining system	AREA,OPEN,CONT	2	1	A4
LOC	1	Location of mine	EAST,MIDW, WEST	2	6	A4
CD	2	Coal density	LIG,BIT	2	11	A4
OVCN	2	Overburden consolidation	LOW,MOD,HIGH	2	16	A4
PREP	2	Type of coal preparation	NONE,BREA,CORS, FINE	2	21	A4

* Default values are underscored

The following format rules apply.

- The first entry in the input group must be $DATA, beginning in column 2.
- The symbolic name must be a valid parameter name as listed in Tables 4-1, 4-2, or 4-3.
- The constant must be a value in the indicated range. Integer variables must not contain a decimal. Two values are assigned to randomized parameters by separating the entries by a comma (,).
- Parameter assignments are separated by commas. The column locations and order of entry is not significant.
- The end of a data group is signaled by $END, entered in column 2 of the input line.

Parameters to be randomized are assigned two values to specify a range (low value, high value) or a mean and standard deviation ($\bar{x}$, s). The order of entry is significant, since the program compares these two values to determine the usage intended. If the first value is greater, a mean and standard deviation is assumed, e.g.,

OT = 40,4

is interpreted as an overburden thickness of 40' with standard deviation of 4. If the second value is greater, a range of values is assumed, e.g.,

OT = 40,50

results in the program assigning random values between 40' and 50'.

The entire input data set is verified by the program prior to performing any model calculations. Any erroneous parameter codes, or data values assigned which exceed the indicated valid ranges result in error messages issued by the program for each invalid usage. The input summary listing is printed and the program proceeds with the next case.

Any number of cases may be submitted for a single run. The user is responsible for ensuring that all required input is assigned for the first case. Input entered via the namelist remains in effect until the program is terminated; therefore, for subsequent runs, only the parameters to be changed need be entered.

Sample input illustrating two cases submitted for the batch version is shown below.

```
//GO.FT05F001 DD *
UNC  CON  DEF
OPEN WEST LIG  MOD  BREA
 $DATA
     PRINT=1,2,3,4,5,6,7,8,   NIT=15,
     OT=200,20,  ST=40,50,  TST=0,  CPA=2000, YDC=3000000, LIFE=15,
     DER=0, LF=5, PF=5, SF=5, OF=5, CF=5,
     DREQ=0, NDPO=2, NDPC=2, NLPO=6, NLPC=5, DMO=2, DMB=2, DMR=3, DMH=3,
     DCF=20, OVHP=50, STAX=5, PYR=1979, BASE=1979, MOHS=150, MOHO=350,
     OLO=20, ROR=20
 $END
UNC  CON  DEF
OPEN WEST LIG  MOD  BREA
 $DATA
   PVC=0
 $END
```

The second case to be run changes the point value option to randomize data base costs. All other parameters are held constant.

INTERACTIVE INPUT FORMAT

All input is entered from an interactive terminal in a free field format. Values assigned to parameters are entered individually, with two exceptions. For the uncertainty analysis, two values must be entered for parameters to be randomized, either a range (low value, high value) or mean and standard deviation. These two values are entered on one line, separated by blanks or commas, in the order indicated. The PRNT parameter represents an array of values itemizing which of the nine output tables are to be printed. These values are also separated by blanks or commas and followed by a slash (/) e.g.,

PRNT: 1 2 4 /

indicates only Tables I, II and IV are to be printed. The slash signifies to the program that only these three numbers are to be read; the full array size of eight entries is not required. If the trailing slash is omitted, the program hangs in a wait state for the full array of input. Should this occur, enter the slash followed by a carriage return to resume processing.

Sample dialogs between the user and the program in the required input section are shown in Figures 4-1 and 4-2.

For the first procedure two values are requested for the randomized parameters, since an uncertainty analysis has been specified. The seam thickness is entered as a range of values between 10' and 15' (10 < 15). The overburden thickness is assigned a mean of 45' and standard deviation of 4 (45 > 4). Topsoil thickness will assume a fixed value of 3'.

The second procedure, shown in Figure 4-2, specifies a point value analysis; hence, single values for all input parameters are requested. For the constant

```
                        SURFACE COAL MINING COST MODEL
♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦

ENTER MINING SYSTEM  (AREA,OPEN,CONT)
AREA

ENTER LOCATION OF MINE (EAST,MIDW,WEST)
WEST

ENTER TYPE OF ANALYSIS  (PV-POINT VALUE, UNC-UNCERTAINTY)
UNC

ENTER ANNUAL PRODUCTION (TONS)
2000000

ENTER SEAM THICKNESS (FT)  (LOW,HIGH OR MEAN,STD DEV)
10,15

ENTER OVERBURDEN THICKNESS (FT)  (LOW,HIGH OR MEAN,STD DEV)
45,4

ENTER TOPSOIL THICKNESS (FT)  (LOW,HIGH OR MEAN,STD DEV)
3,0

MULTIPLE SEAMS? (YES,NO)
YES

ENTER PRODUCTION LIFE  (1-50 YEARS)
15

ENTER FIRST CALENDAR YEAR OF PROJECT
1980

ENTER TYPE OF DOLLAR ANALYSIS  (CON,ESC)
CON

ENTER BASE YEAR
1979

ENTER COST UPDATE FACTORS FOR
LABOR
5
PRIMARY EQUIP
5
SUPPORTING EQUIP
10
OPERATING
10
CONSTRUCTION
6

ENTER PORTION OF CAPITAL BORROWED (%)
25

ENTER DEBT SERVICING RATE (%)
12

ENTER LENGTH OF LOAN PAYBACK PERIOD (YEARS)
7

ENTER ACQUISITION COST OF PROPERTY ($/ACRE)
2000

ENTER COAL VALUE/TON  (ENTER 0 IF CALCULATED)
0

ENTER RATE OF RETURN (%)
25

** INITIAL INPUT SEQUENCE COMPLETE **
```

Figure -4-1

SAMPLE INTERACTIVE DIALOGUE

```
EX SURFACE

                              SURFACE COAL MINING COST MODEL
*************************************************************************

ENTER MINING SYSTEM  (AREA,OPEN,CONT)
AREA

ENTER LOCATION OF MINE (EAST,MIDW,WEST)
MIDW

ENTER TYPE OF ANALYSIS  (PV-POINT VALUE, UNC-UNCERTAINTY)
PV

ENTER ANNUAL PRODUCTION (TONS)
2000000

ENTER SEAM THICKNESS (FT)
10

ENTER OVERBURDEN THICKNESS (FT)
45

ENTER TOPSOIL THICKNESS (FT)
3

MULTIPLE SEAMS? (YES,NO)
NO

ENTER PRODUCTION LIFE  (1-50 YEARS)
20

ENTER FIRST CALENDAR YEAR OF PROJECT
1980

ENTER TYPE OF DOLLAR ANALYSIS  (CON,ESC)
ESC

ENTER ESCALATION FACTORS FOR
LABOR
5
PRIMARY EQUIP
5
SUPPORTING EQUIP
5
OPERATING
2
CONSTRUCTION
2
```

FIGURE 4-2 (1)

SAMPLE INTERACTIVE DIALOGUE

```
ENTER PORTION OF CAPITAL BORROWED (%)
30

ENTER DEBT SERVICING RATE (%)
12

ENTER LENGTH OF LOAN PAYBACK PERIOD (YEARS)
10

ENTER ACQUISITION COST OF PROPERTY ($/ACRE)
1000

ENTER COAL VALUE/TON  (ENTER 0 IF CALCULATED)
20

ENTER ESCALATION FACTOR FOR COAL VALUE
5

◆◆ INITIAL INPUT SEQUENCE COMPLETE ◆◆

◆◆ OPTIONAL INPUT SECTION ◆◆

TO CHANGE A PARAMETER VALUE, ENTER THE CODE FOR THE PARAMETER
YOU WILL THEN BE PROMPTED FOR A NEW VALUE
TO OBTAIN A LIST OF CODES, ENTER "LIST" IN PLACE OF CODE
TO TERMINATE INPUT, ENTER "END" IN PLACE OF CODE

ENTER PARAMETER CODE, "END" OR "LIST"
OVHP
OVHP =    40.0  ENTER NEW VALUE -
50

ENTER PARAMETER CODE, "END" OR "LIST"
DMT
DMT  =    1  ENTER NEW VALUE -
3

ENTER PARAMETER CODE, "END" OR "LIST"
DML
DML  =    1  ENTER NEW VALUE -
2
```

FIGURE 4-2 [2]
(Continued)

dollar analysis, the program prompts the user for the base year, and no prompting message for coal value escalation factor is required.

The optional input section of the program is entered prior to each iteration of the model. In this section, the user has access to all input parameters used by the program, including the required input entered initially. No individual prompting messages are issued by this section of the program. The user must enter the appropriate parameter code to select the parameter to be changed. A full listing of all available parameters, the corresponding codes used for identification, and the current values assigned is presented in Figure 4-3.

Upon entering this section, the user is first given some simple instructions, and then asked to enter either a code name for a parameter, or a "LIST" or "END command. To change a parameter value, the user enters the appropriate parameter code, which is checked by the program for validity. If the code is not valid, a message is printed and the user asked to reenter the code. If a valid code is entered, the program prints the current value of that parameter and then asks the user to enter a new value. The program compares the new value against the corresponding allowable range. If the value entered is out of range, a message is printed indicating the valid range and the user is asked to reenter. If the value is accepted by the model, the program asks for the next command. The optional input procedure is illustrated in Figure 4-2[(2)].

The "LIST" command produces the full listing of current input parameters, as illustrated in Figure 4-3 This listing reflects the input data entered for the required parameters and the default values assigned by the program for the optional parameters. Optionally, the user may request a listing of input parameters for any iteration of the uncertainty analysis in the interactive mode by inputting the proper response to the user terminal messages.

In the interactive mode the user may request tables to be printed for any iteration of the uncertainty analysis by responding to the terminal messages.

```
** OPTIONAL INPUT SECTION **

TO CHANGE A PARAMETER VALUE, ENTER THE CODE FOR THE PARAMETER
YOU WILL THEN BE PROMPTED FOR A NEW VALUE
TO OBTAIN A LIST OF CODES, ENTER "LIST" IN PLACE OF CODE
TO TERMINATE INPUT, ENTER "END" IN PLACE OF CODE

ENTER PARAMETER CODE, "END" OR "LIST"
LIST

                          SUMMARY OF INPUT PARAMETERS
                          ---------------------------


CATEGORY 1  -  REQUIRED INPUT PARAMETERS

    PHYSICAL                                          ACRONYM
    --------                                          -------

         SEAM THICKNESS (FT)                            ST          10.          15.
         OVERBURDEN THICKNESS (FT)                      OT          45.           4.
         TOPSOIL THICKNESS (FT)                         TST          3.           0.
         MULTIPLE SEAMS (0-NO,1-YES)                    MS           1

    OPERATING
    ---------

         MINING SYSTEM                                  MINE       AREA
         ANNUAL PRODUCTION (TONS)                       YDC     2000000.
         MINE LIFE (YEARS)                              LIFE         15
         COAL REGION                                    LOC        WEST

    FINANCIAL
    ---------

         LENGTH OF LOAN PAYBACK PERIOD                  LL            7
         PORTION OF INITIAL CAPITAL BORROWED (%)        DER       25.00
         DEBT SERVICING RATE (%)                        DSR       12.00
         ACQUISITION COST OF PROPERTY ($/ACRE)          CPA       2000.
         PROJECT YEAR                                   PYR        1980
         TYPE OF ANALYSIS                               TYPE        UNC
         CONSTANT DOLLAR ANALYSIS - UPDATE FACTORS
              - BASE YEAR                               BASE       1979
              - LABOR                                   LF         5.00
              - PRIMARY EQUIPMENT                       PF         5.00
              - SUPPORTING EQUIPMENT                    SF        10.00
              - OPERATING                               OF        10.00
              - CONSTRUCTION                            CF         6.00
         RATE OF RETURN (%)                             ROR       25.00
```

Figure 4-3

OPTIONAL INPUT LISTING

CATEGORY 2 - OPTIONAL PARAMETERS (DEFAULT ASSIGNED)

PHYSICAL	ACRONYM		
DEGREE OF COAL PREPARATION (0-NONE, 1-BREA, 2-CORS, 3-FINE)	PREP	0	
REJECT %	REJ	0.0	0.0
RECOVERY %	REC	90.00	0.0
DILUTION %	DIL	2.00	
COAL DENSITY (1-LIG, 2-BIT)	CD	2	
EXPLORATION REQUIRED	EXR	40.	
OPERATING			
DRILLING OVERBURDEN			
# DRILLS/WORKING PLACE	NDPO	1	
DEGREE OF OVERBURDEN CONSOLIDATION (0-LOW, 1-MOD, 2-HIGH)	OVCN	1	
OVERBURDEN EXCAVATION			
DRAGLINE			
# OF WORKING PLACES	NWPO	0	
MAXIMUM BUCKET SIZE (CU YDS)	BCMX	110.	
BUCKET FILL FACTOR	BFFO	80.00	0.0
OPERATOR EFFICIENCY FACTOR	OEFO	75.00	0.0
SCHEDULED MONTHLY OPERATING HRS	MOHO	720	
CYCLE TIME	CYCO	60.0	0.0
COAL DRILLING			
# DRILLS/WORKING PLACE	NDPC	1	
DRILLING REQUIRED	DREQ	YES	
COAL LOADING			
# OF WORKING PLACES	NWPC	0	
SCHEDULED MONTHLY OPERATING HRS	MOHC	336	
BUCKET FILL FACTOR	BFFC	75.00	0.0
OPERATOR EFFICIENCY FACTOR	OEFC	75.00	0.0
COAL LOAD CYCLE TIME	CYCC	35.00	0.0
COAL HAULING			
# OF LOADING PASSES	NLPC	7	
TRUCK TRAVEL TIME LOADED	TTLC	800.	0.
TRUCK TRAVEL TIME EMPTY	TTEC	480.	0.
TURN, SPOT, DUMP TIME	TSDC	200.	0.
TRUCK CAPACITY	TCC	0.	

Figure 4-3
(Continued)

RECLAMATION

SPOIL HANDLING			
WIDTH OF PIT	WID	100.	0.
SCHEDULED MONTHLY OPERATING HRS	MOHD	336	
ANGLE OF SPOIL (DEGREES)	ANGL	36.0	0.0
MAXIMUM BLADE CAPACITY	BDMX	19.	
OPERATOR EFFICIENCY FACTOR	OEFR	75.00	0.0
OPERATING EFFICIENCY FACTOR	OGFR	80.00	0.0
SWELL FACTOR	SWR	25.00	0.0
MATERIAL FACTOR	MFR	80.00	0.0
WEATHER FACTOR	WFR	80.00	0.0
TOPSOIL HANDLING			
SCHEDULED MONTHLY OPERATING HRS	MOHS	168	
MAXIMUM SCRAPER CAPACITY	SCMX	21.00	
LOADING TIME IN TOPSOIL	LT	50.	0.
MANEUVER & SPREAD TIME	MST	42.	0.
TRUCK TRAVEL TIME LOADED	TTLT	410.	0.
TRUCK TRAVEL TIME EMPTY	TTET	246.	0.

