GL00351

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

DIGITAL-COMPUTER MODEL OF GROUND-WATER FLOW IN TOOELE VALLEY, UTAH

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Open-File Report 80-446

Prepared in cooperation with
Utah Department of Natural Resources
Division of Water Rights

Salt Lake City, Utah
1980

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CONVERSION FACTORS

Values in this report are given in inch-pound units followed by metric units. The conversion factors are shown to four significant figures. In the text, however, the metric equivalents are shown only to the number of significant figures consistent with the accuracy of the value in inch-pound units.

Inch-pound Unit (Multiply)	Abbreviation	(by)	Metric Unit (to obtain)	Abbreviation
Acre		0.4047	Square hectometer	hm^2
Acre-foot	acre-ft	.001233	Cubic hectometer	hm^3
		1233	Cubic meter	m^3
Cubic foot per second	ft^3/s	.02832	Cubic meter per second	m^3/s
Foot	ft	.3048	Meter	m
Mile	mi	1.609	Kilometer	km
Square foot	ft^2	.0929	Square meter	m^2

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ABSTRACT

A two-dimensional, finite-difference digital-computer model was used to simulate the ground-water flow in the principal artesian aquifer in Tooele Valley, Utah. The parameters used in the model were obtained through field measurements and tests, from historical records, and by trial-and-error adjustments. The model was calibrated against observed water-level changes that occurred during 1941-50, 1951-60, 1961-66, 1967-73, and 1974-78. The reliability of the predictions is good in most parts of the valley, as is shown by the ability of the model to match historical water-level changes.

INTRODUCTION

A finite-difference, digital-computer model was used to simulate, in two dimensions, the ground-water flow in the principal artesian aquifers in Tooele Valley, Utah, and to predict water-level changes that would be caused by hypothetical well discharges. The predictions of water-level changes are reported by Razem and Steiger (1980, p. 57-59). A description of the development and calibration of the model is presented in this report.

The program used for the model is documented by Trescott, Pinder, and Larson (1976). Modifications to their program are given in table 1. Table 1 also includes subroutine SOLVE2, the direct-solution algorithm (D4), which was used along with the strongly implicit procedure (SIP) (Trescott and others, 1976, p. 91-96) in solving the ground-water flow equations. Larson (1978) gives the documentation for the D4 solution technique. Although Larson wrote the D4 code used in this report, the listing included in the back of this report (table 1) is not exactly the same and does not include the option for water-table extrapolation given by Larson (1978, p. 12-13). The version of D4 given here is less efficient computationally than the published version but gives the same results.

The system of numbering wells in Utah is based on the cadastral land-survey system of the U.S. Government. The number, in addition to designating the well, describes its position in the land net. By the land-survey system, the State is divided into four quadrants by the Salt Lake base line and meridian, and these quadrants are designated by the upper case letters A, B, C, and D, indicating the northeast, northwest, southwest, and southeast quadrants, respectively. Numbers designating the township and range (in that order) follow the quadrant letter, and all three are enclosed in parentheses. The number after the parentheses indicates the section, and is followed by three letters indicating the quarter section, the quarter-quarter section, and the quarter-quarter-quarter section—generally 10 acres (4 hm^2); the letters a, b, c, and d indicate, respectively, the northeast, northwest, southwest, and southeast quarters of each subdivision. The number after the letters is the serial number of the well within a 10-acre (4-hm^2) tract. Thus (C-2-4)31dad-2 designates the second well constructed or visited in the SE¼NE¼SE¼ sec. 31, T. 2 S., R. 4 W. The numbering system is illustrated in figure 1.

DESCRIPTION OF THE MODEL

Many factors influenced the construction of the model of ground-water flow in Tooele Valley. Some factors, such as the type of model, model grid, initial water levels, and boundary conditions, were determined before the model was constructed and usually were not allowed to vary. Other factors, which were changed during trial-and-error runs during calibration, included: transmissivity, coefficient of storage, recharge, properties of a confining bed, and discharge.

Type of model

A two-dimensional, finite-difference model was used because, even though there are several artesian aquifers in Tooele Valley, they are not persistent laterally and for practical purposes they cannot be separated. Thus, for the model, the ground-water system was divided into an artesian aquifer overlain by a confining bed, which in turn is overlain by a water-table aquifer. Because the model is two-dimensional, the water-table aquifer can serve only as a source or sink and the water-table elevation cannot change. The reason for using the model of Trescott, Pinder, and Larson (1976) is that it is well documented, has been successfully tested, and is easily attainable by the reader.

In solving the ground-water flow equation, both the SIP and D4 solution techniques were employed. Both solution techniques gave practically identical results; however, the D4 techniques required less computer time.

Model construction

The construction of the model was done in essentially two major steps. First, after the type of the model was selected, the model grid and boundary conditions were established and historical data such as initial water level, discharge, and recharge from precipitation were entered. Second, other parameters such as transmissivity, and

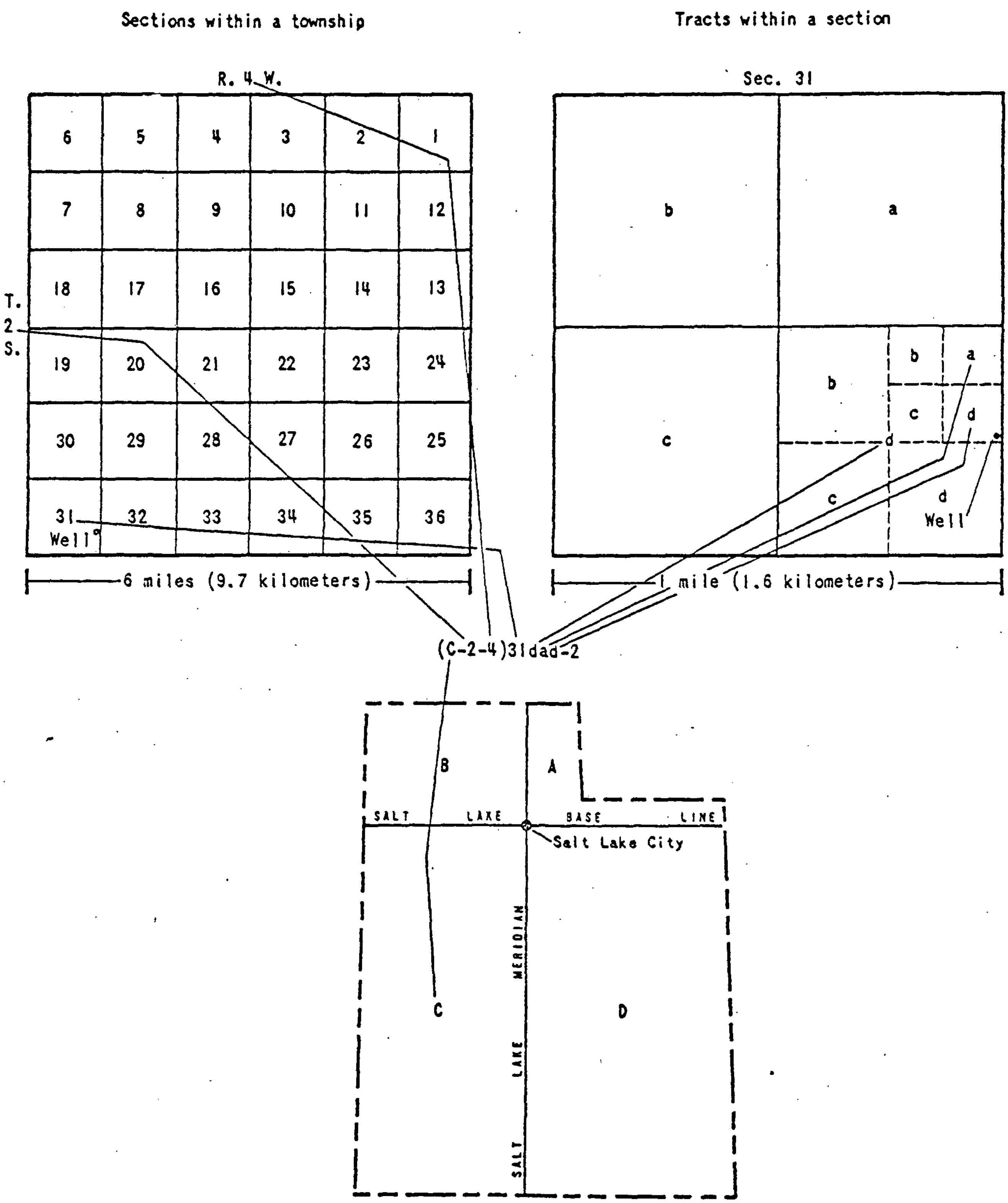

Figure 1.--Well-numbering system used in Utah.

properties of the confining bed were varied, one at a time, in trial-and-error adjustments during calibration. After a satisfactory calibration was attained, the model construction was complete.

Model grid

A block-centered, finite-difference grid with variable grid spacing was used (fig. 2). To simulate the ground-water flow in the artesian system, the study area was divided into a large number of rectangular blocks. The finite-difference equation of ground-water flow was solved at each node, or center point of each block.

The grid designed for the model consisted of 26 rows and 41 columns, or 1,066 nodes (fig. 2). The grid spacing, which was variable, ranged from 1.5 mi (2.4 km) to 0.25 mi (0.40 km). The smaller grid spacings were used where a large number of wells were located or the hydraulic gradient was steep. In contrast, the larger grid spacings were used where data were not available or where the aquifer was not being stressed.

Parameters

The parameters or data used in the model were obtained by field measurements and tests, collection of historical data, and by varying values during calibration until a best-fit condition was obtained. The values for each parameter matrix were obtained by overlaying the grid on a base map that contained the parameter values. For example, the initial head matrix was obtained by overlaying the grid on a map of the initial potentiometric surface and determining the head value at each node.

Boundary conditions and recharge

No-flow (impermeable) boundaries were placed along the entire mathematical border of the model (fig. 2). A finite-flux boundary was placed inside the no-flow boundary at sites where recharge from the mountains and Rush Valley is assumed to take place. The finite-flux boundary was assigned by placing recharge "wells" in selected nodes. A no-flow boundary was used along the northern part of the model even though a small amount of discharge is occurring across this boundary. However, almost all the water moving through the ground-water system is discharged from the aquifers before reaching the northern boundary.

The amount of water that was assigned to the recharge wells was calculated by methods described in Razem and Steiger (1980, p. 30) and by trial-and-error adjustments during calibration. The calibration period was 1941-78, subdivided in five pumping periods. The average recharge of 79.5 ft^3/s (2.25 m^3/s) determined from the 1941

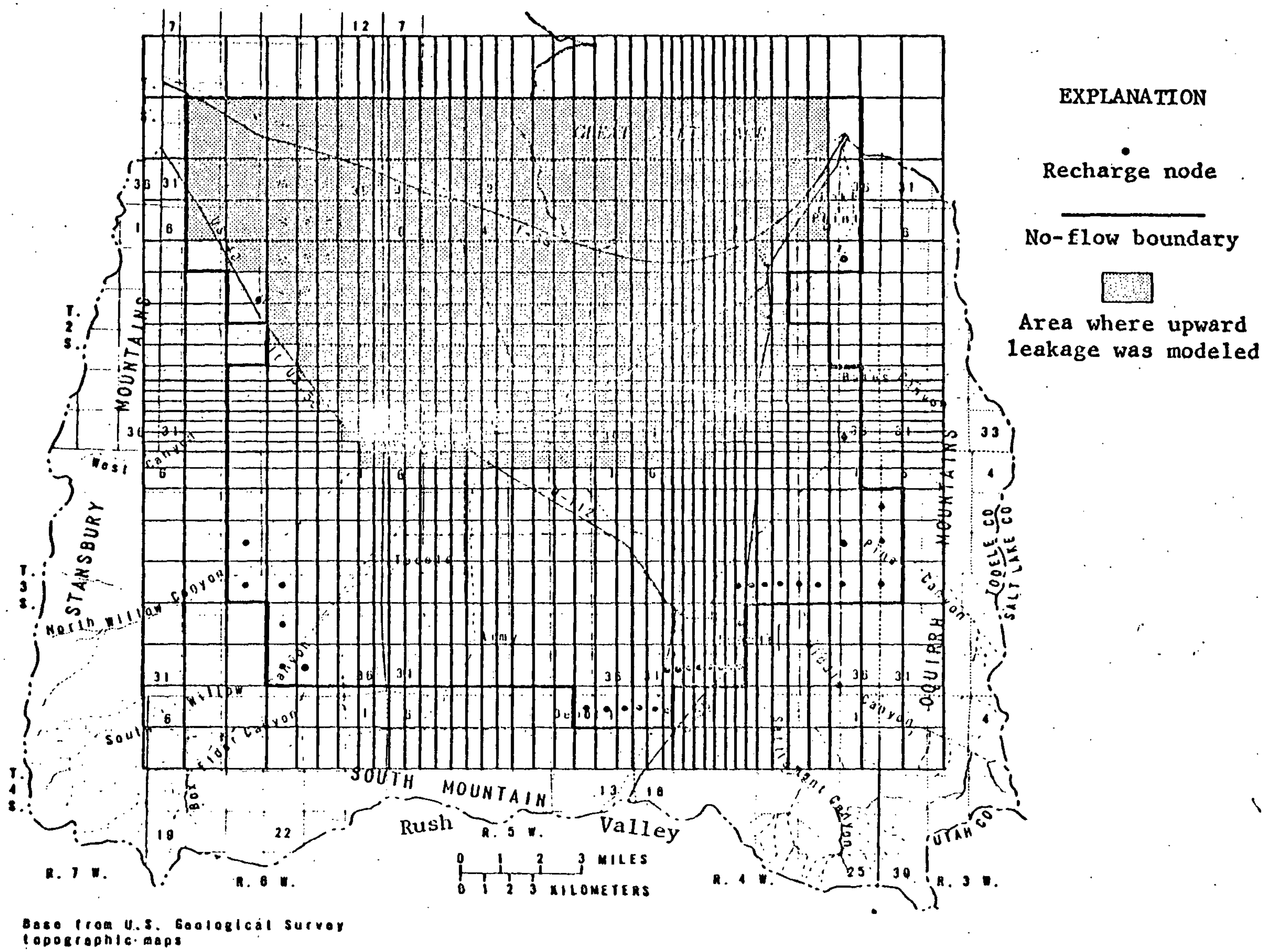

Figure 2.--Map of Tooele Valley showing the grid used for the digital-computer model and the mathematical boundary of the model.

steady-state calibration was used for each pumping period, with the exception of recharge from mine drainage which varied during each pumping period.

