APPENDIX C. EXAMPLE SIMULATIONS

The test case presented in this section provides example input and output files for an entire modeling process including parameter estimation using MODFLOW-2000 in the Parameter-Estimation Process (PES) mode, calculation of correction factors using CORFAC-2k, calculation of nonlinearity measures using BEALE2-2k, calculation of quantities needed for residuals and nonlinearity analyses using RESAN2-2k, and calculation of confidence intervals and residuals analysis using MODFLOW-2000 in Uncertainty Process (UNC) mode.

The test example is taken from the synthetic case study of Christensen and Cooley (2003). The dimensions of the two-dimensional flow domain (fig. C1) are 18 by 8, divided into 90 by 40 uniform structural elements. The transmissivity is constant within each structural element. There is a pumping well in the center of the domain where ground water is withdrawn at a rate of 1. Boundary conditions include no flow across the top and bottom boundaries, a constant head of zero along the right boundary, and a constant flux across the left boundary (simulated as recharge with rate equal to 3.1076 over the left-most column of cells). The vector $\boldsymbol{\beta}$ of unknown system characteristics consists of spatially varying log-transmissivity, which is

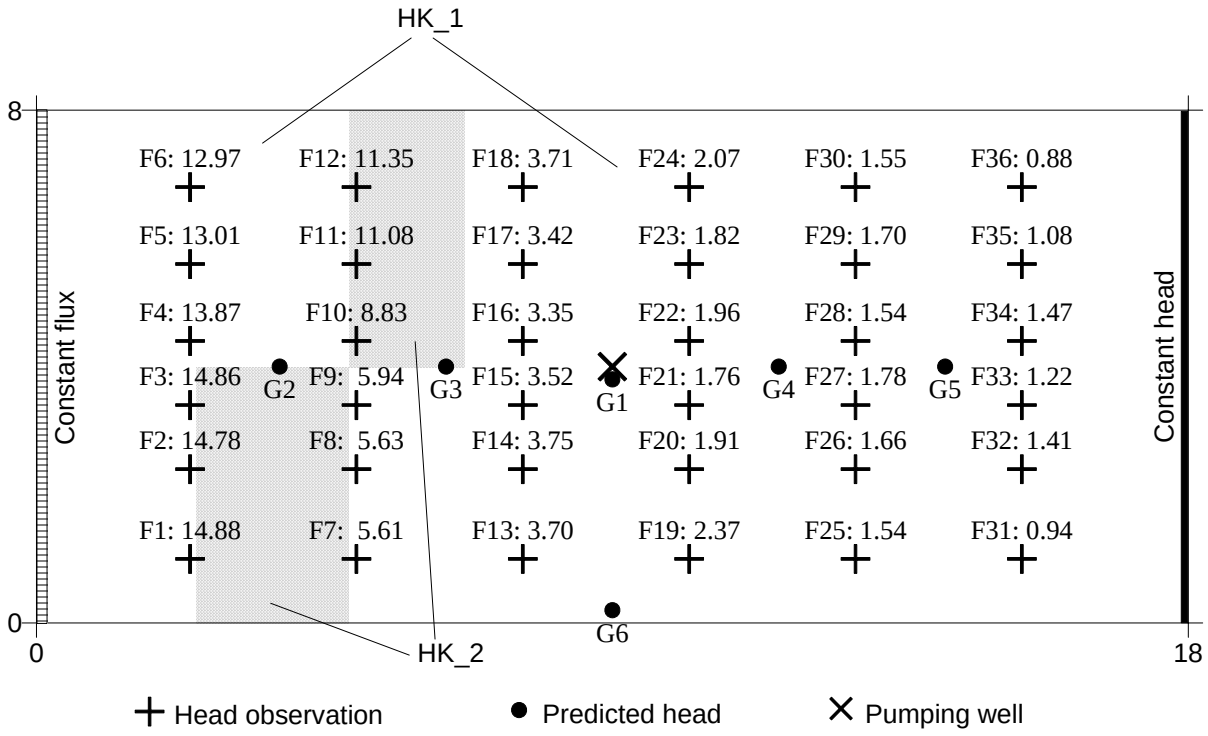

Figure C1. Model domain, boundary conditions, zonation, locations, and values of head observations, and locations of head predictions.

known to be normally distributed with a constant mean of zero and with exponential covariance with a correlation scale of 1.0 and a variance of 4.0.

The observations used for parameter estimation consist of 36 observations of hydraulic head observed at almost uniformly distributed grid points (fig. C1). The observation errors are known to be normally distributed with a variance of 0.01. (In the study of Christensen and Cooley (2003) the variance was 1.0.) The true error second-moment matrix, $\sigma_\varepsilon^2 \boldsymbol{\Omega}$, was computed by the same Monte-Carlo method as used by Christensen and Cooley (2003). Weights for the observations are obtained as the inverses of the diagonal elements of $\boldsymbol{\Omega}$.

The numerical model used for parameter estimation and computation of confidence intervals has 91 by 41 elements. The width of the left-most and right-most columns is 0.1, while the remaining column widths are all 0.2. The width of the upper-most and lower-most rows is 0.1, while all other row-widths are 0.2. Based on the available 36 head observations, we divided the transmissivity field of the model into two transmissivity zones (fig. C1), one of presumably higher transmissivity (low hydraulic head gradient), and one of presumably lower transmissivity (high hydraulic head gradient). The model parameters are the log-transmissivities of each of the two zones and are named HK_1 and HK_2, respectively.

Parameter Estimation

The input files for, and the GLOBAL output file from, the parameter estimation are listed in the 'Parameter Estimation – Input Files' and the 'Parameter Estimation – Global Output File' sections. The diagonal elements of the true error second-moment matrix, $\sigma_\varepsilon^2 \boldsymbol{\Omega}$, have values between 2.0 and 7.3. Because σ_ε^2 equals 0.01, the values of the diagonal elements of $\boldsymbol{\Omega}$ vary between 200 and 730. These values are input to MODFLOW-2000 as STATISTIC in item 6 of the head observation input where STAT-FLAG is set equal to 0 (Hill and others, 2000). Thus the weights for the head observations used in the regression are calculated as the inverses of the diagonal elements of $\boldsymbol{\Omega}$.

OUTNAM in the Observation Process input file is specified to be "example." This defines the names of a number of MODFLOW-2000 output files as explained by Hill and others (2000, p. 27) and in this report.

The initial values of two zonal transmissivity parameters are both set to 1.0, which equals the known expected value of the transmissivity. The estimated parameters HK_1 and HK_2 are both log-transformed zonal transmissivity. HK_1 and HK_2 are estimated by MODFLOW-2000 to be 1.46 and 9.94×10^{-2}, respectively. The high estimate of HK_1 and the low estimate of HK_2 conform with the expectations from the head observations.

The value of the weighted least-squares objective function at the minimum is $S(\hat{\boldsymbol{\theta}}) = 0.014039$. This value is used later to calculate the critical values needed for the calculation of confidence intervals.

Computation of Correction Factors Using CORFAC-2k

The first step to compute correction factors is to make MODFLOW-2000 create the input file example._cf for CORFAC-2k. This is done by the following.

1. The Uncertainty (UNC) process is activated by adding specification of the UNC input file to the Name File (example.nam).
2. The UNC file (unc.dat) where IACT is set equal to 3 is created. Confidence intervals are specified to be calculated for the two parameters HK_1 and HK_2.
3. The final calibrated parameter values from the example._b file are substituted into the SEN file.
4. Information about the six hydraulic head predictions is added to the HOB file (hob.dat).
5. MODFLOW-2000 is run.

The MODFLOW-2000 input files are listed in the 'Modified Input Files for Generation of CORFAC-2k Input File' section.

The created file, example._cf, is in this case modified by setting ITRN in item 1 equal to 1 and by setting V in item 14 equal to $\boldsymbol{\Omega}$. This modified file is listed in the 'Modified _cf Input File to CORFAC-2k' section. Running CORFAC-2k produces the output file example.#cf, which is listed in the 'Output File from CORFAC-2k' section.

In the output file, example.#cf, the computed correction factor for the confidence region is listed as CR=33.243, whereas the corresponding approximate bound is computed to be CRB=46.859. The approximate bound was calculated using the default effective correlation of 0.8 and not the actual effective correlation C=0.7149 computed by CORFAC-2k. If $\boldsymbol{\Omega}$ had been unknown, CRB would have to be used instead of CR to compute Scheffé type confidence intervals using MODFLOW-2000 with the UNC Process. Using CRB would produce wider Scheffé intervals than using CR.

In example.#cf the correction factors CC computed for the individual confidence intervals for the six head predictions and the two parameters, and the corresponding approximate bounds CCB, have the values given in table C1. Using the CCB would in all these cases produce wider individual confidence intervals than using the CC values.

Table C1. Correction factors, CC, and correction factor bounds, CCB, computed by CORFAC-2k for six head predictions (G1 to G6) and two parameters (HK_1 and HK_2).

	G1	G2	G3	G4	G5	G6	HK_1	HK_2
CC	45.638	15.989	46.966	45.492	45.477	45.875	45.473	10.668
CCB	71.613	25.130	73.142	71.470	71.456	71.842	71.452	37.083

Computation of Nonlinearity Measures Using BEALE2-2k

BEALE2-2k needs four input files, example._b1, example._b2, example._b3, and example._b4, that are generated by MODFLOW-2000 using UNC. The _b1 and _b3 files are generated as follows:

1. In the UNC file (unc.dat) IACT in item 1 is set equal to 1 and CFR and CFI are specified in items 8 and 9, respectively. The values of CFR and CFI equal the CR and CC values found in the example.#cf output file from CORFAC-2k.
2. The final calibrated parameter values from the example._b file are substituted into the SEN input file (sen.dat).
3. MODFLOW-2000 is run.

After the example._b1 and example._b3 files are generated, the example._b2 and example._b4 files are generated by changing the value of IACT to 2 in the UNC file (unc.dat), and then re-running MODFLOW-2000. Finally, BEALE2-2k is executed to produce the output file example.#be. The unc.dat, example._b1, example._b2, example._b3, example._b4, and example.#be files are listed in the 'Input Files Used to Generate BEALE2-2k Input Files', the 'BEALE2-2k Input Files', and the 'BEALE2-2k Output File' sections.

In the example.#be output file the computed measure of total nonlinearity, BNT, is approximately 0.064, and the measure of intrinsic nonlinearity, BNI, is approximately 0.45×10^{-3}. This indicates that the regression model is moderately nonlinear, and the intrinsic nonlinearity is insignificant. The combined intrinsic nonlinearity measures for confidence intervals are listed in table C2. These values indicate that the combined intrinsic nonlinearity is insignificant for the G2 head prediction confidence interval, but moderate for all the other intervals. Because the correction factors computed by CORFAC-2k for the latter seven intervals are only slightly larger than 0.09 (see chapter 2) and are all much less than one, correction factors CC should not be effected much by the omitted intrinsic nonlinearity components, and factors CCB should be conservative.

Table C2. Combined intrinsic nonlinearity measures computed by BEALE2-2k.

	G1	G2	G3	G4	G5	G6	HK_1	HK_2
BMI	0.91136E-01	0.13976E-04	0.80532E-01	0.92049E-01	0.92165E-01	0.89142E-01	0.37137E-01	0.22188E-01
BMF0	0.12232E-01	0.37404E-02	0.99148E-02	0.12468E-01	0.12491E-01	0.11832E-01	0.58584E-12	0.59462E-10
BMG0	0.36826E-01	0.40559E-02	0.34126E-01	0.37003E-01	0.37051E-01	0.36261E-01	0.37137E-01	0.22186E-01
BMIMAX	0.11560	0.80979E-02	0.10036	0.11699	0.11715	0.11280	0.37137E-01	0.22188E-01

Residuals Analysis And Detection of Nonlinearity Using RESAN2-2k

RESAN2-2k needs two input files that for the example are named example._ws and example._rs. The example._ws file was generated during parameter estimation and contains weighted simulated equivalents and residuals (Hill and others, 2000, table 5). The example._rs file is generated in a separate step where the B values for HK_1 and HK_2 are both set to 1.0 in item 3 of the SEN file (sen.dat), and where MAX-ITER is set to 0 in item 1 of the PES file (pes.dat). This means that the example._rs file is generated using values of 1.0 for both parameters but parameter estimation is not carried out (Hill and others, 2000, p. 72, 75, 78, and 79).

Before running RESAN2-2k, the example._rs file is modified by increasing NSETS in item 1 from 4 to 1,000, setting STDV in items 1 to 0.01, setting IERT in item 1 to 1, setting ICOV in item 1 to 1, specifying ET in item 10 to equal the expected values of the true errors, and specifying V in item 11 to equal $\boldsymbol{\Omega}_m$. RESAN2-2k is then run to generate the example.#nr and example._md output files. The input files for, and output files from, RESAN2-2k are listed in the 'RESAN2-2k Input Files' and 'RESAN2-2k Output Files' sections.

The example.#nr output file contains results of the analysis of residusls. The mean weighted residual, EM, is approximately –0.0005, and the slope of the weighted residual plot, SLP, is approximately 0.0036. Because both values are close to zero, they both indicate that model and system types of intrinsic nonlinearity are small. The intrinsic nonlinearity measure, QINT, is approximately 0.0002, which is much smaller than $S(\hat{\boldsymbol{\theta}}) = 0.014039$. This also indicates small model intrinsic nonlinearity. The correlation between weighted residuals and the means of synthetic residuals, CED, is approximately 0.996, and that the probability, PROB, of this or a smaller correlation is 0.988. Figure C2 shows a probability plot of ordered weighted residuals with an approximate 95 percent confidence band. This plot was generated from the results in the example._md file. The weighted residuals fall inside the confidence band. This, together with the high probability of CED, indicates normality of the weighted residuals.

Calculation of Confidence Intervals Using MODFLOW-2000 With the UNC Process

Finally, individual 95 percent confidence intervals are calculated for the six predicted heads, G1 to G6, and for the two model parameters, HK_1 and HK_2. This is accomplished with the following steps:

1. The UNC Process is activated by specifying the UNC file (unc.dat) in the Name File (example.nam). Two DATAGLO data files are specified to be opened in the Name file, one called confint.dat with unit number equal to 61 and the other called weight-res.dat with unit number equal to 62. The summary output of computed confidence limits are to be printed in the former data file, whereas weighted residuals from the constrained regression are to be printed in the latter.

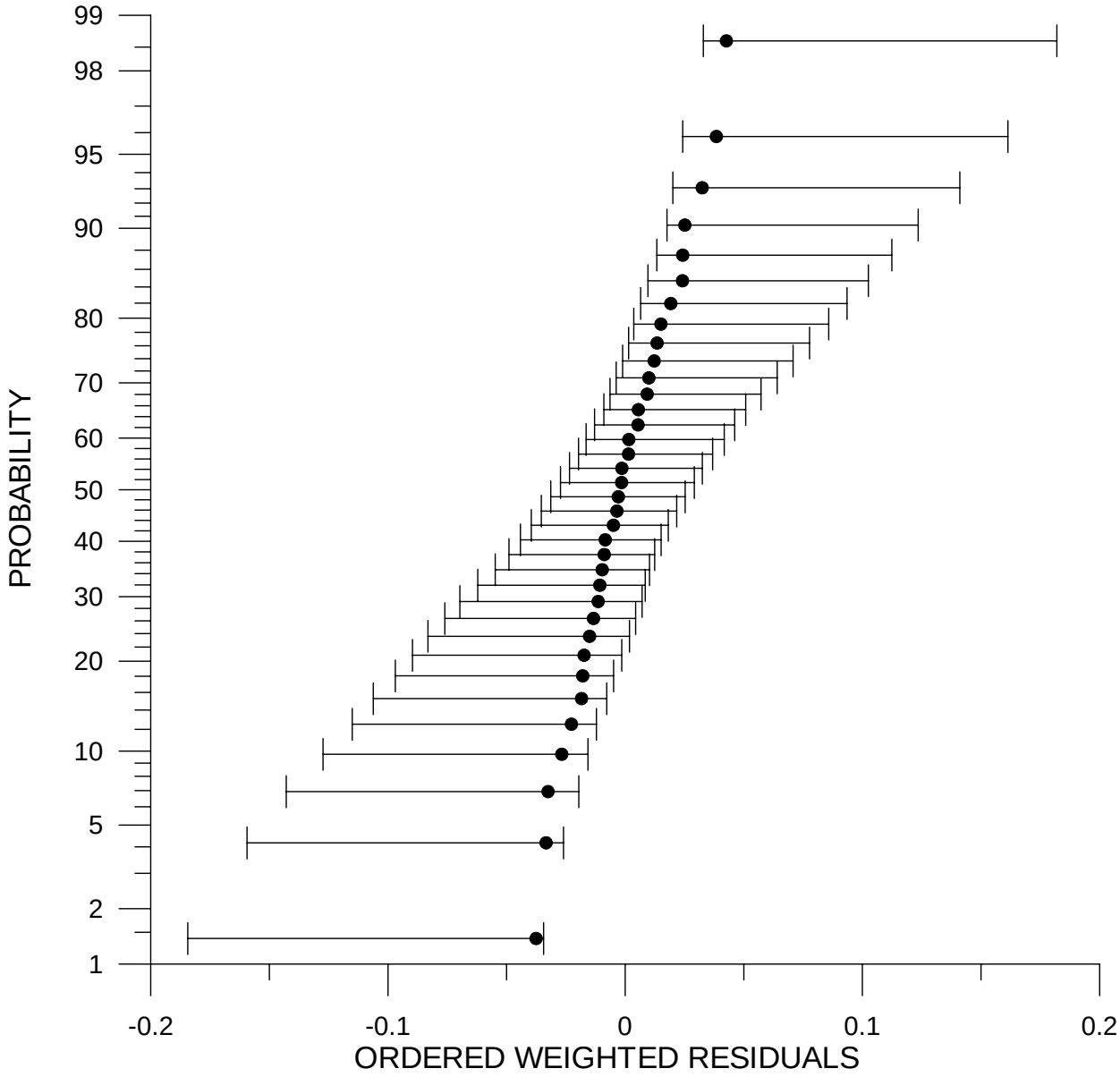

Figure C2. Ordered weighted residuals (dots) plotted with approximate 95 percent confidence band (bars).

2. IACT is set equal to 0, NPI is set equal to 2, IOIN is set equal to 61, IDSQ is set equal to 1, and IWRP is set equal to 62 in item 1 of the UNC file.
3. A critical value is computed from equation 86 for each individual 95 percent confidence interval using the correction factors, CC, in table C1, $t_{2.5}(34) = 2.032,$ and $S(\hat{\boldsymbol{\theta}}) = 0.014039$. The elements of DSQ in item 4 of the UNC file are set equal to the critical values.

4. The two parameters for which confidence intervals are to be computed are specified in item 5 of the UNC file as HK_1 and HK_2, respectively.
5. The initial parameter values in the SEN file (sen.dat) are set equal to the final calibrated values.
6. MODFLOW-2000 is run.

Besides producing the GLOBAL and LIST output files with details concerning the computation of confidence intervals, MODFLOW-2000 in this run also produces the two files mentioned above named confint.dat and weight-res.dat. The input and output files are all listed in the 'MODFLOW-2000 Input Files For Confidence Interval Calculation', the 'GLOBAL Output File For Confidence Interval Calculation', and the 'Summary and Weighted Residuals Output Files' sections.