FINANCIAL

DEFERRED COST TREATMENT	COST	
COST RANGE APPLICABLE		
- EQUIPMENT	REQ	TOT
- CONSTRUCTION	RCON	TOT
UNION WELFARE FUND PAYMENTS (PER MANHR)	UWRM	1.385
UNION WELFARE FUND PAYMENTS (PER TON)	UWRT	1.640
LABOR OVERHEAD (%)	OVHP	40.00
INDIRECT CAPITAL (%)	ICP	15.00
DRILLING COST/FOOT	DCF	15.00
ROYALTY PAYMENT (PERCENTAGE)	ROYP	12.50
ROYALTY PAYMENT (PER TON)	ROYT	0.0
SEVERANCE TAX (PERCENTAGE)	SEVP	0.0
SEVERANCE TAX (PER TON)	SEVT	0.0
STATE & LOCAL TAX	STAX	2.00
BLACK LUNG TAX	BLT	0.25
ABANDONED MINE RECLAMATION FUND	AMRF	0.35
DEPRECIATION METHOD		
- DRAGLINE	DMD	SL
- BUCKETS	DMB	SL
- DRILLS	DMD	SL
- LOADERS / SHOVELS	DML	SL
- HAUL TRUCKS	DMH	SL
- DOZERS & SCRAPERS	DMR	SL
DEPRECIABLE LIFE		
- DRAGLINE	DLD	15
- BUCKETS	DLB	10
- DRILLS	DLD	10
- LOADERS / SHOVELS	DLL	0
- HAUL TRUCKS	DLH	10
- DOZERS & SCRAPERS	DLR	5
SALVAGE VALUE		
- DRAGLINE	SVD	10.00
- BUCKETS	SVB	5.00
- DRILLS	SVD	10.00
- LOADERS / SHOVELS	SVL	10.00
- HAUL TRUCKS	SVH	5.00
- DOZERS & SCRAPERS	SVR	10.00

Figure 4-3
(Continued)

```
CATEGORY 3  -  PARAMETERS WHICH OVERRIDE CALCULATED VALUES

    PHYSICAL                                        ACRONYM
    --------                                        -------

         LAND AREA REQUIREMENTS                       LAR          0.

    OPERATING
    ---------
         TOTAL HOURLY LABOR COST                      HLC          0.          0.
         TOTAL SALARIED PERSONNEL COST                SPC          0.          0.

    FINANCIAL
    ---------

         EXPLORATION & DEVELOPMENT DRILLING COST      EDC          0.          0.
         SUPPORT CAPITAL (% TOTAL CAPITAL)            SCP          0.
         ANNUAL SUPPLIES & MATERIALS COST             SMC          0.          0.
         ANNUAL OPERATING COST                        AOC          0.          0.
         PREPRODUCTION DEVELOPMENT COST               PDC          0.          0.
         WORKING CAPITAL                              WC           0.          0.


CONTROL VARIABLES
-----------------
         NUMBER OF ITERATIONS                         NIT         20
         PRINT TABLES                                 PRNT     0
         PRINT VIII FOR EACH ITERATION                P8           0
         POINT VALUE COSTS (0-NO,1-YES)               PVC          1

ENTER PARAMETER CODE, "END" OR "LIST"
END
```

Figure 4-3
(Continued)

A partial listing can be produced by entering LISTn where n is an integer from 1 to 3 which indicates the section to be listed. This command lists the parameters within a designated category as follows:

LIST 1	Category 1 -	Required input parameters
LIST 2	Category 2 -	Optional parameters (default assigned)
LIST 3	Category 3 -	Parameters which override calculated values

Control variables are printed only when a full listing is requested.

The "END" command is used to terminate the optional input section and proceed with the model calculations.

OUTPUT DESCRIPTION

All output generated by the Coal Mining Cost Model is directed to the user's terminal by the interactive version, and to an offline printer for the batch version. For each case performed by the program, a summary table is printed showing the solution obtained by the code (either coal value/ton or rate of return), some basic information regarding the mining situation under analysis, and for the uncertainty case, the probability of occurrence for a range of values.

Eight other output tables are available for printing upon request by the user. These tables summarize the intermediate results of each of the submodels and each phase of the financial analysis, as described below. For the uncertainty case, the mean and standard deviation is shown for all output parameters. Samples of all possible program output are shown in the test cases presented in Section 5.

Table I - Primary Equipment Selection & Costs

This table summarizes the primary equipment requirements and associated costs for each unit operation performed by the specified type of mining system. The costs for land acquisition and exploration and development dulling are also shown.

Table II - Supporting Capital Item Costs

Cost estimates for support equipment directly associated with the major stripping equipment, auxiliary equipment and capital items, preparation plant and total construction costs are summarized in this table.

Table III - Manpower Requirements and Costs

This table presents the total manpower requirements for both hourly and salaried personnel, and the corresponding costs.

Table IV - Operating Supplies and Materials Costs

This table summarizes all other direct costs, other than labor, associated with the mining operation.

Table V - Total Capital Analysis

This table presents an annual breakdown of all costs incurred in both the initial and deferred cost category. Initial capital refers to capital expenditures incurred prior to the first year of full production. Deferred capital refers to capital expenses incurred after full production begins. The calendar year and relative project year in which each cost is incurred is also shown on the table. All costs are escalated if that option has been requested.

Table VI - Depreciation, Salvage Value, Investment Tax Credit

This table itemizes the depreciation charge, salvage value, and investment tax credit applicable in each year of the project life, for the following four capital cost categories: production section equipment, haulage system, auxiliary equipment and entry haulage system. The depreciation method, depreciable life, and salvage value percentage corresponding to each of the cost categories is also shown. If the escalating dollar option has been exercised, costs listed in the table are the escalated dollar values.

Table VII - Direct Operating Costs

The annual costs listed in this table are for labor, labor overhead charges, supplies and materials, power, union welfare and insurance. In the constant dollar option, all operating costs remain constant for the entire production phase of the project. In the escalating dollar case, a weighted escalation factor is applied to the insurance costs. All other costs are escalated by the designated user input factors.

Table VIII - Cash Flow Summary Table

This table presents the results of the annual discounted cash flow analysis which culminates in the present value evaluation. Each of the 36 cashflow line items, as described in the model definition, are printed for each year of the project life. The cash flow table generated for each iteration of the uncertainty analysis may be printed upon request.

ERROR AND RECOVERY

Several types of errors can occur in the operation of the system. These can be broken down into the following categories, with the appropriate recovery procedures noted for each type.

- Invalid Names in Data Entry

The batch version uses a data directed input procedure, which assigns an input value to the appropriate variable name. Invalid names cause a system error message to occur. Although processing continues, the remainder of the NAMELIST input is ignored and therefore, input parameters will not be set as requested. Verify that all variable names conform to those established in the input list summary and resubmit. The interactive version issues an error message and reentry request to allow on-line correction of the invalid parameter name.

- Invalid Data

Valid ranges for all input data are defined in Tables 4-1, 4-2 and 4-3. During the data editing procedure, the program verifies that all input data conform to these requirements. Erroneous entries are identified with an appropriate message indicating the valid range. The interactive version provides for on-line correction. In the batch version, the case is terminated, and must be resubmitted by the user after correcting the invalid entry.

- Program Interruption

The command list which involves the interactive version allocates the temporary files required for processing to the user's terminal. Upon normal termination of the program, these files are freed before returning the system to the READY mode. If this procedure is interrupted by the user by hitting BREAK during program execution, the user must enter a FREEALL command prior to reinitiating the program procedure.

- Convert Illegal Character

This message is issued by the system during execution of the interactive program, if an alphameric characteristic entered when the program expects to numerical value. The "standard fixup taken" is to set the requested parameter to zero. Connect this entry by reassigning the value in the optional input section.

- No Convergence

This message is issued by the financial model to indicate no solution can be obtained for the current case. Again, this situation is not necessarily due to invalid operation of the code. Imposing more restrictive limitations on the range of randomized variables may yield a solution. Also verify that input parameters have been correctly assigned.

Section 5

SAMPLE TEST CASES

On the following pages of this section three test cases have been included to illustrate the usage of the computerized model and to assist in program validation. For the first case, a terminal session has been reproduced in its entirety to demonstrate the interactive version of the program. The second case illustrates all of the output tables available as generated by the batch version of the program.

TEST CASE 1

Case 1 solves for coal value per ton using the uncertainty analysis for the contour mining system, to illustrate the required input entered by the user in response to program prompting. In the optional input section, several parameters which were assigned default values by the program are overriden, and printing of the first four tables is requested.

Upon completion of this case, a coal value per ton is specified and a point value solution for the rate of return is requested. Note that the rate of return originally specified must be reset to zero. Only the final summary table is shown in the output for this case.

TEST CASES 2 AND 3

The output shown on the pages following Test Case 1 were generated by the batch version of the program. The input data set shown below was for Case 2.

```
UNC  CON  DEF
OPEN WEST LIG  MOD  BREA
 $DATA
     PRINT=1,2,3,4,5,6,7,8, NIT=15,
     OT=200,20,  ST=40,50,  TST=0,  CPA=2000,  YDC=3000000,  LIFE=15,
     DER=0, LF=5, SF=5, OF=5, CF=5, PVC=0, MS=1,
     DREQ=0, NDPO=0, NDPC=2, NLPO=6, DMO=2, DMB=2, DMR=3, DMH=3,
     DCF=20, OVHP=50, STAX=5, PYR=1980, BASE=1980, MOHS=150, MOHD=350,
     DLD=20, ROR=20
 $END
```

The input set shown below represents Case 3.

```
PV    CON
AREA WEST
 $DATA
      PRINT=1,2,3,4,5,6,7,8,
      OT=100, ST=15, TST=2, CPA=1000, YDC=2000000, LIFE=15,
      DER=50, DSR=10, LL=10, LF=2, PF=4, SF=6, OF=8, CF=10,
      PYR=1980, BASE=1980, CVT=15
 $END
```

The first input data set (Case 2) requests an uncertainty analysis to solve for coal value per ton, using the constant dollar analysis, for the open-pit mining system. All eight output tables have been printed.

The second input data set (Case 3) performs a point value analysis to solve for the rate of return on equity for an area mining situation.

```
E> SURFACE


                              SURFACE COAL MINING COST MODEL
****************************************************************************

ENTER MINING SYSTEM  (PREP,OPEN,CONT)
CONT

ENTER LOCATION OF MINE (EAST,MIDW,WEST)
WEST

ENTER TYPE OF ANALYSIS  (PO-POINT VALUE, UNC-UNCERTAINTY)
UNC

ENTER ANNUAL PRODUCTION (TONS)
2000000

ENTER SEAM THICKNESS (FT)  (LOW,HIGH OR MEAN,STD DEV)
5,6

ENTER OVERBURDEN THICKNESS (FT)  (LOW,HIGH OR MEAN,STD DEV)
40,8

ENTER TOPSOIL THICKNESS (FT)  (LOW,HIGH OR MEAN,STD DEV)
3,0

MULTIPLE SEAMS? (YES,NO)
NO

ENTER PRODUCTION LIFE  (1-50 YEARS)
15

ENTER FIRST CALENDAR YEAR OF PROJECT
1990

ENTER TYPE OF DOLLAR ANALYSIS  (CON,CUR)
CON

ENTER BASE YEAR
1990

ENTER COST ESCALATE FACTORS FOR
LABOR
5
PRIMARY EQUIP
4
SUPPORTING EQUIP
4
OPERATING
6
CONSTRUCTION
8
```

```
ENTER PORTION OF CAPITAL BORROWED (%)
25

ENTER INTT SERVICING RATE (%)
12

ENTER LENGTH OF LOAN PAYBACK PERIOD (YEARS)
10

ENTER ACQUISITION COST OF PROPERTY ($/MORE)
2000

ENTER GOAL VALUE/ROR  (ENTER 0 IF CALCULATED)
0

ENTER RATE OF RETURN (%)
20

** INITIAL INPUT SEQUENCE COMPLETE **

** OPTIONAL INPUT SECTION **

TO CHANGE A PARAMETER VALUE, ENTER THE CODE FOR THE PARAMETER
YOU WILL THEN BE PROMPTED FOR A NEW VALUE
TO OBTAIN A LIST OF CODES, ENTER "LIST" IN PLACE OF CODE
TO TERMINATE INPUT, ENTER "END" IN PLACE OF CODE

ENTER PARAMETER CODE, "END" OR "LIST"
NIT
NIT  =  20  ENTER NEW VALUE -
10

ENTER PARAMETER CODE, "END" OR "LIST"
PVC
PVC  =   0  ENTER NEW VALUE -
1

ENTER PARAMETER CODE, "END" OR "LIST"
PRNT
PRNT =  0
ENTER NEW VALUES   (ENTER "/" AFTER LAST VALUE)
1 2 3 4/

ENTER PARAMETER CODE, "END" OR "LIST"
END

** OPTIONAL INPUT COMPLETE **
```

UNCERTAINTY ANALYSIS

ITERATION	COAL VALUE/TON
1	31.29
2	31.00
3	31.01
4	31.05
5	30.88
6	31.03
7	31.02
8	31.04
9	31.05
10	31.03

CONSTANT DOLLAR CASE - UNCERTAINTY OPTION

	MEAN	STD DEV
COAL VALUE/TON	31.46	1.26
MEAN DELTA VARIANCE	-0.46 -	-0.05
PROJECT START YEAR	1990	
FULL PRODUCTION YEARS	1992 - 1996	
RATE OF RETURN ON EQUITY	20.00	
CAPITALIZATION		
- DEBT (%)	25.00	
- EQUITY (%)	75.00	
DEBT SERVICING PERCENTAGE	15.00	
# OF ITERATIONS	10	

PROBABILITY OF OCCURANCE	RANGE OF VALUES
95%	28.97 - 33.94
90%	29.33 - 33.54
85%	29.54 - 33.26
80%	29.64 - 33.05
70%	29.84 - 32.77
60%	30.04 - 32.62

I PRIMARY EQUIPMENT SELECTION AND COSTS

(1980 DOLLARS)

A. LAND AND EXPLORATION	QUANTITY		COST	
	MINE	STRIP	MINE	STRIP
LAND AREA REQUIREMENTS (ACRES)	340.	16.	679876.	32759.
EXPLORATION, DEVELOPMENT DRILLING			5791.	604.