Transmissivity

Transmissivity values obtained from aquifer tests and transmissivity values estimated from specific capacities of wells were used as the basis for initial estimates at specific nodes in the transmissivity matrix. From this foundation, transmissivity values were then estimated for the remainder of the nodes, based on well logs and location of the nodes. In general, transmissivity values decreased moving away from the mountains, with values in the north end of the valley being only a fraction of those near the mountains.

During the calibration, the transmissivity values were varied considerably. Even those nodes that had values obtained from field tests were varied during the trial-and-error runs. It is interesting to note that after all the adjustments were made during the calibration, the transmissivity values obtained in the field and those obtained during calibration were nearly equal (Razem and Steiger, 1980, table 1). However, the low values at the north end of the valley, near the lakeshore, and the high values near the mountain fronts were mostly based on a few well logs. Few water levels were available in these areas to use in adjusting transmissivity values during calibration, so the values should be considered as only rough approximations.

The range of transmissivity values used for the predictive model can be seen from the listing of the model data in table 2. The extremes range from about 0.003 ft^2/s or 260 ft^2/d (24.2 m^2/d) to about 0.550 ft^2/s or 47,500 ft^2/d (4,412.8 m^2/d).

Coefficient of storage

The average value of 0.002 obtained from aquifer tests was used for each node in the storage-coefficient matrix. During calibration, values for storage coefficient ranging from 10^{-5} to 10^{-2} were used, resulting in little difference in results for the 1941-78 period. Whenever discharge is changed, there is associated a change in storage until a new equilibrium is reached. In this model calibration, the amount of change in aquifer storage apparently is very small relative to the amount of water obtained from other sources.

If well discharge were to exceed recharge, removal of water from storage would occur and variations of storage coefficient in the model would be important. However, since no meaningful calibration of the storage coefficient could be made, the average value of 0.002 is assumed to be the best value available.

Initial water levels (1941)

The earliest water-level measurements made in a significantly large part of the valley were in 1941. At that time, well discharge was less than a fourth of the present rate and water levels were not changing appreciably. For these reasons, it was assumed the ground-water system was under approximate steady-state conditions in 1941 and could be simulated in this way with the model.

Confining-bed properties

Three matrices were used to model the confining-bed properties which control the leakage into or out of the artesian aquifer. These matrices were hydraulic conductivity of the confining bed, thickness of the confining bed, and head above the confining bed (in this case, elevation of the water table).

The confining-bed properties are important because upward leakage to the water-table aquifer is the greatest means of natural discharge from the artesian aquifer. Upward leakage is assumed to occur only in the northern area (fig. 2) where the confining bed becomes more distinct and differences exist between the water-table elevation and artesian heads. The leakage could not be measured directly, so it was approximated on the basis of the evapotranspiration from the water-table aquifer. Razem and Steiger (1980, p.36) estimate that the evapotranspiration is about 23,000 acre-ft (28.4 hm^3) per year. Upward leakage from the artesian aquifer is the largest source of recharge to the water-table aquifer, and it probably represents a large part of the water that is discharged by evapotranspiration.

The thickness of the confining bed was set constant at 125 ft (38.1 m) at the nodes where upward leakage was modeled (fig. 2). Then the hydraulic conductivity was adjusted by trial and error. In this way, the two matrices are actually turned into one—the leakance matrix. The water-table elevation, or head above the confining bed, cannot vary in this two-dimensional model, and it probably has not changed significantly in the time period simulated. If well discharge were to increase greatly in the future, however, the water table might decline and this could result in errors in model computations of leakage and water levels in the artesian aquifers.

Discharge

Besides discharging by upward leakage, the artesian aquifer discharges through springs and wells. Discharge from springs has been measured periodically and has stayed fairly constant. Detailed records of well discharge have been kept since 1963, and incomplete records are available for prior years. Well-construction dates, power records, and information from local residents were used in estimating well discharge for years prior to 1963.

The model grid was overlain on a map of well locations and the well discharge from each block was assigned to the corresponding node. The listing of the model data in table 2 shows the average well discharge for each pumping period at each node location. Once the well discharge was determined, these values were not varied. The well and spring discharge for the five pumping periods used for the 1941-78 calibration ranged from 20.11 ft^3/s (0.57 m^3/s) to 41.54 ft^3/s (1.18 m^3/s).

CALIBRATION

The purpose of calibrating a model is to simulate observed ground-water conditions as closely as possible by adjusting parameters that are constrained to be hydrologically reasonable. If the model can reproduce historical field measurements, then simulations of future conditions probably are reliable, especially within the range of conditions simulated in calibrations.

In the Tooele Valley model, two calibrations were made. First, the model was adjusted so that it would reproduce the potentiometric surface as inferred from water levels measured in 1941. This was essentially a steady-state calibration because water levels in the aquifer were relatively stable at that time. This calibration was preliminary because water-level and discharge data were not complete enough in 1941 to determine parameter values over the entire model. The second, and more definitive calibration, was made by simulating water-level changes from 1941-78, thus it was a transient-state calibration. During that period, the changes in well discharge and water levels were great enough so that field measurements of water-level changes in observation wells could be used to judge the validity of model-parameter adjustments, rather than judging the validity by comparing results to subjectively drawn contour lines.

Steady-state calibration

The model was initially calibrated against water-level measurements made in 1941. This calibration period, in which the ground-water system was assumed to be under steady-state conditions, was used to help estimate the parameter values before the more detailed and definitive transient-state calibration was attempted.

The model was adjusted until it reproduced the potentiometric surface as drawn using 1941 water-level measurements. Water levels in 1941 were poorly known in many parts of the valley, thus the 1941 calibration based on the 1941 potentiometric surface is not definitive. The 1941 calibration, however, was useful in helping to estimate some of the other parameters, such as transmissivity, hydraulic conductivity of the confining bed, and recharge.

Transient-state calibration

The definitive calibration of the model used to predict water levels in Tooele Valley (Razem and Steiger, 1980, p. 57-59) was based on measurements of changes made in observation wells during 1941-78. The period 1941-78 was divided into five pumping periods in which ground-water conditions were relatively stable, based on available historical water-level data, precipitation, and pumping patterns. The pumping periods were 1941-50, 1951-60, 1961-66, 1967-73, and 1974-78.

The parameter values approximated in the 1941 calibration were used as a starting point in the 1941-78 calibration, along with average well discharge for each pumping period. The parameter values, primarily recharge, transmissivity, and hydraulic conductivity of the confining bed, were then adjusted until computed water-level changes matched observed changes as closely as possible.

The listing of the model data in table 2 shows the final values for each parameter for the final calibration. These parameters were then left unchanged for the predictions of the effects of future withdrawals that are presented in Razem and Steiger (1980, p. 57-59).

Figure 3 shows the comparison of observed water-level changes and computed water-level changes. The curves for computed values are smoother than the curves for the observed values because the value for average recharge that was used for each simulated pumping period smoothed the highs and lows that resulted from variable precipitation.

The comparison between observed and computed water-level changes appears to be good for many of the wells. Computed hydrographs of wells in the Erda area—(C-2-4)28acd-3, (C-2-4)28dbd-3, (C-2-4)31dad-2 and (C-2-4) 33add-1—did not closely simulate the actual rise in water levels that occurred during 1973-78. This probably is because the recharge from infiltration of water discharged from a mine in Pine Canyon is not known accurately.

A sensitivity analysis of the model with respect to the parameters used to construct the model was made. Although the analysis did not use a statistical approach, significant changes in computed water levels occurred when certain parameters were varied. Transmissivity, hydraulic conductivity of the confining bed, and thickness of the confining bed were increased by 1.5 times and water-level changes were noted. When transmissivity was increased by 1.5 times, water levels generally rose in the northern part of the valley and declined in the southern part of the valley, with the node containing well (C-2-4)33add-1 experiencing about an 11-12 ft (3.4-3.7 m) decline. When the hydrau-

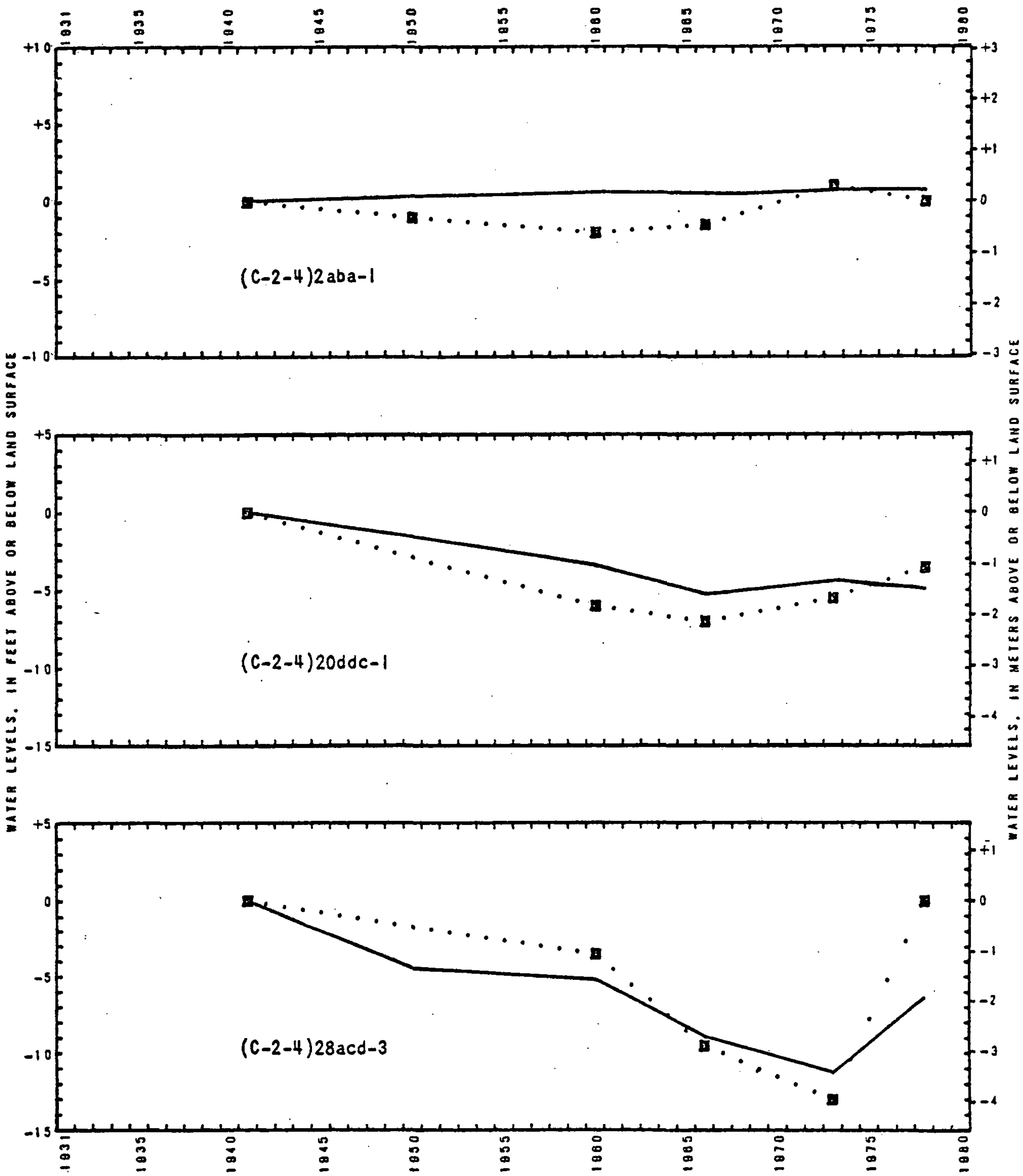

Figure 3.--Hydrographs of selected wells showing observed and computed water-level changes. Dotted line is hydrograph based on actual measurements shown by aquares; solid line is computed hydrograph.