The output file named confint.dat contains the following:

```
C.I.  1: FL= 4.1361     ; SSE=0.91894E-01; ITER=4;  PAR:  1.007    0.1538
C.I.  2: FL= 13.439     ; SSE=0.41351E-01; ITER=3;  PAR:  1.519    0.7981E-01
C.I.  3: FL= 6.4088     ; SSE=0.94127E-01; ITER=4;  PAR:  1.003    0.1496
C.I.  4: FL= 3.1090     ; SSE=0.91639E-01; ITER=4;  PAR:  1.008    0.1541
C.I.  5: FL= 1.8458     ; SSE=0.91618E-01; ITER=4;  PAR:  1.007    0.1542
C.I.  6: FL= 4.6167     ; SSE=0.92338E-01; ITER=4;  PAR:  1.006    0.1531
C.I.  7: FL=0.42100     ; SSE=0.91608E-01; ITER=4;  PAR:  2.636    0.6966E-01
C.I.  8: FL=-0.87902    ; SSE=0.32298E-01; ITER=4;  PAR:  1.264    0.1321
C.I. -1: FL= 1.5895     ; SSE=0.91861E-01; ITER=4;  PAR:  2.641    0.6964E-01
C.I. -2: FL= 10.581     ; SSE=0.41295E-01; ITER=4;  PAR:  1.436    0.1282
C.I. -3: FL= 2.5599     ; SSE=0.94083E-01; ITER=4;  PAR:  2.671    0.6945E-01
C.I. -4: FL= 1.1892     ; SSE=0.91594E-01; ITER=4;  PAR:  2.636    0.6967E-01
C.I. -5: FL= 0.70517    ; SSE=0.91630E-01; ITER=4;  PAR:  2.636    0.6967E-01
C.I. -6: FL= 1.7864     ; SSE=0.92292E-01; ITER=4;  PAR:  2.646    0.6961E-01
C.I. -7: FL= 0.32539E-02; SSE=0.91624E-01; ITER=4;  PAR:  1.008    0.1542
C.I. -8: FL= -1.1052    ; SSE=0.32343E-01; ITER=3;  PAR:  1.750    0.7849E-01
```

Each line summarizes the results for one computed confidence limit: C.I. 1 is for the upper limit of the first confidence interval, C.I. 2 is for the upper limit of the second interval, C.I. –1 is for the lower limit of the first interval, and so on. In this case the first six intervals are for head predictions (G1 to G6), whereas the last two intervals are for the parameters (HK_1 and HK_2). The column of numbers preceded by "FL=" is the confidence limit value. The column of numbers preceded by "SSE=" is the value of the objective function at the parameter values corresponding to the confidence limit. The SSE value should be close to the critical value, DSQ, specified for the confidence interval in the UNC file. This is fulfilled for all confidence limits computed in this example. The column of numbers above preceded by "ITER=" is the number of

iterations necessary to compute the confidence limit. Finally, the two columns of numbers preceded by "PAR:" are the parameter values corresponding to the computed confidence limit.

The output file named weight-res.dat contains weighted residuals for all computed confidence limits. These weighted residuals are defined as $\left(\boldsymbol{I}-\boldsymbol{Q}\boldsymbol{Q}'/\boldsymbol{Q}'\boldsymbol{Q}\right)\boldsymbol{\omega}^{1/2}\left(\boldsymbol{Y}-\boldsymbol{f}\left(\boldsymbol{\gamma}\tilde{\boldsymbol{\theta}}\right)\right)$ in chapter 2. In figure C3 the weighted residuals at the confidence limits are plotted against the weighted residuals from unconstrained regression (parameter estimation), $\boldsymbol{\omega}^{1/2}\left(\boldsymbol{Y}-\boldsymbol{f}\left(\boldsymbol{\gamma}\hat{\boldsymbol{\theta}}\right)\right)$. In all cases the points fall close to the identity line. This is especially true for the head prediction G2, whereas there is a little more scatter for the other head predictions and for the two parameters. This may indicate small combined intrinsic nonlinearity for the confidence interval of G2, and larger combined intrinsic nonlinearity for the other seven confidence intervals. This conforms with the indications of the combined intrinsic nonlinearity measures computed by BEALE2-2k listed in table C2.

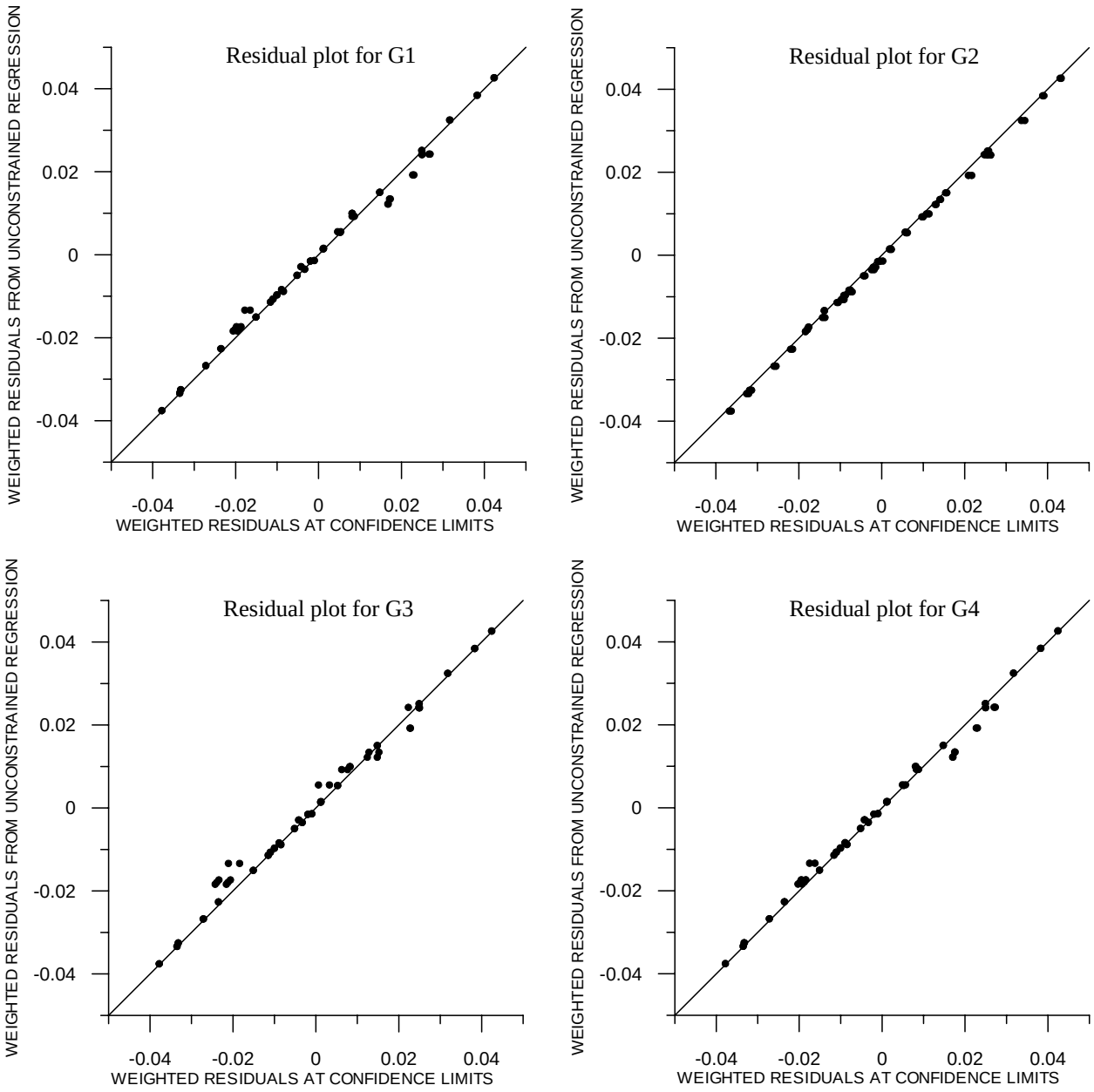

Figure C3. Weighted residuals at confidence limits in relation to weighted residuals from unconstrained regression (parameter estimation). The line is the one-to-one correlation line.

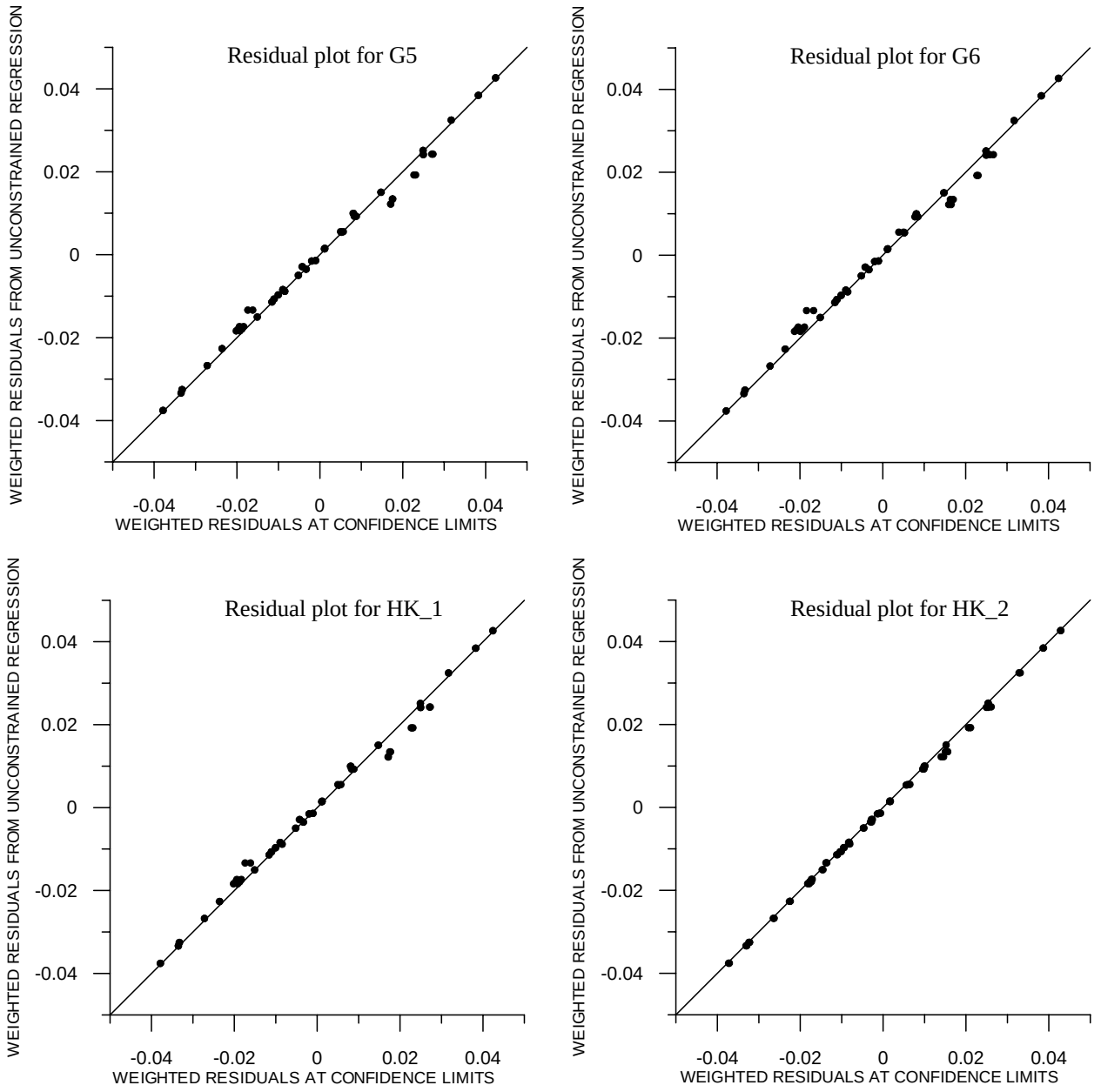

Figure C3 (continued). Weighted residuals at confidence limits in relation to weighted residuals from unconstrained regression (parameter estimation). The line is the one-to-one correlation line.

Parameter Estimation – Input Files

Name file (example.nam):

```
GLOBAL          4 mf2k.global_listing
LIST            3 output.dat
DIS            95 discret.dat
BAS6            1 bas6.dat
ZONE           93 zone.dat
MULT           94 multiple.dat
LPF            31 lpf6.dat
RCH            11 rech6.dat
WEL            12 wel6.dat
PCG            23 pcg2.dat
OC             22 oc.dat
DATA           10 inithead.dat
OBS            40 obs.dat
HOB            41 hob.dat
PES            47 pes.dat
SEN            46 sen.dat
```

DIS file (discret.dat):

```
# Discretization file for MODFLOW-2000, UNC1NLI1 Report Example
         1        41        91         1         1         0
 0
        95         1(16G5.0)                   -1  3. DELR(NCOL)
  0.1  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2
  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2
  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2
  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2
  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2
  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.1
        95         1(16G5.0)                   -1  4. DELC(NROW)
  0.1  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2
  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2
  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.1
         0         1(20G14.0)                   -1  5. TOP OF SYSTEM
         0         0(20G14.0)                   -1  5. BOTTOM OF OF LAYER 1
             1             1         1 SS
```

BAS6 file (bas6.dat):

```
# Basic package file for MODFLOW-2000, UNC1NLI1 Report Example
FREE
         1         1(40I2)                     -1  2. IBOUND Array for Layer 1
 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
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1 1 1 1 1 1 1 1 1 1-1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
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1 1 1 1 1 1 1 1 1-1
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1 1 1 1 1 1 1 1 1 1-1
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1 1 1 1 1 1 1 1 1 1-1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1-1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1-1
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1 1 1 1 1 1 1 1 1 1-1
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1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
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1 1 1 1 1 1 1 1 1 1-1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
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1 1 1 1 1 1 1 1 1 1-1
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1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1-1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1-1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
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1 1 1 1 1 1 1 1 1 1-1
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 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
 1 1 1 1 1 1 1 1 1 1-1
 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
 1 1 1 1 1 1 1 1 1 1-1
   -999.99
        10         1(10F8.3)                    -1  4. Starting Heads in Layer 1
```

ZONE file (zone.dat):

```
# Zone file for MODFLOW-2000, UNC1NLI1 Report Example
 2
ZHK1
        93         1(91I1)                      -1  HK zone array for layer 1
1111111111111111111111111222222222111111111111111111111111111111111111111111111111111111111
1111111111111111111111111222222222111111111111111111111111111111111111111111111111111111111
1111111111111111111111111222222222111111111111111111111111111111111111111111111111111111111
1111111111111111111111111222222222111111111111111111111111111111111111111111111111111111111
1111111111111111111111111222222222111111111111111111111111111111111111111111111111111111111
1111111111111111111111111222222222111111111111111111111111111111111111111111111111111111111
1111111111111111111111111222222222111111111111111111111111111111111111111111111111111111111
1111111111111111111111111222222222111111111111111111111111111111111111111111111111111111111
1111111111111111111111111222222222111111111111111111111111111111111111111111111111111111111
1111111111111111111111111222222222111111111111111111111111111111111111111111111111111111111
1111111111111111111111111222222222111111111111111111111111111111111111111111111111111111111
1111111111111111111111111222222222111111111111111111111111111111111111111111111111111111111
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1111111111111111111111111222222222111111111111111111111111111111111111111111111111111111111
1111111111111111111111111222222222111111111111111111111111111111111111111111111111111111111
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1111111111111111111111111222222222111111111111111111111111111111111111111111111111111111111
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1111111111111111111111111222222222111111111111111111111111111111111111111111111111111111111
1111111111111222222222222111111111111111111111111111111111111111111111111111111111111111111
1111111111111222222222222111111111111111111111111111111111111111111111111111111111111111111
1111111111111222222222222111111111111111111111111111111111111111111111111111111111111111111
1111111111111222222222222111111111111111111111111111111111111111111111111111111111111111111
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1111111111111222222222222111111111111111111111111111111111111111111111111111111111111111111
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1111111111111222222222222111111111111111111111111111111111111111111111111111111111111111111111111111
1111111111111222222222222111111111111111111111111111111111111111111111111111111111111111111111111111
1111111111111222222222222111111111111111111111111111111111111111111111111111111111111111111111111111
1111111111111222222222222111111111111111111111111111111111111111111111111111111111111111111111111111
1111111111111222222222222111111111111111111111111111111111111111111111111111111111111111111111111111
ZVK1
        0       999(20I4)                    -1  VK zone array for layer 1
```

MULT file (multiple.dat):

```
# Multiplier file for MODFLOW-2000, UNC1NLI1 Report Example
 2
HK1
         0         1(20G14.0)                   -1  4. HK Mult. array
VK1
         0         1(20G14.0)                   -1  4. VK Mult. array
```

LPF file (lpf6.dat):

```
# Layer-Property Flow file for MODFLOW-2000, UNC1NLI1 Report Example
         0      999.         3
 0
 0
 1
 0
 0
HK_1 HK   1  1
 1 HK1 ZHK1 1
HK_2 HK   1  1
 1 HK1 ZHK1 2
VK_0 VK   1  1
 1 VK1 ZVK1 999
        31         1(20G14.0)                   -1  10. HK of layer 1
        31         1(20G14.0)                   -1  11. HANI of layer 1
        31         1(20G14.0)                   -1  12. VK of layer 1
```

RCH file (rech6.dat):

```
# RECH file for MODFLOW-2000, UNC1NLI1 Report Example
1  0  NRCHOP  IRCHCB
1     INRECH
        11    6.2152(91G2.0)                 -1  10. RCH of layer 1
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
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1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
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1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
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1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.
```

```
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
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1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.
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1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
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1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
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1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
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1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0
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```

WEL file (wel6.dat):

```
# WELL file for MODFLOW-2000, UNC1NLI1 Report Example
#
PARAMETER 1  1
 1  00
WEL_0_1 Q  1 1
         1        21        46          -1
 0  1
WEL_0_1
```

PCG file (pcg2.dat):

```
        50        30         1
      .001      .001         1         1         1         0         1
```

OC file (oc.dat):

```
# Output control file for MODFLOW-2000, UNC1NLI1 Report Example
         0         0         0         0
         1         0         0         0   PERIOD: 1    TIME STEP: 1
         0         0         0         0   LAYER: 1
```

DATA file with initial heads (inithead.dat):

```
  14.549  14.484  14.397  14.309  14.219  14.128  14.036  13.942  13.848  13.753
  13.657  13.561  13.465  13.369  13.274  13.180  13.088  12.996  12.907  12.821
  12.737  12.656  12.579  12.505  12.435  11.913  10.940   9.971   9.005   8.042
   7.082   6.125   5.170   4.216   3.707   3.642   3.577   3.512   3.447   3.381
   3.316   3.250   3.183   3.117   3.051   2.984   2.918   2.851   2.785   2.718
   2.652   2.585   2.519   2.453   2.386   2.320   2.254   2.188   2.122   2.055
   1.989   1.923   1.857   1.790   1.724   1.658   1.591   1.525   1.458   1.391
```