B. PRIMARY EQUIPMENT	UNIT SIZE	# UNITS	COST	
OVERBURDEN REMOVAL				
DOZER	19. CU.YDS.	2.	425199.	857.
SCRAPER	61. CU.YDS.	5.	1581348.	116578.
OVERBURDEN DRILLING				
DRILLS	9. INCHES	1.	666399.	1056.
COAL DRILLING				
DRILLS		1.	81000.	103.
COAL LOADING				
LOADING SHOVELS	1. CU.YDS.	2.	657200.	499.
TOTAL PRIMARY EQUIPMENT COST			3540148.	119592.

II SUPPORTING CAPITAL ITEM COSTS

(1980 DOLLARS)

	MINE	STRIP
SUPPORT CAPITAL	625488.	19952.
PREPARATION PLANT COST	0.	0.
CONSTRUCTION COSTS	315748.	9967.
SUPPORT EQUIPMENT COST	315748.	9967.

III MANPOWER REQUIREMENTS AND COSTS

(1980 DOLLARS)

	MEAN	STD DEV
HOURLY LABOR		
REQUIREMENTS	24.	1.
DIRECT ANNUAL COSTS	431710.	16001.
TOTAL ANNUAL UNION WELFARE COSTS	34905Z.	2736.
SALARIED PERSONNEL		
REQUIREMENTS	3.	0.
DIRECT ANNUAL COSTS	77500.	7500.
TOTAL MANPOWER		
REQUIREMENTS	27.	1.
DIRECT ANNUAL COSTS	509210.	23503.
PRODUCTIVITY/MAN DAY	32.38	1.27

IV OPERATING SUPPLIES & MATERIALS COSTS

(1980 DOLLARS)

	MEAN	STD DEV
ANNUAL SUPPLIES & MATERIALS COST	2175396.	100415.
ANNUAL PREPARATION PLANT OPERATING COSTS	0.	0.
TOTAL DIRECT NON-LABOR OPERATING COSTS	2175396.	100415.

DO YOU WISH TO SEE A SUMMARY OF INPUT PARAMETERS FOR ANY ITERATION ? (YES/NO)
NO

DO YOU WISH TO SEE TABLES PRODUCED FOR ANY ITERATION ? (YES/NO)
NO

```
DO YOU WISH TO SEE A SUMMARY OF INPUT PARAMETERS FOR ANY ITERATION ?
NO

DO YOU WISH TO SEE TABLES PRODUCED FOR ANY ITERATION ? (YES/NO)
NO

DO YOU WISH TO CONTINUE?  (YES/NO)
YES

** OPTIONAL INPUT SECTION **

ENTER PARAMETER CODE, "END" OR "LIST"
ROR
ROR  =   20.0  ENTER NEW VALUE -
0

ENTER PARAMETER CODE, "END" OR "LIST"
CUT
CUT  =    0.0  ENTER NEW VALUE -
25

ENTER PARAMETER CODE, "END" OR "LIST"
TYPE
TYPE = UNC ENTER NEW VALUE -
PU

ENTER PARAMETER CODE, "END" OR "LIST"
PRNT
PRNT =  1 2 3 4
ENTER NEW VALUES  (ENTER "/" AFTER LAST VALUE)
0/

ENTER PARAMETER CODE, "END" OR "LIST"
END

** OPTIONAL INPUT COMPLETE **
```

CONSTANT DOLLAR CASE - POINT VALUE OPTION

RATE OF RETURN ON EQUITY	6.74
PROJECT START YEAR	1980
FULL PRODUCTION YEARS	1982 - 1996
COAL VALUE/TON	20.00
CAPITALIZATION	
- DEBT (%)	25.00
- EQUITY (%)	75.00
DEBT SERVICING PERCENTAGE	10.00

```
DO YOU WISH TO CONTINUE?  (YES/NO)
NO
```



```
*** NORMAL TERMINATION ***
READY
```

TEST CASE 2
Surface Model
SUMMARY OF INPUT PARAMETERS

CATEGORY 1 - REQUIRED INPUT PARAMETERS

PHYSICAL	ACRONYM		
SEAM THICKNESS (FT)	ST	40.	50.
OVERBURDEN THICKNESS (FT)	OT	200.	20.
TOPSOIL THICKNESS (FT)	TST	0.	0.
MULTIPLE SEAMS (0-NO,1-YES)	MS	1	
OPERATING			
MINING SYSTEM	MINE	OPEN	
ANNUAL PRODUCTION (TONS)	YDC	3000000.	
MINE LIFE (YEARS)	LIFE	15	
COAL REGION	LOC	WEST	
FINANCIAL			
LENGTH OF LOAN PAYBACK PERIOD	LL	0	
PORTION OF INITIAL CAPITAL BORROWED (%)	DER	0.0	
DEBT SERVICING RATE (%)	DSR	0.0	
ACQUISITION COST OF PROPERTY ($/ACRE)	CPA	2000.	
PROJECT YEAR	PYR	1980	
TYPE OF ANALYSIS	TYPE	UNC	
CONSTANT DOLLAR ANALYSIS - UPDATE FACTORS			
- BASE YEAR	BASE	1980	
- LABOR	LF	5.00	
- PRIMARY EQUIPMENT	PF	0.0	
- SUPPORTING EQUIPMENT	SF	5.00	
- OPERATING	OF	5.00	
- CONSTRUCTION	CF	5.00	
RATE OF RETURN (%)	ROR	20.00	

SUMMARY OF INPUT PARAMETERS

(CONT.)

CATEGORY 2 - OPTIONAL PARAMETERS (DEFAULT ASSIGNED)

PHYSICAL	ACRONYM		
DEGREE OF COAL PREPARATION	PREP	BREA	
REJECT %	REJ	0.0	0.0
RECOVERY %	REC	90.00	0.0
DILUTION %	DIL	0.56	
COAL DENSITY	CD	LIG	
EXPLORATION REQUIRED	EXR	40.	
OPERATING			
DRILLING OVERBURDEN			
# DRILLS/WORKING PLACE	NDPO	0	
DEGREE OF OVERBURDEN CONSOLIDATION	OVCN	MOD	
OVERBURDEN EXCAVATION			
SHOVEL OPERATION			
# OF WORKING PLACES	NWPO	0	
MAXIMUM BUCKET SIZE (CU YDS)	BCMX	20.	
BUCKET FILL FACTOR	BFFO	80.00	0.0
OPERATOR EFFICIENCY FACTOR	OEFO	75.00	0.0
SCHEDULED MONTHLY OPERATING HOURS	MOHO	448	
CYCLE TIME	CYCO	35.0	0.0
TRUCK OPERATION			
# OF LOADING PASSES	NLPO	6	
TRUCK TRAVEL TIME LOADED	TTLO	135.0	0.0
TRUCK TRAVEL TIME EMPTY	TTEO	81.0	0.0
TURN, SPOT, DUMP TIME	TSDO	200.0	0.0
TRUCK CAPACITY	TCO	0.0	
COAL DRILLING			
# DRILLS/WORKING PLACE	NDPC	2	
DRILLING REQUIRED	DREQ	NO	
COAL LOADING			
# OF WORKING PLACES	NWPC	0	
SCHEDULED MONTHLY OPERATING HOURS	MOHC	336	
BUCKET FILL FACTOR	BFFC	75.00	0.0
OPERATOR EFFICIENCY FACTOR	OEFC	75.00	0.0
COAL LOAD CYCLE TIME	CYCC	35.00	0.0
COAL HAULING			
# OF LOADING PASSES	NLPC	7	
TRUCK TRAVEL TIME LOADED	TTLC	800.	0.
TRUCK TRAVEL TIME EMPTY	TTEC	480.	0.
TURN, SPOT, DUMP TIME	TSDC	200.	0.
TRUCK CAPACITY	TCC	0.	

RECLAMATION

SPOIL HANDLING			
~~WIDTH OF WINDROW~~	~~WID~~	~~20.~~	~~0.~~
SCHEDULED MONTHLY OPERATING HOURS	MOHD	350	
ANGLE OF SPOIL (DEGREES)	ANGL	36.0	0.0
MAXIMUM BLADE CAPACITY	BDMX	19.	
OPERATOR EFFICIENCY FACTOR	OEFR	75.00	0.0
OPERATING EFFICIENCY FACTOR	OGFR	80.00	0.0
SWELL FACTOR	SWR	25.00	0.0
MATERIAL FACTOR	MFR	80.00	0.0
WEATHER FACTOR	WFR	80.00	0.0
TOPSOIL HANDLING			
SCHEDULED MONTHLY OPERATING HOURS	MOHS	150	
MAXIMUM SCRAPER CAPACITY	SCMX	21.00	
LOADING TIME IN TOPSOIL	LT	50.	0.
MANEUVER & SPREAD TIME	MST	42.	0.
TRUCK TRAVEL TIME LOADED	TTLT	410.	0.
TRUCK TRAVEL TIME EMPTY	TTET	246.	0.

SUMMARY OF INPUT PARAMETERS

(CONT.)

FINANCIAL

DEFERRED COST TREATMENT	COST	
COST RANGE APPLICABLE		
- EQUIPMENT	REQ	TOT
- CONSTRUCTION	RCON	TOT
UNION WELFARE FUND PAYMENTS (PER MANHOUR)	UWRM	1.385
UNION WELFARE FUND PAYMENTS (PER TON)	UWRT	1.640
LABOR OVERHEAD (%)	OVHP	50.00
INDIRECT CAPITAL (%)	ICP	15.00
DRILLING COST/FOOT	DCF	20.00
ROYALTY PAYMENT (PERCENTAGE)	ROYP	12.50
ROYALTY PAYMENT (PER TON)	ROYT	0.0
SEVERANCE TAX (PERCENTAGE)	SEVP	0.0
SEVERANCE TAX (PER TON)	SEVT	0.0
STATE & LOCAL TAX	STAX	5.00
BLACK LUNG TAX	BLT	0.25
ABANDONED MINE RECLAMATION FUND	AMRF	0.35
DEPRECIATION METHOD		
- SHOVEL	DMO	SY
- BUCKETS	DMB	SY
- HAUL TRUCKS	DMT	
- DRILLS	DMD	SL
- LOADERS / SHOVELS	DML	SL
- HAUL TRUCKS	DMH	DDB
- DOZERS & SCRAPERS	DMR	DDB
DEPRECIABLE LIFE		
- SHOVEL	DLO	15
- BUCKETS	DLB	10
- HAUL TRUCKS	DLT	10
- DRILLS	DLD	20
- LOADERS / SHOVELS	DLL	0
- HAUL TRUCKS	DLH	10
- DOZERS & SCRAPERS	DLR	5
SALVAGE VALUE		
- SHOVEL	SVO	10.00
- BUCKETS	SVB	5.00
- HAUL TRUCKS	SVT	5.00
- DRILLS	SVD	10.00
- LOADERS / SHOVELS	SVL	10.00
- HAUL TRUCKS	SVH	5.00
- DOZERS & SCRAPERS	SVR	10.00

SUMMARY OF INPUT PARAMETERS
(CONT.)

CATEGORY 3 - PARAMETERS WHICH OVERRIDE CALCULATED VALUES

PHYSICAL	ACRONYM		
LAND AREA REQUIREMENTS	LAR	0.	
OPERATING			
TOTAL HOURLY LABOR COST	HLC	0.	0.
TOTAL SALARIED PERSONNEL COST	SPC	0.	0.
FINANCIAL			
EXPLORATION & DEVELOPMENT DRILLING COST	EDC	0.	0.
SUPPORT CAPITAL (% TOTAL CAPITAL)	SCP	0.	
ANNUAL SUPPLIES & MATERIALS COST	SMC	0.	0.
ANNUAL OPERATING COST	AOC	0.	0.
PREPRODUCTION DEVELOPMENT COST	PDC	0.	0.
WORKING CAPITAL	WC	0.	0.
CONTROL VARIABLES			
NUMBER OF ITERATIONS	NIT	15	
PRINT TABLES	PRNT	1 2 3 4 5 6 7 8	
PRINT VIII FOR EACH ITERATION	P8	0	
POINT VALUE COSTS (0-NO,1-YES)	PVC	0	

UNCERTAINTY ANALYSIS

ITERATION	COAL VALUE/TON
1	13.49
2	13.07
3	11.32
4	13.40
5	12.73
6	13.00
7	10.75
8	12.16
9	13.76
10	11.50
11	14.40
12	11.35
13	14.08
14	12.66
15	13.90

CONSTANT DOLLAR CASE - UNCERTAINTY OPTION

	MEAN	STD DEV
COAL VALUE/TON	12.77	1.09
MEAN DELTA VARIANCE	0.08 -	0.25
PROJECT START YEAR	1980	
FULL PRODUCTION YEARS	1984 - 1998	
RATE OF RETURN ON EQUITY	20.00	
CAPITALIZATION		
- DEBT (%)	0.0	
- EQUITY (%)	100.00	
DEBT SERVICING PERCENTAGE	0.0	
# OF ITERATIONS	15	

PROBABILITY OF OCCURANCE	RANGE OF VALUES
95%	10.62 - 14.92
90%	10.97 - 14.57
85%	11.20 - 14.34
80%	11.37 - 14.17
70%	11.63 - 13.91
60%	11.85 - 13.69

I PRIMARY EQUIPMENT SELECTION AND COSTS

(1980 DOLLARS)

A. LAND AND EXPLORATION	QUANTITY		COST	
	MEAN	STD DEV	MEAN	STD DEV
LAND AREA REQUIREMENTS (ACRES)	628.	41.	1256279.	81734.
EXPLORATION, DEVELOPMENT DRILLING			77652.	5832.

B. PRIMARY EQUIPMENT	UNIT SIZE	# UNITS	COST	
OVERBURDEN REMOVAL				
SHOVEL	16. CU.YDS.	3.	8157244.	2753846.
HAUL TRUCKS	165. TONS	2.	1596434.	322948.
OVERBURDEN DRILLING				
DRILLS (PARTING)	9. INCHES	3.		
DRILLS (OVERBURDEN)	9. INCHES	3.	3937626.	1029130.
COAL DRILLING (NOT REQUIRED)				
COAL LOADING				
LOADING SHOVELS	5. CU.YDS.	3.	1320020.	234477.
COAL HAULING				
HAUL TRUCKS	32. TONS	20.	3842162.	617798.
RECLAMATION (SPOIL)				
DOZERS	19. CU.YDS.	1.	229791.	24474.
RECLAMATION (TOPSOIL)				
SCRAPERS	21. CU.YDS.	1.	388500.	238.
TOTAL PRIMARY EQUIPMENT COST			19471760.	3854733.

II SUPPORTING CAPITAL ITEM COSTS

(1980 DOLLARS)

	MEAN	STD DEV
SUPPORT CAPITAL	7063385.	1297205.
PREPARATION PLANT COST	6797233.	712831.
CONSTRUCTION COSTS	8916251.	746646.
SUPPORT EQUIPMENT COST	4944369.	908044.