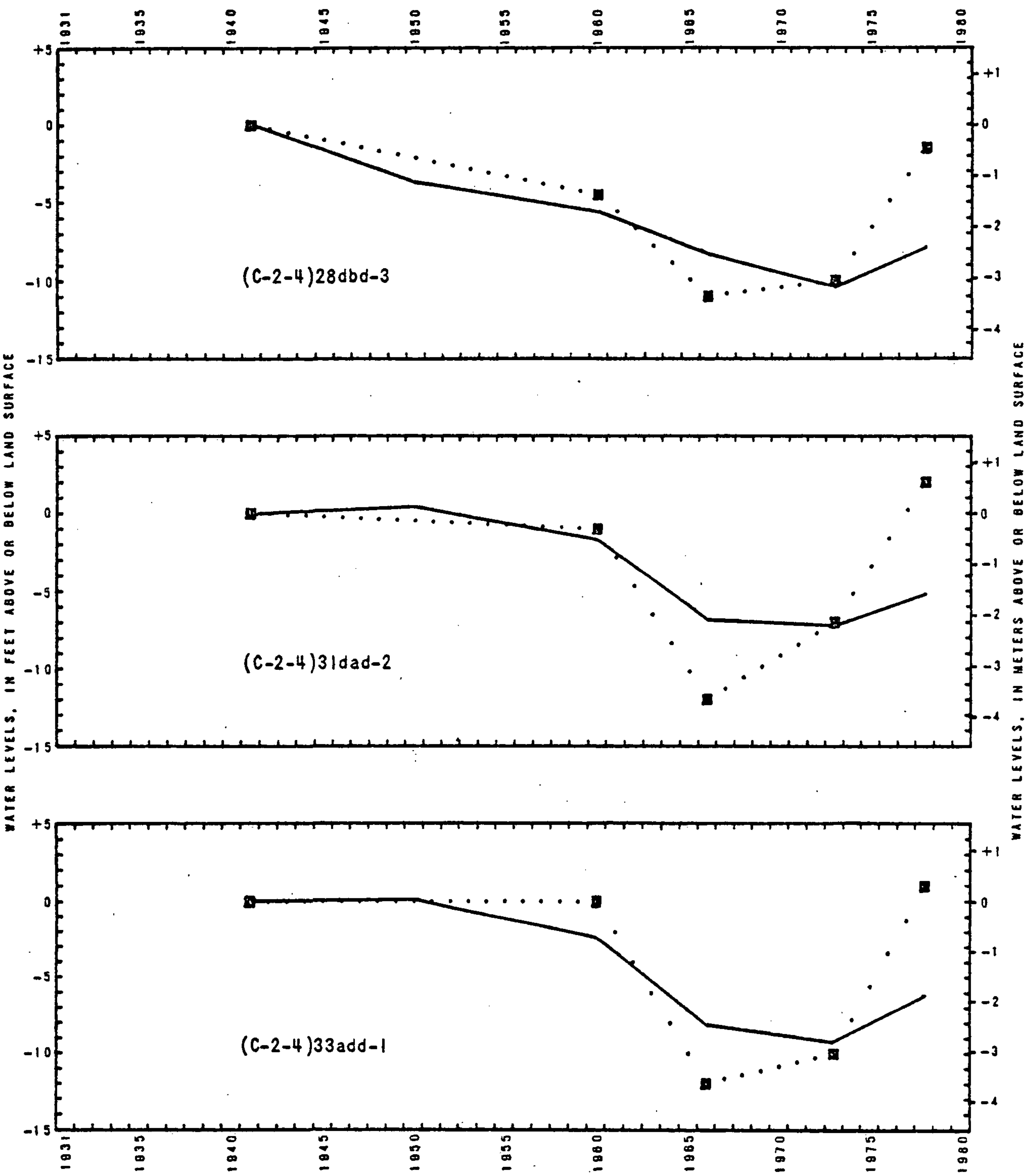

Figure 3.--Continued.

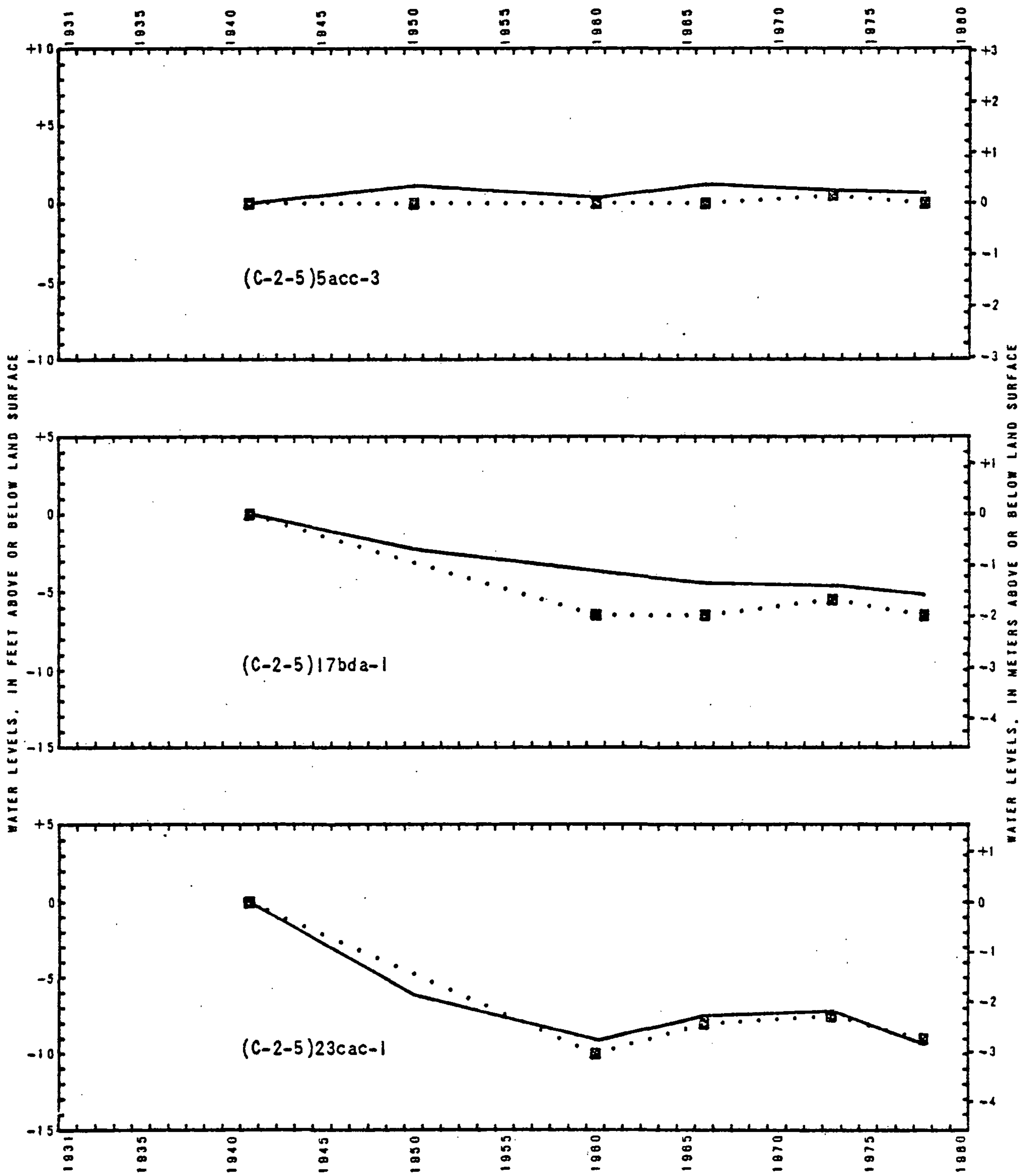

Figure 3.--Continued.

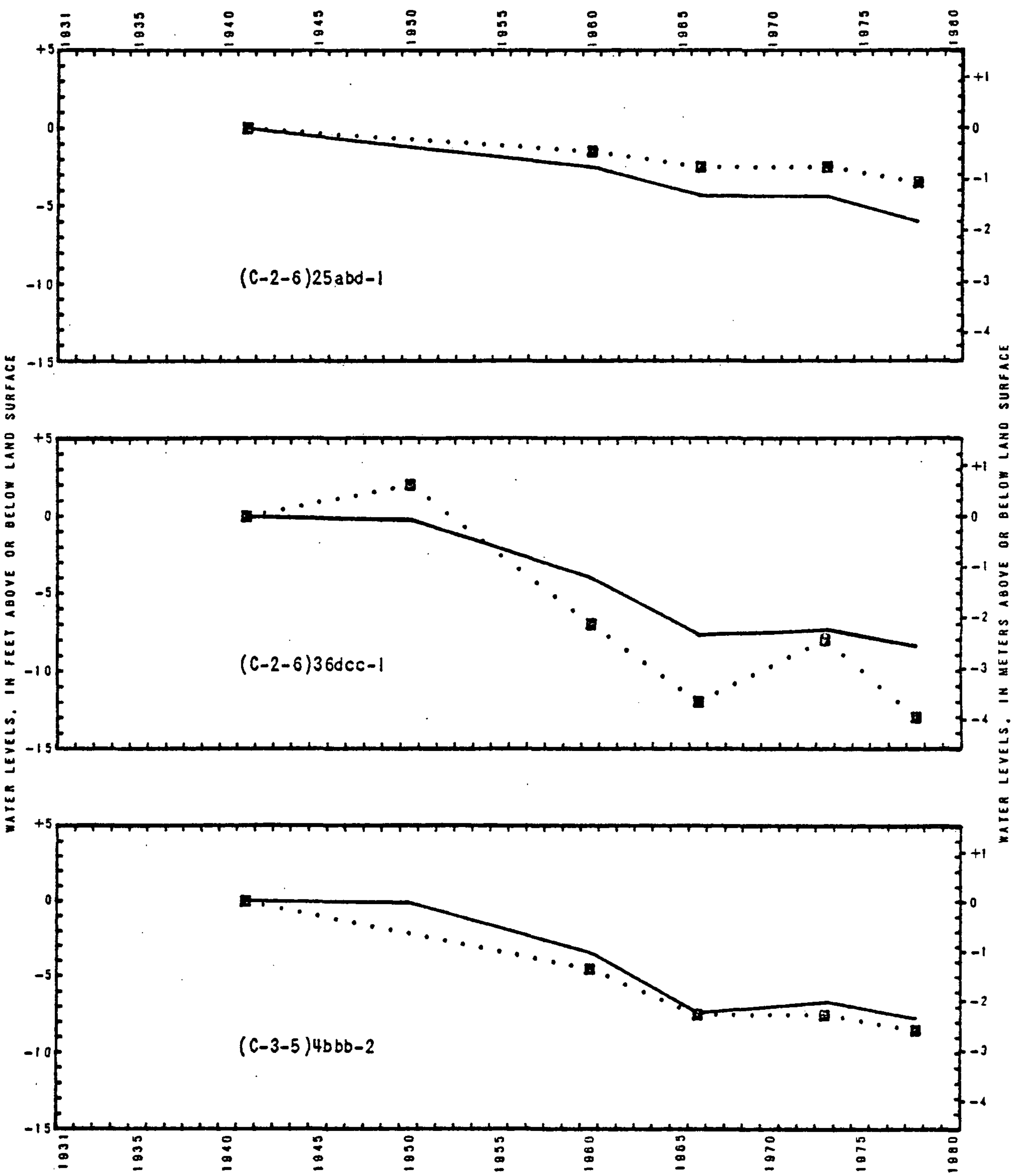

Figure 3.--Continued.

lic conductivity of the confining bed was increased by 1.5 times, water levels declined about 4-7 ft (1.2-2.1 m) throughout the valley, with areas of greater leakage experiencing slightly more decline than other areas. An increase in confining-bed thickness caused about a 6-10 ft (1.8-3.0 m) rise in water levels, with areas of greater leakage experiencing slightly higher rises than other areas.

SUMMARY

A two-dimensional, finite-difference model of ground-water flow in Tooele Valley was calibrated against water levels in 1941 and observed water-level changes that occurred from 1941-78. The water-level changes observed during the five modeled pumping periods are approximated acceptably well by the computed changes.

The model was constructed using a grid of 26 rows and 41 columns, which included 1,066 block-centered nodes. The ground-water flow equations were solved by the SIP and D4 solution techniques, with both giving practically identical results. Boundary conditions were simulated by using a no-flow boundary with recharge wells inside the no-flow boundary in recharge areas to define a finite-flux boundary. Other parameters, such as transmissivity, storage coefficient, initial water levels, confining-bed properties, and discharge were assigned values based on field measurements and tests, historical data, and trial-and-error adjustments.

Although no statistical analyses were used to determine acceptable levels of accuracy, the good match of observed and computed water-level change demonstrates that the model would be reliable for future predictions, especially within the range of conditions used in calibration.

REFERENCES CITED

Larson, S. P., 1978, Direct solution algorithm for the two-dimensional ground-water flow model: U.S. Geological Survey Open-File Report 79-202.

Razem, A. C., and Steiger, J. I., 1980, Ground-water conditions in Tooele Valley, Utah, 1976-78: U.S. Geological Survey Open-File Report 80-439.

Trescott, P. C., Pinder, G. F., and Larson, S. P., 1976, Finite-difference for aquifer simulation in two dimensions with results of numerical experiments: U.S. Geological Survey Techniques Water-Resources Investigations, Book 7, Chapter C1.

Table 1.--Listing of the changes to the standard computer program

This table includes the corrections and additons to the code given in Trescott, Pinder, and Larson (1976). The sequence number on the right-hand side of each printed line indicates its proper location in the code. Cards in the original program with the same sequence number should be replaced with those listed here.