```
 1.325   1.258   1.191   1.124   1.057   0.990   0.923   0.856   0.789   0.722
 0.655   0.588   0.521   0.454   0.387   0.319   0.252   0.185   0.118   0.050
 0.000
14.549  14.485  14.398  14.309  14.220  14.128  14.036  13.942  13.848  13.753
13.657  13.561  13.465  13.369  13.274  13.180  13.087  12.996  12.906  12.820
12.736  12.655  12.577  12.503  12.433  11.912  10.938   9.969   9.002   8.040
 7.081   6.124   5.170   4.217   3.707   3.643   3.578   3.513   3.447   3.382
 3.316   3.250   3.184   3.117   3.051   2.984   2.918   2.851   2.785   2.718
 2.652   2.585   2.519   2.453   2.386   2.320   2.254   2.188   2.122   2.055
 1.989   1.923   1.857   1.790   1.724   1.658   1.591   1.525   1.458   1.391
 1.325   1.258   1.191   1.124   1.057   0.990   0.923   0.856   0.789   0.722
 0.655   0.588   0.521   0.454   0.387   0.319   0.252   0.185   0.118   0.050
 0.000
14.551  14.487  14.400  14.311  14.222  14.130  14.038  13.944  13.849  13.754
13.658  13.561  13.465  13.368  13.273  13.178  13.084  12.992  12.903  12.816
12.731  12.650  12.572  12.498  12.427  11.906  10.932   9.963   8.997   8.035
 7.077   6.122   5.169   4.216   3.708   3.643   3.578   3.513   3.448   3.382
 3.316   3.250   3.184   3.117   3.051   2.984   2.918   2.851   2.785   2.718
 2.652   2.585   2.519   2.453   2.386   2.320   2.254   2.188   2.122   2.055
 1.989   1.923   1.857   1.790   1.724   1.658   1.591   1.525   1.458   1.391
 1.325   1.258   1.191   1.124   1.057   0.990   0.923   0.856   0.789   0.722
 0.655   0.588   0.521   0.454   0.387   0.319   0.252   0.185   0.118   0.050
 0.000
14.555  14.491  14.404  14.315  14.225  14.133  14.040  13.946  13.851  13.755
13.658  13.561  13.464  13.367  13.270  13.174  13.080  12.987  12.897  12.808
12.723  12.641  12.563  12.488  12.418  11.896  10.922   9.953   8.988   8.027
 7.070   6.117   5.166   4.215   3.708   3.644   3.579   3.514   3.448   3.383
 3.317   3.251   3.184   3.118   3.051   2.984   2.918   2.851   2.784   2.718
 2.651   2.585   2.519   2.453   2.386   2.320   2.254   2.188   2.122   2.055
 1.989   1.923   1.857   1.790   1.724   1.658   1.591   1.525   1.458   1.391
 1.325   1.258   1.191   1.124   1.057   0.991   0.924   0.857   0.789   0.722
 0.655   0.588   0.521   0.454   0.387   0.320   0.252   0.185   0.118   0.050
 0.000
14.560  14.496  14.409  14.320  14.230  14.138  14.044  13.950  13.854  13.757
13.660  13.562  13.463  13.365  13.267  13.170  13.074  12.980  12.888  12.798
12.712  12.629  12.550  12.475  12.404  11.881  10.908   9.939   8.975   8.016
 7.061   6.110   5.161   4.214   3.709   3.644   3.580   3.515   3.449   3.384
 3.318   3.251   3.185   3.118   3.051   2.985   2.918   2.851   2.784   2.718
 2.651   2.585   2.519   2.452   2.386   2.320   2.254   2.188   2.122   2.055
 1.989   1.923   1.857   1.791   1.724   1.658   1.591   1.525   1.458   1.392
 1.325   1.258   1.191   1.125   1.058   0.991   0.924   0.857   0.790   0.723
 0.655   0.588   0.521   0.454   0.387   0.319   0.252   0.185   0.118   0.050
 0.000
14.567  14.503  14.416  14.326  14.236  14.143  14.050  13.954  13.858  13.760
13.661  13.562  13.462  13.362  13.263  13.164  13.066  12.970  12.877  12.786
12.698  12.613  12.533  12.457  12.385  11.862  10.888   9.920   8.957   8.000
 7.048   6.100   5.156   4.213   3.710   3.645   3.581   3.516   3.451   3.385
 3.319   3.252   3.185   3.119   3.052   2.985   2.918   2.851   2.784   2.717
 2.651   2.585   2.518   2.452   2.386   2.320   2.254   2.188   2.122   2.056
 1.989   1.923   1.857   1.791   1.724   1.658   1.592   1.525   1.458   1.392
 1.325   1.258   1.192   1.125   1.058   0.991   0.924   0.857   0.790   0.723
 0.655   0.588   0.521   0.454   0.387   0.319   0.252   0.185   0.118   0.050
 0.000
14.576  14.511  14.424  14.335  14.244  14.151  14.056  13.960  13.863  13.764
13.664  13.563  13.461  13.360  13.258  13.157  13.057  12.959  12.863  12.769
```

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12.679  12.593  12.511  12.434  12.362  11.839  10.863   9.895   8.934   7.979
 7.031   6.087   5.148   4.211   3.711   3.647   3.583   3.518   3.452   3.386
 3.320   3.253   3.186   3.119   3.052   2.985   2.917   2.850   2.784   2.717
 2.650   2.584   2.518   2.452   2.386   2.320   2.254   2.188   2.122   2.056
 1.990   1.923   1.857   1.791   1.725   1.658   1.592   1.525   1.459   1.392
 1.325   1.259   1.192   1.125   1.058   0.991   0.924   0.857   0.790   0.723
 0.656   0.588   0.521   0.454   0.387   0.319   0.252   0.185   0.118   0.050
 0.000
14.586  14.522  14.434  14.345  14.253  14.160  14.065  13.968  13.869  13.769
13.667  13.564  13.461  13.357  13.253  13.149  13.046  12.945  12.846  12.750
12.657  12.569  12.485  12.407  12.334  11.809  10.833   9.864   8.904   7.952
 7.008   6.070   5.138   4.208   3.712   3.649   3.585   3.520   3.454   3.388
 3.322   3.254   3.187   3.120   3.052   2.985   2.917   2.850   2.783   2.716
 2.650   2.584   2.517   2.451   2.385   2.320   2.254   2.188   2.122   2.056
 1.990   1.924   1.858   1.791   1.725   1.659   1.592   1.526   1.459   1.392
 1.326   1.259   1.192   1.125   1.058   0.991   0.924   0.857   0.790   0.723
 0.656   0.589   0.521   0.454   0.387   0.320   0.252   0.185   0.118   0.050
 0.000
14.598  14.534  14.446  14.356  14.264  14.171  14.075  13.977  13.877  13.775
13.672  13.567  13.461  13.354  13.247  13.140  13.034  12.929  12.827  12.727
12.631  12.540  12.454  12.373  12.300  11.773  10.794   9.825   8.865   7.917
 6.978   6.048   5.125   4.205   3.715   3.652   3.588   3.523   3.457   3.391
 3.324   3.256   3.188   3.120   3.052   2.984   2.917   2.849   2.782   2.716
 2.649   2.583   2.517   2.451   2.385   2.319   2.254   2.188   2.122   2.056
 1.990   1.924   1.858   1.792   1.725   1.659   1.593   1.526   1.459   1.393
 1.326   1.259   1.192   1.125   1.059   0.992   0.924   0.857   0.790   0.723
 0.656   0.589   0.521   0.454   0.387   0.320   0.252   0.185   0.118   0.050
 0.000
14.613  14.548  14.460  14.370  14.278  14.183  14.087  13.988  13.886  13.783
13.677  13.570  13.461  13.351  13.241  13.130  13.020  12.911  12.804  12.700
12.601  12.505  12.416  12.334  12.258  11.729  10.745   9.774   8.817   7.872
 6.941   6.021   5.109   4.201   3.717   3.655   3.591   3.527   3.461   3.394
 3.326   3.258   3.189   3.121   3.052   2.984   2.916   2.848   2.781   2.714
 2.648   2.582   2.516   2.450   2.385   2.319   2.254   2.188   2.122   2.056
 1.990   1.924   1.858   1.792   1.726   1.660   1.593   1.527   1.460   1.393
 1.326   1.260   1.193   1.126   1.059   0.992   0.925   0.858   0.790   0.723
 0.656   0.589   0.522   0.454   0.387   0.320   0.252   0.185   0.118   0.050
 0.000
14.629  14.565  14.477  14.386  14.293  14.198  14.101  14.001  13.898  13.793
13.685  13.575  13.463  13.350  13.235  13.120  13.005  12.891  12.779  12.670
12.565  12.465  12.372  12.286  12.209  11.674  10.684   9.710   8.753   7.815
 6.893   5.985   5.088   4.196   3.721   3.660   3.596   3.532   3.465   3.398
 3.329   3.260   3.191   3.121   3.052   2.983   2.914   2.847   2.780   2.713
 2.647   2.581   2.515   2.450   2.384   2.319   2.254   2.188   2.122   2.057
 1.991   1.925   1.859   1.793   1.726   1.660   1.594   1.527   1.460   1.394
 1.327   1.260   1.193   1.126   1.059   0.992   0.925   0.858   0.791   0.724
 0.656   0.589   0.522   0.454   0.387   0.320   0.253   0.185   0.118   0.050
 0.000
14.648  14.584  14.495  14.405  14.312  14.216  14.118  14.016  13.912  13.805
13.695  13.582  13.467  13.349  13.229  13.109  12.988  12.868  12.750  12.635
12.524  12.419  12.321  12.231  12.151  11.608  10.608   9.628   8.672   7.740
 6.831   5.939   5.061   4.191   3.726   3.666   3.603   3.538   3.471   3.403
 3.333   3.263   3.192   3.121   3.051   2.981   2.913   2.845   2.778   2.711
 2.645   2.580   2.514   2.449   2.384   2.319   2.254   2.188   2.123   2.057
 1.991   1.926   1.860   1.793   1.727   1.661   1.594   1.528   1.461   1.394
```

```
 1.328   1.261   1.194   1.127   1.060   0.993   0.925   0.858   0.791   0.724
 0.657   0.589   0.522   0.455   0.387   0.320   0.253   0.185   0.118   0.051
 0.000
14.669  14.605  14.516  14.425  14.332  14.236  14.137  14.035  13.930  13.821
13.708  13.592  13.473  13.350  13.225  13.098  12.971  12.844  12.719  12.596
12.478  12.365  12.260  12.165  12.082  11.528  10.510   9.521   8.565   7.643
 6.750   5.880   5.027   4.183   3.733   3.674   3.611   3.546   3.478   3.409
 3.338   3.266   3.194   3.121   3.050   2.979   2.910   2.842   2.775   2.709
 2.643   2.578   2.513   2.449   2.384   2.319   2.254   2.189   2.123   2.058
 1.992   1.926   1.860   1.794   1.728   1.662   1.595   1.528   1.462   1.395
 1.328   1.261   1.194   1.127   1.060   0.993   0.926   0.859   0.791   0.724
 0.657   0.589   0.522   0.455   0.387   0.320   0.253   0.185   0.118   0.051
 0.000
14.693  14.628  14.540  14.449  14.355  14.259  14.160  14.057  13.951  13.840
13.725  13.605  13.481  13.353  13.222  13.089  12.954  12.819  12.685  12.553
12.426  12.304  12.191  12.088  11.999  11.428  10.385   9.382   8.426   7.516
 6.645   5.805   4.985   4.175   3.743   3.685   3.622   3.557   3.488   3.416
 3.343   3.269   3.195   3.121   3.047   2.976   2.906   2.838   2.771   2.706
 2.641   2.576   2.512   2.448   2.384   2.319   2.254   2.189   2.124   2.059
 1.993   1.927   1.861   1.795   1.729   1.662   1.596   1.529   1.462   1.396
 1.329   1.262   1.195   1.128   1.061   0.993   0.926   0.859   0.792   0.724
 0.657   0.590   0.522   0.455   0.388   0.320   0.253   0.185   0.118   0.051
 0.000
14.719  14.654  14.566  14.475  14.382  14.285  14.186  14.083  13.975  13.863
13.746  13.623  13.494  13.360  13.222  13.080  12.936  12.792  12.649  12.506
12.368  12.234  12.110  11.997  11.901  11.302  10.219   9.196   8.241   7.350
 6.510   5.709   4.931   4.165   3.756   3.699   3.637   3.570   3.499   3.426
 3.350   3.273   3.196   3.119   3.043   2.970   2.900   2.832   2.766   2.702
 2.638   2.575   2.511   2.447   2.384   2.319   2.255   2.190   2.125   2.060
 1.994   1.928   1.862   1.796   1.730   1.663   1.597   1.530   1.463   1.396
 1.330   1.263   1.196   1.128   1.061   0.994   0.927   0.859   0.792   0.725
 0.657   0.590   0.523   0.455   0.388   0.320   0.253   0.186   0.118   0.051
 0.000
14.747  14.682  14.594  14.504  14.410  14.315  14.215  14.113  14.005  13.892
13.773  13.647  13.513  13.371  13.224  13.073  12.920  12.765  12.610  12.456
12.304  12.157  12.017  11.889  11.781  11.137   9.992   8.942   7.994   7.132
 6.337   5.588   4.866   4.156   3.775   3.719   3.656   3.587   3.514   3.437
 3.358   3.277   3.196   3.116   3.037   2.962   2.891   2.825   2.760   2.697
 2.635   2.573   2.510   2.447   2.384   2.320   2.256   2.191   2.126   2.061
 1.995   1.929   1.863   1.797   1.731   1.664   1.598   1.531   1.464   1.397
 1.330   1.263   1.196   1.129   1.062   0.995   0.927   0.860   0.793   0.725
 0.658   0.590   0.523   0.455   0.388   0.321   0.253   0.186   0.118   0.051
 0.000
14.777  14.713  14.625  14.535  14.442  14.347  14.249  14.147  14.040  13.927
13.807  13.678  13.538  13.388  13.231  13.069  12.905  12.739  12.572  12.404
12.236  12.071  11.911  11.763  11.636  10.911   9.667   8.588   7.660   6.849
 6.119   5.441   4.790   4.148   3.801   3.746   3.681   3.609   3.532   3.451
 3.368   3.282   3.196   3.110   3.027   2.950   2.879   2.815   2.753   2.692
 2.632   2.571   2.510   2.447   2.384   2.321   2.257   2.192   2.128   2.062
 1.997   1.931   1.865   1.799   1.732   1.666   1.599   1.532   1.465   1.398
 1.331   1.264   1.197   1.130   1.062   0.995   0.928   0.860   0.793   0.726
 0.658   0.591   0.523   0.456   0.388   0.321   0.253   0.186   0.118   0.051
 0.000
14.809  14.745  14.658  14.568  14.477  14.383  14.286  14.186  14.081  13.970
13.851  13.720  13.574  13.412  13.241  13.067  12.891  12.713  12.534  12.351
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12.167  11.980  11.794  11.615  11.456  10.571   9.178   8.083   7.210   6.483
 5.848   5.265   4.706   4.146   3.839   3.782   3.713   3.636   3.554   3.468
 3.379   3.288   3.195   3.102   3.012   2.930   2.862   2.801   2.744   2.687
 2.629   2.570   2.510   2.448   2.386   2.323   2.259   2.194   2.129   2.064
 1.999   1.933   1.867   1.800   1.734   1.667   1.600   1.533   1.466   1.399
 1.332   1.265   1.198   1.130   1.063   0.996   0.928   0.861   0.794   0.726
 0.659   0.591   0.523   0.456   0.388   0.321   0.253   0.186   0.118   0.051
 0.000
14.844  14.780  14.693  14.604  14.514  14.422  14.327  14.229  14.128  14.021
13.905  13.777  13.626  13.444  13.256  13.068  12.879  12.690  12.498  12.301
12.098  11.888  11.670  11.446  11.231   9.968   8.391   7.356   6.612   6.026
 5.524   5.066   4.622   4.162   3.893   3.831   3.754   3.669   3.579   3.487
 3.392   3.295   3.194   3.091   2.989   2.896   2.836   2.785   2.735   2.683
 2.628   2.570   2.511   2.450   2.388   2.325   2.261   2.197   2.132   2.066
 2.001   1.935   1.868   1.802   1.735   1.669   1.602   1.535   1.468   1.401
 1.333   1.266   1.199   1.131   1.064   0.996   0.929   0.862   0.794   0.726
 0.659   0.591   0.524   0.456   0.389   0.321   0.254   0.186   0.118   0.051
 0.000
14.879  14.815  14.729  14.641  14.553  14.463  14.371  14.277  14.180  14.080
13.974  13.856  13.711  13.481  13.270  13.068  12.869  12.669  12.466  12.257
12.038  11.805  11.551  11.267  10.951   8.573   7.064   6.335   5.859   5.484
 5.157   4.854   4.553   4.223   3.977   3.895   3.802   3.705   3.608   3.509
 3.408   3.305   3.196   3.080   2.955   2.831   2.800   2.769   2.729   2.681
 2.629   2.572   2.513   2.453   2.391   2.328   2.264   2.199   2.134   2.069
 2.003   1.937   1.870   1.804   1.737   1.670   1.603   1.536   1.469   1.402
 1.334   1.267   1.200   1.132   1.065   0.997   0.930   0.862   0.795   0.727
 0.659   0.592   0.524   0.457   0.389   0.321   0.254   0.186   0.118   0.051
 0.000
14.916  14.852  14.766  14.680  14.593  14.505  14.417  14.327  14.237  14.145
14.053  13.961  13.880  13.631  13.317  13.048  12.791  12.533  12.268  11.986
11.675  11.313  10.847  10.128   8.629   6.255   5.939   5.656   5.402   5.169
 4.950   4.739   4.532   4.325   4.110   3.970   3.852   3.743   3.638   3.533
 3.428   3.319   3.205   3.079   2.921   2.671   2.763   2.762   2.730   2.685
 2.633   2.577   2.518   2.457   2.395   2.331   2.267   2.203   2.137   2.072
 2.005   1.939   1.873   1.806   1.739   1.672   1.605   1.538   1.470   1.403
 1.336   1.268   1.201   1.133   1.065   0.998   0.930   0.863   0.795   0.727
 0.660   0.592   0.524   0.457   0.389   0.321   0.254   0.186   0.118   0.051
 0.000
14.953  14.889  14.805  14.719  14.634  14.549  14.464  14.379  14.294  14.211
14.131  14.058  13.999  13.758  13.362  12.998  12.644  12.286  11.912  11.506
11.046  10.494   9.782   8.774   7.225   5.976   5.763   5.541   5.324   5.115
 4.915   4.720   4.530   4.345   4.169   4.022   3.895   3.778   3.666   3.558
 3.450   3.340   3.227   3.108   2.979   2.852   2.819   2.787   2.745   2.696
 2.642   2.584   2.524   2.463   2.400   2.336   2.271   2.206   2.141   2.075
 2.008   1.942   1.875   1.808   1.741   1.674   1.607   1.539   1.472   1.404
 1.337   1.269   1.202   1.134   1.066   0.999   0.931   0.863   0.796   0.728
 0.660   0.593   0.525   0.457   0.389   0.322   0.254   0.186   0.119   0.051
 0.000
14.990  14.927  14.843  14.759  14.675  14.592  14.510  14.429  14.350  14.274
14.203  14.140  14.089  13.832  13.376  12.936  12.501  12.056  11.589  11.080
10.508   9.836   9.012   7.962   6.613   5.751   5.596   5.420   5.237   5.054
 4.873   4.696   4.524   4.356   4.199   4.056   3.927   3.807   3.692   3.582
 3.473   3.365   3.255   3.145   3.037   2.939   2.874   2.820   2.767   2.712
 2.654   2.594   2.532   2.470   2.406   2.341   2.276   2.211   2.145   2.078
 2.012   1.945   1.878   1.810   1.743   1.676   1.608   1.541   1.473   1.406
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 1.338   1.270   1.203   1.135   1.067   0.999   0.932   0.864   0.796   0.728
 0.661   0.593   0.525   0.457   0.390   0.322   0.254   0.186   0.119   0.051
 0.000
15.028  14.964  14.881  14.798  14.716  14.635  14.556  14.478  14.404  14.333
14.267  14.209  14.161  13.882  13.372  12.870  12.367  11.849  11.305  10.719
10.069   9.330   8.467   7.450   6.265   5.572   5.449   5.306   5.150   4.990
 4.829   4.669   4.511   4.358   4.213   4.076   3.949   3.829   3.715   3.604
 3.496   3.390   3.285   3.181   3.083   2.993   2.919   2.853   2.791   2.730
 2.668   2.605   2.542   2.478   2.413   2.347   2.281   2.215   2.149   2.082
 2.015   1.948   1.880   1.813   1.745   1.678   1.610   1.543   1.475   1.407
 1.339   1.272   1.204   1.136   1.068   1.000   0.932   0.865   0.797   0.729
 0.661   0.593   0.526   0.458   0.390   0.322   0.254   0.186   0.119   0.051
 0.000
15.064  15.001  14.918  14.836  14.755  14.676  14.599  14.525  14.453  14.386
14.323  14.268  14.220  13.918  13.361  12.806  12.245  11.669  11.065  10.421
 9.721   8.945   8.078   7.105   6.033   5.427   5.324   5.203   5.069   4.928
 4.783   4.638   4.494   4.353   4.217   4.088   3.964   3.847   3.734   3.624
 3.518   3.414   3.312   3.213   3.119   3.032   2.954   2.882   2.814   2.748
 2.683   2.618   2.552   2.486   2.420   2.354   2.287   2.220   2.153   2.086
 2.018   1.951   1.883   1.816   1.748   1.680   1.612   1.544   1.476   1.408
 1.341   1.273   1.205   1.137   1.069   1.001   0.933   0.865   0.797   0.730
 0.662   0.594   0.526   0.458   0.390   0.322   0.254   0.187   0.119   0.051
 0.000
15.099  15.036  14.954  14.872  14.793  14.716  14.640  14.568  14.499  14.433
14.373  14.318  14.270  13.948  13.348  12.748  12.140  11.516  10.866  10.180
 9.447   8.654   7.792   6.858   5.862   5.309   5.218   5.112   4.994   4.868
 4.738   4.606   4.474   4.343   4.216   4.093   3.974   3.859   3.749   3.641
 3.537   3.435   3.336   3.240   3.149   3.063   2.983   2.907   2.836   2.766
 2.698   2.630   2.563   2.495   2.428   2.360   2.293   2.225   2.158   2.090
 2.022   1.954   1.886   1.818   1.750   1.682   1.614   1.546   1.478   1.410
 1.342   1.274   1.206   1.138   1.070   1.002   0.934   0.866   0.798   0.730
 0.662   0.594   0.526   0.458   0.390   0.323   0.255   0.187   0.119   0.051
 0.000
15.133  15.070  14.988  14.907  14.829  14.753  14.679  14.608  14.540  14.476
14.417  14.362  14.313  13.972  13.336  12.697  12.051  11.389  10.704   9.988
 9.233   8.431   7.578   6.675   5.729   5.210   5.128   5.033   4.927   4.813
 4.695   4.574   4.452   4.330   4.210   4.093   3.979   3.868   3.760   3.655
 3.553   3.454   3.357   3.263   3.174   3.088   3.007   2.929   2.855   2.783
 2.712   2.642   2.573   2.504   2.436   2.367   2.299   2.231   2.162   2.094
 2.026   1.957   1.889   1.821   1.753   1.684   1.616   1.548   1.480   1.411
 1.343   1.275   1.207   1.139   1.071   1.003   0.935   0.867   0.799   0.731
 0.663   0.595   0.527   0.459   0.391   0.323   0.255   0.187   0.119   0.051
 0.000
15.165  15.102  15.020  14.940  14.863  14.787  14.715  14.645  14.578  14.515
14.456  14.401  14.351  13.993  13.325  12.655  11.976  11.284  10.572   9.834
 9.065   8.259   7.415   6.535   5.624   5.127   5.051   4.964   4.867   4.764
 4.655   4.543   4.429   4.316   4.202   4.091   3.981   3.874   3.769   3.667
 3.567   3.469   3.375   3.283   3.194   3.109   3.027   2.948   2.872   2.798
 2.725   2.654   2.583   2.513   2.443   2.374   2.305   2.236   2.167   2.098
 2.029   1.961   1.892   1.823   1.755   1.686   1.618   1.550   1.481   1.413
 1.344   1.276   1.208   1.140   1.072   1.003   0.935   0.867   0.799   0.731
 0.663   0.595   0.527   0.459   0.391   0.323   0.255   0.187   0.119   0.051
 0.000
15.195  15.132  15.051  14.971  14.894  14.819  14.747  14.678  14.612  14.549
14.490  14.435  14.384  14.012  13.317  12.620  11.916  11.200  10.467   9.712
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 8.933   8.125   7.288   6.425   5.539   5.058   4.986   4.904   4.815   4.719
 4.618   4.514   4.407   4.300   4.193   4.086   3.981   3.877   3.775   3.675
 3.578   3.482   3.389   3.299   3.211   3.126   3.044   2.964   2.887   2.811
 2.737   2.664   2.593   2.521   2.451   2.381   2.311   2.241   2.171   2.102
 2.033   1.964   1.895   1.826   1.757   1.688   1.620   1.551   1.483   1.414
 1.346   1.277   1.209   1.141   1.072   1.004   0.936   0.868   0.800   0.732
 0.663   0.595   0.527   0.459   0.391   0.323   0.255   0.187   0.119   0.051
 0.000
15.223  15.160  15.079  15.000  14.923  14.849  14.777  14.708  14.643  14.580
14.521  14.465  14.413  14.029  13.312  12.593  11.867  11.132  10.382   9.615
 8.828   8.020   7.189   6.337   5.469   4.999   4.930   4.853   4.769   4.679
 4.585   4.487   4.386   4.284   4.182   4.080   3.979   3.878   3.780   3.682
 3.587   3.493   3.401   3.312   3.225   3.140   3.058   2.978   2.900   2.823
 2.748   2.674   2.601   2.529   2.458   2.387   2.316   2.246   2.176   2.106
 2.036   1.967   1.898   1.829   1.759   1.691   1.622   1.553   1.484   1.416
 1.347   1.278   1.210   1.142   1.073   1.005   0.937   0.868   0.800   0.732
 0.664   0.596   0.528   0.459   0.391   0.323   0.255   0.187   0.119   0.051
 0.000
15.249  15.186  15.105  15.026  14.949  14.876  14.804  14.736  14.670  14.608
14.548  14.492  14.439  14.045  13.309  12.572  11.829  11.078  10.315   9.539
 8.746   7.936   7.110   6.267   5.411   4.949   4.882   4.809   4.729   4.644
 4.554   4.462   4.366   4.269   4.172   4.073   3.976   3.878   3.782   3.687
 3.594   3.502   3.411   3.323   3.237   3.152   3.070   2.990   2.911   2.834
 2.758   2.683   2.609   2.537   2.464   2.393   2.321   2.251   2.180   2.110
 2.040   1.970   1.900   1.831   1.762   1.692   1.623   1.554   1.486   1.417
 1.348   1.280   1.211   1.142   1.074   1.006   0.937   0.869   0.801   0.732
 0.664   0.596   0.528   0.460   0.392   0.323   0.255   0.187   0.119   0.051
 0.000
15.272  15.210  15.128  15.050  14.973  14.900  14.829  14.760  14.695  14.632
14.572  14.516  14.462  14.060  13.308  12.556  11.799  11.035  10.262   9.478
 8.681   7.871   7.047   6.210   5.363   4.906   4.842   4.771   4.694   4.613
 4.528   4.439   4.348   4.255   4.161   4.067   3.972   3.877   3.784   3.691
 3.599   3.509   3.420   3.332   3.247   3.163   3.080   3.000   2.921   2.843
 2.766   2.691   2.617   2.543   2.470   2.398   2.326   2.255   2.184   2.113
 2.043   1.973   1.903   1.833   1.764   1.694   1.625   1.556   1.487   1.418
 1.349   1.281   1.212   1.143   1.075   1.006   0.938   0.869   0.801   0.733
 0.665   0.596   0.528   0.460   0.392   0.324   0.255   0.187   0.119   0.051
 0.000
15.293  15.231  15.150  15.071  14.995  14.921  14.850  14.782  14.716  14.653
14.593  14.536  14.482  14.073  13.309  12.544  11.775  11.002  10.221   9.430
 8.630   7.818   6.996   6.164   5.323   4.870   4.807   4.738   4.665   4.586
 4.504   4.419   4.332   4.242   4.151   4.060   3.968   3.876   3.784   3.693
 3.603   3.514   3.426   3.340   3.255   3.171   3.089   3.008   2.929   2.851
 2.774   2.698   2.623   2.549   2.476   2.403   2.331   2.259   2.188   2.117
 2.046   1.975   1.905   1.835   1.766   1.696   1.627   1.557   1.488   1.419
 1.350   1.281   1.213   1.144   1.075   1.007   0.938   0.870   0.802   0.733
 0.665   0.597   0.528   0.460   0.392   0.324   0.256   0.187   0.119   0.051
 0.000
15.312  15.249  15.168  15.090  15.014  14.940  14.869  14.801  14.735  14.672
14.612  14.554  14.499  14.085  13.310  12.535  11.757  10.976  10.188   9.393
 8.589   7.777   6.956   6.127   5.290   4.840   4.778   4.711   4.639   4.563
 4.484   4.402   4.317   4.230   4.142   4.053   3.964   3.874   3.784   3.695
 3.606   3.518   3.431   3.346   3.261   3.178   3.096   3.015   2.936   2.858
 2.780   2.704   2.629   2.554   2.480   2.407   2.335   2.262   2.191   2.119
 2.048   1.978   1.907   1.837   1.767   1.698   1.628   1.559   1.489   1.420
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```
 1.351   1.282   1.213   1.145   1.076   1.007   0.939   0.870   0.802   0.734
 0.665   0.597   0.529   0.460   0.392   0.324   0.256   0.188   0.119   0.051
 0.000
15.328  15.265  15.184  15.106  15.030  14.956  14.885  14.817  14.751  14.688
14.627  14.569  14.514  14.095  13.312  12.529  11.744  10.955  10.162   9.363
 8.557   7.744   6.924   6.097   5.263   4.815   4.754   4.688   4.618   4.544
 4.467   4.387   4.305   4.220   4.134   4.047   3.960   3.872   3.784   3.696
 3.608   3.522   3.436   3.351   3.267   3.184   3.102   3.021   2.942   2.863
 2.786   2.709   2.634   2.559   2.484   2.411   2.338   2.266   2.194   2.122
 2.051   1.980   1.909   1.839   1.769   1.699   1.629   1.560   1.490   1.421
 1.352   1.283   1.214   1.145   1.077   1.008   0.939   0.871   0.802   0.734
 0.666   0.597   0.529   0.461   0.392   0.324   0.256   0.188   0.119   0.051
 0.000
15.342  15.279  15.198  15.120  15.044  14.970  14.899  14.831  14.765  14.701
14.641  14.582  14.526  14.104  13.314  12.525  11.734  10.940  10.143   9.341
 8.533   7.719   6.899   6.073   5.242   4.795   4.734   4.669   4.600   4.528
 4.453   4.374   4.294   4.211   4.127   4.042   3.956   3.870   3.783   3.696
 3.610   3.524   3.439   3.354   3.271   3.188   3.107   3.026   2.946   2.868
 2.790   2.713   2.638   2.562   2.488   2.414   2.341   2.268   2.196   2.124
 2.053   1.982   1.911   1.840   1.770   1.700   1.630   1.561   1.491   1.422
 1.353   1.284   1.215   1.146   1.077   1.008   0.940   0.871   0.803   0.734
 0.666   0.597   0.529   0.461   0.392   0.324   0.256   0.188   0.119   0.051
 0.000
15.353  15.290  15.209  15.131  15.055  14.981  14.910  14.842  14.776  14.712
14.651  14.593  14.536  14.111  13.317  12.522  11.727  10.929  10.128   9.323
 8.514   7.699   6.879   6.054   5.224   4.779   4.718   4.654   4.586   4.515
 4.441   4.364   4.285   4.204   4.122   4.038   3.953   3.868   3.782   3.696
 3.611   3.526   3.441   3.357   3.274   3.192   3.110   3.030   2.950   2.872
 2.794   2.717   2.641   2.565   2.491   2.417   2.343   2.270   2.198   2.126
 2.054   1.983   1.912   1.842   1.771   1.701   1.631   1.561   1.492   1.423
 1.353   1.284   1.215   1.146   1.077   1.009   0.940   0.871   0.803   0.734
 0.666   0.598   0.529   0.461   0.393   0.324   0.256   0.188   0.119   0.051
 0.000
15.362  15.299  15.218  15.139  15.063  14.990  14.919  14.850  14.784  14.721
14.660  14.601  14.544  14.117  13.319  12.520  11.722  10.921  10.118   9.311
 8.500   7.685   6.864   6.040   5.211   4.767   4.706   4.643   4.576   4.505
 4.432   4.356   4.278   4.199   4.117   4.034   3.950   3.866   3.781   3.696
 3.612   3.527   3.443   3.359   3.277   3.194   3.113   3.033   2.953   2.874
 2.797   2.720   2.643   2.568   2.493   2.419   2.345   2.272   2.200   2.127
 2.056   1.984   1.913   1.843   1.772   1.702   1.632   1.562   1.493   1.423
 1.354   1.285   1.216   1.147   1.078   1.009   0.940   0.872   0.803   0.735
 0.666   0.598   0.529   0.461   0.393   0.324   0.256   0.188   0.119   0.051
 0.000
15.368  15.305  15.224  15.146  15.070  14.996  14.925  14.857  14.790  14.727
14.665  14.607  14.550  14.121  13.320  12.520  11.719  10.916  10.111   9.302
 8.490   7.674   6.854   6.030   5.202   4.758   4.698   4.635   4.568   4.498
 4.426   4.351   4.274   4.195   4.114   4.032   3.949   3.865   3.781   3.696
 3.612   3.528   3.444   3.361   3.278   3.196   3.115   3.035   2.955   2.876
 2.799   2.721   2.645   2.570   2.495   2.420   2.347   2.273   2.201   2.128
 2.057   1.985   1.914   1.843   1.773   1.702   1.632   1.563   1.493   1.423
 1.354   1.285   1.216   1.147   1.078   1.009   0.941   0.872   0.803   0.735
 0.666   0.598   0.529   0.461   0.393   0.324   0.256   0.188   0.120   0.051
 0.000
15.372  15.309  15.228  15.149  15.073  15.000  14.929  14.860  14.794  14.730
14.669  14.610  14.553  14.124  13.322  12.519  11.717  10.913  10.107   9.297
```

```
  8.484   7.668   6.848   6.024   5.196   4.753   4.693   4.630   4.563   4.494
  4.422   4.347   4.271   4.192   4.112   4.030   3.948   3.864   3.780   3.696
  3.612   3.528   3.445   3.362   3.279   3.197   3.116   3.036   2.956   2.878
  2.800   2.723   2.646   2.571   2.496   2.421   2.347   2.274   2.201   2.129
  2.057   1.986   1.915   1.844   1.773   1.703   1.633   1.563   1.493   1.424
  1.354   1.285   1.216   1.147   1.078   1.009   0.941   0.872   0.803   0.735
  0.666   0.598   0.530   0.461   0.393   0.324   0.256   0.188   0.120   0.051
  0.000
 15.373  15.310  15.229  15.150  15.074  15.001  14.930  14.861  14.795  14.731
 14.670  14.611  14.554  14.125  13.322  12.519  11.716  10.911  10.105   9.295
  8.482   7.666   6.846   6.022   5.195   4.751   4.692   4.629   4.562   4.493
  4.421   4.347   4.270   4.191   4.111   4.030   3.947   3.864   3.780   3.696
  3.612   3.529   3.445   3.362   3.279   3.198   3.116   3.036   2.957   2.878
  2.800   2.723   2.646   2.571   2.496   2.421   2.348   2.274   2.201   2.129
  2.057   1.986   1.915   1.844   1.773   1.703   1.633   1.563   1.493   1.424
  1.354   1.285   1.216   1.147   1.078   1.009   0.941   0.872   0.803   0.735
  0.666   0.598   0.530   0.461   0.393   0.324   0.256   0.188   0.120   0.051
  0.000
```