III MANPOWER REQUIREMENTS AND COSTS

(1980 DOLLARS)

	MEAN	STD DEV
HOURLY LABOR		
REQUIREMENTS	102.	16.
DIRECT ANNUAL COSTS	1812115.	276386.
TOTAL ANNUAL UNION WELFARE COSTS	4457435.	46749.
SALARIED PERSONNEL		
REQUIREMENTS	36.	5.
DIRECT ANNUAL COSTS	892499.	136121.
TOTAL MANPOWER		
REQUIREMENTS	138.	21.
DIRECT ANNUAL COSTS	2704614.	412504.
PRODUCTIVITY/MAN DAY	98.98	16.92

IV OPERATING SUPPLIES & MATERIALS COSTS

(1980 DOLLARS)

	MEAN	STD DEV
ANNUAL SUPPLIES & MATERIALS COST	3970340.	640665.
ANNUAL PREPARATION PLANT OPERATING COSTS	1163479.	1090.
TOTAL DIRECT NON-LABOR OPERATING COSTS	5133818.	640705.

V TOTAL CAPITAL ANALYSIS

(1980 DOLLARS)

CAPITAL COST CATEGORY	CALENDAR YR INCURRED	PROJECT YR INCURRED	COST UPDATE FACTOR	CAPITAL COST MEAN	CAPITAL COST STD DEV
INITIAL CAPITAL					
ACQUISITION COST	1980	1		1256279.	81734.
EXPLORATION COSTS	1980	1		77652.	5832.
PRIMARY EQUIPMENT COST					
- OVERBURDEN STRIPPING	1981	2	0.0%	2926099.	873683.
	1982	3		3901465.	1164909.
	1983	4		2926099.	873683.
- OVERBURDEN & COAL DRILLING	1981	2	0.0%	787527.	205820.
	1982	3		1181289.	308733.
	1983	4		1968811.	514571.
- COAL LOADING	1981	2	0.0%	264004.	46896.
	1982	3		396006.	70343.
	1983	4		660010.	117236.
- COAL HAULING	1981	2	0.0%	768432.	123561.
	1982	3		1152649.	185337.
	1983	4		1921078.	308918.
- RECLAMATION	1981	2	0.0%	123658.	4903.
	1982	3		185487.	7347.
	1983	4		309145.	12244.
SUPPORTING EQUIPMENT COSTS					
- 20 YEAR EQUIPMENT	1981	2	5.0%	197775.	36322.
	1982	3		296662.	54483.
	1983	4		494437.	90804.
- 10 YEAR EQUIPMENT	1981	2	5.0%	148331.	27242.
	1982	3		222496.	40863.
	1983	4		370828.	68104.
- 5 YEAR EQUIPMENT	1981	2	5.0%	346106.	63564.
	1982	3		519159.	95344.
	1983	4		865265.	158903.
CONSTRUCTION COSTS	1980	1	5.0%	3928369.	351772.
	1981	2		3928369.	351772.
	1982	3		3928369.	351772.
	1983	4		3928369.	351772.

V TOTAL CAPITAL ANALYSIS

(1980 DOLLARS)

CAPITAL COST CATEGORY	CALENDAR YR INCURRED	PROJECT YR INCURRED	COST UPDATE FACTOR	CAPITAL COST	
				MEAN	STD DEV
INDIRECT CAPITAL	1981	2	0.0%	1319713.	169701.
	1982	3		1611788.	225259.
	1983	4		1757026.	223979.
PREPRODUCTION COST	1983	4	5.0%	3412041.	326317.
ACCRUED INTEREST	1984	5		0.	0.
			TOTAL	48080784.	774031.

V TOTAL CAPITAL ANALYSIS

(1980 DOLLARS)

CAPITAL COST CATEGORY	CALENDAR YR INCURRED	PROJECT YR INCURRED	COST UPDATE FACTOR	CAPITAL COST	
				MEAN	STD DEV
DEFERRED CAPITAL					
WORKING CAPITAL	1984	5		5117782.	425420.
PRIMARY EQUIPMENT REPLACEMENTS					
- OVERBURDEN STRIPPING	1993	14	0.0%	1759577.	350991.
- COAL LOADING	1988	9	0.0%	1320020.	234477.
	1993	14		1320020.	234477.
	1998	19		1320020.	234477.
- COAL HAULING	1993	14	0.0%	3842162.	617798.
- RECLAMATION	1988	9	0.0%	618291.	24477.
	1993	14		618291.	24477.
	1998	19		618291.	24477.
SUPPORTING EQUIPMENT REPLACEMENTS					
- 10 YEAR EQUIPMENT	1993	14	5.0%	741655.	136205.
- 5 YEAR EQUIPMENT	1988	9	5.0%	1730529.	317814.
	1993	14		1730529.	317814.
	1998	19		1730529.	317814.
			TOTAL	22467693.	975890.

VI DEPRECIATION, SALVAGE VALUE, INVESTMENT TAX CREDIT

(1980 DOLLARS)

CAPITAL COST CATEGORY	DEPRECIATION METHOD	DEPRECIABLE LIFE	CALENDAR YEAR	DEPRECIATION CHARGE MEAN/STD DEV	SALVAGE VALUE %	SALVAGE VALUE MEAN/STD DEV	INVESTMENT TAX CREDIT MEAN/STD DEV
SHOVELS	SUM OF YEARS DIGITS	15	1981		10.0		244717.
							82616.
			1982				326289.
							110155.
			1983	917689.			244717.
				309806.			82616.
			1984	856510.			
				289153.			
			1985	795331.			
				268499.			
			1986	734151.			
				247846.			
			1987	672972.			
				227192.			
			1988	611793.			
				206539.			
			1989	550613.			
				185885.			
			1990	489434.			
				165231.			
			1991	428255.			
				144578.			
			1992	367075.			
				123924.			
			1993	305896.			
				103270.			
			1994	244717.			
				82616.			
			1995	183538.			
				61962.			
			1996	122358.			
				41308.			
			1997	61179.			
				20654.			
			1998			815725.	
						275384.	
BUCKETS	SUM OF YEARS DIGITS	10	1993	28180.	5.0		10876.
				9513.			3672.
			1994	25362.			
				8562.			

VI DEPRECIATION, SALVAGE VALUE, INVESTMENT TAX CREDIT

(1980 DOLLARS)

CAPITAL COST CATEGORY	DEPRECIATION METHOD	DEPRECIABLE LIFE	CALENDAR YEAR	DEPRECIATION CHARGE MEAN/STD DEV	SALVAGE VALUE %	SALVAGE VALUE MEAN/STD DEV	INVESTMENT TAX CREDIT MEAN/STD DEV
			1995	22544.			
				7611.			
			1996	19726.			
				6659.			
			1997	16908.			
				5708.			
			1998	14090.		36337.	
				4757.		12267.	
HAUL TRUCKS	STRAIGHT LINE	10	1981		5.0		47893.
							9688.
			1982				63857.
							12917.
			1983	151661.			47893.
				30681.			9688.
			1984	151661.			
				30681.			
			1985	151661.			
				30681.			
			1986	151661.			
				30681.			
			1987	151661.			
				30681.			
			1988	151661.			
				30681.			
			1989	151661.			
				30681.			
			1990	151661.			
				30681.			
			1991	151661.			
				30681.			
			1992	151661.			
				30681.			
			1993	151661.		79822.	106429.
				30680.		16148.	21530.
			1994	151661.			
				30680.			
			1995	151661.			
				30680.			
			1996	151661.			
				30680.			
			1997	151661.			
				30680.			

VI DEPRECIATION, SALVAGE VALUE, INVESTMENT TAX CREDIT

(1980 DOLLARS)

CAPITAL COST CATEGORY	DEPRECIATION METHOD	DEPRECIABLE LIFE	CALENDAR YEAR	DEPRECIATION CHARGE MEAN/STD DEV	SALVAGE VALUE %	SALVAGE VALUE MEAN/STD DEV	INVESTMENT TAX CREDIT MEAN/STD DEV
			1998	151661. 30680.		686467. 138864.	
OVERBURDEN & COAL DRILLS	STRAIGHT LINE	20	1981		10.0		78753. 20582.
			1982				118129. 30874.
			1983	177193. 46311.			196881. 51456.
			1984	177193. 46311.			
			1985	177193. 46311.			
			1986	177193. 46311.			
			1987	177193. 46311.			
			1988	177193. 46311.			
			1989	177193. 46311.			
			1990	177193. 46311.			
			1991	177193. 46311.			
			1992	177193. 46311.			
			1993	177193. 46311.			
			1994	177193. 46311.			
			1995	177193. 46311.			
			1996	177193. 46311.			
			1997	177193. 46311.			
			1998	177193. 46311.		1102535. 288146.	
COAL LOADING SHOVELS	STRAIGHT LINE	5	1981		10.0		26400. 4690.

VI DEPRECIATION, SALVAGE VALUE, INVESTMENT TAX CREDIT

(1980 DOLLARS)

CAPITAL COST CATEGORY	DEPRECIATION METHOD	DEPRECIABLE LIFE	CALENDAR YEAR	DEPRECIATION CHARGE MEAN/STD DEV	SALVAGE VALUE %	SALVAGE VALUE MEAN/STD DEV	INVESTMENT TAX CREDIT MEAN/STD DEV
			1982				39601.
							7034.
			1983	237603.			66001.
				42206.			11724.
			1984	237603.			
				42206.			
			1985	237603.			
				42206.			
			1986	237603.			
				42206.			
			1987	237603.			
				42206.			
			1988	237604.		132002.	132002.
				42205.		23449.	23448.
			1989	237604.			
				42205.			
			1990	237604.			
				42205.			
			1991	237604.			
				42205.			
			1992	237604.			
				42205.			
			1993	237604.		132002.	88001.
				42205.		23448.	15633.
			1994	237604.			
				42205.			
			1995	237604.			
				42205.			
			1996	237604.			
				42205.			
			1997	237604.			
				42205.			
			1998	237604.		1214418.	
				42205.		215720.	
COAL HAUL TRUCKS	DOUBLE DECLINING BALANCE	10	1981		5.0		76843.
							12356.
			1982				115265.
							18534.
			1983	768432.			192108.
				123559.			30891.
			1984	614746.			
				98848.			

VI DEPRECIATION, SALVAGE VALUE, INVESTMENT TAX CREDIT

(1980 DOLLARS)

CAPITAL COST CATEGORY	DEPRECIATION METHOD	DEPRECIABLE LIFE	CALENDAR YEAR	DEPRECIATION CHARGE	SALVAGE VALUE %	SALVAGE VALUE	INVESTMENT TAX CREDIT
				MEAN/STD DEV		MEAN/STD DEV	MEAN/STD DEV
			1985	491796.			
				79080.			
			1986	393437.			
				63263.			
			1987	314750.			
				50610.			
			1988	251800.			
				40488.			
			1989	201439.			
				32391.			
			1990	161151.			
				25914.			
			1991	128921.			
				20730.			
			1992	103137.			
				16585.			
			1993	768432.		412549.	256144.
				123561.		66334.	41189.
			1994	614746.			
				98849.			
			1995	491796.			
				79081.			
			1996	393437.			
				63263.			
			1997	314750.			
				50611.			
			1998	251800.		1007200.	
				40488.		161947.	
DOZERS & SCRAPERS	DOUBLE DECLINING BALANCE	5	1981		10.0		12366.
							490.
			1982				18549.
							735.
			1983	247316.			30915.
				9804.			1224.
			1984	148389.			
				5885.			
			1985	89034.			
				3527.			
			1986	53420.			
				2115.			
			1987	18301.			
				726.			

VI DEPRECIATION, SALVAGE VALUE, INVESTMENT TAX CREDIT

(1980 DOLLARS)

CAPITAL COST CATEGORY	DEPRECIATION METHOD	DEPRECIABLE LIFE	CALENDAR YEAR	DEPRECIATION CHARGE MEAN/STD DEV	SALVAGE VALUE %	SALVAGE VALUE MEAN/STD DEV	INVESTMENT TAX CREDIT MEAN/STD DEV
			1988	247316.		61829.	61829.
				9803.		2448.	2448.
			1989	148390.			
				5875.			
			1990	89034.			
				3527.			
			1991	53420.			
				2115.			
			1992	18301.			
				726.			
			1993	247316.		61829.	41219.
				9803.		2448.	1632.
			1994	148390.			
				5875.			
			1995	89034.			
				3527.			
			1996	53420.			
				2115.			
			1997	18301.			
				726.			
			1998	247316.		432803.	
				9803.		17139.	
20-YEAR SUPPORT EQUIP.	SUM OF YEARS DIGITS	20	1981		5.0		19777.
							3632.
			1982				29666.
							5448.
			1983	89469.			49444.
				16431.			9080.
			1984	84996.			
				15610.			
			1985	80522.			
				14788.			
			1986	76049.			
				13967.			
			1987	71576.			
				13145.			
			1988	67102.			
				12323.			
			1989	62629.			
				11502.			
			1990	58155.			
				10680.			

VI DEPRECIATION, SALVAGE VALUE, INVESTMENT TAX CREDIT

(1980 DOLLARS)

CAPITAL COST CATEGORY	DEPRECIATION METHOD	DEPRECIABLE LIFE	CALENDAR YEAR	DEPRECIATION CHARGE MEAN/STD DEV	SALVAGE VALUE %	SALVAGE VALUE MEAN/STD DEV	INVESTMENT TAX CREDIT MEAN/STD DEV
			1991	53682.			
				9859.			
			1992	49208.			
				9037.			
			1993	44735.			
				8216.			
			1994	40261.			
				7394.			
			1995	35788.			
				6572.			
			1996	31314.			
				5751.			
			1997	26841.			
				4929.			
			1998	22367.		94179.	
				4108.		17297.	
10-YEAR SUPPORT EQUIP.	SUM OF YEARS DIGITS	10	1981		5.0		14833.
							2724.
			1982				22250.
							4086.
			1983	128104.			37083.
				23527.			6810.
			1984	115293.			
				21175.			
			1985	102483.			
				18822.			
			1986	89673.			
				16469.			
			1987	76862.			
				14116.			
			1988	64052.			
				11763.			
			1989	51242.			
				9410.			
			1990	38431.			
				7058.			
			1991	25621.			
				4705.			
			1992	12810.			
				2353.			
			1993	128104.		37083.	49444.
				23527.		6810.	9080.