The computer listing of the subroutine SOLVE2 (D4) (S. P. Larson, written commun., 1977) has been given because it is slightly different from that given by Larson (1978)

MAIN PROGRAM

```
       DIMENSION Y(70000), L(38), IFMT1(9), IFMT2(9), IFMT3(9), NAME(99),MAN 200*
       DATA IFMT1/4H(1H0,4H,I5,,4H10E1,4H2.3/,4H(1H ,4H,5X,,4H10E1,4H2.3)MAN 320*
      1,4H)    /                                                        MAN 330*
       DATA IFMT2/4H(1H0,4H,I5,,4H10F1,4H2.1/,4H(1H ,4H,5X,,4H10F1.4H2.1)MAN 340*
      1,4H)    /                                                        MAN 350*
       DATA IFMT3/4H(1H0,4H,I5,,4H10F1,4H2.5/,4H(1H ,4H,5X,,4H10F1,4H2.5)MAN 360*
      1,4H)    /                                                        MAN 370*
       DEFINE FILE 2(14,1107,U,ZKK)                                     MAN 480*
       ISUM=ISUM+ISIZ                                                   MAN1504*
       L(38)=ISUM                                                       MAN1505*
      2,Y(L(20)),Y(L(21)),Y(L(22)),Y(L(23)),Y(L(24)),Y(L(29)),Y(L(32)),Y(MAN1830*
      3L(38)))                                                          MAN1835*
```

SUBROUTINE DATAI

```
  530 FORMAT (1H0,1X,I2,2X,10F12.1/(1H ,5X,10F12.1))                    DAT2590*
```

SUBROUTINE CHECKI

```
      1TOM,SY,RATE,RIVER,M,TOP,GRND,DELX,DELY,TLEAK)                    CHK  20*
      3,JR), M(IR,JR), TOP(IC,JC), GRND(IL,JL), DELX(JZ), DELY(IZ), TLEAKCHK 160*
      4(IZ,JZ)                                                          CHK 165*
       GTLEK=0.0                                                        CHK 405*
       DO 239 I=1,DIML                                                  CHK 412*
       DO 239 J=1,DIMW                                                  CHK 414*
       TLEAK(I,J)=0.0                                                   CHK 415*
  239 CONTINUE                                                          CHK 418*
       RLEAK=((XX+YY)*DELT)/43560                                       CHK1252*
       TLEAK(I,J)=TLEAK(I,J)+RLEAK                                      CHK1254*
       GTLEK=GTLEK+TLEAK(I,J)                                           CHK1255*
C      COMPUTE TOTAL LEAKAGE IN AC-FT                                   CHK1275*
C      WRITE LEAKAGE                                                    CHK1561*
       WRITE (P,251)                                                    CHK1562*
       DO 252 I=1,DIML                                                  CHK1563*
       WRITE (P,253) I,(TLEAK(I,J),J=1,DIMW)                            CHK1565*
  252 CONTINUE                                                          CHK1567*
       WRITE (P,254) GTLEK                                              CHK1568*
  251 FORMAT (1H1,45X,'LEAKAGE AT EACH NODE (AC-FT)'/1X,'ROW'/)         CHK1562*
  253 FORMAT (1H0,I5,10F12.5/(1H ,5X,10F12.5))                          CHK1564*
  254 FORMAT (1H0,//36X,'TOTAL LEAKAGE (AC-FT) = ',F20.5)               CHK1555*
```

BLOCK DATA

```
       DATA VF4/'(1H0',',',',' ',',X,I4',',10F',',12.1',',/(',',' ',',X,10'BLD 440*
      1,'F12.',',1))'/                                                  BLD 450*
```

```
      SUBROUTINE SOLVE2(PHI,D1,D2,D3,KEEP,PHE,STRT,T,S,QRE,WELL,TL,SL,D1
     14,D5,D6,D7,DELX,D8,DELY,D9,TEST3,TR,TC,GRND,SY,TOP,RATE,M,RIVER)
C     SPECIFICATIONS:
      REAL *8PHI,E,RHO,CL,CR,CA,CB,AREA
      REAL *4KEEP,M
      INTEGER R,P,PU,DIML,DIMW,CHK,WATER,CONVRT,EVAP,CHCK,PNCH,NUM,HEAD,
     1CONTR,LEAK,RECH,SIP,ADI
C
      DIMENSION PHI(1), BE(1), G(1), TEMP(1), KEEP(1), PHE(1), STRT(1),
     1T(1), S(1), QRE(1), WELL(1), TL(1), SL(1), DEL(1), ETA(1), V(1), X
     2I(1), DELX(1), BETA(1), DELY(1), ALFA(1), TEST3(1), TR(1), TC(1),
     3GRND(1), SY(1), TOP(1), RATE(1), M(1), RIVER(1)
      DIMENSION AU(486,5), AL(486,29), IC(486,5), IN(29,38), B(972)
C
      COMMON /SARRAY/ VF4(11),CHK(15)
      COMMON /SPARAM/ WATER,CONVRT,EVAP,CHCK,PNCH,NUM,HEAD,CONTR,EROR,LE
     1AK,RECH,SIP,U,SS,TT,TMIN,ETDIST,QET,ERR,TMAX,CDLT,HMAX,YDIM,WIDTH,
     2NUMS,LSOR,ADI,DELT,SUM,SUMP,SUBS,STORE,TEST,ETQB,ETQD,FACTX,FACTY,
     3IERR,KOUNT,IFINAL,NUMT,KT,KP,NPER,KTH,ITMAX,LENGTH,NWEL,NW,DIML,DI
     4MW,JNO1,INO1,R,P,PU,IXX,JXX,IDK1,IDK2
      RETURN
C     ..............................................................
C
C*******************
      ENTRY ITER2
C*******************
      IM=DIML-2
      JM=DIMW-2
C*****COMPUTE EQUATION NUMBERS FOR D4 ORDERING
      NXP=IM+JM-1
      DO 10 I=1,IM
      DO 10 J=1,JM
   10 IN(I,J)=0
      K=0
C*****ORDER--LEFT TO RIGHT, BOTTOM TO TOP
      DO 20 I=1,NXP,2
      DO 20 J=1,JM
      IK=I-J+1
      IF (IK.LT.1) GO TO 20
      IF (IK.GT.IM) GO TO 20
      IF (T(IK+J*DIML+1).LE.0.) GO TO 20
      K=K+1
      IN(IK,J)=K
   20 CONTINUE
      ICR=K+1
      DO 30 I=2,NXP,2
      DO 30 J=1,JM
      IK=I-J+1
      IF (IK.LT.1) GO TO 30
      IF (IK.GT.IM) GO TO 30
      IF (T(IK+J*DIML+1).LE.0.) GO TO 30
```

```
      K=K+1
      IN(IK,J)=K
   30 CONTINUE
C*****COMPUTE BANDWIDTH AND DETERMINE CONNECTING EQUATION NUMBERS
      MNO=9999
      MXO=0
      DO 80 I=1,IM
      DO 80 J=1,JM
      IR=IN(I,J)
      IF (IR.EQ.0.OR.IR.GE.ICR) GO TO 80
      JU=1
C**  LEFT
      IF ((J-1).LT.1) GO TO 40
      IF (IN(I,J-1).EQ.0) GO TO 40
      JU=JU+1
      IC(IR,JU)=IN(I,J-1)
      MM=IN(I,J-1)-IR
      MXO=MAX0(MM,MXO)
      MNO=MIN0(MM,MNO)
C**  ABOVE
   40 IF ((I-1).LT.1) GO TO 50
      IF (IN(I-1,J).EQ.0) GO TO 50
      JU=JU+1
      IC(IR,JU)=IN(I-1,J)
      MM=IN(I-1,J)-IR
      MNO=MIN0(MM,MNO)
      MXO=MAX0(MM,MXO)
C**  BELOW
   50 IF ((I+1).GT.IM) GO TO 60
      IF (IN(I+1,J).EQ.0) GO TO 60
      JU=JU+1
      IC(IR,JU)=IN(I+1,J)
      MM=IN(I+1,J)-IR
      MXO=MAX0(MM,MXO)
      MNO=MIN0(MM,MNO)
C**  RIGHT
   60 IF ((J+1).GT.JM) GO TO 70
      IF (IN(I,J+1).EQ.0) GO TO 70
      JU=JU+1
      IC(IR,JU)=IN(I,J+1)
      MM=IN(I,J+1)-IR
      MXO=MAX0(MM,MXO)
      MNO=MIN0(MM,MNO)
   70 IC(IR,1)=JU
   80 CONTINUE
      IB=MXO-MNO+2
      NEQ=K
      ICR1=ICR-1
      IB1=IB-1
      LH1=NEQ-ICR1
      LH=NEQ-ICR
```

```
      WRITE (P,430) HMAX,LENGTH,ITMAX
      WRITE (P,440) ICR1,LH1,IB1,ICR1,NEQ
      RETURN
C*******************
      ENTRY NEWITB
C*******************
      KOUNT=0
      IF (WATER.EQ.CHK(2)) CALL TCOF
   90 BIGI=0.
C** LOAD MATRIX A AND VECTOR B FOR D4
      DO 100 I=1,ICR1
      DO 100 J=1,5
  100 AU(I,J)=0.
      DO 110 I=1,LH1
      DO 110 J=1,IB1
  110 AL(I,J)=0.
      DO 120 I=1,NEQ
  120 B(I)=0.
      DO 280 I=1,IM
      DO 280 J=1,JM
      IF (IN(I,J).EQ.0) GO TO 280
      IR=IN(I,J)
      N=I+1+DIML*J
      NA=N-1
      NB=N+1
      NL=N-DIML
      NR=N+DIML
      PHE(N)=PHI(N)
C     ..................................................................
C
C     ---COMPUTE COEFFICIENTS---
      IF (EVAP.NE.CHK(6)) GO TO 140
C
C     ---COMPUTE EXPLICIT AND IMPLICIT PARTS OF ET RATE---
      ETQB=0.
      ETQD=0.0
      IF (PHE(N).LE.GRND(N)-ETDIST) GO TO 140
      IF (PHE(N).GT.GRND(N)) GO TO 130
      ETQB=QET/ETDIST
      ETQD=ETQB*(ETDIST-GRND(N))
      GO TO 140
  130 ETQD=QET
C
C     ---COMPUTE STORAGE TERM---
  140 IF (CONVRT.EQ.CHK(7)) GO TO 150
      RHO=S(N)/DELT
      IF (WATER.EQ.CHK(2)) RHO=SY(N)/DELT
      GO TO 220
C
C     ---COMPUTE STORAGE COEFFICIENT FOR CONVERSION PROBLEM---
  150 SUBS=0.0
```

```
      IF (KEEP(N).GE.TOP(N).AND.PHE(N).GE.TOP(N)) GO TO 190
      IF (KEEP(N).LT.TOP(N).AND.PHE(N).LT.TOP(N)) GO TO 180
      IF (KEEP(N)-PHE(N)) 160,170,170
  160 SUBS=(SY(N)-S(N))/DELT*(KEEP(N)-TOP(N))
      GO TO 190
  170 SUBS=(S(N)-SY(N))/DELT*(KEEP(N)-TOP(N))
  180 RHO=SY(N)/DELT
      GO TO 200
  190 RHO=S(N)/DELT
  200 IF (LEAK.NE.CHK(9)) GO TO 220
C
C     ---COMPUTE NET LEAKAGE TERM FOR CONVERSION SIMULATION---
      IF (RATE(N).EQ.0..OR.M(N).EQ.0.) GO TO 220
      HED1=AMAX1(STRT(N),TOP(N))
      U=1.
      HED2=0.
      IF (PHE(N).GE.TOP(N)) GO TO 210
      HED2=TOP(N)
      U=0.
  210 SL(N)=RATE(N)/M(N)*(RIVER(N)-HED1)+TL(N)*(HED1-HED2-STRT(N))
  220 CONTINUE
C
      AREA=DELX(J+1)*DBLE(DELY(I+1))
      E=(RHO+TL(N)*U+ETQB)*AREA
C*****LOAD COEFFICIENTS INTO AU AND AL
      CL=DBLE(TR(NL))*DELY(I+1)
      CR=DBLE(TR(N))*DELY(I+1)
      CA=DBLE(TC(NA))*DELX(J+1)
      CB=DBLE(TC(N))*DELX(J+1)
      IF (IR.GE.ICR) GO TO 270
      JU=1
      IF ((J-1).LT.1) GO TO 230
      IF (IN(I,J-1).EQ.0) GO TO 230
      JU=JU+1
      AU(IR,JU)=-CL
      E=E+CL
  230 IF ((I-1).LT.1) GO TO 240
      IF (IN(I-1,J).EQ.0) GO TO 240
      JU=JU+1
      AU(IR,JU)=-CA
      E=E+CA
  240 IF ((I+1).GT.IM) GO TO 250
      IF (IN(I+1,J).EQ.0) GO TO 250
      JU=JU+1
      AU(IR,JU)=-CB
      E=E+CB
  250 IF ((J+1).GT.JM) GO TO 260
      IF (IN(I,J+1).EQ.0) GO TO 260
      JU=JU+1
      AU(IR,JU)=-CR
      E=E+CR
```

```
  260 AU(IR,1)=E
      B(IR)=(RHO*KEEP(N)+SL(N)+QRE(N)+WELL(N)-ETQD+SUBS+TL(N)*STRT(N))*A
     1REA+CA*PHI(NA)+CB*PHI(NB)+CL*PHI(NL)+CR*PHI(NR)-E*PHI(N)
      IF (S(N).GE.0..AND.T(N).GT.0.) GO TO 280
      AU(IR,1)=1.E7*AU(IR,1)
      IF (T(N).LE.0.) AU(IR,1)=1.
      B(IR)=0.
      GO TO 280
  270 IRR=IR-ICR1
      AL(IRR,1)=E+CR+CL+CA+CB
      B(IR)=(RHO*KEEP(N)+SL(N)+QRE(N)+WELL(N)-ETQD+SUBS+TL(N)*STRT(N))*A
     1REA+CA*PHI(NA)+CB*PHI(NB)+CL*PHI(NL)+CR*PHI(NR)-AL(IRR,1)*PHI(N)
      IF (S(N).GE.0..AND.T(N).GT.0.) GO TO 280
      AL(IRR,1)=1.E7*AL(IRR,1)
      IF (T(N).LE.0.) AL(IRR,1)=1.
      B(IR)=0.
  280 CONTINUE
C*****ELIMINATE TO FILL AL
      DO 310 I=1,ICR1
      JJ=IC(I,1)
      DO 300 J=2,JJ
      LR=IC(I,J)
      L=LR-ICR1
      C=AU(I,J)/AU(I,1)
      DO 290 K=J,JJ
      KL=IC(I,K)-LR+1
      AL(L,KL)=AL(L,KL)-C*AU(I,K)
  290 CONTINUE
      AU(I,J)=C
      B(LR)=B(LR)-C*B(I)
  300 CONTINUE
  310 B(I)=B(I)/AU(I,1)
C*****ELIMINATE AL
      DO 340 I=1,LH
      IR=I+ICR1
      L=I
      DO 330 J=2,IB1
      L=L+1
      IF (AL(I,J).EQ.0.) GO TO 330
      LR=L+ICR1
      C=AL(I,J)/AL(I,1)
      KL=0
      DO 320 K=J,IB1
      KL=KL+1
      IF (AL(I,K).NE.0.) AL(L,KL)=AL(L,KL)-C*AL(I,K)
  320 CONTINUE
      AL(I,J)=C
      B(LR)=B(LR)-C*B(IR)
  330 CONTINUE
  340 B(IR)=B(IR)/AL(I,1)
C*****BACK SOLVE--LOWER HALF
```

```
      B(NEQ)=B(NEQ)/AL(NEQ-ICR1,1)
      DO 360 I=1,LH
      K=NEQ-I
      KL=K-ICR1
      L=K
      DO 350 J=2,IB1
      L=L+1
      IF (AL(KL,J).NE.0.) B(K)=B(K)-AL(KL,J)*B(L)
  350 CONTINUE
  360 CONTINUE
C*****BACK SOLVE--UPPER HALF
      DO 380 I=1,ICR1
      K=ICR-I
      JJ=IC(K,1)
      DO 370 J=2,JJ
      L=IC(K,J)
      B(K)=B(K)-AU(K,J)*B(L)
  370 CONTINUE
  380 CONTINUE
C*****COMPUTE NEW PHI VALUES
      DO 390 I=1,IM
      DO 390 J=1,JM
      IF (IN(I,J).EQ.0) GO TO 390
      N=I+1+DIML*J
      L=IN(I,J)
      TCHK=ABS(B(L))
      IF (TCHK.GT.BIGI) BIGI=TCHK
      PHI(N)=PHI(N)+HMAX*B(L)
  390 CONTINUE
C*****CHECK TERMINATION CONDITIONS
      TEST3(KOUNT+1)=BIGI
      IF (LENGTH.GT.0.AND.WATER.NE.CHK(2)) GO TO 410
      IF (WATER.NE.CHK(2)) RETURN
      IF (BIGI.LE.ERR) RETURN
      KOUNT=KOUNT+1
      IF (KOUNT.LE.ITMAX) GO TO 400
      WRITE (P,420)
      CALL TRANS
      CALL TERM1
      RETURN
  400 CALL TRANS
      GO TO 90
  410 IF (KOUNT.GT.LENGTH.AND.BIGI.LE.ERR) RETURN
      KOUNT=KOUNT+1
      IF (KOUNT.LE.ITMAX) GO TO 90
      WRITE (P,420)
      CALL TERM1
      RETURN
C
  420 FORMAT ('0EXCEEDED PERMITTED NUMBER OF ITERATIONS FOR NON-LINEAR S
     1OLUTION'/' ',63('*'))
```

```
430 FORMAT (1H-,41X,'SOLUTION BY LDU FACTORIZATION ASSUMING D4 ORDERIND4 3050
   1G',/,42X,50(1H_),//,61X,'BETA =',F5.2,//,45X,'ITERATIONS:  MINIMUMD4 3060
   2 =',I5,/,58X,'MAXIMUM =',I5)                                        D4 3070
440 FORMAT (1H-,25X,'*****WARNING*****MINIMUM DIMENSIONS FOR ARRAYS USD4 3080
   1ED BY THIS METHOD ARE AS FOLLOWS:',//,64X,'AU:',I5,' BY     5',/,64D4 3090
   2X,'AL:',I5,' BY',I5,/,64X,'IC:',I5,' BY     5',/,65X,'B:',I5)       D4 3100
    END                                                                 D4 3110-
```