OBS file (obs.dat):

```
# OBS file for MODFLOW-2000, UNC1NLI1 Report Example
Example        1
```

HOB file (hob.dat):

```
# HOBS file for MODFLOW-2000, UNC1NLI1 Report Example
 36  0  0
 1  1
F1    1  37  13  1  0  0  0  14.88  7.2928  0  1    1
F2    1  30  13  1  0  0  0  14.78  6.9068  0  1    1
F3    1  25  13  1  0  0  0  14.86  6.6802  0  1    1
F4    1  20  13  1  0  0  0  13.87  6.9935  0  1    1
F5    1  14  13  1  0  0  0  13.01  7.2859  0  1    1
F6    1   8  13  1  0  0  0  12.97  7.4680  0  1    1
F7    1  37  26  1  0  0  0   5.61  6.4327  0  1    1
F8    1  30  26  1  0  0  0   5.63  6.6651  0  1    1
F9    1  25  26  1  0  0  0   5.94  6.8781  0  1    1
F10   1  20  26  1  0  0  0   8.83  7.2128  0  1    1
F11   1  14  26  1  0  0  0  11.08  7.1766  0  1    1
F12   1   8  26  1  0  0  0  11.35  7.3150  0  1    1
F13   1  37  39  1  0  0  0    3.7  6.4067  0  1    1
F14   1  30  39  1  0  0  0   3.75  6.4828  0  1    1
F15   1  25  39  1  0  0  0   3.52  6.1912  0  1    1
F16   1  20  39  1  0  0  0   3.35  6.0780  0  1    1
F17   1  14  39  1  0  0  0   3.42  6.3866  0  1    1
F18   1   8  39  1  0  0  0   3.71  6.2947  0  1    1
F19   1  37  52  1  0  0  0   2.37  5.4804  0  1    1
F20   1  30  52  1  0  0  0   1.91  5.3105  0  1    1
F21   1  25  52  1  0  0  0   1.76  5.2649  0  1    1
F22   1  20  52  1  0  0  0   1.96  5.3133  0  1    1
F23   1  14  52  1  0  0  0   1.82  5.4639  0  1    1
F24   1   8  52  1  0  0  0   2.06  5.4263  0  1    1
```

```
F25  1  37  65  1  0  0  0   1.54  4.2383  0  1    1
F26  1  30  65  1  0  0  0   1.66  4.2794  0  1    1
F27  1  25  65  1  0  0  0   1.78  4.2922  0  1    1
F28  1  20  65  1  0  0  0   1.54  4.2612  0  1    1
F29  1  14  65  1  0  0  0    1.7  4.3214  0  1    1
F30  1   8  65  1  0  0  0   1.55  4.4493  0  1    1
F31  1  37  78  1  0  0  0    .94  1.5312  0  1    1
F32  1  30  78  1  0  0  0   1.41  1.9728  0  1    1
F33  1  25  78  1  0  0  0   1.22  1.9722  0  1    1
F34  1  20  78  1  0  0  0   1.47  2.0206  0  1    1
F35  1  14  78  1  0  0  0   1.08  2.1253  0  1    1
F36  1   8  78  1  0  0  0    .88  2.0226  0  1    1
```

PES file (pes.dat):

```
# PES file for MODFLOW-2000, UNC1NLI1 Report Example
#
 50  2  .01  0                    Item 1
 0  0  0  0  0  0  .001  1.5  0  Item 2
 1  0  0                         Item 3
  .08  0  1                      Item 4
 0  0  0                         Item 5
```

SEN file (sen.dat):

```
# SEN file for MODFLOW-2000, UNC1NLI1 Report Example
#
 2  0  0  2                          Item 1
 1  0   0  0                         Item 2
HK_1 1  1   1.00000  .01  100  1E-10  Item 3
HK_2 1  1   1.00000  .01  100  1E-10  Item 3
```