VI DEPRECIATION, SALVAGE VALUE, INVESTMENT TAX CREDIT

(1980 DOLLARS)

CAPITAL COST CATEGORY	DEPRECIATION METHOD	DEPRECIABLE LIFE	CALENDAR YEAR	DEPRECIATION CHARGE MEAN/STD DEV	SALVAGE VALUE %	SALVAGE VALUE MEAN/STD DEV	INVESTMENT TAX CREDIT MEAN/STD DEV
			1994	115293.			
				21175.			
			1995	102483.			
				18822.			
			1996	89673.			
				16469.			
			1997	76862.			
				14116.			
			1998	64052.		165187.	
				11763.		30338.	
5-YEAR SUPPORT EQUIP.	SUM OF YEARS DIGITS	5	1981		10.0		34611.
							6356.
			1982				51916.
							9534.
			1983	519158.			86526.
				95345.			15891.
			1984	415327.			
				76275.			
			1985	311495.			
				57208.			
			1986	207663.			
				38138.			
			1987	103832.			
				19069.			
			1988	519158.		173053.	173053.
				95344.		31782.	31783.
			1989	415327.			
				76276.			
			1990	311495.			
				57208.			
			1991	207663.			
				38138.			
			1992	103832.			
				19069.			
			1993	519158.		173053.	115368.
				95344.		31783.	21188.
			1994	415327.			
				76276.			
			1995	311495.			
				57208.			
			1996	207663.			
				38138.			

VI DEPRECIATION, SALVAGE VALUE, INVESTMENT TAX CREDIT

(1980 DOLLARS)

CAPITAL COST CATEGORY	DEPRECIATION METHOD	DEPRECIABLE LIFE	CALENDAR YEAR	DEPRECIATION CHARGE MEAN/STD DEV	SALVAGE VALUE %	SALVAGE VALUE MEAN/STD DEV	INVESTMENT TAX CREDIT MEAN/STD DEV
			1997	103832.			
				19069.			
			1998	519158.		1384422.	
				95344.		254253.	

VII DIRECT OPERATING COSTS

(1980 DOLLARS)

CALENDAR YEAR	LABOR	LABOR OVERHEAD	DIRECT NON-LABOR OPERATING COSTS	UMW COST	INSURANCE	TOTAL
		MEAN/STD DEV	MEAN/STD DEV	MEAN/STD DEV	MEAN/STD DEV	MEAN/STD DEV
1984	2704614.	1352307.	5133818.	4457435.	234270.	13882455.
	412504.	206252.	640705.	46749.	29863.	1327332.
1985	2704614.	1352307.	5133818.	4457435.	234270.	13882455.
	412504.	206252.	640705.	46749.	29863.	1327332.
1986	2704614.	1352307.	5133818.	4457435.	234270.	13882455.
	412504.	206252.	640705.	46749.	29863.	1327332.
1987	2704614.	1352307.	5133818.	4457435.	234270.	13882455.
	412504.	206252.	640705.	46749.	29863.	1327332.
1988	2704614.	1352307.	5133818.	4457435.	234270.	13882455.
	412504.	206252.	640705.	46749.	29863.	1327332.
1989	2704614.	1352307.	5133818.	4457435.	234270.	13882455.
	412504.	206252.	640705.	46749.	29863.	1327332.
1990	2704614.	1352307.	5133818.	4457435.	234270.	13882455.
	412504.	206252.	640705.	46749.	29863.	1327332.
1991	2704614.	1352307.	5133818.	4457435.	234270.	13882455.
	412504.	206252.	640705.	46749.	29863.	1327332.
1992	2704614.	1352307.	5133818.	4457435.	234270.	13882455.
	412504.	206252.	640705.	46749.	29863.	1327332.
1993	2704614.	1352307.	5133818.	4457435.	234270.	13882455.
	412504.	206252.	640705.	46749.	29863.	1327332.
1994	2704614.	1352307.	5133818.	4457435.	234270.	13882455.
	412504.	206252.	640705.	46749.	29863.	1327332.
1995	2704614.	1352307.	5133818.	4457435.	234270.	13882455.
	412504.	206252.	640705.	46749.	29863.	1327332.
1996	2704614.	1352307.	5133818.	4457435.	234270.	13882455.
	412504.	206252.	640705.	46749.	29863.	1327332.
1997	2704614.	1352307.	5133818.	4457435.	234270.	13882455.
	412504.	206252.	640705.	46749.	29863.	1327332.
1998	2704614.	1352307.	5133818.	4457435.	234270.	13882455.
	412504.	206252.	640705.	46749.	29863.	1327332.

VIII CASH FLOW SUMMARY TABLE

(1980 DOLLARS)

CALENDAR YEAR OF PROJECT:	1980	1981	1982	1983	1984	1985	1986	1987
RELATIVE YEAR OF FULL PRODUCTION:	-4	-3	-2	-1	1	2	3	4
LINE CASHFLOW LINE ITEMS								
101 COAL VALUE/TON	0.0	0.0	0.0	0.0	12.77	12.77	12.77	12.77
	0.0	0.0	0.0	0.0	1.09	1.09	1.09	1.09
102 ANNUAL PRODUCTION CLEAN COAL	0.	0.	0.	0.	3000000.	3000000.	3000000.	3000000.
	0.	0.	0.	0.	529.	529.	529.	529.
103 ANNUAL SALES REVENUE	0.	0.	0.	0.	38309520.	38309520.	38309520.	38309520.
	0.	0.	0.	0.	3279868.	3279868.	3279868.	3279868.
104 ANNUAL OPERATING COSTS	0.	0.	0.	0.	13882455.	13882455.	13882455.	13882455.
	0.	0.	0.	0.	1327332.	1327332.	1327332.	1327332.
105 GROSS PROFIT	0.	0.	0.	0.	24427088.	24427088.	24427088.	24427088.
	0.	0.	0.	0.	2189980.	2189980.	2189980.	2189980.
OTHER COSTS AND DEDUCTIONS								
106 AMORTIZATION	0.	0.	0.	0.	1626884.	1626884.	1626884.	1626884.
	0.	0.	0.	0.	126426.	126426.	126426.	126426.
107 DEPRECIATION	0.	0.	0.	3236622.	2801713.	2437113.	2120846.	1824746.
	0.	0.	0.	573093.	515300.	460833.	409008.	359359.
108 EXPENSED PREPRODUCTION EXPLORATION, CONSTRUCTION	77652.	0.	0.	0.	-77652.	0.	0.	0.
	5832.	0.	0.	0.	5832.	0.	0.	0.
109 ROYALTY PAYMENTS	0.	0.	0.	0.	4788693.	4788693.	4788693.	4788693.
	0.	0.	0.	0.	409971.	409971.	409971.	409971.
110 LOAN INTEREST	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
111 MISCELLANEOUS	0.	0.	0.	0.	1800000.	1800000.	1800000.	1800000.
	0.	0.	0.	0.	0.	0.	0.	0.
112 NET INCOME BEFORE TAXES	-77652.	0.	0.	-3236622.	13487466.	13774412.	14090681.	14386780.
	5832.	0.	0.	573093.	1238625.	1282911.	1328421.	1372352.
113 STATE & LOCAL INCOME TAXES	0.	0.	0.	0.	674373.	688721.	704534.	719339.
	0.	0.	0.	0.	61933.	64146.	66422.	68620.

VIII CASH FLOW SUMMARY TABLE

(1980 DOLLARS)

CALENDAR YEAR OF PROJECT: / RELATIVE YEAR OF FULL PRODUCTION:	1980 -4	1981 -3	1982 -2	1983 -1	1984 1	1985 2	1986 3	1987 4
LINE CASHFLOW LINE ITEMS								
114 DEPLETION ALLOWANCE	0. 0.	0. 0.	0. 0.	0. 0.	3352083. 286991.	3352083. 286991.	3352083. 286991.	3352083. 286991.
115 TAX LOSS CARRIED FORWARD	0. 0.	77652. 5832.	77652. 5832.	77652. 5832.	3314272. 576593.	0. 0.	0. 0.	0. 0.
116 NET INCOME SUBJECT TO FEDERAL TAXATION	0. 0.	0. 0.	0. 0.	0. 0.	6146722. 549967.	9733604. 957929.	10034056. 999473.	10315351. 1039960.
117 FEDERAL TAXES	0. 0.	0. 0.	0. 0.	0. 0.	2808240. 252996.	4458202. 440687.	4596411. 459802.	4725809. 478402.
118 INVESTMENT TAX CREDIT	0. 0.	0. 0.	0. 0.	0. 0.	1922437. 200544.	370844. 355869.	0. 0.	0. 0.
119 NET FEDERAL TAXES PAID	0. 0.	0. 0.	0. 0.	0. 0.	885804. 155292.	4087358. 376711.	4596411. 459802.	4725809. 478402.
120 NET PROFIT	0. 0.	0. 0.	0. 0.	0. 0.	5260921. 471618.	5646238. 777382.	5437639. 539744.	5589538. 561610.
121 ADDITIONAL INCOME	0. 0.	0. 0.	0. 0.	0. 0.	0. 0.	0. 0.	0. 0.	0. 0.
ADJUSTED NET								
122 ADDBACK OF NONCASH COSTS	77652. 5832.	77652. 5832.	77652. 5832.	3314272. 576593.	11017309. 1426945.	7416088. 810421.	7099820. 759910.	6803719. 712081.
123 LOAN PRINCIPAL PAYMENT	0. 0.	0. 0.	0. 0.	0. 0.	0. 0.	0. 0.	0. 0.	0. 0.
124 NET CASH INFLOW FROM OPERATIONS	0. 0.	0. 0.	0. 0.	0. 0.	16278238. 1741162.	13062330. 1578338.	12537465. 1280821.	12393264. 1258311.

VIII CASH FLOW SUMMARY TABLE

(1980 DOLLARS)

LINE	CASHFLOW LINE ITEMS	1980	1981	1982	1983	1984	1985	1986	1987
	CALENDAR YEAR OF PROJECT:	1980	1981	1982	1983	1984	1985	1986	1987
	RELATIVE YEAR OF FULL PRODUCTION:	-4	-3	-2	-1	1	2	3	4
	CAPITAL EXPENDITURES FOR YEAR								
125	ACQUISITION	1256279.	0.	0.	0.	0.	0.	0.	0.
		81734.	0.	0.	0.	0.	0.	0.	0.
126	EXPLORATION	77652.	0.	0.	0.	0.	0.	0.	0.
		5832.	0.	0.	0.	0.	0.	0.	0.
127	PREPRODUCTION DEVELOPMENT	0.	0.	0.	3412041.	0.	0.	0.	0.
		0.	0.	0.	326317.	0.	0.	0.	0.
128	CONSTRUCTION	3928369.	3928369.	3928369.	3928369.	0.	0.	0.	0.
		351772.	351772.	351772.	351772.	0.	0.	0.	0.
129	EQUIPMENT	0.	4869718.	6816900.	7785155.	0.	0.	0.	0.
		0.	1044208.	1427896.	1413597.	0.	0.	0.	0.
130	ACCRUED INTEREST	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	0.	0.	0.	0.
131	INDIRECT CAPITAL	589256.	1319713.	1611788.	1757026.	0.	0.	0.	0.
		52761.	169701.	225259.	223979.	0.	0.	0.	0.
132	WORKING CAPITAL	0.	0.	0.	0.	5117782.	0.	0.	0.
		0.	0.	0.	0.	425420.	0.	0.	0.
133	TOTAL ANNUAL CAPITAL EXPENDITURE	5851555.	10117808.	12357064.	16882592.	5117782.	0.	0.	0.
		400059.	1300987.	1726877.	1970502.	425420.	0.	0.	0.
134	AMOUNT FUNDED FROM EQUITY	5851555.	10117808.	12357064.	16882592.	5117782.	0.	0.	0.
		400059.	1300987.	1726877.	1970502.	425420.	0.	0.	0.
135	AMOUNT FUNDED FROM LOANS	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	0.	0.	0.	0.
136	ANNUAL NET CASHFLOW	-5851555.	-10117808.	-12357064.	-16882592.	11160448.	13062330.	12537465.	12393264.
		400059.	1300987.	1726877.	1970502.	1435535.	1578338.	1280821.	1258311.

VIII CASH FLOW SUMMARY TABLE

(1980 DOLLARS)

LINE	CASHFLOW LINE ITEMS	1988	1989	1990	1991	1992	1993	1994	1995
	CALENDAR YEAR OF PROJECT:	1988	1989	1990	1991	1992	1993	1994	1995
	RELATIVE YEAR OF FULL PRODUCTION:	5	6	7	8	9	10	11	12
101	COAL VALUE/TON	12.77	12.77	12.77	12.77	12.77	12.77	12.77	12.77
		1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
102	ANNUAL PRODUCTION CLEAN COAL	3000000.	3000000.	3000000.	3000000.	3000000.	3000000.	3000000.	3000000.
		529.	529.	529.	529.	529.	529.	529.	529.
103	ANNUAL SALES REVENUE	38309520.	38309520.	38309520.	38309520.	38309520.	38309520.	38309520.	38309520.
		3279868.	3279868.	3279868.	3279868.	3279868.	3279868.	3279868.	3279868.
104	ANNUAL OPERATING COSTS	13882455.	13882455.	13882455.	13882455.	13882455.	13882455.	13882455.	13882455.
		1327332.	1327332.	1327332.	1327332.	1327332.	1327332.	1327332.	1327332.
105	GROSS PROFIT	24427088.	24427088.	24427088.	24427088.	24427088.	24427088.	24427088.	24427088.
		2189980.	2189980.	2189980.	2189980.	2189980.	2189980.	2189980.	2189980.
	OTHER COSTS AND DEDUCTIONS								
106	AMORTIZATION	1626884.	1626884.	1626884.	1626884.	1626884.	1626884.	1626884.	1626884.
		126426.	126426.	126426.	126426.	126426.	126426.	126426.	126426.
107	DEPRECIATION	2327673.	1996093.	1714154.	1464018.	1220821.	2608274.	2170550.	1803131.
		404861.	358601.	313301.	268859.	225340.	387752.	328809.	273969.
108	EXPENSED PREPRODUCTION EXPLORATION, CONSTRUCTION	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	0.	0.	0.	0.
109	ROYALTY PAYMENTS	4788693.	4788693.	4788693.	4788693.	4788693.	4788693.	4788693.	4788693.
		409971.	409971.	409971.	409971.	409971.	409971.	409971.	409971.
110	LOAN INTEREST	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	0.	0.	0.	0.
111	MISCELLANEOUS	1800000.	1800000.	1800000.	1800000.	1800000.	1800000.	1800000.	1800000.
		0.	0.	0.	0.	0.	0.	0.	0.
112	NET INCOME BEFORE TAXES	13883853.	14215432.	14497373.	14747510.	14990709.	13603251.	14040976.	14408396.
		1329895.	1371462.	1411941.	1451753.	1491148.	1344584.	1397729.	1447949.
113	STATE & LOCAL INCOME TAXES	694193.	710772.	724869.	737376.	749535.	680163.	702049.	720420.
		66496.	68573.	70598.	72589.	74559.	67230.	69887.	72400.