Table 2.--Listing of the model data for the 1941-78 calibration

The following listing gives the model data as they were coded for entry in the computer. The model data listed are for the 1941-78 calibration with five pumping periods. The listing is given in the same order as the instructions for setting up the data deck given by Trescott, Pinder, and Larson (1976, p. 49-55). Because this table is organized for users, the data have been arranged according to the formats required for running the model. This allows the user to keypunch directly from this table and eliminate format errors.

The card numbers on the left side of each line are not part of the data, but are meant to be used for reference by the reader. Wherever a card number is not followed by a number, a blank card should be inserted. Do not code the card reference numbers on the data card when running the model.

CARD NUMBER

GROUP I:TITLE, SIMULATION OPTIONS, AND PROBLEM DIMENSIONS

```
1 | **   SIMULATION OF PUMPING PERIODS   1941-50, 1951-60, 1961-66, 1967-73, 1974-7|
2 |7          BY ALLAN RAZEM         ***                                        |
3 |     LEAK                 SIP  CHEC                    NUME                  |
4 |        27          41                    50                                 |
```

GROUP II:SCALAR PARAMETERS

CARD NUMBER								
5	CONT		5280	5280	1.5	1	MILES	
6		5	30	.01	.01			10
7		1	1	1				
8								
9								
10								

GROUP III:ARRAY DATA
STARTING HEAD MATRIX
(FT)

CARD NUMBER								
11	1	1						
12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	0.0							
18	0.0	4221.0718	4220.1154	4218.8112	4217.5289	4216.3248	4214.8966	4213.4802
19	4212.3121	4211.1619	4210.0071	4208.8658	4207.7938	4206.8570	4205.9356	4204.9963
20	4204.0447	4203.1106	4202.3139	4201.6509	4201.0595	4200.6738	4200.4754	4200.3542
21	4200.2494	4200.1613	4200.0874	4200.0117	4199.9410	4199.8892	4199.8693	4199.9177
22	4200.0187	4200.1261	4200.1440	4199.5889	4201.1367	4205.7770	4218.1758	0.0
23	0.0							
24	0.0	4225.5718	4224.9905	4223.8000	4222.3800	4220.9062	4219.3031	4217.7111
25	4216.2351	4214.7166	4213.2457	4211.8852	4210.6468	4209.8039	4209.1691	4208.6608
26	4208.1511	4207.5463	4206.8753	4206.4632	4206.3268	4206.3084	4206.3631	4206.4295
27	4206.4073	4206.2894	4206.0896	4205.7566	4205.2502	4204.5761	4203.6613	4203.9887
28	4205.2670	4207.5236	4210.5694	4215.6188	4224.5808	4237.6508	4248.8774	0.0
29	0.0							
30	0.0	4229.4921	4230.0749	4229.1970	4227.8826	4226.4347	4224.5847	4222.5728
31	4220.6726	4218.6393	4216.6656	4214.4253	4211.2858	4212.6591	4213.2700	4213.4932
32	4213.4873	4213.4820	4213.4469	4213.2079	4213.2848	4213.5466	4213.9666	4214.3149
33	4214.5119	4214.5973	4214.6287	4214.5754	4214.4068	4213.9685	4215.1753	4217.1752
34	4220.3644	4224.3067	4229.4442	4236.9446	4246.9730	4257.9965	4267.1707	0.0
35	0.0							
36	0.0	4232.1577	4236.5779	4236.5247	4234.9053	4232.9548	4230.6251	4228.1454
37	4225.4535	4221.8829	4222.1247	4221.7388	4221.1078	4220.8367	4220.6784	4220.5805
38	4220.7789	4221.3119	4221.7620	4222.2413	4222.8338	4223.7393	4224.6005	4225.0903
39	4225.2817	4224.8960	4224.2316	4224.7270	4226.2891	4228.2460	4230.8267	4233.9832
40	4237.4206	4241.0811	4246.6388	4255.9007	4266.0031	4277.5647	4294.2357	0.0
41	0.0							
42	0.0	0.0	4244.8895	4245.0421	4242.4225	4239.3794	4236.5426	4234.1589
43	4232.0349	4230.1195	4228.8366	4227.9711	4227.1078	4226.6770	4226.3902	4225.9059
44	4226.0096	4228.0327	4229.0888	4229.7548	4230.9116	4232.6627	4234.1018	4235.1027
45	4235.9853	4236.5203	4236.6769	4237.9099	4239.7850	4241.9834	4244.7455	4247.8447
46	4251.1386	4254.4617	4258.8988	4262.9837	4320.0000	4360.0000	0.0	0.0
47	0.0							
48	0.0	0.0	4250.3657	4259.9490	4257.1129	4252.9400	4248.8357	4245.5471
49	4242.8074	4240.1002	4238.2065	4237.0091	4236.3459	4235.9986	4235.8378	4235.6430
50	4235.0029	4235.8453	4236.0782	4234.9157	4236.2861	4239.9434	4242.0651	4243.5042
51	4244.9397	4246.9733	4248.5235	4250.8804	4253.6976	4256.7383	4259.7803	4263.0056
52	4266.6307	4270.5080	4275.9657	4282.5023	4330.0000	4350.0000	0.0	0.0
53	0.0							
54	0.0	0.0	0.0	4272.3823	4268.2457	4263.6674	4258.9490	4255.4000
55	4252.3578	4249.6010	4247.3362	4245.3344	4243.7555	4242.8535	4242.4406	4242.5156
56	4243.1027	4243.6001	4244.0344	4244.1043	4245.9227	4248.0073	4249.9001	4251.1054
57	4251.0584	4256.2736	4259.8008	4263.4611	4267.1664	4271.0425	4274.7108	4278.3691
58	4282.3391	4287.1549	4295.2045	4309.7380	4332.6085	4345.1409	4365.0000	0.0
59	0.0							
60	0.0	0.0	0.0	4281.9862	4276.4237	4271.6523	4266.9726	4263.7221
61	4261.0254	4258.3251	4255.6135	4253.2285	4251.4579	4250.5277	4250.1862	4250.2568

GROUP III:ARRAY DATA (CONT)
STARTING HEAD MATRIX (CONT)
(FT)

CARD NUMBER								
62	4250.7000	4252.3882	4253.0625	4252.4406	4256.0708	4256.8279	4259.2163	4261.5315
63	4264.1568	4268.3873	4272.3305	4277.1486	4282.6163	4288.4240	4293.2904	4297.4557
64	4301.1098	4305.5418	4313.2885	4327.8638	4346.2135	4357.6736	4390.0000	0.0
65	0.0							
66	0.0	0.0	4301.3260	4289.2766	4281.4590	4275.3838	4270.4277	4267.4513
67	4265.0496	4262.6611	4260.5601	4258.4821	4257.5263	4257.2385	4257.2785	4257.5150
68	4257.9979	4259.3186	4259.7500	4258.9677	4264.4663	4263.2048	4267.2508	4270.3844
69	4274.7833	4279.7592	4284.2428	4290.8026	4299.0488	4307.6707	4312.6661	4316.4442
70	4320.0520	4325.3849	4333.3533	4346.1144	4360.3723	4372.3691	4383.4380	0.0
71	0.0							
72	0.0	0.0	4302.8402	4293.8096	4286.6616	4279.9727	4274.7173	4271.4217
73	4269.0854	4267.2547	4265.8389	4264.5416	4264.2447	4264.4827	4264.7868	4265.0368
74	4265.3654	4265.8301	4266.3766	4260.5734	4272.2159	4273.2545	4279.5884	4284.7025
75	4289.5880	4295.4434	4301.2670	4311.1611	4320.3272	4327.7058	4331.4510	4332.6353
76	4337.0998	4342.4004	4351.9944	4361.0465	4368.2273	4378.3404	4386.2053	0.0
77	0.0							
78	0.0	0.0	4304.6569	4297.4584	4290.8015	4284.1455	4278.9317	4275.1369
79	4272.7967	4271.5276	4270.3316	4269.6377	4269.6486	4269.9335	4270.0997	4270.0860
80	4270.4048	4271.1970	4271.8951	4269.7657	4279.3456	4287.2912	4296.3780	4303.0905
81	4309.5828	4316.3504	4323.0215	4330.7483	4335.5830	4342.5118	4344.8536	4346.7484
82	4349.9608	4354.1696	4360.3424	4365.6028	4374.3162	4381.9232	4388.2443	0.0
83	0.0							
84	0.0	0.0	4306.9563	4301.1177	4295.0505	4289.0114	4283.5321	4280.0236
85	4277.6514	4276.3051	4275.1369	4274.1212	4274.2051	4273.9632	4273.5255	4273.0125
86	4273.3646	4274.8747	4276.4952	4278.2527	4287.5177	4302.7499	4312.9862	4320.8306
87	4328.1548	4334.2907	4338.7824	4342.2414	4345.2883	4346.8971	4349.2710	4351.4858
88	4354.4450	4358.0353	4363.3051	4369.5965	4377.0538	4383.9939	4389.9027	0.0
89	0.0							
90	0.0	0.0	4309.5015	4304.5415	4299.1124	4293.9102	4288.3626	4284.7595
91	4282.3859	4280.8902	4279.6596	4278.7836	4278.3270	4277.6985	4277.2528	4276.0138
92	4276.1871	4279.1907	4281.7803	4285.8865	4295.3375	4307.9391	4318.2536	4326.0492
93	4333.1819	4338.6614	4342.3464	4345.5040	4348.0395	4350.4425	4353.0356	4355.7023
94	4358.7332	4362.1296	4366.7548	4372.9869	4380.1871	4386.6179	4392.3489	0.0
95	0.0							
96	0.0	0.0	4312.2422	4307.8682	4303.0370	4298.3603	4292.9641	4289.2495
97	4286.9052	4285.0327	4283.8154	4283.0919	4282.4147	4282.0361	4281.3234	4280.7044
98	4280.8293	4283.8319	4287.3257	4292.7844	4301.9207	4313.3719	4323.4508	4330.7107
99	4337.2547	4341.8445	4345.3123	4348.5887	4351.3680	4354.2907	4357.1659	4360.0585
100	4363.1255	4366.3516	4370.4848	4376.9130	4383.7698	4389.7033	4395.5592	0.0
101	0.0							
102	0.0	0.0	4315.2956	4311.4072	4307.1299	4302.8472	4297.6847	4293.8824
103	4291.5565	4289.7891	4288.6947	4288.0039	4287.0403	4286.2388	4285.7064	4285.5115
104	4286.1705	4288.6740	4293.0864	4299.4884	4308.4446	4319.1005	4328.4882	4335.1550
105	4341.2456	4345.7691	4349.4009	4352.5742	4355.7261	4358.6312	4361.7709	4364.6940
106	4367.8925	4371.0800	4375.3176	4381.4493	4387.4224	4392.7613	4399.1513	0.0
107	0.0							
108	0.0	0.0	4318.5886	4315.1327	4311.3424	4307.5544	4303.0854	4299.0055
109	4296.6799	4295.1726	4294.0174	4293.0285	4291.7682	4290.7587	4290.2694	4290.3363
110	4291.3015	4293.8481	4298.9583	4305.9222	4314.7213	4324.7938	4333.7054	4340.2358
111	4346.2226	4350.8296	4354.3811	4357.6161	4360.8117	4363.8136	4366.7791	4369.7811
112	4373.1251	4376.2351	4380.5260	4385.5579	4390.7394	4395.5249	4400.4146	0.0