Parameter Estimation – GLOBAL Output File

GLOBAL Output File (mf2k.global_listing):

```
      U.S. GEOLOGICAL SURVEY MODULAR FINITE-DIFFERENCE GROUND-WATER FLOW MODEL
                          VERSION 1.6SC1 ¨25/02/2003


 This model run produced both GLOBAL and LIST files.  This is the GLOBAL file.

 GLOBAL LISTING FILE: mf2k.global_listing
                         UNIT   4

 OPENING output.dat
 FILE TYPE:LIST   UNIT   3   STATUS:REPLACE
 FORMAT:FORMATTED             ACCESS:SEQUENTIAL

 OPENING discret.dat
 FILE TYPE:DIS   UNIT  95   STATUS:OLD
 FORMAT:FORMATTED             ACCESS:SEQUENTIAL

 OPENING bas6.dat
 FILE TYPE:BAS6   UNIT   1   STATUS:OLD
 FORMAT:FORMATTED             ACCESS:SEQUENTIAL

 OPENING zone.dat
 FILE TYPE:ZONE   UNIT  93   STATUS:OLD
 FORMAT:FORMATTED             ACCESS:SEQUENTIAL

 OPENING multiple.dat
 FILE TYPE:MULT   UNIT  94   STATUS:OLD
 FORMAT:FORMATTED             ACCESS:SEQUENTIAL

 OPENING lpf6.dat
 FILE TYPE:LPF   UNIT  31   STATUS:OLD
 FORMAT:FORMATTED             ACCESS:SEQUENTIAL

 OPENING rech6.dat
 FILE TYPE:RCH   UNIT  11   STATUS:OLD
 FORMAT:FORMATTED             ACCESS:SEQUENTIAL

 OPENING wel6.dat
 FILE TYPE:WEL   UNIT  12   STATUS:OLD
 FORMAT:FORMATTED             ACCESS:SEQUENTIAL

 OPENING pcg2.dat
 FILE TYPE:PCG   UNIT  23   STATUS:OLD
 FORMAT:FORMATTED             ACCESS:SEQUENTIAL

 OPENING oc.dat
 FILE TYPE:OC   UNIT  22   STATUS:OLD
 FORMAT:FORMATTED             ACCESS:SEQUENTIAL
```

```
 OPENING inithead.dat
 FILE TYPE:DATA   UNIT  10   STATUS:UNKNOWN
 FORMAT:FORMATTED              ACCESS:SEQUENTIAL

 OPENING obs.dat
 FILE TYPE:OBS   UNIT  40   STATUS:OLD
 FORMAT:FORMATTED              ACCESS:SEQUENTIAL

 OPENING hob.dat
 FILE TYPE:HOB   UNIT  41   STATUS:OLD
 FORMAT:FORMATTED              ACCESS:SEQUENTIAL

 OPENING pes.dat
 FILE TYPE:PES   UNIT  47   STATUS:OLD
 FORMAT:FORMATTED              ACCESS:SEQUENTIAL

 OPENING sen.dat
 FILE TYPE:SEN   UNIT  46   STATUS:OLD
 FORMAT:FORMATTED              ACCESS:SEQUENTIAL
#UNC           60 unc.dat
#DATA           61 ci-res.dat
 THE FREE FORMAT OPTION HAS BEEN SELECTED

 DISCRETIZATION INPUT DATA READ FROM UNIT 95
 # Discretization file for MODFLOW-2000, UNC1NLI1 Report Example
    1 LAYERS        41 ROWS        91 COLUMNS
   1 STRESS PERIOD(S) IN SIMULATION
 MODEL TIME UNIT IS SECONDS
 MODEL LENGTH UNIT IS UNDEFINED
 THE GROUND-WATER TRANSPORT PROCESS IS INACTIVE

 THE OBSERVATION PROCESS IS ACTIVE
 THE SENSITIVITY PROCESS IS ACTIVE
 THE PARAMETER-ESTIMATION PROCESS IS ACTIVE

 MODE: PARAMETER ESTIMATION


 ZONE OPTION, INPUT READ FROM UNIT 93
 # Zone file for MODFLOW-2000, UNC1NLI1 Report Example
     2 ZONE ARRAYS

 MULTIPLIER OPTION, INPUT READ FROM UNIT 94
 # Multiplier file for MODFLOW-2000, UNC1NLI1 Report Example
   2 MULTIPLIER ARRAYS
  Confining bed flag for each layer:
   0

      41173  ELEMENTS OF GX ARRAY USED OUT OF      41173
       3731  ELEMENTS OF GZ ARRAY USED OUT OF       3731
      11193  ELEMENTS OF IG ARRAY USED OUT OF      11193



                              DELR
```

```
READING ON UNIT  95 WITH FORMAT: (16G5.0)



                             DELC
READING ON UNIT  95 WITH FORMAT: (16G5.0)

TOP ELEVATION OF LAYER 1 =   1.00000

  MODEL LAYER BOTTOM EL. =   0.00000     FOR LAYER   1


STRESS PERIOD     LENGTH       TIME STEPS     MULTIPLIER FOR DELT    SS FLAG
------------------------------------------------------------------------------
       1         1.000000          1                    1.000         SS

STEADY-STATE SIMULATION



 MULT. ARRAY: HK1        =   1.00000

 MULT. ARRAY: VK1        =   1.00000



           ZONE ARRAY: ZHK1
READING ON UNIT  93 WITH FORMAT: (91I1)

  ZONE ARRAY: ZVK1       =            999

LPF1 -- LAYER PROPERTY FLOW PACKAGE, VERSION 1, 1/11/2000
        INPUT READ FROM UNIT 31
# Layer-Property Flow file for MODFLOW-2000, UNC1NLI1 Report Example
HEAD AT CELLS THAT CONVERT TO DRY=   999.00
    3 Named Parameters

  LAYER FLAGS:
LAYER       LAYTYP        LAYAVG         CHANI        LAYVKA        LAYWET
------------------------------------------------------------------------------
   1             0             0     1.000E+00             0             0

  INTERPRETATION OF LAYER FLAGS:
                       INTERBLOCK     HORIZONTAL    DATA IN
        LAYER TYPE   TRANSMISSIVITY   ANISOTROPY   ARRAY VKA   WETTABILITY
LAYER      (LAYTYP)      (LAYAVG)       (CHANI)      (LAYVKA)      (LAYWET)
------------------------------------------------------------------------------
   1      CONFINED      HARMONIC     1.000E+00    VERTICAL K  NON-WETTABLE

      7462 ELEMENTS IN X ARRAY ARE USED BY LPF
         6 ELEMENTS IN IX ARRAY ARE USED BY LPF

PCG2 -- CONJUGATE GRADIENT SOLUTION PACKAGE, VERSION 2.4, 12/29/98
MAXIMUM OF     50 CALLS OF SOLUTION ROUTINE
```

```
MAXIMUM OF     30 INTERNAL ITERATIONS PER CALL TO SOLUTION ROUTINE
MATRIX PRECONDITIONING TYPE :    1
     14193 ELEMENTS IN X ARRAY ARE USED BY PCG
     10500 ELEMENTS IN IX ARRAY ARE USED BY PCG
      7462 ELEMENTS IN Z ARRAY ARE USED BY PCG

SEN1BAS6 -- SENSITIVITY PROCESS, VERSION 1.0, 10/15/98
INPUT READ FROM UNIT  46
# SEN file for MODFLOW-2000, UNC1NLI1 Report Example
#

NUMBER OF PARAMETER VALUES TO BE READ FROM SEN FILE:    2
ISENALL.....................................:    0
SENSITIVITIES WILL BE STORED IN MEMORY
FOR UP TO   2 PARAMETERS

      3745 ELEMENTS IN X ARRAY ARE USED FOR SENSITIVITIES
      3731 ELEMENTS IN Z ARRAY ARE USED FOR SENSITIVITIES
         4 ELEMENTS IN IX ARRAY ARE USED FOR SENSITIVITIES

PES1BAS6 -- PARAMETER-ESTIMATION PROCESS, VERSION 1.0, 07/22/99
INPUT READ FROM UNIT  47
# PES file for MODFLOW-2000, UNC1NLI1 Report Example
#

MAXIMUM NUMBER OF PARAMETER-ESTIMATION ITERATIONS (MAX-ITER)  =    50
MAXIMUM PARAMETER CORRECTION (MAX-CHANGE) ------------------- =  2.0000
CLOSURE CRITERION (TOL) ------------------------------------- = 0.10000E-01
SUM OF SQUARES CLOSURE CRITERION (SOSC) --------------------- =  0.0000

FLAG TO GENERATE INPUT NEEDED BY BEALE-2000 (IBEFLG) -------- =     0
FLAG TO GENERATE INPUT NEEDED BY YCINT-2000 (IYCFLG) -------- =     0
OMIT PRINTING TO SCREEN (IF = 1) (IOSTAR) ------------------- =     0
ADJUST GAUSS-NEWTON MATRIX WITH NEWTON UPDATES (IF = 1)(NOPT) =     0
NUMBER OF FLETCHER-REEVES ITERATIONS (NFIT) ----------------- =     0
CRITERION FOR ADDING MATRIX R (SOSR) ------------------------ =  0.0000
VALUE USED TO INCREMENT MARQUARDT PARAMETER (RMAR) ---------- = 0.10000E-02
MARQUARDT PARAMETER MULTIPLIER (RMARM) ---------------------- =  1.5000
APPLY MAX-CHANGE IN REGRESSION SPACE (IF = 1) (IAP) --------- =     0

FORMAT CODE FOR COVARIANCE AND CORRELATION MATRICES (IPRCOV)  =     1
PRINT PARAMETER-ESTIMATION STATISTICS
    EACH ITERATION (IF > 0)  (IPRINT) ----------------------- =     0
PRINT EIGENVALUES AND EIGENVECTORS OF
    COVARIANCE MATRIX (IF > 0)  (LPRINT) -------------------- =     0

SEARCH DIRECTION ADJUSTMENT PARAMETER (CSA) ----------------- = 0.80000E-01
MODIFY CONVERGENCE CRITERIA (IF > 0) (FCONV) ---------------- =  0.0000
CALCULATE SENSITIVITIES USING FINAL
    PARAMETER ESTIMATES (IF > 0) (LASTX) -------------------- =     1

NUMBER OF USUALLY POS. PARAMETERS THAT MAY BE NEGATIVE (NPNG) =     0
NUMBER OF PARAMETERS WITH CORRELATED PRIOR INFORMATION (IPR)  =     0
NUMBER OF PRIOR-INFORMATION EQUATIONS (MPR) ----------------- =     0
```

```
   479 ELEMENTS IN X ARRAY ARE USED FOR PARAMETER ESTIMATION
    81 ELEMENTS IN Z ARRAY ARE USED FOR PARAMETER ESTIMATION
    52 ELEMENTS IN IX ARRAY ARE USED FOR PARAMETER ESTIMATION

OBS1BAS6 -- OBSERVATION PROCESS, VERSION 1.0, 4/27/99
INPUT READ FROM UNIT  40
# OBS file for MODFLOW-2000, UNC1NLI1 Report Example
OBSERVATION GRAPH-DATA OUTPUT FILES
WILL BE PRINTED AND NAMED USING THE BASE: Example
DIMENSIONLESS SCALED OBSERVATION SENSITIVITIES WILL BE PRINTED

HEAD OBSERVATIONS -- INPUT READ FROM UNIT  41
# HOBS file for MODFLOW-2000, UNC1NLI1 Report Example

NUMBER OF HEADS.....................................:   36
  NUMBER OF MULTILAYER HEADS........................:    0
  MAXIMUM NUMBER OF LAYERS FOR MULTILAYER HEADS....:    0

    718 ELEMENTS IN X ARRAY ARE USED FOR OBSERVATIONS
      2 ELEMENTS IN Z ARRAY ARE USED FOR OBSERVATIONS
    363 ELEMENTS IN IX ARRAY ARE USED FOR OBSERVATIONS

COMMON ERROR VARIANCE FOR ALL OBSERVATIONS SET TO:       1.000

     26597  ELEMENTS OF X ARRAY USED OUT OF      26597
     11276  ELEMENTS OF Z ARRAY USED OUT OF      11276
     10925  ELEMENTS OF IX ARRAY USED OUT OF      10925
      7462  ELEMENTS OF XHS ARRAY USED OUT OF       7462

INFORMATION ON PARAMETERS LISTED IN SEN FILE
                                          LOWER         UPPER       ALTERNATE
                       VALUE IN SEN   REASONABLE    REASONABLE     SCALING
   NAME     ISENS  LN   INPUT FILE      LIMIT         LIMIT         FACTOR
----------  -----  --  ------------  ------------  ------------  ------------
HK_1          1     1    1.0000       0.10000E-01    100.00       0.10000E-09
HK_2          1     1    1.0000       0.10000E-01    100.00       0.10000E-09
-------------------------------------------------------------------------------
FOR THE PARAMETERS LISTED IN THE TABLE ABOVE, PARAMETER VALUES IN INDIVIDUAL
PACKAGE INPUT FILES ARE REPLACED BY THE VALUES FROM THE SEN INPUT FILE.  THE
ALTERNATE SCALING FACTOR IS USED TO SCALE SENSITIVITIES IF IT IS LARGER THAN
THE PARAMETER VALUE IN ABSOLUTE VALUE AND THE PARAMETER IS NOT LOG-TRANSFORMED.

ISENS IS GREATER THAN ZERO FOR    2 PARAMETERS

HEAD OBSERVATION VARIANCES ARE MULTIPLIED BY:       1.000

OBSERVED HEAD DATA -- TIME OFFSETS ARE MULTIPLIED BY:   1.0000

                  REFER.
      OBSERVATION  STRESS    TIME                                STATISTIC   PLOT
 OBS#    NAME      PERIOD   OFFSET    OBSERVATION  STATISTIC     TYPE      SYM.
    1 F1              1    0.000       14.88       729.3      VARIANCE       1
    2 F2              1    0.000       14.78       690.7      VARIANCE       1
    3 F3              1    0.000       14.86       668.0      VARIANCE       1
    4 F4              1    0.000       13.87       699.3      VARIANCE       1
```

5	F5	1	0.000	13.01	728.6	VARIANCE	1
6	F6	1	0.000	12.97	746.8	VARIANCE	1
7	F7	1	0.000	5.610	643.3	VARIANCE	1
8	F8	1	0.000	5.630	666.5	VARIANCE	1
9	F9	1	0.000	5.940	687.8	VARIANCE	1
10	F10	1	0.000	8.830	721.3	VARIANCE	1
11	F11	1	0.000	11.08	717.7	VARIANCE	1
12	F12	1	0.000	11.35	731.5	VARIANCE	1
13	F13	1	0.000	3.700	640.7	VARIANCE	1
14	F14	1	0.000	3.750	648.3	VARIANCE	1
15	F15	1	0.000	3.520	619.1	VARIANCE	1
16	F16	1	0.000	3.350	607.8	VARIANCE	1
17	F17	1	0.000	3.420	638.7	VARIANCE	1
18	F18	1	0.000	3.710	629.5	VARIANCE	1
19	F19	1	0.000	2.370	548.0	VARIANCE	1
20	F20	1	0.000	1.910	531.0	VARIANCE	1
21	F21	1	0.000	1.760	526.5	VARIANCE	1
22	F22	1	0.000	1.960	531.3	VARIANCE	1
23	F23	1	0.000	1.820	546.4	VARIANCE	1
24	F24	1	0.000	2.060	542.6	VARIANCE	1
25	F25	1	0.000	1.540	423.8	VARIANCE	1
26	F26	1	0.000	1.660	427.9	VARIANCE	1
27	F27	1	0.000	1.780	429.2	VARIANCE	1
28	F28	1	0.000	1.540	426.1	VARIANCE	1
29	F29	1	0.000	1.700	432.1	VARIANCE	1
30	F30	1	0.000	1.550	444.9	VARIANCE	1
31	F31	1	0.000	0.9400	153.1	VARIANCE	1
32	F32	1	0.000	1.410	197.3	VARIANCE	1
33	F33	1	0.000	1.220	197.2	VARIANCE	1
34	F34	1	0.000	1.470	202.1	VARIANCE	1
35	F35	1	0.000	1.080	212.5	VARIANCE	1
36	F36	1	0.000	0.8800	202.3	VARIANCE	1