VIII CASH FLOW SUMMARY TABLE

(1980 DOLLARS)

LINE	CASHFLOW LINE ITEMS	CALENDAR YEAR OF PROJECT: 1988	1989	1990	1991	1992	1993	1994	1995
		RELATIVE YEAR OF FULL PRODUCTION: 5	6	7	8	9	10	11	12
114	DEPLETION ALLOWANCE	3352083.	3352083.	3352083.	3352083.	3352083.	3352083.	3352083.	3352083.
		286991.	286991.	286991.	286991.	286991.	286991.	286991.	286991.
115	TAX LOSS CARRIED FORWARD	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	0.	0.	0.	0.
116	NET INCOME SUBJECT TO FEDERAL TAXATION	9837572.	10152573.	10420416.	10658044.	10889082.	9571000.	9986838.	10335884.
		999759.	1038441.	1076347.	1113765.	1150953.	1020694.	1068919.	1115051.
117	FEDERAL TAXES	4506028.	4650931.	4774137.	4883445.	4989725.	4383408.	4574692.	4735254.
		459952.	477719.	495156.	512385.	529456.	469540.	491749.	512937.
118	INVESTMENT TAX CREDIT	366884.	0.	0.	0.	0.	667482.	0.	0.
		50276.	0.	0.	0.	0.	86490.	0.	0.
119	NET FEDERAL TAXES PAID	4139145.	4650931.	4774137.	4883445.	4989725.	3715924.	4574692.	4735254.
		418018.	477719.	495156.	512385.	529456.	403273.	491749.	512937.
120	NET PROFIT	5698421.	5501638.	5646273.	5774593.	5899353.	5855069.	5412141.	5600627.
		583226.	560797.	581240.	601453.	621538.	622900.	577232.	602132.
121	ADDITIONAL INCOME	366884.	0.	0.	0.	0.	896337.	0.	0.
		50275.	0.	0.	0.	0.	117314.	0.	0.
	ADJUSTED NET								
122	ADDBACK OF NONCASH COSTS	7306647.	6975066.	6693127.	6442990.	6199792.	7587251.	7149522.	6782106.
		755989.	711563.	668773.	627475.	587552.	752477.	695244.	642607.
123	LOAN PRINCIPAL PAYMENT	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	0.	0.	0.	0.
124	NET CASH INFLOW FROM OPERATIONS	13371956.	12476710.	12339405.	12217587.	12099153.	14338663.	12561670.	12382736.
		1372067.	1258511.	1238104.	1218269.	1198823.	1460646.	1246958.	1221793.

VIII CASH FLOW SUMMARY TABLE

(1980 DOLLARS)

LINE	CASHFLOW LINE ITEMS	1988	1989	1990	1991	1992	1993	1994	1995
	CALENDAR YEAR OF PROJECT:	1988	1989	1990	1991	1992	1993	1994	1995
	RELATIVE YEAR OF FULL PRODUCTION:	5	6	7	8	9	10	11	12
	CAPITAL EXPENDITURES FOR YEAR								
125	ACQUISITION	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	0.	0.	0.	0.
126	EXPLORATION	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	0.	0.	0.	0.
127	PREPRODUCTION DEVELOPMENT	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	0.	0.	0.	0.
128	CONSTRUCTION	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	0.	0.	0.	0.
129	EQUIPMENT	1938308.	0.	0.	0.	0.	7540051.	0.	0.
		237866.	0.	0.	0.	0.	917791.	0.	0.
130	ACCRUED INTEREST	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	0.	0.	0.	0.
131	INDIRECT CAPITAL	290746.	0.	0.	0.	0.	1131008.	0.	0.
		35680.	0.	0.	0.	0.	137665.	0.	0.
132	WORKING CAPITAL	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	0.	0.	0.	0.
133	TOTAL ANNUAL CAPITAL EXPENDITURE	1938308.	0.	0.	0.	0.	7540051.	0.	0.
		237866.	0.	0.	0.	0.	917791.	0.	0.
134	AMOUNT FUNDED FROM EQUITY	1938308.	0.	0.	0.	0.	7540051.	0.	0.
		237866.	0.	0.	0.	0.	917791.	0.	0.
135	AMOUNT FUNDED FROM LOANS	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	0.	0.	0.	0.
136	ANNUAL NET CASHFLOW	11433645.	12476710.	12339405.	12217587.	12099153.	6798603.	12561670.	12382736.
		1209985.	1258511.	1238104.	1218269.	1198823.	800081.	1246958.	1221793.

VIII CASH FLOW SUMMARY TABLE

(1980 DOLLARS)

CALENDAR YEAR OF PROJECT:	1996	1997	1998	
RELATIVE YEAR OF FULL PRODUCTION:	13	14	15	TOTAL
LINE CASHFLOW LINE ITEMS				
101 COAL VALUE/TON	12.77	12.77	12.77	
	1.09	1.09	1.09	
102 ANNUAL PRODUCTION				
CLEAN COAL	3000000.	3000000.	3000000.	45000000.
	529.	529.	529.	0.
103 ANNUAL SALES REVENUE	38309520.	38309520.	38309520.	574641664.
	3279868.	3279868.	3279868.	0.
104 ANNUAL OPERATING COSTS	13882455.	13882455.	13882455.	208236720.
	1327332.	1327332.	1327332.	0.
105 GROSS PROFIT	24427088.	24427088.	24427088.	366405888.
	2189980.	2189980.	2189980.	0.
OTHER COSTS AND DEDUCTIONS				
106 AMORTIZATION	1626884.	1626884.	1626884.	24403232.
	126426.	126426.	126426.	0.
107 DEPRECIATION	1484046.	1185130.	1685239.	32080112.
	222788.	175364.	217741.	0.
108 EXPENSED PREPRODUCTION				
EXPLORATION, CONSTRUCTION	0.	0.	0.	0.
	0.	0.	0.	0.
109 ROYALTY PAYMENTS	4788693.	4788693.	4788693.	71830336.
	409971.	409971.	409971.	0.
110 LOAN INTEREST	0.	0.	0.	0.
	0.	0.	0.	0.
111 MISCELLANEOUS	1800000.	1800000.	1800000.	27000000.
	0.	0.	0.	0.
112 NET INCOME BEFORE TAXES	14727480.	15026398.	14526292.	211092624.
	1495931.	1542207.	1499397.	0.
113 STATE & LOCAL INCOME TAXES	736374.	751320.	726314.	10720343.
	74798.	77111.	74973.	0.

VIII CASH FLOW SUMMARY TABLE

(1980 DOLLARS)

LINE	CASHFLOW LINE ITEMS	CALENDAR YEAR OF PROJECT: 1996 RELATIVE YEAR OF FULL PRODUCTION: 13	1997 14	1998 15	
114	DEPLETION ALLOWANCE	3352083. 286991.	3352083. 286991.	3352083. 286991.	50281216. 0.
115	TAX LOSS CARRIED FORWARD	0. 0.	0. 0.	0. 0.	3547227. 0.
116	NET INCOME SUBJECT TO FEDERAL TAXATION	10639016. 1159467.	10922988. 1202656.	10447884. 1161951.	150090912. 0.
117	FEDERAL TAXES	4874696. 533360.	5005322. 553240.	4786773. 534525.	68753008. 0.
118	INVESTMENT TAX CREDIT	0. 0.	0. 0.	0. 0.	3327646. 0.
119	NET FEDERAL TAXES PAID	4874696. 533360.	5005322. 553240.	4786773. 534525.	65425344. 0.
120	NET PROFIT	5764317. 626126.	5917661. 649460.	5661107. 627471.	84665456. 0.
121	ADDITIONAL INCOME	0. 0.	0. 0.	6939268. 1070547.	8202488. 0.
	ADJUSTED NET				
122	ADDBACK OF NONCASH COSTS	6463019. 593989.	6164099. 548846.	6664211. 589114.	110311904. 0.
123	LOAN PRINCIPAL PAYMENT	0. 0.	0. 0.	0. 0.	0. 0.
124	NET CASH INFLOW FROM OPERATIONS	12227341. 1198116.	12081769. 1175621.	19264592. 2223339.	199632800. 0.

VIII CASH FLOW SUMMARY TABLE

(1980 DOLLARS)

LINE	CASHFLOW LINE ITEMS				
	CALENDAR YEAR OF PROJECT:	1996	1997	1998	
	RELATIVE YEAR OF FULL PRODUCTION:	13	14	15	
	CAPITAL EXPENDITURES FOR YEAR				
125	ACQUISITION	0.	0.	0.	1256279.
		0.	0.	0.	0.
126	EXPLORATION	0.	0.	0.	77652.
		0.	0.	0.	0.
127	PREPRODUCTION DEVELOPMENT	0.	0.	0.	3412041.
		0.	0.	0.	0.
128	CONSTRUCTION	0.	0.	0.	15713476.
		0.	0.	0.	0.
129	EQUIPMENT	0.	0.	1938308.	30888416.
		0.	0.	237866.	0.
130	ACCRUED INTEREST	0.	0.	0.	0.
		0.	0.	0.	0.
131	INDIRECT CAPITAL	0.	0.	290746.	6990282.
		0.	0.	35680.	0.
132	WORKING CAPITAL	0.	0.	0.	5117782.
		0.	0.	0.	0.
133	TOTAL ANNUAL CAPITAL EXPENDITURE	0.	0.	1938308.	61743440.
		0.	0.	237866.	0.
134	AMOUNT FUNDED FROM EQUITY	0.	0.	1938308.	61743440.
		0.	0.	237866.	0.
135	AMOUNT FUNDED FROM LOANS	0.	0.	0.	0.
		0.	0.	0.	0.
136	ANNUAL NET CASHFLOW	12227341.	12081769.	17326272.	137889328.
		1198116.	1175621.	2046223.	0.

TEST CASE 3
Surface Model
SUMMARY OF INPUT PARAMETERS

CATEGORY 1 - REQUIRED INPUT PARAMETERS

PHYSICAL	ACRONYM		
SEAM THICKNESS (FT)	ST	15.	0.
OVERBURDEN THICKNESS (FT)	OT	100.	0.
TOPSOIL THICKNESS (FT)	TST	2.	0.
MULTIPLE SEAMS (0-NO,1-YES)	MS	0	
OPERATING			
MINING SYSTEM	MINE	AREA	
ANNUAL PRODUCTION (TONS)	YDC	2000000.	
MINE LIFE (YEARS)	LIFE	15	
COAL REGION	LOC	WEST	
FINANCIAL			
LENGTH OF LOAN PAYBACK PERIOD	LL	10	
PORTION OF INITIAL CAPITAL BORROWED (%)	DER	50.00	
DEBT SERVICING RATE (%)	DSR	10.00	
ACQUISITION COST OF PROPERTY ($/ACRE)	CPA	1000.	
PROJECT YEAR	PYR	1980	
TYPE OF ANALYSIS	TYPE	PV	
CONSTANT DOLLAR ANALYSIS - UPDATE FACTORS			
- BASE YEAR	BASE	1980	
- LABOR	LF	2.00	
- PRIMARY EQUIPMENT	PF	4.00	
- SUPPORTING EQUIPMENT	SF	6.00	
- OPERATING	OF	8.00	
- CONSTRUCTION	CF	10.00	
COAL VALUE/TON	CVT	15.00	

SUMMARY OF INPUT PARAMETERS

(CONT.)

CATEGORY 2 - OPTIONAL PARAMETERS (DEFAULT ASSIGNED)

PHYSICAL	ACRONYM		
DEGREE OF COAL PREPARATION	PREP	NONE	
REJECT %	REJ	0.0	0.0
RECOVERY %	REC	90.00	0.0
DILUTION %	DIL	1.67	
COAL DENSITY	CD	BIT	
EXPLORATION REQUIRED	EXR	40.	
OPERATING			
DRILLING OVERBURDEN			
# DRILLS/WORKING PLACE	NDPO	1	
DEGREE OF OVERBURDEN CONSOLIDATION	OVCN	MOD	
OVERBURDEN EXCAVATION			
DRAGLINE			
# OF WORKING PLACES	NWPO	0	
MAXIMUM BUCKET SIZE (CU YDS)	BCMX	110.	
BUCKET FILL FACTOR	BFFO	80.00	0.0
OPERATOR EFFICIENCY FACTOR	OEFO	75.00	0.0
SCHEDULED MONTHLY OPERATING HOURS	MOHO	720	
CYCLE TIME	CYCO	60.0	0.0
COAL DRILLING			
# DRILLS/WORKING PLACE	NDPC	1	
DRILLING REQUIRED	DREQ	YES	
COAL LOADING			
# OF WORKING PLACES	NWPC	0	
SCHEDULED MONTHLY OPERATING HOURS	MOHC	336	
BUCKET FILL FACTOR	BFFC	75.00	0.0
OPERATOR EFFICIENCY FACTOR	OEFC	75.00	0.0
COAL LOAD CYCLE TIME	CYCC	35.00	0.0
COAL HAULING			
# OF LOADING PASSES	NLPC	7	
TRUCK TRAVEL TIME LOADED	TTLC	800.	0.
TRUCK TRAVEL TIME EMPTY	TTEC	480.	0.
TURN, SPOT, DUMP TIME	TSDC	200.	0.
TRUCK CAPACITY	TCC	0.	

RECLAMATION

SPOIL HANDLING			
WIDTH OF PIT	WID	100.	0.
SCHEDULED MONTHLY OPERATING HOURS	MOHD	336	
ANGLE OF SPOIL (DEGREES)	ANGL	36.0	0.0
MAXIMUM BLADE CAPACITY	BDMX	19.	
OPERATOR EFFICIENCY FACTOR	OEFR	75.00	0.0
OPERATING EFFICIENCY FACTOR	OGFR	80.00	0.0
SWELL FACTOR	SWR	25.00	0.0
MATERIAL FACTOR	MFR	80.00	0.0
WEATHER FACTOR	WFR	80.00	0.0
TOPSOIL HANDLING			
SCHEDULED MONTHLY OPERATING HOURS	MOHS	168	
MAXIMUM SCRAPER CAPACITY	SCMX	21.00	
LOADING TIME IN TOPSOIL	LT	50.	0.
MANEUVER & SPREAD TIME	MST	42.	0.
TRUCK TRAVEL TIME LOADED	TTLT	410.	0.
TRUCK TRAVEL TIME EMPTY	TTET	246.	0.

SUMMARY OF INPUT PARAMETERS

(CONT.)