GROUP III:ARRAY DATA (CONT)
STARTING HEAD MATRIX (CONT)
(FT)

CARD NUMBER								
113	0.0							
114	0.0	0.0	4322.8754	4319.9301	4316.6337	4313.4192	4309.6754	4305.7755
115	4303.4170	4301.6162	4300.0750	4298.5552	4297.2590	4296.3570	4295.9775	4296.2378
116	4297.4326	4300.3402	4306.2035	4313.5367	4322.1767	4331.8491	4340.4378	4346.9760
117	4353.0122	4357.7310	4361.1041	4364.1969	4367.1397	4369.9832	4373.0289	4376.0867
118	4379.0686	4381.9780	4385.6120	4389.8053	4394.2453	4398.4265	4402.3277	0.0
119	0.0							
120	0.0	0.0	4328.0205	4325.5452	4322.7906	4320.1246	4317.1411	4314.3483
121	4312.1087	4309.9684	4308.0424	4306.3853	4305.1644	4304.4353	4304.3059	4304.9632
122	4306.6631	4310.2792	4316.7545	4324.4980	4333.2472	4342.8871	4351.2228	4357.6683
123	4363.3758	4367.5975	4370.3409	4372.9621	4375.5259	4378.1047	4380.7107	4383.3139
124	4385.8835	4388.4017	4391.4733	4394.9613	4398.6940	4402.2992	4405.7012	0.0
125	0.0							
126	0.0	0.0	4334.0109	4331.6661	4329.2903	4327.1240	4324.8041	4322.7467
127	4320.9794	4319.3066	4317.8674	4316.7530	4316.0696	4315.9239	4316.4261	4317.7794
128	4320.1479	4324.4220	4331.1170	4339.0118	4347.9481	4357.4760	4365.4584	4371.3370
129	4376.1273	4379.3570	4381.5712	4383.7845	4385.9791	4388.1675	4390.3650	4392.5447
130	4394.6815	4396.7543	4399.2487	4402.0446	4405.0654	4408.2134	4412.0994	4419.7385
131	0.0							
132	0.0	0.0	4342.7238	4339.6920	4337.3609	4335.4924	4333.7169	4332.3477
133	4331.2979	4330.3504	4329.6469	4329.3536	4329.5195	4330.2051	4331.5276	4333.6450
134	4336.7591	4341.5804	4348.4653	4356.5966	4365.6797	4374.7090	4381.7505	4386.6087
135	4390.5064	4393.2447	4395.3377	4397.3581	4399.3255	4401.2823	4403.2183	4405.0986
136	4406.8795	4408.5040	4410.3482	4412.2762	4414.2033	4416.0773	4418.3680	4422.0296
137	0.0							
138	0.0	0.0	4350.5719	4348.6891	4346.0682	4344.1333	4342.4737	4341.3794
139	4340.7381	4340.3802	4340.3242	4340.6601	4341.4264	4342.6800	4344.5346	4347.1627
140	4350.6961	4355.9375	4363.3061	4371.8472	4381.0110	4389.7516	4396.3911	4401.0355
141	4404.8998	4407.7208	4409.8834	4411.9899	4414.0927	4416.2419	4418.4430	4420.6900
142	4422.9877	4423.9932	4424.7557	4425.6513	4425.7088	4425.0146	4424.6672	4425.1331
143	0.0							
144	0.0	0.0	0.0	4357.0757	4354.1292	4351.6735	4349.5961	4348.3022
145	4347.5901	4347.3150	4347.4472	4347.9586	4348.8669	4350.2199	4352.2753	4355.3115
146	4359.3227	4365.2097	4373.6497	4383.3923	4393.7060	4403.1507	4410.1246	4415.2365
147	4419.5059	4422.6207	4425.1632	4427.7550	4430.3804	4433.0201	4435.6498	4438.2420
148	4440.7584	4600.0000	4700.0000	4800.0000	4900.0000	5000.0000	0.0	0.0
149	0.0							
150	0.0	0.0	0.0	4365.0818	4362.5847	4357.7010	4354.3242	4352.4038
151	4351.3347	4350.7923	4350.7389	4351.1486	4352.0296	4353.5708	4356.0449	4359.5046
152	4364.0336	4370.9704	4380.8831	4392.6044	4406.6690	4416.8700	4423.9269	4429.2271
153	4433.9113	4438.0639	4441.4995	4445.3312	4449.0114	4452.6060	4456.1747	4459.7763
154	4461.5988	0.0	0.0	0.0	0.0	0.0	0.0	0.0
155	0.0							
156	0.0	0.0	0.0	4500.0000	4500.0000	4500.0000	4500.0000	4500.0000
157	4500.0000	4500.0000	4500.0000	4500.0000	4500.0000	4500.0000	4500.0000	4500.0000
158	4500.0000	4500.0000	4500.0000	4500.0000	4429.8143	4432.5672	4436.0385	4439.4958
159	4441.3783	4441.9476	4560.0000	4565.0000	4570.0000	4575.0000	4800.0000	0.0
160	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
161	0.0							
162	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
163	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

GROUP III:ARRAY DATA (CONT)
STARTING HEAD MATRIX (CONT)
(FT)

CARD NUMBER								
164	0.0	0.0	0.0	0.0	0.0	4600.0000	4650.0000	4700.0000
165	4750.0000	4800.0000	0.0	0.0	0.0	0.0	0.0	0.0
166	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
167	0.0							
168	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
169	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
170	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
171	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
172	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
173	0.0							

GROUP III:ARRAY DATA (CONT)
STORAGE COEFFICIENT

CARD NUMBER	
174	0.002

GROUP III:ARRAY DATA (CONT)
TRANSMISSIVITY
(FT^2/S) X 1.000

CARD NUMBER																				
175	1.0E-03				1															
176																				
177																				
178																				
179		9	9	8	8	8	7	7	7	7	7	7	7	7	6	6	5	5	5	4
180	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	4	5	5	6	
181																				
182		17	13	12	10	9	9	8	8	8	8	8	7	7	7	7	6	6	5	5
183	5	5	5	5	5	5	5	5	5	6	6	7	7	8	8	9	9	13	35	
184																				
185		20	15	13	12	12	11	10	10	9	9	9	8	8	8	8	7	7	7	6
186	6	6	6	7	7	8	8	8	8	8	9	9	9	10	12	13	15	30	45	
187																				
188		20	17	15	15	15	15	14	13	12	11	11	10	10	9	9	9	9	9	8
189	8	8	8	9	9	9	10	10	11	13	13	14	15	15	15	15	25	40	50	
190																				
191			17	17	17	17	17	17	15	15	14	15	15	15	15	15	15	15	15	15
192	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15				
193																				
194			34	34	34	31	28	25	22	19	17	20	25	29	34	33	15	15	15	15
195	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15				
196																				
197				50	45	38	34	31	27	25	28	31	34	36	38	40	40	15	15	15
198	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15		
199																				
200				120	120	110	100	100	85	70	60	50	40	40	40	40	40	15	15	15
201	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15		
202																				
203			150	130	120	120	110	110	90	80	65	55	49	50	51	52	52	52	52	52
204	52	15	15	15	15	15	15	15	15	30	30	30	15	15	15	15	50	50	50	
205																				
206			150	130	130	120	120	110	100	90	75	60	60	60	60	61	61	60	60	60
207	60	15	15	15	15	15	15	15	30	30	30	30	30	30	30	50	50	50	50	
208																				
209			150	130	130	120	120	110	110	90	90	90	90	115	145	174	170	160	160	160
210	150	15	15	15	15	15	15	30	30	160	160	160	160	180	200	200	200	200	200	
211																				
212			150	140	140	130	130	120	120	110	110	120	140	174	210	210	210	174	160	160
213	120	120	120	120	120	120	160	160	310	300	300	300	290	275	275	200	200	200	200	
214																				
215			170	170	160	150	150	150	155	160	165	170	174	200	230	250	210	174	170	160
216	160	160	160	160	160	200	250	300	315	310	305	300	295	290	290	200	200	200	200	
217																				
218			170	170	160	160	160	160	165	165	170	174	230	290	295	295	290	230	174	160
219	160	160	200	250	300	300	300	310	315	320	320	320	310	310	375	200	200	200	200	
220																				
221			170	170	160	160	160	160	165	165	170	174	230	290	300	300	290	230	174	160
222	160	160	200	250	300	300	300	310	315	320	320	320	315	375	250	250	250	250	250	
223																				
224			174	170	165	160	160	165	170	170	174	230	290	300	310	300	290	230	174	170
225	170	170	210	250	300	300	310	315	320	325	375	300	300	300	300	300	300	300	300	

GROUP III:ARRAY DATA (CONT) (CONT)
TRANSMISSIVITY (CONT)
$(FT^2/S) \times 1{,}000$

CARD NUMBER																				
226																				
227			180	174	170	170	170	170	174	210	250	290	300	305	305	300	290	230	174	170
228	170	170	210	250	300	320	340	350	400	400	400	400	400	400	400	400	400	400	400	
229																				
230			280	270	260	260	270	275	285	290	300	310	310	300	290	260	230	200	174	170
231	170	170	200	250	325	440	480	480	480	480	480	480	480	480	480	480	480	430	480	
232																				
233			350	350	350	350	350	340	330	320	310	290	270	250	230	210	194	174	170	170
234	170	180	200	250	325	440	480	500	520	520	520	520	520	520	520	520	520	520	520	520
235																				
236			400	400	400	400	400	400	370	330	310	290	270	250	225	200	174	170	170	170
237	180	220	280	350	450	480	510	540	550	550	550	550	550	550	550	550	550	550	550	550
238																				
239			400	400	400	400	400	400	400	340	290	280	270	250	230	210	190	174	170	170
240	180	220	280	350	450	480	510	540	550	550	550	550	550	550	550	550	550	550	550	550
241																				
242				400	400	400	400	400	400	400	400	400	400	380	300	250	225	200	175	175
243	174	210	250	290	400	400	400	400	400	400	400	400	400							
244																				
245				400	400	400	400	400	400	400	400	400	380	300	250	225	200	175	175	175
246	174	210	250	290	400	400	400	400	400	400	400	400	400							
247																				
248																				
249	200	220	250	290	350	350														
250																				
251																				
252																				
253																				
254																				
255																				
256																				

GROUP III:ARRAY DATA (CONT)
HYDRAULIC CONDUCTIVITY OF THE CONFINING BED
(FT/S) X 10

CARD NUMBER																				
257	1.0E-07				1															
258																				
259																				
260																				
261		.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1
262	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	1	1	1	1	
263																				
264		.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1
265	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	1	1	1	1	1	1	1	1	1	
266																				
267		.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1
268	.1	.1	.1	.1	.1	.1	.1	.1	.1	1	1	1	1	1	1	1	1	1	1	
269																				
270		.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1
271	.1	.1	.1	.1	.1	.1	1	1	1	1	1	1	1	1	1	1	1	1	1	
272																				
273			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	.1	.1	.1
274	.1	.1	.1	.1	.1	.1	1	1	1	1	1	1	1	1	1	1	1	1		
275																				
276			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	.1	.1	.1
277	.1	.1	.1	.1	.1	.1	1	1	1	1	1	1	1	1	1	1	1	1		
278																				
279			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	.1	.1	.1
280	.1	.1	.1	.1	.1	.1	1	1	1	1	1	1	1	1	1	1	1	1		
281																				
282			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	.1	.1	.1
283	.1	.1	.1	.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
284																				
285			8	8	8	8	8	6	6	6	6	6	6	6	6	6	6	6	6	6
286	6	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
287																				
288			8	8	8	8	8	6	6	6	6	6	6	6	6	6	6	6	6	6
289	6	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
290																				
291			8	8	8	8	8	6	6	6	6	6	6	6	6	6	6	6	6	6
292	6	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
293																				
294			8	8	8	8	8	8	8	6	6	6	6	6	6	6	6	6	6	6
295	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
296																				
297			8	8	8	8	8	8	8	6	6	6	6	6	6	6	6	6	6	6
298	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
299																				
300			8	8	8	8	8	8	8	8	6	6	6	6	6	6	6	6	6	6
301	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
302																				
303			8	8	8	8	8	8	8	8	6	6	6	6	6	6	6	6	6	6
304	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
305																				
306			8	8	8	8	8	8	8	8	6	6	6	6	6	6	6	6	6	6
307	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	

GROUP III:ARRAY DATA (CONT) (CONT)
HYDRAULIC CONDUCTIVITY OF THE CONFINING BED (CONT)
(FT/S) x 10

CARD NUMBER																				
308																				
309			8	8	8	8	8	8	8	8	6	6	6	6	6	6	6	6	6	6
310	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
311																				
312																				
313																				
314																				
315																				
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328																				
329																				
330																				
331																				
332																				
333																				
334																				
335																				
336																				
337																				
338																				

GROUP III:ARRAY DATA (CONT)