OBS#	OBSERVATION NAME	LAY	ROW	COL	ROW OFFSET	COL OFFSET	HEAD CHANGE REFERENCE OBSERVATION (IF > 0)
1	F1	1	37	13	0.000	0.000	0
2	F2	1	30	13	0.000	0.000	0
3	F3	1	25	13	0.000	0.000	0
4	F4	1	20	13	0.000	0.000	0
5	F5	1	14	13	0.000	0.000	0
6	F6	1	8	13	0.000	0.000	0
7	F7	1	37	26	0.000	0.000	0
8	F8	1	30	26	0.000	0.000	0
9	F9	1	25	26	0.000	0.000	0
10	F10	1	20	26	0.000	0.000	0
11	F11	1	14	26	0.000	0.000	0
12	F12	1	8	26	0.000	0.000	0
13	F13	1	37	39	0.000	0.000	0
14	F14	1	30	39	0.000	0.000	0
15	F15	1	25	39	0.000	0.000	0
16	F16	1	20	39	0.000	0.000	0
17	F17	1	14	39	0.000	0.000	0
18	F18	1	8	39	0.000	0.000	0

```
   19  F19             1   37   52   0.000   0.000        0
   20  F20             1   30   52   0.000   0.000        0
   21  F21             1   25   52   0.000   0.000        0
   22  F22             1   20   52   0.000   0.000        0
   23  F23             1   14   52   0.000   0.000        0
   24  F24             1    8   52   0.000   0.000        0
   25  F25             1   37   65   0.000   0.000        0
   26  F26             1   30   65   0.000   0.000        0
   27  F27             1   25   65   0.000   0.000        0
   28  F28             1   20   65   0.000   0.000        0
   29  F29             1   14   65   0.000   0.000        0
   30  F30             1    8   65   0.000   0.000        0
   31  F31             1   37   78   0.000   0.000        0
   32  F32             1   30   78   0.000   0.000        0
   33  F33             1   25   78   0.000   0.000        0
   34  F34             1   20   78   0.000   0.000        0
   35  F35             1   14   78   0.000   0.000        0
   36  F36             1    8   78   0.000   0.000        0


                                 SOLUTION BY THE CONJUGATE-GRADIENT METHOD
                                -----------------------------------------
                  MAXIMUM NUMBER OF CALLS TO PCG ROUTINE =       50
                      MAXIMUM ITERATIONS PER CALL TO PCG =       30
                              MATRIX PRECONDITIONING TYPE =        1
       RELAXATION FACTOR (ONLY USED WITH PRECOND. TYPE 1) =    0.10000E+01
PARAMETER OF POLYNOMIAL PRECOND. = 2 (2) OR IS CALCULATED :        1
                        HEAD CHANGE CRITERION FOR CLOSURE =    0.10000E-02
                   RESIDUAL CHANGE CRITERION FOR CLOSURE =    0.10000E-02
           PCG HEAD AND RESIDUAL CHANGE PRINTOUT INTERVAL =        1
    PRINTING FROM SOLVER IS LIMITED(1) OR SUPPRESSED (>1) =        0
                                       DAMPING PARAMETER =    0.10000E+01

CONVERGENCE CRITERIA FOR SENSITIVITIES
PARAMETER      HCLOSE        RCLOSE
----------  ------------  ------------
HK_1         0.10000E-04   0.10000E-04
HK_2         0.10000E-04   0.10000E-04
-------------------------------------

WETTING CAPABILITY IS NOT ACTIVE IN ANY LAYER

PARAMETERS DEFINED IN THE LPF PACKAGE

PARAMETER NAME:HK_1         TYPE:HK     CLUSTERS:   1
Parameter value from package file is:    1.0000
               LAYER:  1    MULTIPLIER ARRAY: HK1    ZONE ARRAY: ZHK1
               ZONE VALUES:    1

PARAMETER NAME:HK_2         TYPE:HK     CLUSTERS:   1
Parameter value from package file is:    1.0000
               LAYER:  1    MULTIPLIER ARRAY: HK1    ZONE ARRAY: ZHK1
               ZONE VALUES:    2
```

```
 PARAMETER NAME:VK_0         TYPE:VK     CLUSTERS:   1
 Parameter value from package file is:    1.0000
               LAYER:  1    MULTIPLIER ARRAY: VK1    ZONE ARRAY: ZVK1
               ZONE VALUES:  999

    HYD. COND. ALONG ROWS FOR LAYER   1 WILL BE DEFINED BY PARAMETERS
 (PRINT FLAG=  31)

      VERTICAL HYD. COND. FOR LAYER   1 WILL BE DEFINED BY PARAMETERS
 (PRINT FLAG=  31)


     1 Well parameters

 PARAMETER NAME:WEL_0_1      TYPE:Q
 Parameter value from package file is:    1.0000
   NUMBER OF ENTRIES:      1

 WELL NO.  LAYER   ROW   COL   STRESS FACTOR
 ----------------------------------------------
      1      1     21     46      -1.000


     0 Recharge parameters

   4 PARAMETERS HAVE BEEN DEFINED IN ALL PACKAGES.
 (SPACE IS ALLOCATED FOR  500 PARAMETERS.)

OBSERVATION SENSITIVITY TABLE(S) FOR PARAMETER-ESTIMATION ITERATION     1

 DIMENSIONLESS SCALED SENSITIVITIES (SCALED BY B*(WT**.5))

         PARAMETER:   HK_1        HK_2
 OBS #  OBSERVATION
     1  F1            -0.261      -0.556E-01
     2  F2            -0.269      -0.564E-01
     3  F3            -0.275      -0.557E-01
     4  F4            -0.275      -0.482E-01
     5  F5            -0.274      -0.425E-01
     6  F6            -0.272      -0.408E-01
     7  F7            -0.270      -0.346E-02
     8  F8            -0.263      -0.518E-02
     9  F9            -0.255      -0.899E-02
    10  F10           -0.236      -0.218E-01
    11  F11           -0.226      -0.324E-01
    12  F12           -0.221      -0.350E-01
    13  F13           -0.209      -0.244E-02
    14  F14           -0.206      -0.228E-02
    15  F15           -0.210      -0.158E-02
    16  F16           -0.213       0.431E-03
    17  F17           -0.212       0.221E-02
    18  F18           -0.215       0.245E-02
    19  F19           -0.165      -0.106E-02
    20  F20           -0.166      -0.771E-03
    21  F21           -0.165      -0.381E-03
```

```
   22  F22           -0.164       0.100E-03
   23  F23           -0.164       0.625E-03
   24  F24           -0.168       0.968E-03
   25  F25           -0.124      -0.433E-03
   26  F26           -0.123      -0.296E-03
   27  F27           -0.123      -0.141E-03
   28  F28           -0.124       0.364E-04
   29  F29           -0.123       0.238E-03
   30  F30           -0.122       0.379E-03
   31  F31           -0.102      -0.229E-03
   32  F32           -0.900E-01  -0.138E-03
   33  F33           -0.900E-01  -0.656E-04
   34  F34           -0.890E-01   0.165E-04
   35  F35           -0.869E-01   0.107E-03
   36  F36           -0.892E-01   0.178E-03

       COMPOSITE SCALED SENSITIVITIES ((SUM OF THE SQUARED VALUES)/ND)**.5
                      0.196       0.224E-01

 PARAMETER    COMPOSITE SCALED SENSITIVITY
 ----------   ----------------------------
 HK_1           1.95517E-01
 HK_2           2.24057E-02

STARTING VALUES OF REGRESSION PARAMETERS :

  HK_1         HK_2

   1.000        1.000

SUMS OF SQUARED, WEIGHTED RESIDUALS:
  ALL DEPENDENT VARIABLES:  0.40901
  DEP. VARIABLES PLUS PARAMETERS:  0.40901

-----------------------------------------------------------------------
PARAMETER VALUES AND STATISTICS FOR ALL PARAMETER-ESTIMATION ITERATIONS
-----------------------------------------------------------------------

    MODIFIED GAUSS-NEWTON CONVERGES IF THE ABSOLUTE VALUE OF THE MAXIMUM
FRACTIONAL PARAMETER CHANGE (MAX CALC. CHANGE) IS LESS THAN TOL OR IF THE
SUM OF SQUARED, WEIGHTED RESIDUALS CHANGES LESS THAN SOSC OVER TWO
PARAMETER-ESTIMATION ITERATIONS.

MODIFIED GAUSS-NEWTON PROCEDURE FOR PARAMETER-ESTIMATION ITERATION NO. =     1

VALUES FROM SOLVING THE NORMAL EQUATION :
  MARQUARDT PARAMETER ------------------- =  0.0000
  MAX. FRAC. PAR. CHANGE (TOL= 0.100E-01) = -.99783
       OCCURRED FOR PARAMETER  "HK_2      " TYPE N

CALCULATION OF DAMPING PARAMETER
  MAX-CHANGE SPECIFIED:   2.0       USED:   2.0
  OSCILL. CONTROL FACTOR (1, NO EFFECT)-- =  1.0000
  DAMPING PARAMETER (RANGE 0 TO 1) ------ =  1.0000
       CONTROLLED BY PARAMETER "HK_2      " TYPE N
```

```
UPDATED ESTIMATES OF REGRESSION PARAMETERS :

  HK_1         HK_2

   1.404       2.1694E-03

SUMS OF SQUARED, WEIGHTED RESIDUALS:
  ALL DEPENDENT VARIABLES:   1022.7
  DEP. VARIABLES PLUS PARAMETERS:   1022.7

MODIFIED GAUSS-NEWTON PROCEDURE FOR PARAMETER-ESTIMATION ITERATION NO. =     2

VALUES FROM SOLVING THE NORMAL EQUATION :
  MARQUARDT PARAMETER ------------------- =  0.0000
  MAX. FRAC. PAR. CHANGE (TOL= 0.100E-01) =  1.6663
       OCCURRED FOR PARAMETER  "HK_2      " TYPE P

CALCULATION OF DAMPING PARAMETER
  MAX-CHANGE SPECIFIED:   2.0       USED:   2.0
  OSCILL. CONTROL FACTOR (1, NO EFFECT)-- = 0.98277
  DAMPING PARAMETER (RANGE 0 TO 1) ------ = 0.98277
       CONTROLLED BY PARAMETER "HK_2      " TYPE P

UPDATED ESTIMATES OF REGRESSION PARAMETERS :

  HK_1         HK_2

   1.476       5.6874E-03

SUMS OF SQUARED, WEIGHTED RESIDUALS:
  ALL DEPENDENT VARIABLES:   139.07
  DEP. VARIABLES PLUS PARAMETERS:   139.07

MODIFIED GAUSS-NEWTON PROCEDURE FOR PARAMETER-ESTIMATION ITERATION NO. =     3

VALUES FROM SOLVING THE NORMAL EQUATION :
  MARQUARDT PARAMETER ------------------- =  0.0000
  MAX. FRAC. PAR. CHANGE (TOL= 0.100E-01) =  1.5827
       OCCURRED FOR PARAMETER  "HK_2      " TYPE P

CALCULATION OF DAMPING PARAMETER
  MAX-CHANGE SPECIFIED:   2.0       USED:   2.0
  OSCILL. CONTROL FACTOR (1, NO EFFECT)-- =  1.0000
  DAMPING PARAMETER (RANGE 0 TO 1) ------ =  1.0000
       CONTROLLED BY PARAMETER "HK_2      " TYPE P

UPDATED ESTIMATES OF REGRESSION PARAMETERS :

  HK_1         HK_2

   1.477       1.4689E-02

SUMS OF SQUARED, WEIGHTED RESIDUALS:
  ALL DEPENDENT VARIABLES:   17.395
```

```
  DEP. VARIABLES PLUS PARAMETERS:   17.395

MODIFIED GAUSS-NEWTON PROCEDURE FOR PARAMETER-ESTIMATION ITERATION NO. =     4

VALUES FROM SOLVING THE NORMAL EQUATION :
  MARQUARDT PARAMETER ------------------- =  0.0000
  MAX. FRAC. PAR. CHANGE (TOL= 0.100E-01) =  1.3735
       OCCURRED FOR PARAMETER  "HK_2      " TYPE P

CALCULATION OF DAMPING PARAMETER
  MAX-CHANGE SPECIFIED:   2.0       USED:   2.0
  OSCILL. CONTROL FACTOR (1, NO EFFECT)-- =  1.0000
  DAMPING PARAMETER (RANGE 0 TO 1) ------ =  1.0000
       CONTROLLED BY PARAMETER "HK_2      " TYPE P

UPDATED ESTIMATES OF REGRESSION PARAMETERS :

  HK_1         HK_2

   1.472       3.4864E-02

SUMS OF SQUARED, WEIGHTED RESIDUALS:
  ALL DEPENDENT VARIABLES:   1.8804
  DEP. VARIABLES PLUS PARAMETERS:   1.8804

MODIFIED GAUSS-NEWTON PROCEDURE FOR PARAMETER-ESTIMATION ITERATION NO. =     5

VALUES FROM SOLVING THE NORMAL EQUATION :
  MARQUARDT PARAMETER ------------------- =  0.0000
  MAX. FRAC. PAR. CHANGE (TOL= 0.100E-01) = 0.94318
       OCCURRED FOR PARAMETER  "HK_2      " TYPE P

CALCULATION OF DAMPING PARAMETER
  MAX-CHANGE SPECIFIED:   2.0       USED:   2.0
  OSCILL. CONTROL FACTOR (1, NO EFFECT)-- =  1.0000
  DAMPING PARAMETER (RANGE 0 TO 1) ------ =  1.0000
       CONTROLLED BY PARAMETER "HK_2      " TYPE P

UPDATED ESTIMATES OF REGRESSION PARAMETERS :

  HK_1         HK_2

   1.465       6.7748E-02

SUMS OF SQUARED, WEIGHTED RESIDUALS:
  ALL DEPENDENT VARIABLES:  0.14038
  DEP. VARIABLES PLUS PARAMETERS:  0.14038

MODIFIED GAUSS-NEWTON PROCEDURE FOR PARAMETER-ESTIMATION ITERATION NO. =     6

VALUES FROM SOLVING THE NORMAL EQUATION :
  MARQUARDT PARAMETER ------------------- =  0.0000
  MAX. FRAC. PAR. CHANGE (TOL= 0.100E-01) = 0.38419
       OCCURRED FOR PARAMETER  "HK_2      " TYPE P
```

```
CALCULATION OF DAMPING PARAMETER
  MAX-CHANGE SPECIFIED:   2.0       USED:   2.0
  OSCILL. CONTROL FACTOR (1, NO EFFECT)-- =  1.0000
  DAMPING PARAMETER (RANGE 0 TO 1) ------ =  1.0000
       CONTROLLED BY PARAMETER "HK_2      " TYPE P

UPDATED ESTIMATES OF REGRESSION PARAMETERS :

  HK_1         HK_2

   1.462       9.3776E-02

SUMS OF SQUARED, WEIGHTED RESIDUALS:
  ALL DEPENDENT VARIABLES:  0.16299E-01
  DEP. VARIABLES PLUS PARAMETERS:  0.16299E-01

MODIFIED GAUSS-NEWTON PROCEDURE FOR PARAMETER-ESTIMATION ITERATION NO. =     7

VALUES FROM SOLVING THE NORMAL EQUATION :
  MARQUARDT PARAMETER ------------------- =  0.0000
  MAX. FRAC. PAR. CHANGE (TOL= 0.100E-01) = 0.59154E-01
       OCCURRED FOR PARAMETER  "HK_2      " TYPE P

CALCULATION OF DAMPING PARAMETER
  MAX-CHANGE SPECIFIED:   2.0       USED:   2.0
  OSCILL. CONTROL FACTOR (1, NO EFFECT)-- =  1.0000
  DAMPING PARAMETER (RANGE 0 TO 1) ------ =  1.0000
       CONTROLLED BY PARAMETER "HK_2      " TYPE P

UPDATED ESTIMATES OF REGRESSION PARAMETERS :

  HK_1         HK_2

   1.463       9.9323E-02

SUMS OF SQUARED, WEIGHTED RESIDUALS:
  ALL DEPENDENT VARIABLES:  0.14039E-01
  DEP. VARIABLES PLUS PARAMETERS:  0.14039E-01

MODIFIED GAUSS-NEWTON PROCEDURE FOR PARAMETER-ESTIMATION ITERATION NO. =     8

VALUES FROM SOLVING THE NORMAL EQUATION :
  MARQUARDT PARAMETER ------------------- =  0.0000
  MAX. FRAC. PAR. CHANGE (TOL= 0.100E-01) = 0.11102E-02
       OCCURRED FOR PARAMETER  "HK_2      " TYPE P

CALCULATION OF DAMPING PARAMETER
  MAX-CHANGE SPECIFIED:   2.0       USED:   2.0
  OSCILL. CONTROL FACTOR (1, NO EFFECT)-- =  1.0000
  DAMPING PARAMETER (RANGE 0 TO 1) ------ =  1.0000
       CONTROLLED BY PARAMETER "HK_2      " TYPE P

UPDATED ESTIMATES OF REGRESSION PARAMETERS :

  HK_1         HK_2
```

```
   1.464       9.9433E-02

 *** PARAMETER ESTIMATION CONVERGED BY SATISFYING THE TOL CRITERION ***


OBSERVATION SENSITIVITY TABLE(S) FOR PARAMETER-ESTIMATION ITERATION     8

 DIMENSIONLESS SCALED SENSITIVITIES (SCALED BY B*(WT**.5))

         PARAMETER:   HK_1        HK_2
 OBS #  OBSERVATION
     1  F1            -0.258      -0.281
     2  F2            -0.262      -0.287
     3  F3            -0.262      -0.289
     4  F4            -0.243      -0.276
     5  F5            -0.232      -0.268
     6  F6            -0.229      -0.264
     7  F7            -0.189      -0.950E-04
     8  F8            -0.190      -0.366E-02
     9  F9            -0.197      -0.101E-01
    10  F10           -0.185      -0.135
    11  F11           -0.181      -0.246
    12  F12           -0.186      -0.251
    13  F13           -0.148      -0.182E-02
    14  F14           -0.146      -0.228E-02
    15  F15           -0.148      -0.225E-02
    16  F16           -0.146      -0.706E-03
    17  F17           -0.140       0.169E-02
    18  F18           -0.141       0.299E-02
    19  F19           -0.115      -0.974E-03
    20  F20           -0.115      -0.800E-03
    21  F21           -0.114      -0.496E-03
    22  F22           -0.112      -0.399E-04
    23  F23           -0.111       0.567E-03
    24  F24           -0.112       0.105E-02
    25  F25           -0.858E-01  -0.425E-03
    26  F26           -0.849E-01  -0.305E-03
    27  F27           -0.843E-01  -0.160E-03
    28  F28           -0.843E-01   0.170E-04
    29  F29           -0.835E-01   0.233E-03
    30  F30           -0.823E-01   0.396E-03
    31  F31           -0.703E-01  -0.230E-03
    32  F32           -0.618E-01  -0.141E-03
    33  F33           -0.617E-01  -0.700E-04
    34  F34           -0.608E-01   0.131E-04
    35  F35           -0.591E-01   0.107E-03
    36  F36           -0.605E-01   0.184E-03

        COMPOSITE SCALED SENSITIVITIES ((SUM OF THE SQUARED VALUES)/ND)**.5
                       0.154       0.130

  PARAMETER    COMPOSITE SCALED SENSITIVITY
  ----------   ----------------------------
  HK_1           1.53635E-01
```

```
 HK_2           1.29572E-01

FINAL PARAMETER VALUES AND STATISTICS:

PARAMETER NAME(S) AND VALUE(S):

  HK_1         HK_2

   1.464       9.9433E-02

SUMS OF SQUARED WEIGHTED RESIDUALS:
  OBSERVATIONS   PRIOR INFO.    TOTAL
   0.140E-01      0.00         0.140E-01

-----------------------------------------------------------------------

SELECTED STATISTICS FROM MODIFIED GAUSS-NEWTON ITERATIONS

       MAX. PARAMETER CALC. CHANGE   MAX. CHANGE     DAMPING
ITER.      PARNAM     MAX. CHANGE       ALLOWED      PARAMETER
-----   ----------  -------------   -------------  ------------
   1    HK_2        -0.997831         2.00000        1.0000
   2    HK_2          1.66634         2.00000       0.98277
   3    HK_2          1.58271         2.00000        1.0000
   4    HK_2          1.37349         2.00000        1.0000
   5    HK_2         0.943184         2.00000        1.0000
   6    HK_2         0.384188         2.00000        1.0000
   7    HK_2         0.591537E-01     2.00000        1.0000
   8    HK_2         0.111021E-02     2.00000        1.0000

SUMS OF SQUARED WEIGHTED RESIDUALS FOR EACH ITERATION

        SUMS OF SQUARED WEIGHTED RESIDUALS
ITER.  OBSERVATIONS  PRIOR INFO.      TOTAL
    1   0.40901        0.0000       0.40901
    2    1022.7        0.0000        1022.7
    3    139.07        0.0000        139.07
    4    17.395        0.0000        17.395
    5    1.8804        0.0000        1.8804
    6   0.14038        0.0000       0.14038
    7   0.16299E-01    0.0000       0.16299E-01
    8   0.14039E-01    0.0000       0.14039E-01
FINAL   0.14039E-01    0.0000       0.14039E-01

*** PARAMETER ESTIMATION CONVERGED BY SATISFYING THE TOL CRITERION ***

-----------------------------------------------------------------------

         VARIANCE-COVARIANCE MATRIX FOR THE PARAMETERS
         --------------------------------------------

           HK_1       HK_2
..............................
HK_1        1.083E-03 -9.540E-04
HK_2       -9.540E-04  1.523E-03
```

```
_____________________

PARAMETER SUMMARY
_____________________

_____________________________________________________________________________

PARAMETER VALUES IN "REGRESSION" SPACE --- LOG TRANSFORMED AS APPLICABLE
_____________________________________________________________________________

PARAMETER:        HK_1       HK_2
* = LOG TRNS:        *          *


UPPER 95% C.I.     1.95E-01  -9.68E-01
FINAL VALUES       1.65E-01  -1.00E+00
LOWER 95% C.I.     1.36E-01  -1.04E+00

STD. DEV.          1.43E-02   1.69E-02

COEF. OF VAR. (STD. DEV. / FINAL VALUE); "--" IF FINAL VALUE = 0.0
                   8.64E-02   1.69E-02

-----------------------------------------------------------------------
-----------------------------------------------------------------------

_____________________________________________________________________________

PHYSICAL PARAMETER VALUES --- EXP10 OF LOG TRANSFORMED PARAMETERS
_____________________________________________________________________________

PARAMETER:        HK_1       HK_2
* = LOG TRNS:        *          *

UPPER 95% C.I.     1.57E+00   1.08E-01
FINAL VALUES       1.46E+00   9.94E-02
LOWER 95% C.I.     1.37E+00   9.18E-02

    REASONABLE
   UPPER LIMIT     1.00E+02   1.00E+02
    REASONABLE
   LOWER LIMIT     1.00E-02   1.00E-02

ESTIMATE ABOVE (1)
BELOW(-1)LIMITS        0          0
ENTIRE CONF. INT.
ABOVE(1)BELOW(-1)      0          0


         ------------------------------------
         CORRELATION MATRIX FOR THE PARAMETERS
         ------------------------------------
```

```
           HK_1       HK_2
.............................
HK_1         1.00     -0.743
HK_2        -0.743       1.00

THE CORRELATION OF THE FOLLOWING PARAMETER PAIRS >= .95
    PARAMETER   PARAMETER   CORRELATION

THE CORRELATION OF THE FOLLOWING PARAMETER PAIRS IS BETWEEN .90 AND .95
    PARAMETER   PARAMETER   CORRELATION

THE CORRELATION OF THE FOLLOWING PARAMETER PAIRS IS BETWEEN .85 AND .90
    PARAMETER   PARAMETER   CORRELATION


 LEAST-SQUARES OBJ FUNC (DEP.VAR. ONLY)- = 0.14039E-01
 LEAST-SQUARES OBJ FUNC (W/PARAMETERS)-- = 0.14039E-01
 CALCULATED ERROR VARIANCE-------------- = 0.41292E-03
 STANDARD ERROR OF THE REGRESSION------- = 0.20320E-01
 CORRELATION COEFFICIENT---------------- = 0.99322
      W/PARAMETERS---------------------- = 0.99322
 ITERATIONS---------------------------- =       8

 MAX LIKE OBJ FUNC =  289.19
 AIC STATISTIC---- =  293.19
 BIC STATISTIC---- =  296.36

SMALLEST AND LARGEST WEIGHTED RESIDUALS

     SMALLEST WEIGHTED RESIDUALS      |       LARGEST WEIGHTED RESIDUALS
                WEIGHTED   PERCENT OF |                  WEIGHTED   PERCENT OF
NAME            RESIDUAL    OBJ FUNC  |  NAME            RESIDUAL    OBJ FUNC
F21           -0.376E-01    10.05     |  F34            0.427E-01    12.96
F20           -0.334E-01     7.93     |  F32            0.384E-01    10.52
F23           -0.325E-01     7.54     |  F7             0.325E-01     7.51
F22           -0.267E-01     5.09     |  F33            0.251E-01     4.50
F24           -0.226E-01     3.65     |  F3             0.242E-01     4.19

STATISTICS FOR ALL RESIDUALS :
AVERAGE WEIGHTED RESIDUAL  :-0.500E-03
# RESIDUALS >= 0. :     16
# RESIDUALS < 0.  :     20
NUMBER OF RUNS  :    9  IN   36 OBSERVATIONS

INTERPRETING THE CALCULATED RUNS STATISTIC VALUE OF     -3.18
NOTE: THE FOLLOWING APPLIES ONLY IF
       # RESIDUALS >= 0 . IS GREATER THAN 10 AND
       # RESIDUALS < 0.   IS GREATER THAN 10
THE NEGATIVE VALUE MAY INDICATE TOO FEW RUNS:
   IF THE VALUE IS LESS THAN -1.28, THERE IS LESS THAN A 10 PERCENT
      CHANCE THE VALUES ARE RANDOM,
   IF THE VALUE IS LESS THAN -1.645, THERE IS LESS THAN A 5 PERCENT
      CHANCE THE VALUES ARE RANDOM,
   IF THE VALUE IS LESS THAN -1.96, THERE IS LESS THAN A 2.5 PERCENT
      CHANCE THE VALUES ARE RANDOM.
```

```
CORRELATION BETWEEN ORDERED WEIGHTED RESIDUALS AND NORMAL ORDER STATISTICS
FOR OBSERVATIONS =    0.988

------------------------------------------------------------------------
COMMENTS ON THE INTERPRETATION OF THE CORRELATION BETWEEN
WEIGHTED RESIDUALS AND NORMAL ORDER STATISTICS:

The critical value for correlation at the 5% significance level is 0.944

IF the reported CORRELATION is GREATER than the 5% critical value, ACCEPT
the hypothesis that the weighted residuals are INDEPENDENT AND NORMALLY
DISTRIBUTED at the 5% significance level.  The probability that this
conclusion is wrong is less than 5%.

IF the reported correlation IS LESS THAN the 5% critical value REJECT the,
hypothesis that the weighted residuals are INDEPENDENT AND NORMALLY
DISTRIBUTED at the 5% significance level.

The analysis can also be done using the 10% significance level.
The associated critical value is 0.953
------------------------------------------------------------------------


*** PARAMETER ESTIMATION CONVERGED BY SATISFYING THE TOL CRITERION ***
```