FINANCIAL

DEFERRED COST TREATMENT	COST	
COST RANGE APPLICABLE		
- EQUIPMENT	REQ	TOT
- CONSTRUCTION	RCON	TOT
UNION WELFARE FUND PAYMENTS (PER MANHOUR)	UWRM	1.385
UNION WELFARE FUND PAYMENTS (PER TON)	UWRT	1.640
LABOR OVERHEAD (%)	OVHP	40.00
INDIRECT CAPITAL (%)	ICP	15.00
DRILLING COST/FOOT	DCF	15.00
ROYALTY PAYMENT (PERCENTAGE)	ROYP	12.50
ROYALTY PAYMENT (PER TON)	ROYT	0.0
SEVERANCE TAX (PERCENTAGE)	SEVP	0.0
SEVERANCE TAX (PER TON)	SEVT	0.0
STATE & LOCAL TAX	STAX	2.00
BLACK LUNG TAX	BLT	0.25
ABANDONED MINE RECLAMATION FUND	AMRF	0.35
DEPRECIATION METHOD		
- DRAGLINE	DMO	SL
- BUCKETS	DMB	SL
- HAUL TRUCKS	DMT	
- DRILLS	DMD	SL
- LOADERS / SHOVELS	DML	SL
- HAUL TRUCKS	DMH	SL
- DOZERS & SCRAPERS	DMR	SL
DEPRECIABLE LIFE		
- DRAGLINE	DLO	15
- BUCKETS	DLB	10
- HAUL TRUCKS	DLT	0
- DRILLS	DLD	10
- LOADERS / SHOVELS	DLL	0
- HAUL TRUCKS	DLH	10
- DOZERS & SCRAPERS	DLR	5
SALVAGE VALUE		
- DRAGLINE	SVO	10.00
- BUCKETS	SVB	5.00
- HAUL TRUCKS	SVT	5.00
- DRILLS	SVD	10.00
- LOADERS / SHOVELS	SVL	10.00
- HAUL TRUCKS	SVH	5.00
- DOZERS & SCRAPERS	SVR	10.00

SUMMARY OF INPUT PARAMETERS

(CONT.)

CATEGORY 3 - PARAMETERS WHICH OVERRIDE CALCULATED VALUES

PHYSICAL	ACRONYM		
LAND AREA REQUIREMENTS	LAR	0.	
OPERATING			
TOTAL HOURLY LABOR COST	HLC	0.	0.
TOTAL SALARIED PERSONNEL COST	SPC	0.	0.
FINANCIAL			
EXPLORATION & DEVELOPMENT DRILLING COST	EDC	0.	0.
SUPPORT CAPITAL (% TOTAL CAPITAL)	SCP	0.	
ANNUAL SUPPLIES & MATERIALS COST	SMC	0.	0.
ANNUAL OPERATING COST	AOC	0.	0.
PREPRODUCTION DEVELOPMENT COST	PDC	0.	0.
WORKING CAPITAL	WC	0.	0.
CONTROL VARIABLES			
NUMBER OF ITERATIONS	NIT	1	
PRINT TABLES	PRNT	1 2 3 4 5 6 7 8	
PRINT VIII FOR EACH ITERATION	P8	0	
POINT VALUE COSTS (0-NO,1-YES)	PVC	1	

CONSTANT DOLLAR CASE - POINT VALUE OPTION

RATE OF RETURN ON EQUITY	29.70
PROJECT START YEAR	1980
FULL PRODUCTION YEARS	1984 - 1998
COAL VALUE/TON	15.00
CAPITALIZATION	
- DEBT (%)	50.00
- EQUITY (%)	50.00
DEBT SERVICING PERCENTAGE	10.00

I PRIMARY EQUIPMENT SELECTION AND COSTS

(1980 DOLLARS)

A. LAND AND EXPLORATION	QUANTITY	COST
LAND AREA REQUIREMENTS (ACRES)	1255.	1255492.
EXPLORATION, DEVELOPMENT DRILLING		54143.

B. PRIMARY EQUIPMENT	UNIT SIZE	# UNITS	COST
OVERBURDEN REMOVAL			
DRAGLINE	43. CU.YDS.	1.	11220000.
OVERBURDEN DRILLING			
DRILLS (OVERBURDEN)	9. INCHES	1.	666400.
COAL DRILLING			
DRILLS		1.	210000.
COAL LOADING			
LOADING SHOVELS	8. CU.YDS.	1.	574700.
COAL HAULING			
HAUL TRUCKS	50. TONS	8.	2060800.
RECLAMATION (SPOIL)			
DOZERS	19. CU.YDS.	1.	212600.
RECLAMATION (TOPSOIL)			
SCRAPERS	21. CU.YDS.	5.	1942500.
TOTAL PRIMARY EQUIPMENT COST			16886992.

II SUPPORTING CAPITAL ITEM COSTS

(1980 DOLLARS)

SUPPORT CAPITAL	5170305.
PREPARATION PLANT COST	0.
CONSTRUCTION COSTS	1551091.
SUPPORT EQUIPMENT COST	3619213.

III MANPOWER REQUIREMENTS AND COSTS

(1980 DOLLARS)

HOURLY LABOR

REQUIREMENTS	114.
DIRECT ANNUAL COSTS	2025307.
TOTAL ANNUAL UNION WELFARE COSTS	3108023.

SALARIED PERSONNEL

REQUIREMENTS	51.
DIRECT ANNUAL COSTS	1275000.

TOTAL MANPOWER

REQUIREMENTS	165.
DIRECT ANNUAL COSTS	3300307.
PRODUCTIVITY/MAN DAY	53.63

IV OPERATING SUPPLIES & MATERIALS COSTS

(1980 DOLLARS)

ANNUAL SUPPLIES & MATERIALS COST	4980469.
ANNUAL PREPARATION PLANT OPERATING COSTS	0.
TOTAL DIRECT NON-LABOR OPERATING COSTS	4980469.

V TOTAL CAPITAL ANALYSIS

(1980 DOLLARS)

CAPITAL COST CATEGORY	CALENDAR YR INCURRED	PROJECT YR INCURRED	COST UPDATE FACTOR	CAPITAL COST
INITIAL CAPITAL				
ACQUISITION COST	1980	1		1255492.
EXPLORATION COSTS	1980	1		54143.
PRIMARY EQUIPMENT COST				
- OVERBURDEN STRIPPING	1981	2	4.0%	3366000.
	1982	3		4487999.
	1983	4		3366000.
- OVERBURDEN & COAL DRILLING	1981	2	4.0%	175280.
	1982	3		262920.
	1983	4		438200.
- COAL LOADING	1981	2	4.0%	114940.
	1982	3		172410.
	1983	4		287350.
- COAL HAULING	1981	2	4.0%	412160.
	1982	3		618240.
	1983	4		1030400.
- RECLAMATION	1981	2	4.0%	431020.
	1982	3		646530.
	1983	4		1077550.
SUPPORTING EQUIPMENT COSTS				
- 20 YEAR EQUIPMENT	1981	2	6.0%	144768.
	1982	3		217153.
	1983	4		361921.
- 10 YEAR EQUIPMENT	1981	2	6.0%	108576.
	1982	3		162865.
	1983	4		271441.
- 5 YEAR EQUIPMENT	1981	2	6.0%	253345.
	1982	3		380017.
	1983	4		633362.
CONSTRUCTION COSTS	1980	1	10.0%	775546.
	1981	2		775546.
	1982	3		775546.
	1983	4		775546.

V TOTAL CAPITAL ANALYSIS

(1980 DOLLARS)

CAPITAL COST CATEGORY	CALENDAR YR INCURRED	PROJECT YR INCURRED	COST UPDATE FACTOR	CAPITAL COST
INDIRECT CAPITAL	1981	2	0.0%	791241.
	1982	3		1044546.
	1983	4		1046256.
PREPRODUCTION COST	1983	4	8.0%	6354460.
ACCRUED INTEREST	1984	5		3404987.
			TOTAL	36473740.

V TOTAL CAPITAL ANALYSIS

(1980 DOLLARS)

CAPITAL COST CATEGORY	CALENDAR YR INCURRED	PROJECT YR INCURRED	COST UPDATE FACTOR	CAPITAL COST
DEFERRED CAPITAL				
WORKING CAPITAL	1984	5		4449604.
PRIMARY EQUIPMENT REPLACEMENTS				
- OVERBURDEN STRIPPING	1993	14	4.0%	224400.
- OVERBURDEN & COAL DRILLING	1993	14	4.0%	876400.
- COAL LOADING	1988	9	4.0%	574700.
	1993	14		574700.
	1998	19		574700.
- COAL HAULING	1993	14	4.0%	2060800.
- RECLAMATION	1988	9	4.0%	2155100.
	1993	14		2155100.
	1998	19		2155100.
SUPPORTING EQUIPMENT REPLACEMENTS				
- 10 YEAR EQUIPMENT	1993	14	6.0%	542882.
- 5 YEAR EQUIPMENT	1988	9	6.0%	1266724.
	1993	14		1266724.
	1998	19		1266724.
			TOTAL	20143652.

VI DEPRECIATION, SALVAGE VALUE, INVESTMENT TAX CREDIT

(1980 DOLLARS)

CAPITAL COST CATEGORY	DEPRECIATION METHOD	DEPRECIABLE LIFE	CALENDAR YEAR	DEPRECIATION CHARGE	SALVAGE VALUE %	SALVAGE VALUE	INVESTMENT TAX CREDIT
DRAGLINES	STRAIGHT LINE	15	1981		10.0		336600.
			1982				448800.
			1983	673200.			336600.
			1984	673200.			
			1985	673200.			
			1986	673200.			
			1987	673200.			
			1988	673200.			
			1989	673200.			
			1990	673200.			
			1991	673200.			
			1992	673200.			
			1993	673200.			
			1994	673200.			
			1995	673200.			
			1996	673200.			
			1997	673200.			
			1998			1122000.	
BUCKETS	STRAIGHT LINE	10	1993	21318.	5.0		14960.
			1994	21318.			
			1995	21318.			
			1996	21318.			
			1997	21318.			
			1998	21318.		96492.	
OVERBURDEN & COAL DRILLS	STRAIGHT LINE	10	1981		10.0		17528.
			1982				26292.
			1983	78876.			43820.
			1984	78876.			
			1985	78876.			
			1986	78876.			
			1987	78876.			
			1988	78876.			
			1989	78876.			
			1990	78876.			
			1991	78876.			
			1992	78876.			

VI DEPRECIATION, SALVAGE VALUE, INVESTMENT TAX CREDIT

(1980 DOLLARS)

CAPITAL COST CATEGORY	DEPRECIATION METHOD	DEPRECIABLE LIFE	CALENDAR YEAR	DEPRECIATION CHARGE	SALVAGE VALUE %	SALVAGE VALUE	INVESTMENT TAX CREDIT
			1993	78876.		87640.	58427.
			1994	78876.			
			1995	78876.			
			1996	78876.			
			1997	78876.			
			1998	78876.		403144.	
COAL LOADING SHOVELS	STRAIGHT LINE	5	1981		10.0		11494.
			1982				17241.
			1983	103446.			28735.
			1984	103446.			
			1985	103446.			
			1986	103446.			
			1987	103446.			
			1988	103446.		57470.	57470.
			1989	103446.			
			1990	103446.			
			1991	103446.			
			1992	103446.			
			1993	103446.		57470.	38313.
			1994	103446.			
			1995	103446.			
			1996	103446.			
			1997	103446.			
			1998	103446.		528724.	
COAL HAUL TRUCKS	STRAIGHT LINE	10	1981		5.0		41216.
			1982				61824.
			1983	195776.			103040.
			1984	195776.			
			1985	195776.			
			1986	195776.			
			1987	195776.			
			1988	195776.			
			1989	195776.			
			1990	195776.			
			1991	195776.			
			1992	195776.			
			1993	195776.		103040.	137387.
			1994	195776.			
			1995	195776.			

VI DEPRECIATION, SALVAGE VALUE, INVESTMENT TAX CREDIT

(1980 DOLLARS)

CAPITAL COST CATEGORY	DEPRECIATION METHOD	DEPRECIABLE LIFE	CALENDAR YEAR	DEPRECIATION CHARGE	SALVAGE VALUE %	SALVAGE VALUE	INVESTMENT TAX CREDIT
			1996	195776.			
			1997	195776.			
			1998	195776.		886144.	
DOZERS & SCRAPERS	STRAIGHT LINE	5	1981		10.0		43102.
			1982				64653.
			1983	387918.			107755.
			1984	387918.			
			1985	387918.			
			1986	387918.			
			1987	387918.			
			1988	387918.		215510.	215510.
			1989	387918.			
			1990	387918.			
			1991	387918.			
			1992	387918.			
			1993	387918.		215510.	143673.
			1994	387918.			
			1995	387918.			
			1996	387918.			
			1997	387918.			
			1998	387918.		1982692.	
20-YEAR SUPPORT EQUIP.	STRAIGHT LINE	20	1981		5.0		14477.
			1982				21715.
			1983	34383.			36192.
			1984	34383.			
			1985	34383.			
			1986	34383.			
			1987	34383.			
			1988	34383.			
			1989	34383.			
			1990	34383.			
			1991	34383.			
			1992	34383.			
			1993	34383.			
			1994	34383.			
			1995	34383.			
			1996	34383.			
			1997	34383.			
			1998	34383.		173721.	

VI DEPRECIATION, SALVAGE VALUE, INVESTMENT TAX CREDIT

(1980 DOLLARS)

CAPITAL COST CATEGORY	DEPRECIATION METHOD	DEPRECIABLE LIFE	CALENDAR YEAR	DEPRECIATION CHARGE	SALVAGE VALUE %	SALVAGE VALUE	INVESTMENT TAX CREDIT
10-YEAR SUPPORT EQUIP.	STRAIGHT LINE	10	1981		5.0		10858.
			1982				16286.
			1983	51574.			27144.
			1984	51574.			
			1985	51574.			
			1986	51574.			
			1987	51574.			
			1988	51574.			
			1989	51574.			
			1990	51574.			
			1991	51574.			
			1992	51574.			
			1993	51574.		27144.	36192.
			1994	51574.			
			1995	51574.			
			1996	51574.			
			1997	51574.			
			1998	51574.		233439.	
5-YEAR SUPPORT EQUIP.	STRAIGHT LINE	5	1981		10.0		25334.
			1982				38002.
			1983	228010.			63336.
			1984	228010.			
			1985	228010.			
			1986	228010.			
			1987	228010.			
			1988	228010.		126672.	126672.
			1989	228010.			
			1990	228010.			
			1991	228010.			
			1992	228010.			
			1993	228010.		126672.	84448.
			1994	228010.			
			1995	228010.			
			1996	228010.			
			1997	228010.			
			1998	228010.		1165386.	

VII DIRECT OPERATING COSTS

(1980 DOLLARS)

CALENDAR YEAR	LABOR	LABOR OVERHEAD	DIRECT NON-LABOR OPERATING COSTS	UMW COST	INSURANCE	TOTAL
1984	3300307.	1320122.	4980469.	3108023.	139501.	12848421.
1985	3300307.	1320122.	4980469.	3108023.	139501.	12848421.
1986	3300307.	1320122.	4980469.	3108023.	139501.	12848421.
1987	3300307.	1320122.	4980469.	3108023.	139501.	12848421.
1988	3300307.	1320122.	4980469.	3108023.	139501.	12848421.
1989	3300307.	1320122.	4980469.	3108023.	139501.	12848421.
1990	3300307.	1320122.	4980469.	3108023.	139501.	12848421.
1991	3300307.	1320122.	4980469.	3108023.	139501.	12848421.
1992	3300307.	1320122.	4980469.	3108023.	139501.	12848421.
1993	3300307.	1320122.	4980469.	3108023.	139501.	12848421.
1994	3300307.	1320122.	4980469.	3108023.	139501.	12848421.
1995	3300307.	1320122.	4980469.	3108023.	139501.	12848421.
1996	3300307.	1320122.	4980469.	3108023.	139501.	12848421.
1997	3300307.	1320122.	4980469.	3108023.	139501.	12848421.
1998	3300307.	1320122.	4980469.	3108023.	139501.	12848421.