HEAD ON THE OTHER SIDE OF THE CONFINING BED

(FT)

```
CARD
NUMBER

339 |           1          1                                                                       |
340 |                                                                                              |
341 |                                                                                              |
342 |                                                                                              |
343 |     42134210421042104209420842054205420542044202420042004200419841954195419541954195|
344 |419541954195419541954195419541954195419541954195419541954195419541954195419541954195       |
345 |                                                                                              |
346 |     42154215421542134210421042104210420842064205420542034200420042004198419541954195|
347 |4195419541954195419541954195419541954195419541954195419542004200420042104220424O       |
348 |                                                                                              |
349 |     42304220421542154215421542124212421242104208420542054205420542004200420041954195|
350 |41954195419541954195420042004200420042054205421042154218422542304240425 5       |
351 |                                                                                              |
352 |     42704231422042204220421842154215421342154215421042104210420542054205420042004200|
353 |41954195420042004205420542104210421542154220422542304230423542404255427042 85       |
354 |                                                                                              |
355 |          42554230422542204220422042204220422042204215421542154210421042104205 4205|
356 |42054205421042104215422042204225423042304235424042454245425542704280431 0       |
357 |                                                                                              |
358 |              4255423542254225422542254220422042204220422042204220421542154210 4210|
359 |421042154220422042254230423542404245425042504250425542554261429043104330       |
360 |                                                                                              |
361 |              42604255424542354230422542254225422542254225422542254225422542254220|
362 |4225422542304235424042504255426042604265426542654265426542754310432 0       |
363 |                                                                                              |
364 |              42704260425542454245424042404235423542354235423542354235423542354235|
365 |42354245425042554255426042604265427042704275428042854275427543 15       |
366 |                                                                                              |
367 |                  427042604255425542554250425042454245424542454245424542454245 4250|
368 |42554255426042604265427042704275427542854295430543104315432043304340       |
369 |                                                                                              |
370 |                      4270426042604255425542554250425042504250425042504250425542 53|
371 |42604260426542704270427542754285429543054310431543204325433043354340       |
372 |                                                                                              |
373 |                      4270427042654260426042554255425542554255425542554255425542 60|
374 |426042654270427542804290430043054310431543204320432543304335434 0       |
375 |                                                                                              |
376 |                      4280427042704265426042604260426042604260426042604260426042 65|
377 |42704275428042904300430543104315432043204325432543304335434 0       |
378 |                                                                                              |
379 |                          42804275427042704265426542604260426042604260426542654275|
380 |42804290430043054310431543204320432543254330433043354335434 0       |
381 |                                                                                              |
382 |                          42854280428042754270427042704265426542654270427042754280|
383 |42904300430543104315432043204325432543304330433543354340434 0       |
384 |                                                                                              |
385 |                          42854280428042754275427542704270427042704275427542854290|
386 |430043104315432043204325432543304330433543354340434 0       |
387 |                                                                                              |
388 |                              428542854285428042804280428042804280428542854295 4300|
389 |43104315432043204325432543304330433543354340434 0       |
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GROUP III:ARRAY DATA (CONT) (CONT)

HEAD ON THE OTHER SIDE OF THE CONFINING BED (CONT)

(FT)

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 CARD
NUMBER

  390 |
  391 |                                 429042904290428542854285428542854285429042904300430
  392 |431043154320432043254325433043304335433543404340
  393 |
  394 |                                                                  430543054305431043154320
  395 |4320432543304330433543404340
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GROUP III:ARRAY DATA (CONT)
THICKNESS OF THE CONFINING BED
(FT)

CARD NUMBER																				
421			1		1															
422																				
423																				
424																				
425		125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125
426	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125		
427																				
428		125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125
429	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125		
430																				
431		125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125
432	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125		
433																				
434			125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125
435	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125					
436																				
437				125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125
438	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125					
439																				
440				125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125
441	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125					
442																				
443				125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125
444	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125				
445																				
446					125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125
447	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125				
448																				
449					125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125
450	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125			
451																				
452						125	125	125	125	125	125	125	125	125	125	125	125	125	125	125
453	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125			
454																				
455						125	125	125	125	125	125	125	125	125	125	125	125	125	125	125
456	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125				
457																				
458						125	125	125	125	125	125	125	125	125	125	125	125	125	125	125
459	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125					
460																				
461							125	125	125	125	125	125	125	125	125	125	125	125	125	125
462	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125					
463																				
464							125	125	125	125	125	125	125	125	125	125	125	125	125	125
465	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125					
466																				
467							125	125	125	125	125	125	125	125	125	125	125	125	125	125
468	125	125	125	125	125	125	125	125	125	125	125	125	125							
469																				
470								125	125	125	125	125	125	125	125	125	125	125	125	125
471	125	125	125	125	125	125	125	125	125	125	125	125								

GROUP III:ARRAY DATA (CONT) (CONT)
THICKNESS OF THE CONFINING RED (CONT)
(FT)

CARD NUMBER																				
472																				
473								125	125	125	125	125	125	125	125	125	125	125	125	125
474	125	125	125	125	125	125	125	125	125	125										
475																				
476																				
477																				
478																				
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499																				
500																				
501																				
502																				

GROUP III:ARRAY DATA (CONT)
GRID SPACING IN THE X DIRECTION
(FT)

CARD NUMBER								
503	1	1						
504	5280	5280	5280	3960	2640	2640	2640	1980
505	1980	1980	1980	1980	1980	1980	1980	1980
506	1980	2640	2640	2640	2640	2640	1980	1980
507	1980	1320	1320	1320	1320	1320	1320	1320
508	1320	1320	1980	1980	2640	2640	3960	5280
509	5280							

GROUP III:ARRAY DATA (CONT)
GRID SPACING IN THE Y DIRECTION
(FT)

CARD NUMBER								
510	1	1						
511	7920	7920	5280	5280	3960	3960	2640	2640
512	2640	1980	1320	1320	1320	1320	1320	1320
513	1320	1980	2640	3960	5280	5280	5280	5280
514	5280	5280	5280					

GROUP IV:PARAMETERS THAT CHANGE WITH THE PUMPING PERIOD
PUMPING PERIOD NUMBER 1 - 1941 TO 1950
DISCHARGE(-) AND RECHARGE(+) IN FT³/S:
PUMPING PERIOD IN DAYS: INITIAL TIME STEP IN HOURS

CARD NUMBER							
515	1	0	92	3650	100	1.5	430
516	21	39	4.00				
517	4	13	-.1				
518	4	38	-.08				
519	5	10	-.1				
520	6	12	-.10				
521	7	4	-.06				
522	7	20	-.08				
523	7	21	-.08				
524	8	7	-.5				
525	8	25	-.16				
526	9	5	-.14				
527	9	20	-.40				
528	11	18	-.08				
529	11	20	-1.86				
530	11	32	-1.24				
531	11	33	-.24				
532	11	34	-.24				
533	12	33	-.24				
534	12	9	-.84				
535	12	34	-2.74				
536	12	8	-.14				
537	12	20	-1.86				
538	12	29	-.08				
539	12	32	-.24				
540	13	12	-.16				
541	13	15	-.13				
542	13	16	-.12				
543	13	30	-.16				
544	13	32	-.24				
545	13	33	-.24				
546	13	34	-.24				
547	14	14	-.23				
548	14	16	-.90				
549	14	17	-.90				
550	14	31	-.15				
551	15	10	-.06				
552	15	11	-.06				
553	15	13	-.20				
554	15	15	-.15				
555	15	16	-.15				
556	15	17	-.90				
557	15	18	-.06				
558	15	24	-.16				
559	15	25	-.16				
560	15	26	-.21				
561	15	27	-.16				
562	15	29	-.16				
563	15	31	-.17				
564	15	34	-.24				
565	16	24	-.16				

GROUP IV:PARAMETERS THAT CHANGE WITH THE PUMPING PERIOD (CONT)
PUMPING PERIOD NUMBER 1 - 1941 TO 1950 (CONT)
DISCHARGE(-) AND RECHARGE(+) IN FT^3/S:
PUMPING PERIOD IN DAYS: INITIAL TIME STEP IN HOURS

CARD NUMBER			
566	16	25	-.36
567	16	26	-.16
568	16	28	-.16
569	16	30	-.16
570	16	38	-.10
571	18	12	-.04
572	18	15	-.20
573	17	26	-.36
574	23	26	-.5
575	5	39	2.00
576	16	39	2.00
577	20	40	2.00
578	21	3	2.00
579	21	40	2.000
580	22	3	4.00
581	22	4	1.00
582	22	33	3.00
583	22	34	3.00
584	22	35	3.00
585	22	36	4.00
586	22	37	4.00
587	22	38	2.00
588	22	39	2.00
589	22	40	2.00
590	23	4	2.00
591	23	33	4.00
592	24	4	4.00
593	24	5	4.00
594	24	26	1.00
595	24	27	1.00
596	24	28	2.00
597	24	29	2.00
598	24	30	2.00
599	24	31	2.00
600	24	32	5.00
601	24	33	5.00
602	25	21	1.00
603	25	22	1.00
604	25	23	.50
605	25	24	2.00
606	25	25	2.00
607	25	26	1.00

GROUP IV:PARAMETERS THAT CHANGE WITH THE PUMPING PERIOD (CONT)
PUMPING PERIOD NUMBER 2 - 1951 TO 1960
DISCHARGE(-) AND RECHARGE(+) IN FT³/S;
PUMPING PERIOD IN DAYS; INITIAL TIME STEP IN HOURS

CARD NUMBER							
608	2	1	123	3650	100	1.5	430
609	21	39	3.00				
610	4	8	-.07				
611	4	13	-.09				
612	4	38	-.07				
613	5	10	-.09				