Modified Input Files For Generation of CORFAC-2k Input File

Name file (example.nam):

```
GLOBAL          4 mf2k.global_listing
LIST            3 output.dat
DIS            95 discret.dat
BAS6            1 bas6.dat
ZONE           93 zone.dat
MULT           94 multiple.dat
LPF            31 lpf6.dat
RCH            11 rech6.dat
WEL            12 wel6.dat
PCG            23 pcg2.dat
OC             22 oc.dat
DATA           10 inithead.dat
OBS            40 obs.dat
HOB            41 hob.dat
PES            47 pes.dat
SEN            46 sen.dat
UNC            60 unc.dat
```

UNC file (example.unc):

```
    3    2    0    0    1    0   61  0    1    0    4    0
.01 .1 .1
  0.0
HK_1 .0
HK_2 .0
```

SEN file (sen.dat):

```
# SEN file for MODFLOW-2000, UNC1NLI1 Report Example
#
 2  0  0  2                           Item 1
 1  0   0  0                          Item 2
HK_1 1  1   1.46378  .01  100  1E-10  Item 3
HK_2 1  1  .0994330  .01  100  1E-10  Item 3
```

HOB file (hob.dat):

```
# HOBS file for MODFLOW-2000, UNC1NLI1 Report Example
 42  0  0  6
 1  1
F1   1  37  13  1  0  0  0  14.88  729.28  0  1
F2   1  30  13  1  0  0  0  14.78  690.68  0  1
F3   1  25  13  1  0  0  0  14.86  668.02  0  1
F4   1  20  13  1  0  0  0  13.87  699.35  0  1
F5   1  14  13  1  0  0  0  13.01  728.59  0  1
```

```
F6   1   8  13  1  0  0  0  12.97  746.80  0  1
F7   1  37  26  1  0  0  0   5.61  643.27  0  1
F8   1  30  26  1  0  0  0   5.63  666.51  0  1
F9   1  25  26  1  0  0  0   5.94  687.81  0  1
F10  1  20  26  1  0  0  0   8.83  721.28  0  1
F11  1  14  26  1  0  0  0  11.08  717.66  0  1
F12  1   8  26  1  0  0  0  11.35  731.50  0  1
F13  1  37  39  1  0  0  0    3.7  640.67  0  1
F14  1  30  39  1  0  0  0   3.75  648.28  0  1
F15  1  25  39  1  0  0  0   3.52  619.12  0  1
F16  1  20  39  1  0  0  0   3.35  607.80  0  1
F17  1  14  39  1  0  0  0   3.42  638.66  0  1
F18  1   8  39  1  0  0  0   3.71  629.47  0  1
F19  1  37  52  1  0  0  0   2.37  548.04  0  1
F20  1  30  52  1  0  0  0   1.91  531.05  0  1
F21  1  25  52  1  0  0  0   1.76  526.49  0  1
F22  1  20  52  1  0  0  0   1.96  531.33  0  1
F23  1  14  52  1  0  0  0   1.82  546.39  0  1
F24  1   8  52  1  0  0  0   2.06  542.63  0  1
F25  1  37  65  1  0  0  0   1.54  423.83  0  1
F26  1  30  65  1  0  0  0   1.66  427.94  0  1
F27  1  25  65  1  0  0  0   1.78  429.22  0  1
F28  1  20  65  1  0  0  0   1.54  426.12  0  1
F29  1  14  65  1  0  0  0    1.7  432.14  0  1
F30  1   8  65  1  0  0  0   1.55  444.93  0  1
F31  1  37  78  1  0  0  0    .94  153.12  0  1
F32  1  30  78  1  0  0  0   1.41  197.28  0  1
F33  1  25  78  1  0  0  0   1.22  197.22  0  1
F34  1  20  78  1  0  0  0   1.47  202.06  0  1
F35  1  14  78  1  0  0  0   1.08  212.53  0  1
F36  1   8  78  1  0  0  0    .88  202.26  0  1
G1   1  22  46  1  0  0  0      0  1037.4  0  1
G2   1  21  20  1  0  0  0      0  723.55  0  1
G3   1  21  33  1  0  0  0      0  620.74  0  1
G4   1  21  59  1  0  0  0      0  488.07  0  1
G5   1  21  72  1  0  0  0      0  329.80  0  1
G6   1  40  46  1  0  0  0      0  597.63  0  1
```

Modified _cf Input File to CORFAC-2k

Modified _cf Input File to CORFAC-2k (example._cf):

```
         2        36         0         0         0  0.412962E-03  -1.00000
1
HK_1       HK_2
F1           F2           F3           F4           F5           F6
F7           F8           F9           F10          F11          F12
F13          F14          F15          F16          F17          F18
F19          F20          F21          F22          F23          F24
F25          F26          F27          F28          F29          F30
F31          F32          F33          F34          F35          F36
 0.37029926E-01 0.38050603E-01 0.38690582E-01 0.37814010E-01 0.37047457E-01
0.36592986E-01 0.39427873E-01 0.38734384E-01
 0.38129907E-01 0.37234716E-01 0.37328508E-01 0.36973692E-01 0.39507795E-01
0.39275225E-01 0.40189497E-01 0.40562026E-01
 0.39569918E-01 0.39857723E-01 0.42716324E-01 0.43394260E-01 0.43581776E-01
0.43382823E-01 0.42780772E-01 0.42928737E-01
 0.48574030E-01 0.48340213E-01 0.48268080E-01 0.48443336E-01 0.48104730E-01
0.47408275E-01 0.80813520E-01 0.71196474E-01
 0.71207300E-01 0.70349306E-01 0.68594590E-01 0.70314519E-01
 -6.95528     -7.59430
 -6.88616     -7.54031
 -6.76804     -7.46494
 -6.43567     -7.28740
 -6.26939     -7.22403
 -6.24739     -7.22516
 -4.78414    -0.240649E-02
 -4.91206    -0.944998E-01
 -5.17005    -0.265524
 -4.96155     -3.61991
 -4.84161     -6.59591
 -5.02165     -6.79714
 -3.74236    -0.460639E-01
 -3.72761    -0.580034E-01
 -3.68348    -0.559502E-01
 -3.59604    -0.174140E-01
 -3.53574     0.426478E-01
 -3.53499     0.750806E-01
 -2.69891    -0.227933E-01
 -2.66038    -0.184378E-01
 -2.61047    -0.113816E-01
 -2.57549    -0.919775E-03
 -2.59367     0.132558E-01
 -2.61204     0.244984E-01
 -1.76582    -0.875923E-02
 -1.75638    -0.630512E-02
 -1.74753    -0.331463E-02
 -1.74041     0.349868E-03
 -1.73644     0.484277E-02
 -1.73592     0.835407E-02
-0.870245    -0.284664E-02
```

```
-0.868096    -0.198254E-02
-0.865989    -0.983839E-03
-0.863890     0.186636E-03
-0.862079     0.156564E-02
-0.861022     0.261434E-02
         8         6         0         2         1         0
G1           G2           G3           G4           G5           G6
  HK_1         HK_2
 0.31047517E-01 0.37176263E-01 0.40137023E-01 0.45264628E-01 0.55064879E-01
0.40905699E-01  0.0000000      0.0000000
 -2.84418    -0.123538E-01
 -5.29811     -6.69752
 -4.37059    -0.168617
 -2.13973    -0.106125E-02
 -1.27031    -0.137881E-03
 -3.16943    -0.333658E-01
  1.00000      0.00000
  0.00000      1.00000
729.28    667.57    615.68    586.33    557.59    534.25    584.85    598.77
591.88    569.46    549.34    541.11    477.64    485.80    477.81    474.03
490.18    486.31    326.73    325.31    323.54    332.79    344.61    339.91
208.67    221.75    226.29    225.34    240.21    245.61    68.870    101.52
103.49    110.91    118.31    98.075
667.57    690.68    654.63    620.72    586.71    561.51    589.59    601.63
595.99    577.41    559.76    549.42    478.84    483.95    474.92    467.99
483.29    478.43    321.55    318.49    315.94    322.14    333.98    331.21
214.14    224.01    227.44    222.64    233.67    236.83    72.997    106.27
108.19    114.37    119.57    96.373
615.68    654.63    668.02    651.43    618.29    587.79    577.61    590.09
588.78    576.27    558.71    553.40    467.96    471.16    460.22    452.06
465.32    460.42    308.79    303.50    300.50    304.75    314.61    312.42
202.47    210.94    215.14    210.02    220.51    221.90    72.489    104.27
105.26    110.19    114.24    92.439
586.33    620.72    651.43    699.35    686.13    649.67    562.03    574.93
574.79    566.42    550.59    553.37    452.96    452.53    440.17    430.63
441.05    439.34    293.55    290.00    287.19    289.52    297.87    293.66
193.48    201.20    204.83    198.65    206.20    206.93    69.506    99.734
99.477    103.72    107.11    87.286
557.59    586.71    618.29    686.13    728.59    707.08    543.25    559.94
561.06    555.06    538.05    538.75    443.24    442.05    428.49    417.27
424.38    421.98    288.46    285.79    281.38    283.14    288.82    282.64
192.57    200.60    204.67    197.13    203.52    203.09    69.115    99.001
98.459    104.13    107.79    87.132
534.25    561.51    587.79    649.67    707.08    746.80    525.38    543.55
547.06    545.23    529.14    527.88    437.16    436.68    423.31    411.63
418.82    415.31    289.42    286.38    280.51    281.62    286.86    279.57
191.49    200.05    202.37    193.86    198.61    197.71    65.800    95.801
95.834    100.16    103.22    82.084
584.85    589.59    577.61    562.03    543.25    525.38    643.27    632.46
614.20    600.57    577.59    562.10    507.35    507.86    491.01    477.72
483.99    476.30    331.83    326.31    325.01    329.89    338.91    334.53
216.78    225.84    232.23    227.82    238.01    242.82    71.272    107.29
108.79    114.71    123.51    104.54
598.77    601.63    590.09    574.93    559.94    543.55    632.46    666.51
657.18    644.11    618.41    599.20    524.83    525.59    509.64    499.58
510.39    501.63    346.45    338.31    333.05    337.30    349.23    345.68
```

```
221.67    230.89    237.21    232.60    242.72    247.01    73.206    109.94
110.31    115.26    124.50    105.37
591.88    595.99    588.78    574.79    561.06    547.06    614.20    657.18
687.81    686.21    659.29    637.88    537.68    541.81    526.18    517.05
531.07    522.43    362.45    354.14    347.07    349.82    361.59    358.58
232.67    240.53    246.07    242.48    250.68    254.24    78.717    114.03
114.30    119.04    127.26    106.76
569.46    577.41    576.27    566.42    555.06    545.23    600.57    644.11
686.21    721.28    701.42    676.61    554.47    562.74    551.08    543.76
558.91    552.38    379.87    372.12    363.43    363.69    375.96    372.75
242.19    249.08    254.99    254.22    261.06    263.36    84.298    120.19
120.19    124.31    131.48    110.02
549.34    559.76    558.71    550.59    538.05    529.14    577.59    618.41
659.29    701.42    717.66    702.17    553.51    566.83    558.53    551.51
566.99    560.49    382.08    375.64    366.97    367.21    378.36    374.44
245.30    252.08    257.29    255.75    261.15    262.41    88.611    121.30
120.89    124.28    131.52    112.32
541.11    549.42    553.40    553.37    538.75    527.88    562.10    599.20
637.88    676.61    702.17    731.50    549.20    564.90    560.42    557.96
574.98    566.97    382.48    378.58    371.67    371.59    381.56    374.77
248.91    256.43    261.51    258.12    261.74    261.68    91.934    123.40
123.28    127.11    134.16    113.32
477.64    478.84    467.96    452.96    443.24    437.16    507.35    524.83
537.68    554.47    553.51    549.20    640.67    626.22    591.51    563.61
555.08    535.82    453.45    447.14    440.73    438.31    441.10    423.05
295.30    305.66    312.49    311.97    316.94    320.88    105.64    144.94
148.93    153.49    165.66    142.97
485.80    483.95    471.16    452.53    442.05    436.68    507.86    525.59
541.81    562.74    566.83    564.90    626.22    648.28    618.24    588.02
580.79    558.88    460.96    454.52    448.96    446.67    449.88    432.98
303.50    313.53    320.28    319.66    325.02    328.34    111.31    149.19
151.82    155.30    165.42    142.83
477.81    474.92    460.22    440.17    428.49    423.31    491.01    509.64
526.18    551.08    558.53    560.42    591.51    618.24    619.12    597.36
588.69    566.62    452.11    449.96    444.33    443.98    453.68    439.92
300.25    308.91    315.03    313.82    319.76    324.34    108.06    145.56
148.64    152.55    161.93    139.60
474.03    467.99    452.06    430.63    417.27    411.63    477.72    499.58
517.05    543.76    551.51    557.96    563.61    588.02    597.36    607.80
599.81    577.83    445.39    443.84    438.99    440.63    456.72    446.56
296.70    305.68    312.57    310.46    316.16    321.64    106.61    144.37
146.88    150.81    159.16    137.11
490.18    483.29    465.32    441.05    424.38    418.82    483.99    510.39
531.07    558.91    566.99    574.98    555.08    580.79    588.69    599.81
638.66    617.67    438.33    438.82    437.99    440.62    458.55    449.80
292.93    303.57    309.94    308.99    313.48    315.66    105.79    143.49
145.72    148.31    155.68    131.83
486.31    478.43    460.42    439.34    421.98    415.31    476.30    501.63
522.43    552.38    560.49    566.97    535.82    558.88    566.62    577.83
617.67    629.47    428.62    428.57    430.59    437.01    456.18    447.76
288.83    299.85    307.41    307.76    311.41    313.08    105.58    143.63
146.56    150.52    156.68    132.63
326.73    321.55    308.79    293.55    288.46    289.42    331.83    346.45
362.45    379.87    382.08    382.48    453.45    460.96    452.11    445.39
438.33    428.62    548.04    522.35    500.04    484.78    471.74    454.53
379.15    390.62    392.18    383.88    378.94    379.17    137.98    179.29
```

```
184.21    190.21    201.84    174.92
325.31    318.49    303.50    290.00    285.79    286.38    326.31    338.31
354.14    372.12    375.64    378.58    447.14    454.52    449.96    443.84
438.82    428.57    522.35    531.05    515.27    499.46    486.02    465.12
377.99    389.36    391.95    384.08    380.66    379.82    139.14    177.36
182.01    187.59    198.06    171.04
323.54    315.94    300.50    287.19    281.38    280.51    325.01    333.05
347.07    363.43    366.97    371.67    440.73    448.96    444.33    438.99
437.99    430.59    500.04    515.27    526.49    517.52    502.76    477.30
381.07    395.46    399.39    394.44    392.14    390.23    145.44    183.03
188.11    193.42    204.07    177.28
332.79    322.14    304.75    289.52    283.14    281.62    329.89    337.30
349.82    363.69    367.21    371.59    438.31    446.67    443.98    440.63
440.62    437.01    484.78    499.46    517.52    531.33    522.51    497.03
371.13    389.59    396.26    394.86    398.34    402.69    143.86    182.63
188.43    193.53    205.17    179.10
344.61    333.98    314.61    297.87    288.82    286.86    338.91    349.23
361.59    375.96    378.36    381.56    441.10    449.88    453.68    456.72
458.55    456.18    471.74    486.02    502.76    522.51    546.39    526.83
360.58    381.27    390.93    393.82    401.50    409.36    141.58    181.57
187.82    192.83    203.97    177.63
339.91    331.21    312.42    293.66    282.64    279.57    334.53    345.68
358.58    372.75    374.44    374.77    423.05    432.98    439.92    446.56
449.80    447.76    454.53    465.12    477.30    497.03    526.83    542.63
346.27    367.35    378.05    383.54    394.49    404.22    134.42    174.09
180.86    186.84    198.00    171.15
208.67    214.14    202.47    193.48    192.57    191.49    216.78    221.67
232.67    242.19    245.30    248.91    295.30    303.50    300.25    296.70
292.93    288.83    379.15    377.99    381.07    371.13    360.58    346.27
423.83    409.60    393.71    366.08    338.05    324.23    170.89    210.96
207.57    202.51    198.52    162.88
221.75    224.01    210.94    201.20    200.60    200.05    225.84    230.89
240.53    249.08    252.08    256.43    305.66    313.53    308.91    305.68
303.57    299.85    390.62    389.36    395.46    389.59    381.27    367.35
409.60    427.94    417.14    392.68    365.92    350.74    173.99    216.39
216.19    214.18    214.04    179.48
226.29    227.44    215.14    204.83    204.67    202.37    232.23    237.21
246.07    254.99    257.29    261.51    312.49    320.28    315.03    312.57
309.94    307.41    392.18    391.95    399.39    396.26    390.93    378.05
393.71    417.14    429.22    411.90    388.36    372.38    172.20    216.59
217.49    217.96    221.48    188.33
225.34    222.64    210.02    198.65    197.13    193.86    227.82    232.60
242.48    254.22    255.75    258.12    311.97    319.66    313.82    310.46
308.99    307.76    383.88    384.08    394.44    394.86    393.82    383.54
366.08    392.68    411.90    426.12    411.10    395.28    165.65    211.41
215.82    218.80    226.66    197.82
240.21    233.67    220.51    206.20    203.52    198.61    238.01    242.72
250.68    261.06    261.15    261.74    316.94    325.02    319.76    316.16
313.48    311.41    378.94    380.66    392.14    398.34    401.50    394.49
338.05    365.92    388.36    411.10    432.14    425.39    160.29    207.36
214.39    219.04    231.88    204.96
245.61    236.83    221.90    206.93    203.09    197.71    242.82    247.01
254.24    263.36    262.41    261.68    320.88    328.34    324.34    321.64
315.66    313.08    379.17    379.82    390.23    402.69    409.36    404.22
324.23    350.74    372.38    395.28    425.39    444.93    153.77    201.63
210.36    217.26    232.57    206.41
```

```
68.870    72.997    72.489    69.506    69.115    65.800    71.272    73.206
78.717    84.298    88.611    91.934    105.64    111.31    108.06    106.61
105.79    105.58    137.98    139.14    145.44    143.86    141.58    134.42
170.89    173.99    172.20    165.65    160.29    153.77    153.12    155.86
140.83    128.13    111.47    93.066
101.52    106.27    104.27    99.734    99.001    95.801    107.29    109.94
114.03    120.19    121.30    123.40    144.94    149.19    145.56    144.37
143.49    143.63    179.29    177.36    183.03    182.63    181.57    174.09
210.96    216.39    216.59    211.41    207.36    201.63    155.86    197.28
185.59    173.70    156.95    128.51
103.49    108.19    105.26    99.477    98.459    95.834    108.79    110.31
114.30    120.19    120.89    123.28    148.93    151.82    148.64    146.88
145.72    146.56    184.21    182.01    188.11    188.43    187.82    180.86
207.57    216.19    217.49    215.82    214.39    210.36    140.83    185.59
197.22    190.73    175.32    147.00
110.91    114.37    110.19    103.72    104.13    100.16    114.71    115.26
119.04    124.31    124.28    127.11    153.49    155.30    152.55    150.81
148.31    150.52    190.21    187.59    193.42    193.53    192.83    186.84
202.51    214.18    217.96    218.80    219.04    217.26    128.13    173.70
190.73    202.06    192.15    162.93
118.31    119.57    114.24    107.11    107.79    103.22    123.51    124.50
127.26    131.48    131.52    134.16    165.66    165.42    161.93    159.16
155.68    156.68    201.84    198.06    204.07    205.17    203.97    198.00
198.52    214.04    221.48    226.66    231.88    232.57    111.47    156.95
175.32    192.15    212.53    188.12
98.075    96.373    92.439    87.286    87.132    82.084    104.54    105.37
106.76    110.02    112.32    113.32    142.97    142.83    139.60    137.11
131.83    132.63    174.92    171.04    177.28    179.10    177.63    171.15
162.88    179.48    188.33    197.82    204.96    206.41    93.066    128.51
147.00    162.93    188.12    202.26
```