VIII CASH FLOW SUMMARY TABLE

(1980 DOLLARS)

LINE	CASHFLOW LINE ITEMS	1980	1981	1982	1983	1984	1985	1986	1987
	CALENDAR YEAR OF PROJECT:	1980	1981	1982	1983	1984	1985	1986	1987
	RELATIVE YEAR OF FULL PRODUCTION:	-4	-3	-2	-1	1	2	3	4
101	COAL VALUE/TON	0.0	0.0	0.0	0.0	15.00	15.00	15.00	15.00
102	ANNUAL PRODUCTION CLEAN COAL	0.	0.	0.	0.	2000000.	2000000.	2000000.	2000000.
103	ANNUAL SALES REVENUE	0.	0.	0.	0.	30000000.	30000000.	30000000.	30000000.
104	ANNUAL OPERATING COSTS	0.	0.	0.	0.	12848421.	12848421.	12848421.	12848421.
105	GROSS PROFIT	0.	0.	0.	0.	17151568.	17151568.	17151568.	17151568.
	OTHER COSTS AND DEDUCTIONS								
106	AMORTIZATION	0.	0.	0.	0.	830334.	830334.	830334.	830334.
107	DEPRECIATION	0.	0.	0.	1753179.	1753179.	1753179.	1753179.	1753179.
108	EXPENSED PREPRODUCTION EXPLORATION, CONSTRUCTION	54143.	0.	0.	0.	-54143.	0.	0.	0.
109	ROYALTY PAYMENTS	0.	0.	0.	0.	3750000.	3750000.	3750000.	3750000.
110	LOAN INTEREST	0.	0.	0.	0.	1873079.	1755549.	1626268.	1484058.
111	MISCELLANEOUS	0.	0.	0.	0.	1200000.	1200000.	1200000.	1200000.
112	NET INCOME BEFORE TAXES	-54143.	0.	0.	-1753179.	7799120.	7862506.	7991787.	8133997.
113	STATE & LOCAL INCOME TAXES	0.	0.	0.	0.	155982.	157250.	159836.	162680.
114	DEPLETION ALLOWANCE	0.	0.	0.	0.	2625000.	2625000.	2625000.	2625000.
115	TAX LOSS CARRIED FORWARD	0.	54143.	54143.	54143.	1807322.	0.	0.	0.
116	NET INCOME SUBJECT TO FEDERAL TAXATION	0.	0.	0.	0.	3210815.	5080256.	5206952.	5346318.
117	FEDERAL TAXES	0.	0.	0.	0.	1457724.	2317667.	2375947.	2440056.
118	INVESTMENT TAX CREDIT	0.	0.	0.	0.	1027907.	914138.	0.	0.

VIII CASH FLOW SUMMARY TABLE

(1980 DOLLARS)

LINE	CASHFLOW LINE ITEMS	1980	1981	1982	1983	1984	1985	1986	1987
	CALENDAR YEAR OF PROJECT:	1980	1981	1982	1983	1984	1985	1986	1987
	RELATIVE YEAR OF FULL PRODUCTION:	-4	-3	-2	-1	1	2	3	4
119	NET FEDERAL TAXES PAID	0.	0.	0.	0.	429817.	1403528.	2375947.	2440056.
120	NET PROFIT	0.	0.	0.	0.	2780997.	3676728.	2831005.	2906262.
121	ADDITIONAL INCOME	0.	0.	0.	0.	0.	0.	0.	0.
	ADJUSTED NET								
122	ADDBACK OF NONCASH COSTS	54143.	54143.	54143.	1807322.	6961691.	5208513.	5208513.	5208513.
123	LOAN PRINCIPAL PAYMENT	0.	0.	0.	0.	1175287.	1292817.	1422098.	1564308.
124	NET CASH INFLOW FROM OPERATIONS	0.	0.	0.	0.	8567401.	7592424.	6617420.	6550467.
	CAPITAL EXPENDITURES FOR YEAR								
125	ACQUISITION	1255492.	0.	0.	0.	0.	0.	0.	0.
126	EXPLORATION	54143.	0.	0.	0.	0.	0.	0.	0.
127	PREPRODUCTION DEVELOPMENT	0.	0.	0.	6354460.	0.	0.	0.	0.
128	CONSTRUCTION	775546.	775546.	775546.	775546.	0.	0.	0.	0.
129	EQUIPMENT	0.	4499396.	6188097.	6199498.	0.	0.	0.	0.
130	ACCRUED INTEREST	0.	0.	0.	0.	3404987.	0.	0.	0.
131	INDIRECT CAPITAL	116332.	791241.	1044546.	1046256.	0.	0.	0.	0.
132	WORKING CAPITAL	0.	0.	0.	0.	4449604.	0.	0.	0.
133	TOTAL ANNUAL CAPITAL EXPENDITURE	2201512.	6066182.	8008188.	14375759.	4449604.	0.	0.	0.
134	AMOUNT FUNDED FROM EQUITY	1100755.	3033090.	4004093.	7187878.	4449604.	0.	0.	0.
135	AMOUNT FUNDED FROM LOANS	1100756.	3033091.	4004094.	7187880.	0.	0.	0.	0.
136	ANNUAL NET CASHFLOW	-1100755.	-3033090.	-4004093.	-7187878.	4117797.	7592424.	6617420.	6550467.

VIII CASH FLOW SUMMARY TABLE

(1980 DOLLARS)

CALENDAR YEAR OF PROJECT:	1988	1989	1990	1991	1992	1993	1994	1995
RELATIVE YEAR OF FULL PRODUCTION:	5	6	7	8	9	10	11	12
LINE CASHFLOW LINE ITEMS								
101 COAL VALUE/TON	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
102 ANNUAL PRODUCTION CLEAN COAL	2000000.	2000000.	2000000.	2000000.	2000000.	2000000.	2000000.	2000000.
103 ANNUAL SALES REVENUE	30000000.	30000000.	30000000.	30000000.	30000000.	30000000.	30000000.	30000000.
104 ANNUAL OPERATING COSTS	12848421.	12848421.	12848421.	12848421.	12848421.	12848421.	12848421.	12848421.
105 GROSS PROFIT	17151568.	17151568.	17151568.	17151568.	17151568.	17151568.	17151568.	17151568.
OTHER COSTS AND DEDUCTIONS								
106 AMORTIZATION	830334.	830334.	830334.	830334.	830334.	830334.	830334.	830334.
107 DEPRECIATION	1753180.	1753180.	1753180.	1753180.	1753180.	1774498.	1774498.	1774498.
108 EXPENSED PREPRODUCTION EXPLORATION, CONSTRUCTION	0.	0.	0.	0.	0.	0.	0.	0.
109 ROYALTY PAYMENTS	3750000.	3750000.	3750000.	3750000.	3750000.	3750000.	3750000.	3750000.
110 LOAN INTEREST	1327627.	1155553.	966273.	758063.	529033.	277100.	0.	0.
111 MISCELLANEOUS	1200000.	1200000.	1200000.	1200000.	1200000.	1200000.	1200000.	1200000.
112 NET INCOME BEFORE TAXES	8290427.	8462501.	8651782.	8859991.	9089021.	9319636.	9596736.	9596736.
113 STATE & LOCAL INCOME TAXES	165808.	169250.	173036.	177200.	181780.	186393.	191935.	191935.
114 DEPLETION ALLOWANCE	2625000.	2625000.	2625000.	2625000.	2625000.	2625000.	2625000.	2625000.
115 TAX LOSS CARRIED FORWARD	0.	0.	0.	0.	0.	0.	0.	0.
116 NET INCOME SUBJECT TO FEDERAL TAXATION	5499619.	5668252.	5853747.	6057792.	6282241.	6508244.	6779802.	6779802.
117 FEDERAL TAXES	2510574.	2588145.	2673473.	2767334.	2870580.	2974542.	3099458.	3099458.
118 INVESTMENT TAX CREDIT	399652.	0.	0.	0.	0.	513400.	0.	0.

VIII CASH FLOW SUMMARY TABLE

(1980 DOLLARS)

LINE	CASHFLOW LINE ITEMS	1988	1989	1990	1991	1992	1993	1994	1995
	CALENDAR YEAR OF PROJECT:	1988	1989	1990	1991	1992	1993	1994	1995
	RELATIVE YEAR OF FULL PRODUCTION:	5	6	7	8	9	10	11	12
119	NET FEDERAL TAXES PAID	2110921.	2588145.	2673473.	2767334.	2870580.	2461141.	3099458.	3099458.
120	NET PROFIT	3388698.	3080107.	3180274.	3290458.	3411661.	4047103.	3680344.	3680344.
121	ADDITIONAL INCOME	399652.	0.	0.	0.	0.	617476.	0.	0.
	ADJUSTED NET								
122	ADDBACK OF NONCASH COSTS	5208514.	5208514.	5208514.	5208514.	5208514.	5229832.	5229832.	5229832.
123	LOAN PRINCIPAL PAYMENT	1720739.	1892813.	2082093.	2290302.	2519332.	2771265.	0.	0.
124	NET CASH INFLOW FROM OPERATIONS	7276125.	6395808.	6306695.	6208670.	6100843.	7123146.	8910176.	8910176.
	CAPITAL EXPENDITURES FOR YEAR								
125	ACQUISITION	0.	0.	0.	0.	0.	0.	0.	0.
126	EXPLORATION	0.	0.	0.	0.	0.	0.	0.	0.
127	PREPRODUCTION DEVELOPMENT	0.	0.	0.	0.	0.	0.	0.	0.
128	CONSTRUCTION	0.	0.	0.	0.	0.	0.	0.	0.
129	EQUIPMENT	2729799.	0.	0.	0.	0.	5891398.	0.	0.
130	ACCRUED INTEREST	0.	0.	0.	0.	0.	0.	0.	0.
131	INDIRECT CAPITAL	409470.	0.	0.	0.	0.	883710.	0.	0.
132	WORKING CAPITAL	0.	0.	0.	0.	0.	0.	0.	0.
133	TOTAL ANNUAL CAPITAL EXPENDITURE	2729799.	0.	0.	0.	0.	5891398.	0.	0.
134	AMOUNT FUNDED FROM EQUITY	2729799.	0.	0.	0.	0.	5891398.	0.	0.
135	AMOUNT FUNDED FROM LOANS	0.	0.	0.	0.	0.	0.	0.	0.
136	ANNUAL NET CASHFLOW	4546326.	6395808.	6306695.	6208670.	6100843.	1231748.	8910176.	8910176.

VIII CASH FLOW SUMMARY TABLE

(1980 DOLLARS)

LINE	CASHFLOW LINE ITEMS	1996	1997	1998	TOTAL
	CALENDAR YEAR OF PROJECT:				
	RELATIVE YEAR OF FULL PRODUCTION:	13	14	15	
101	COAL VALUE/TON	15.00	15.00	15.00	
102	ANNUAL PRODUCTION CLEAN COAL	2000000.	2000000.	2000000.	30000000.
103	ANNUAL SALES REVENUE	30000000.	30000000.	30000000.	449999104.
104	ANNUAL OPERATING COSTS	12848421.	12848421.	12848421.	192726240.
105	GROSS PROFIT	17151568.	17151568.	17151568.	257273520.
	OTHER COSTS AND DEDUCTIONS				
106	AMORTIZATION	830334.	830334.	830334.	12455010.
107	DEPRECIATION	1774498.	1774498.	1101300.	27505568.
108	EXPENSED PREPRODUCTION EXPLORATION, CONSTRUCTION	0.	0.	0.	0.
109	ROYALTY PAYMENTS	3750000.	3750000.	3750000.	56250000.
110	LOAN INTEREST	0.	0.	0.	11752602.
111	MISCELLANEOUS	1200000.	1200000.	1200000.	18000000.
112	NET INCOME BEFORE TAXES	9596736.	9596736.	10269934.	131310240.
113	STATE & LOCAL INCOME TAXES	191935.	191935.	205399.	2662346.
114	DEPLETION ALLOWANCE	2625000.	2625000.	2625000.	39374928.
115	TAX LOSS CARRIED FORWARD	0.	0.	0.	1969751.
116	NET INCOME SUBJECT TO FEDERAL TAXATION	6779802.	6779802.	7439536.	89272912.
117	FEDERAL TAXES	3099458.	3099458.	3402936.	40776768.
118	INVESTMENT TAX CREDIT	0.	0.	0.	2855096.

VIII CASH FLOW SUMMARY TABLE

(1980 DOLLARS)

LINE	CASHFLOW LINE ITEMS	CALENDAR YEAR OF PROJECT: 1996 RELATIVE YEAR OF FULL PRODUCTION: 13	1997 14	1998 15	
119	NET FEDERAL TAXES PAID	3099458.	3099458.	3402936.	37921680.
120	NET PROFIT	3680344.	3680344.	4036600.	51351184.
121	ADDITIONAL INCOME	0.	0.	6591740.	7608868.
	ADJUSTED NET				
122	ADDBACK OF NONCASH COSTS	5229832.	5229832.	4556634.	81305280.
123	LOAN PRINCIPAL PAYMENT	0.	0.	0.	18731040.
124	NET CASH INFLOW FROM OPERATIONS	8910176.	8910176.	15184974.	119564592.
	CAPITAL EXPENDITURES FOR YEAR				
125	ACQUISITION	0.	0.	0.	1255492.
126	EXPLORATION	0.	0.	0.	54143.
127	PREPRODUCTION DEVELOPMENT	0.	0.	0.	6354460.
128	CONSTRUCTION	0.	0.	0.	3102181.
129	EQUIPMENT	0.	0.	2729799.	28237952.
130	ACCRUED INTEREST	0.	0.	0.	3404987.
131	INDIRECT CAPITAL	0.	0.	409470.	4701021.
132	WORKING CAPITAL	0.	0.	0.	4449604.
133	TOTAL ANNUAL CAPITAL EXPENDITURE	0.	0.	2729799.	46452208.
134	AMOUNT FUNDED FROM EQUITY	0.	0.	2729799.	31126384.
135	AMOUNT FUNDED FROM LOANS	0.	0.	0.	15325821.
136	ANNUAL NET CASHFLOW	8910176.	8910176.	12455175.	88438208.