614	6	12	-.13				
615	7	4	-.05				
616	7	19	-.05				
617	7	20	-.07				
618	7	21	-.07				
619	7	22	-.25				
620	8	7	-.30				
621	8	17	-.30				
622	8	25	-.14				
623	9	5	-.14				
624	9	15	-.30				
625	9	20	-.40				
626	10	30	-.10				
627	10	6	-.10				
628	10	20	-.15				
629	11	15	-.50				
630	11	18	-.07				
631	11	20	-2.01				
632	11	32	-1.11				
633	11	33	-.21				
634	11	34	-.21				
635	12	8	-.13				
636	12	9	-.73				
637	12	14	-.50				
638	12	19	-.20				
639	12	20	-1.86				
640	12	29	-.07				
641	12	31	-.10				
642	12	32	-.21				
643	12	33	-.41				
644	12	34	-2.46				
645	13	11	-.50				
646	13	12	-.14				
647	13	15	-.11				
648	13	16	-.11				
649	13	30	-.14				
650	13	32	-.21				
651	13	33	-.21				
652	13	34	-.21				
653	14	14	-.20				
654	14	16	-.90				
655	14	17	-.90				
656	14	31	-.15				
657	14	34	-.07				
658	15	8	-.20				

GROUP IV:PARAMETERS THAT CHANGE WITH THE PUMPING PERIOD (CONT) (CONT)
PUMPING PERIOD NUMBER 2 - 1951 TO 1960, (CONT)
DISCHARGE(-) AND RECHARGE(+) IN FT^3/S;
PUMPING PERIOD IN DAYS; INITIAL TIME STEP IN HOURS

CARD NUMBER			
659	15	10	-.05
660	15	11	-.06
661	15	13	-.18
662	15	15	-.13
663	15	16	-.13
664	15	17	-.90
665	15	18	-.09
666	15	23	-.10
667	15	24	-.39
668	15	25	-.14
669	15	26	-.19
670	15	27	-.14
671	15	29	-.14
672	15	31	-.17
673	15	32	-.08
674	15	34	-.22
675	16	17	-.10
676	16	22	-.24
677	16	24	-.14
678	16	25	-.29
679	16	26	-.14
680	16	28	-.14
681	16	30	-.14
682	16	37	-.50
683	16	38	-.12
684	17	16	-.31
685	17	23	-.18
686	17	25	-.05
687	17	26	-.36
688	18	12	-.04
689	18	13	-.13
690	18	14	-.09
691	18	15	-.33
692	19	7	-1.68
693	20	10	-.59
694	21	10	-.37
695	23	26	-.50
696	24	9	-.10
697	24	24	-.20
698	24	27	-.10
699	5	39	2.00
700	16	39	2.00
701	20	40	2.00
702	21	3	2.00
703	21	40	2.000
704	22	3	4.00
705	22	4	1.00
706	22	33	3.00
707	22	34	3.00
708	22	35	3.00
709	22	36	4.00

GROUP IV:PARAMETERS THAT CHANGE WITH THE PUMPING PERIOD (CONT) (CONT)
PUMPING PERIOD NUMBER 2 - 1951 TO 1960 (CONT)
DISCHARGE(-) AND RECHARGE(+) IN FT^3/S:
PUMPING PERIOD IN DAYS; INITIAL TIME STEP IN HOURS

CARD NUMBER			
710	22	37	4.00
711	22	38	2.00
712	22	39	2.00
713	22	40	2.00
714	23	4	2.00
715	23	33	4.00
716	24	4	4.00
717	24	5	4.00
718	24	26	1.00
719	24	27	1.00
720	24	28	2.00
721	24	29	2.00
722	24	30	2.00
723	24	31	2.00
724	24	32	5.00
725	24	33	5.00
726	25	21	1.00
727	25	22	1.00
728	25	23	.50
729	25	24	2.00
730	25	25	2.00
731	25	26	1.00

GROUP IV:PARAMETERS THAT CHANGE WITH THE PUMPING PERIOD (CONT)
PUMPING PERIOD NUMBER 3 - 1961 TO 1966
DISCHARGE(-) AND RECHARGE(+) IN FT^3/S:
PUMPING PERIOD IN DAYS: INITIAL TIME STEP IN HOURS

CARD NUMBER							
732	3	2	135	2190	100	1.5	310
733	4	13	-.07				
734	4	38	-.07				
735	5	10	-.07				
736	6	12	-.08				
737	7	4	-.04				
738	7	19	-.07				
739	7	12	-.23				
740	7	20	-.05				
741	7	21	-.05				
742	7	22	-.50				
743	8	7	-.22				
744	8	17	-.62				
745	8	25	-.10				
746	9	5	-.1				
747	9	15	-.29				
748	9	20	-.20				
749	10	5	-.07				
750	10	6	-.50				
751	10	30	-.10				
752	10	20	-.17				
753	10	34	-.63				
754	11	15	-2.32				
755	11	18	-.05				
756	11	20	-2.16				
757	11	32	-.95				
758	11	33	-.30				
759	11	34	-.30				
760	12	8	-.09				
761	12	9	-.40				
762	14	18	-.10				
763	12	14	-.33				
764	12	19	-.33				
765	12	20	-1.86				
766	12	29	-.10				
767	12	31	-.10				
768	12	32	-.21				
769	12	33	-.25				
770	12	34	-1.37				
771	13	6	-.34				
772	13	11	-.53				
773	13	12	-.10				
774	13	15	-.08				
775	13	16	-.08				
776	13	30	-.10				
777	13	32	-.18				
778	13	33	-.15				
779	13	34	-.15				
780	14	7	-.26				
781	14	8	-.21				
782	14	14	-.15				

GROUP IV:PARAMETERS THAT CHANGE WITH THE PUMPING PERIOD (CONT) (CONT)
PUMPING PERIOD NUMBER 3 - 1961 TO 1966, (CONT)
DISCHARGE(-) AND RECHARGE(+) IN FT3/S;
PUMPING PERIOD IN DAYS; INITIAL TIME STEP IN HOURS

CARD NUMBER			
783	14	16	-.90
784	14	17	-.90
785	14	31	-.15
786	14	34	-.44
787	15	8	-1.00
788	15	10	-.24
789	15	11	-.04
790	15	13	-.13
791	15	15	-.10
792	15	16	-.10
793	15	17	-.90
794	15	18	-.26
795	15	23	-.57
796	15	24	-.54
797	15	25	-.10
798	15	26	-.26
799	15	27	-.10
800	15	29	-.10
801	15	31	-.17
802	15	32	-.42
803	15	34	-.40
804	16	16	-.15
805	16	17	-.25
806	16	21	-.09
807	16	22	-.40
808	16	23	-.30
809	16	24	-.10
810	16	25	-.20
811	16	26	-.20
812	16	27	-.50
813	16	28	-.24
814	16	30	-.10
815	16	34	-.11
816	16	36	-.16
817	16	37	-.65
818	16	38	-.06
819	17	16	-.71
820	17	23	-.36
821	17	25	-.49
822	17	26	-.30
823	18	12	-.03
824	18	13	-.17
825	18	14	-.12
826	18	15	-.70
827	19	7	-1.71
828	20	10	-1.20
829	21	10	-.73
830	23	26	-.50
831	23	27	-.10
832	24	9	-.20
833	24	24	-.20

GROUP IV:PARAMETERS THAT CHANGE WITH THE PUMPING PERIOD (CONT) (CONT)
PUMPING PERIOD NUMBER 3 - 1961 TO 1966 (CONT)
DISCHARGE(-) AND RECHARGE(+) IN FT³/S;
PUMPING PERIOD IN DAYS; INITIAL TIME STEP IN HOURS

CARD NUMBER			
834	24	27	-.20
835	5	39	2.00
836	16	39	2.00
837	20	40	2.00
838	21	3	2.00
839	21	40	2.000
840	22	3	4.00
841	22	4	1.00
842	22	33	3.00
843	22	34	3.00
844	22	35	3.00
845	22	36	4.00
846	22	37	4.00
847	22	38	2.00
848	22	39	2.00
849	22	40	2.00
850	23	4	2.00
851	23	33	4.00
852	24	4	4.00
853	24	5	4.00
854	24	26	1.00
855	24	27	1.00
856	24	28	2.00
857	24	29	2.00
858	24	30	2.00
859	24	31	2.00
860	24	32	5.00
861	24	33	5.00
862	25	21	1.00
863	25	22	1.00
864	25	23	.50
865	25	24	2.00
866	25	25	2.00
867	25	26	1.00

GROUP IV:PARAMETERS THAT CHANGE WITH THE PUMPING PERIOD (CONT)
PUMPING PERIOD NUMBER 4 - 1967 TO 1973
DISCHARGE(−) AND RECHARGE(+) IN FT^3/S:
PUMPING PERIOD IN DAYS: INITIAL TIME STEP IN HOURS

CARD NUMBER							
868	4	3	138	2555	100	1.5	365
869	4	13	-.08				
870	4	38	-.06				
871	5	10	-.08				
872	6	12	-.10				
873	7	4	-.04				
874	7	12	-.20				
875	7	19	-.07				
876	7	20	-.06				
877	7	21	-.06				
878	7	22	-.50				
879	8	7	-.15				
880	8	17	-.50				
881	8	25	-.12				
882	9	5	-.10				
883	9	15	-.29				
884	9	20	-.20				
885	10	5	-.29				
886	10	6	-.50				
887	10	34	-.60				
888	10	20	-.15				
889	11	15	-1.80				
890	11	18	-.06				
891	11	20	-2.16				
892	11	32	-.88				
893	11	33	-.38				
894	11	34	-.30				
895	11	35	-.32				
896	11	36	-.26				
897	12	8	-.11				
898	12	9	-.61				
899	12	14	-.30				
900	12	19	-.25				
901	12	20	-1.86				
902	12	29	-.06				
903	12	31	-.10				
904	12	32	-.55				
905	12	33	-.26				
906	12	34	-1.71				
907	13	6	-.30				
908	13	11	-.70				
909	13	12	-.12				
910	13	15	-.10				
911	13	16	-.09				
912	13	30	-.12				
913	13	32	-.21				
914	13	33	-.18				
915	13	34	-.18				
916	14	7	-.21				
917	14	8	-.01				
918	14	14	-.17				

GROUP IV:PARAMETERS THAT CHANGE WITH THE PUMPING PERIOD (CONT) (CONT)
PUMPING PERIOD NUMBER 4 - 1967 TO 1973 (CONT)
DISCHARGE(-) AND RECHARGE(+) IN FT3/S:
PUMPING PERIOD IN DAYS: INITIAL TIME STEP IN HOURS

CARD NUMBER			
919	14	16	-.90
920	14	17	-.90
921	14	31	-.15
922	14	34	-.35
923	15	8	-1.20
924	14	18	-.10
925	15	10	-.24
926	15	11	-.05
927	15	12	-.04
928	15	13	-.15
929	15	15	-.11
930	15	16	-.11
931	15	17	-.90
932	15	18	-.14
933	15	23	-.52
934	15	24	-.29
935	15	25	-.12
936	15	26	-.30
937	15	27	-.12
938	15	29	-.19
939	15	31	-.17
940	15	32	-.37
941	15	34	-.36
942	16	16	-.23
943	16	17	-.14
944	16	21	-.09
945	16	22	-.46
946	16	23	-.30
947	16	24	-.12
948	16	25	-.31
949	16	26	-.12
950	16	27	-.47
951	16	28	-.22
952	16	29	-.03
953	16	30	-.12
954	16	34	-.10
955	16	36	-.09
956	16	37	-.57
957	16	38	-.12
958	17	16	-.40
959	17	23	-.36
960	17	25	-.60
961	17	26	-.28
962	18	12	-.03
963	18	13	-.08
964	18	14	-.15
965	18	15	-.66
966	19	7	-1.57
967	20	10	-.86
968	21	10	-.74
969	23	26	-.50

GROUP IV:PARAMETERS THAT CHANGE WITH THE PUMPING PERIOD (CONT) (CONT)
PUMPING PERIOD NUMBER 4 - 1967 TO 1973 (CONT)
DISCHARGE(-) AND RECHARGE(+) IN FT^3/S:
PUMPING PERIOD IN DAYS: INITIAL TIME STEP IN HOURS

CARD NUMBER			
970	23	27	-.10
971	24	9	-.20
972	24	24	-.20
973	24	27	-.20
974	5	39	2.00
975	16	39	2.00
976	20	40	2.00
977	21	3	2.00
978	21	40	2.000
979	22	3	4.00
980	22	4	1.00
981	22	33	3.00
982	22	34	3.00
983	22	35	3.00
984	22	36	4.00
985	22	37	4.00
986	22	38	2.00
987	22	39	2.00
988	22	40	2.00
989	23	4	2.00
990	23	33	4.00
991	24	4	4.00
992	24	5	4.00
993	24	26	1.00
994	24	27	1.00
995	24	28	2.00
996	24	29	2.00
997	24	30	2.00
998	24	31	2.00
999	24	32	5.00
1000	24	33	5.00
1001	25	21	1.00
1002	25	22	1.00
1003	25	23	.50
1004	25	24	2.00
1005	25	25	2.00
1006	25	26	1.00

GROUP IV:PARAMETERS THAT CHANGE WITH THE PUMPING PERIOD (CONT)
PUMPING PERIOD NUMBER 1 - 1974 TO 1977
DISCHARGE(-) AND RECHARGE(+) IN FT^3/S:
PUMPING PERIOD IN DAYS: INITIAL TIME STEP IN HOURS

CARD NUMBER							
1007	5	4	144	1460	100	1.5	210
1008	21	39	5.00				
1009	4	13	-.08				
1010	4	38	-.06				
1011	5	10	-.08				
1012	6	12	-.13				
1013	7	4	-.04				
1014	7	12	-.20				
1015	7	19	-.07				
1016	7	20	-.06				
1017	7	21	-.06				
1018	7	22	-.50				
1019	8	7	-.09				
1020	8	17	-.27				
1021	8	25	-.12				
1022	9	5	-.20				
1023	9	7	-.28				
1024	9	15	-.29				
1025	9	20	-.3				
1026	10	30	-.10				
1027	10	5	-.33				
1028	10	6	-1.09				
1029	10	20	-.15				
1030	10	34	-.58				
1031	11	15	-.80				
1032	11	18	-.06				
1033	11	20	-2.46				
1034	11	32	-1.08				
1035	11	34	-.18				
1036	11	35	-.43				
1037	11	36	-2.06				
1038	12	9	-1.17				
1039	12	14	-.30				
1040	12	19	-.22				
1041	12	20	-1.86				
1042	12	29	-.06				
1043	12	31	-.10				
1044	12	32	-.49				
1045	12	33	-.22				
1046	12	34	-1.65				
1047	13	6	-.32				
1048	13	11	-.85				
1049	13	12	-.32				
1050	13	15	-.10				
1051	13	16	-.09				
1052	13	30	-.12				
1053	13	32	-.21				
1054	13	33	-.18				
1055	13	34	-.18				
1056	13	35	-.05				
1057	14	7	-.11				

GROUP IV:PARAMETERS THAT CHANGE WITH THE PUMPING PERIOD (CONT) (CONT)
PUMPING PERIOD NUMBER 1 - 1974 TO 1977 (CONT)
DISCHARGE(-) AND RECHARGE(+) IN FT^3/S:
PUMPING PERIOD IN DAYS: INITIAL TIME STEP IN HOURS

CARD NUMBER			
1058	14	14	-.17
1059	14	16	-.90
1060	14	17	-.90
1061	14	31	-.14
1062	14	34	-.33
1063	15	8	-1.35
1064	14	18	-.10
1065	15	10	-.10
1066	15	11	-.10
1067	15	12	-.04
1068	15	13	-.15
1069	15	15	-.11
1070	15	16	-.11
1071	15	17	-.90
1072	15	18	-.16
1073	15	23	-.29
1074	15	24	-.26
1075	15	25	-.12
1076	15	26	-.39
1077	15	27	-.12
1078	15	28	-.08
1079	15	29	-.19
1080	15	31	-.17
1081	15	32	-.55
1082	15	34	-.36
1083	16	14	-.18
1084	16	16	-.53
1085	16	17	-.08
1086	16	20	-.19
1087	16	21	-.09
1088	16	22	-.75
1089	16	23	-.31
1090	16	24	-.12
1091	16	25	-.33
1092	16	26	-.12
1093	16	27	-.56
1094	16	28	-.19
1095	16	29	-.06
1096	16	30	-.12
1097	16	34	-.10
1098	16	36	-.09
1099	16	37	-.55
1100	16	38	-.12
1101	17	16	-.22
1102	17	23	-.67
1103	17	25	-.34
1104	17	26	-.24
1105	18	12	-.03
1106	18	13	-.38
1107	18	14	-.08
1108	18	15	-1.12

GROUP IV:PARAMETERS THAT CHANGE WITH THE PUMPING PERIOD (CONT) (CONT)
PUMPING PERIOD NUMBER 1 - 1974 TO 1977 (CONT)
DISCHARGE(-) AND RECHARGE(+) IN FT^3/S:
PUMPING PERIOD IN DAYS: INITIAL TIME STEP IN HOURS

CARD NUMBER			
1109	18	16	-.06
1110	19	7	-2.00
1111	20	10	-.89
1112	20	30	-.38
1113	21	10	-.80
1114	23	26	-.50
1115	23	27	-.10
1116	24	9	-.20
1117	24	24	-.20
1118	24	27	-.10
1119	5	39	2.00
1120	16	39	2.00
1121	20	40	2.00
1122	21	3	2.00
1123	21	40	2.000
1124	22	3	4.00
1125	22	4	1.00
1126	22	33	3.00
1127	22	34	3.00
1128	22	35	3.00
1129	22	36	4.00
1130	22	37	4.00
1131	22	38	2.00
1132	22	39	2.00
1133	22	40	2.00
1134	23	4	2.00
1135	23	33	4.00
1136	24	4	4.00
1137	24	5	4.00
1138	24	26	1.00
1139	24	27	1.00
1140	24	28	2.00
1141	24	29	2.00
1142	24	30	2.00
1143	24	31	2.00
1144	24	32	5.00
1145	24	33	5.00
1146	25	21	1.00
1147	25	22	1.00
1148	25	23	.50
1149	25	24	2.00
1150	25	25	2.00
1151	25	26	1.00