Output File from CORFAC-2k

Output File from CORFAC-2k (example.#cf):

```
                                    CORFAC

               MODFLOW-2000 POST-PROCESSING PROGRAM TO CALCULATE
 CORRECTION FACTORS FOR CONFIDENCE REGION AND CONFIDENCE AND PREDICTION
INTERVALS
                            Version 1.0.0 31/10/2003

 NUMBER OF ESTIMATED PARAMETERS...................:    2
 NUMBER OF HEAD OBSERVATIONS......................:   36
 NUMBER OF ALL OTHER OBSERVATIONS.................:    0
 TOTAL NUMBER OF OBSERVATIONS.....................:   36

 NUMBER OF PRIOR-INFORMATION EQUATIONS............:    0
 NUMBER OF PRIOR INFORMATION W/ FULL WEIGHT MATRIX:    0
 CALCULATED ERROR VARIANCE........................: 0.41296E-03

 EFFECTIVE CORRELATION (EC).......................: 0.80000    (WAS RESET
BECAUSE IN INPUT FILE EC<0.0)

 TRANSFORM WITH OBS. COV. MATRIX? (YES,NO)=(1,0)..:    1


           SQUARE-ROOT OF WEIGHTS FOR SAMPLE INFORMATION
    NO. OBSERVATION      W          NO. OBSERVATION      W
  HEADS:
     1  F1           0.37030E-01    19  F19          0.42716E-01
     2  F2           0.38051E-01    20  F20          0.43394E-01
     3  F3           0.38691E-01    21  F21          0.43582E-01
     4  F4           0.37814E-01    22  F22          0.43383E-01
     5  F5           0.37047E-01    23  F23          0.42781E-01
     6  F6           0.36593E-01    24  F24          0.42929E-01
     7  F7           0.39428E-01    25  F25          0.48574E-01
     8  F8           0.38734E-01    26  F26          0.48340E-01
     9  F9           0.38130E-01    27  F27          0.48268E-01
    10  F10          0.37235E-01    28  F28          0.48443E-01
    11  F11          0.37329E-01    29  F29          0.48105E-01
    12  F12          0.36974E-01    30  F30          0.47408E-01
    13  F13          0.39508E-01    31  F31          0.80814E-01
    14  F14          0.39275E-01    32  F32          0.71196E-01
    15  F15          0.40189E-01    33  F33          0.71207E-01
    16  F16          0.40562E-01    34  F34          0.70349E-01
    17  F17          0.39570E-01    35  F35          0.68595E-01
    18  F18          0.39858E-01    36  F36          0.70315E-01

 SENSITIVITIES FOR OPTIMUM PARAMETERS

 PARAMETER   F1           F2           F3           F4           F5
 ----------  ------------ ------------ ------------ ------------ ------------
 HK_1         -6.9553      -6.8862      -6.7680      -6.4357      -6.2694
```

```
HK_2          -7.5943       -7.5403       -7.4649       -7.2874       -7.2240

PARAMETER   F6            F7            F8            F9            F10
----------  ------------ ------------ ------------ ------------ ------------
HK_1          -6.2474       -4.7841       -4.9121       -5.1701       -4.9616
HK_2          -7.2252      -0.24065E-02 -0.94500E-01 -0.26552       -3.6199

PARAMETER   F11           F12           F13           F14           F15
----------  ------------ ------------ ------------ ------------ ------------
HK_1          -4.8416       -5.0216       -3.7424       -3.7276       -3.6835
HK_2          -6.5959       -6.7971      -0.46064E-01 -0.58003E-01 -0.55950E-01

PARAMETER   F16           F17           F18           F19           F20
----------  ------------ ------------ ------------ ------------ ------------
HK_1          -3.5960       -3.5357       -3.5350       -2.6989       -2.6604
HK_2         -0.17414E-01  0.42648E-01  0.75081E-01 -0.22793E-01 -0.18438E-01

PARAMETER   F21           F22           F23           F24           F25
----------  ------------ ------------ ------------ ------------ ------------
HK_1          -2.6105       -2.5755       -2.5937       -2.6120       -1.7658
HK_2         -0.11382E-01 -0.91977E-03  0.13256E-01  0.24498E-01 -0.87592E-02

PARAMETER   F26           F27           F28           F29           F30
----------  ------------ ------------ ------------ ------------ ------------
HK_1          -1.7564       -1.7475       -1.7404       -1.7364       -1.7359
HK_2         -0.63051E-02 -0.33146E-02  0.34987E-03  0.48428E-02  0.83541E-02

PARAMETER   F31           F32           F33           F34           F35
----------  ------------ ------------ ------------ ------------ ------------
HK_1         -0.87024     -0.86810     -0.86599     -0.86389     -0.86208
HK_2         -0.28466E-02 -0.19825E-02 -0.98384E-03  0.18664E-03  0.15656E-02

PARAMETER   F36
----------  ------------
HK_1         -0.86102
HK_2          0.26143E-02

          SQUARE-ROOT OF WEIGHTS FOR INTERVALS
   NO.   INTERVAL       W          NO.   INTERVAL       W
    1  G1            0.0000         5  G5            0.0000
    2  G2            0.0000         6  G6            0.0000
    3  G3            0.0000         7    HK_1        0.0000
    4  G4            0.0000         8    HK_2        0.0000

SENSITIVITIES FOR OPTIMUM PARAMETERS

PARAMETER   G1            G2            G3            G4            G5
----------  ------------ ------------ ------------ ------------ ------------
HK_1          -2.8442       -5.2981       -4.3706       -2.1397       -1.2703
HK_2         -0.12354E-01  -6.6975      -0.16862     -0.10612E-02 -0.13788E-03

PARAMETER   G6             HK_1          HK_2
----------  ------------ ------------ ------------
HK_1          -3.1694       1.0000       0.0000
HK_2         -0.33366E-01   0.0000       1.0000
```

```
****** CORRECTION FACTOR COMPUTED FOR CONFIDENCE REGION


CORRECTION FACTOR FOR N-P (A) ---- =  11.910
SCALING FACTOR (B) --------------- =  1.0000
EFFECTIVE CORRELATION (C) -------- = 0.71490
(N-P)/(N-A*P) VALUE (FAC) -------- =  2.7913
CORRECTION FACTOR (CR) ----------- =  33.243


APPROXIMATE N-A*P VALUE (DFB) ---- =  9.5836
APPROX. (N-P)/(N-A*P) VALUE (FACB) =  3.5477
APPROXIMATE BOUND FOR CR (CRB) --- =  46.859



****** CORRECTION FACTORS COMPUTED FOR CONFIDENCE INTERVALS


TOTAL NUMBER OF INTERVALS (NOINT).....................:    8
NUMBER OF INTERVALS FOR HEAD (NHI)....................:    6
NUMBER OF INTERVALS FOR HEAD DEPENDENT FLOWS (NQI).....:    0
NUMBER OF INTERVALS FOR PARAMETERS (NPI)..............:    2
INTERVAL TYPE (1=CONFIDENCE,2=PREDICTION)..............:    1
HEAD AND FLOW INTERVALS ON DIFFERENCES (0,1)=(NO,YES)..:    0

          SQUARE-ROOT OF WEIGHTS FOR INTERVALS
   NO.   INTERVAL       W          NO.   INTERVAL       W
    1  G1            0.0000         5  G5            0.0000
    2  G2            0.0000         6  G6            0.0000
    3  G3            0.0000         7    HK_1        0.0000
    4  G4            0.0000         8    HK_2        0.0000

SENSITIVITIES FOR OPTIMUM PARAMETERS

PARAMETER   G1           G2           G3           G4           G5
----------  ------------ ------------ ------------ ------------ ------------
HK_1         -2.8442      -5.2981      -4.3706      -2.1397      -1.2703
HK_2        -0.12354E-01  -6.6975     -0.16862     -0.10612E-02 -0.13788E-03

PARAMETER   G6            HK_1         HK_2
----------  ------------ ------------ ------------
HK_1         -3.1694       1.0000       0.0000
HK_2        -0.33366E-01   0.0000       1.0000


** CONFIDENCE INTERVAL NO.   1, FOR G1

CORRECTION FACTOR XI FOR C. I. ------ =  16.350
CORRECTION FACTOR (CC) -------------- =  45.638

ESTIMATED VARIANCE OF PREDICTION (VE) = 0.86984E-02
BOUND FOR XI USING POS. VALUES (XIPB) =  24.982
BOUND FOR XI USING NEG. VALUES (XINB) = 0.15332E-01
```

```
 APPROXIMATE BOUND FOR CC (CCB) ------ =  71.613


** CONFIDENCE INTERVAL NO.   2, FOR G2

 CORRECTION FACTOR XI FOR C. I. ------ =  5.7280
 CORRECTION FACTOR (CC) -------------- =  15.989

 ESTIMATED VARIANCE OF PREDICTION (VE) = 0.31039E-01
 BOUND FOR XI USING POS. VALUES (XIPB) =  8.6042
 BOUND FOR XI USING NEG. VALUES (XINB) = 0.27022
 APPROXIMATE BOUND FOR CC (CCB) ------ =  25.130


** CONFIDENCE INTERVAL NO.   3, FOR G3

 CORRECTION FACTOR XI FOR C. I. ------ =  16.826
 CORRECTION FACTOR (CC) -------------- =  46.966

 ESTIMATED VARIANCE OF PREDICTION (VE) = 0.19335E-01
 BOUND FOR XI USING POS. VALUES (XIPB) =  25.521
 BOUND FOR XI USING NEG. VALUES (XINB) = 0.91738E-02
 APPROXIMATE BOUND FOR CC (CCB) ------ =  73.142


** CONFIDENCE INTERVAL NO.   4, FOR G4

 CORRECTION FACTOR XI FOR C. I. ------ =  16.298
 CORRECTION FACTOR (CC) -------------- =  45.492

 ESTIMATED VARIANCE OF PREDICTION (VE) = 0.49567E-02
 BOUND FOR XI USING POS. VALUES (XIPB) =  24.932
 BOUND FOR XI USING NEG. VALUES (XINB) = 0.16355E-01
 APPROXIMATE BOUND FOR CC (CCB) ------ =  71.470


** CONFIDENCE INTERVAL NO.   5, FOR G5

 CORRECTION FACTOR XI FOR C. I. ------ =  16.292
 CORRECTION FACTOR (CC) -------------- =  45.477

 ESTIMATED VARIANCE OF PREDICTION (VE) = 0.17482E-02
 BOUND FOR XI USING POS. VALUES (XIPB) =  24.927
 BOUND FOR XI USING NEG. VALUES (XINB) = 0.16459E-01
 APPROXIMATE BOUND FOR CC (CCB) ------ =  71.456


** CONFIDENCE INTERVAL NO.   6, FOR G6

 CORRECTION FACTOR XI FOR C. I. ------ =  16.435
 CORRECTION FACTOR (CC) -------------- =  45.875

 ESTIMATED VARIANCE OF PREDICTION (VE) = 0.10685E-01
 BOUND FOR XI USING POS. VALUES (XIPB) =  25.063
 BOUND FOR XI USING NEG. VALUES (XINB) = 0.13742E-01
 APPROXIMATE BOUND FOR CC (CCB) ------ =  71.842
```

```
** CONFIDENCE INTERVAL NO.   7, FOR   HK_1

 CORRECTION FACTOR XI FOR C. I. ------ =  16.291
 CORRECTION FACTOR (CC) -------------- =  45.473

 ESTIMATED VARIANCE OF PREDICTION (VE) = 0.10836E-02
 BOUND FOR XI USING POS. VALUES (XIPB) = 0.16488E-01
 BOUND FOR XI USING NEG. VALUES (XINB) =  24.925
 APPROXIMATE BOUND FOR CC (CCB) ------ =  71.452


** CONFIDENCE INTERVAL NO.   8, FOR   HK_2

 CORRECTION FACTOR XI FOR C. I. ------ =  3.8218
 CORRECTION FACTOR (CC) -------------- =  10.668

 ESTIMATED VARIANCE OF PREDICTION (VE) = 0.15234E-02
 BOUND FOR XI USING POS. VALUES (XIPB) =  12.816
 BOUND FOR XI USING NEG. VALUES (XINB) =  3.8470
 APPROXIMATE BOUND FOR CC (CCB) ------ =  37.083
```

Input Files Used to Generate BEALE2-2k Input Files

Name file (example.nam):

```
GLOBAL          4 mf2k.global_listing
LIST            3 output.dat
DIS            95 discret.dat
BAS6            1 bas6.dat
ZONE           93 zone.dat
MULT           94 multiple.dat
LPF            31 lpf6.dat
RCH            11 rech6.dat
WEL            12 wel6.dat
PCG            23 pcg2.dat
OC             22 oc.dat
DATA           10 inithead.dat
OBS            40 obs.dat
HOB            41 hob.dat
PES            47 pes.dat
SEN            46 sen.dat
UNC            60 unc.dat
```

UNC file (unc.dat):

```
    1    2    0   00    1    0   61  0    1    0    4    0
.01 .1 .1
  0.0
HK_1 .0
HK_2 .0
33.243
45.638  15.989  46.966  45.492  45.477  45.875  45.473  10.668
```

SEN file (sen.dat):

```
# SEN file for MODFLOW-2000, UNC1NLI1 Report Example
#
 2  0  0  2                          Item 1
 1  0   0  0                         Item 2
HK_1 1  1   1.46378  .01  100  1E-10  Item 3
HK_2 1  1  .0994330  .01  100  1E-10  Item 3
```

BEALE2-2k Input Files

_b1 file (example._b1):

```
         2        36         0         0         0  0.412962E-03   33.2430
HK_1       HK_2
  1.46378     0.994330E-01
F1           F2           F3           F4           F5           F6
F7           F8           F9           F10          F11          F12
F13          F14          F15          F16          F17          F18
F19          F20          F21          F22          F23          F24
F25          F26          F27          F28          F29          F30
F31          F32          F33          F34          F35          F36
  14.5496      14.4265      14.2330      13.7231      13.4935      13.4726
  4.78655      5.00656      5.43558      8.58150      11.4376      11.8188
  3.78842      3.78562      3.73943      3.61346      3.49310      3.45992
  2.72171      2.67882      2.62185      2.57641      2.58042      2.58755
  1.77458      1.76269      1.75084      1.74006      1.73160      1.72757
 0.873092     0.870080     0.866973     0.863704     0.860516     0.858411
  14.8800      14.7800      14.8600      13.8700      13.0100      12.9700
  5.61000      5.63000      5.94000      8.83000      11.0800      11.3500
  3.70000      3.75000      3.52000      3.35000      3.42000      3.71000
  2.37000      1.91000      1.76000      1.96000      1.82000      2.06000
  1.54000      1.66000      1.78000      1.54000      1.70000      1.55000
 0.940000      1.41000      1.22000      1.47000      1.08000     0.880000
 0.13712154E-02 0.14478485E-02 0.14969611E-02 0.14298992E-02 0.13725139E-02
0.13390466E-02 0.15545571E-02 0.15003525E-02
 0.14538899E-02 0.13864241E-02 0.13934176E-02 0.13670539E-02 0.15608660E-02
0.15425433E-02 0.16151958E-02 0.16452781E-02
 0.15657784E-02 0.15886382E-02 0.18246844E-02 0.18830620E-02 0.18993714E-02
0.18820695E-02 0.18301945E-02 0.18428763E-02
 0.23594366E-02 0.23367761E-02 0.23298075E-02 0.23467569E-02 0.23140649E-02
0.22475447E-02 0.65308255E-02 0.50689378E-02
 0.50704796E-02 0.49490249E-02 0.47052181E-02 0.49441312E-02
 -6.95528     -7.59430
 -6.88616     -7.54031
 -6.76804     -7.46494
 -6.43567     -7.28740
 -6.26939     -7.22403
 -6.24739     -7.22516
 -4.78414    -0.240649E-02
 -4.91206    -0.944998E-01
 -5.17005    -0.265524
 -4.96155     -3.61991
 -4.84161     -6.59591
 -5.02165     -6.79714
 -3.74236    -0.460639E-01
 -3.72761    -0.580034E-01
 -3.68348    -0.559502E-01
 -3.59604    -0.174140E-01
 -3.53574     0.426478E-01
 -3.53499     0.750806E-01
 -2.69891    -0.227933E-01
```

```
 -2.66038    -0.184378E-01
 -2.61047    -0.113816E-01
 -2.57549    -0.919775E-03
 -2.59367     0.132558E-01
 -2.61204     0.244984E-01
 -1.76582    -0.875923E-02
 -1.75638    -0.630512E-02
 -1.74753    -0.331463E-02
 -1.74041     0.349868E-03
 -1.73644     0.484277E-02
 -1.73592     0.835407E-02
-0.870245    -0.284664E-02
-0.868096    -0.198254E-02
-0.865989    -0.983839E-03
-0.863890     0.186636E-03
-0.862079     0.156564E-02
-0.861022     0.261434E-02
         1         1
 THE PARAMETER SETS FOLLOW
  1.11920     0.125942
  1.91444     0.785038E-01
  1.78665     0.723296E-01
  1.19926     0.136693
```

_b2 file (example._b2):

```
  1.11920     0.125942
  14.9125      14.7902      14.5913      14.0530      13.7994      13.7717
  6.25830      6.48017      6.91921      9.29229      11.4711      11.8419
  4.92199      4.90968      4.85074      4.71361      4.59867      4.57772
  3.54356      3.49045      3.42087      3.36873      3.38397      3.40104
  2.31476      2.30107      2.28757      2.27605      2.26799      2.26511
  1.13968      1.13657      1.13324      1.12992      1.12660      1.12444
  1.91444     0.785038E-01
  14.7982      14.6854      14.5117      14.0612      13.8643      13.8490
  3.66131      3.86141      4.24862      8.33661      12.0036      12.3774
  2.91287      2.91490      2.87901      2.76949      2.65662      2.61988
  2.08898      2.05466      2.00876      1.97049      1.96871      1.97038
  1.35974      1.34991      1.33980      1.33040      1.32244      1.31831
 0.668514     0.665898     0.663172     0.660340     0.657408     0.655526
  1.78665     0.723296E-01
  15.9823      15.8606      15.6737      15.1897      14.9787      14.9621
  3.92336      4.13889      4.55545      8.99430      12.9751      13.3778
  3.12183      3.12423      3.08576      2.96817      2.84692      2.80706
  2.23880      2.20211      2.15289      2.11173      2.10983      2.11143
  1.45719      1.44666      1.43587      1.42568      1.41723      1.41261
 0.716377     0.713626     0.710627     0.707445     0.704398     0.702631
  1.19926     0.136693
  13.8379      13.7248      13.5404      13.0412      12.8058      12.7800
  5.84041      6.04568      6.45219      8.63549      10.6408      10.9837
  4.59238      4.58067      4.52578      4.39841      4.29207      4.27328
  3.30650      3.25695      3.19203      3.14359      3.15788      3.17407
  2.15999      2.14697      2.13451      2.12386      2.11640      2.11393
  1.06347      1.06053      1.05755      1.05446      1.05147      1.04941
```

_b3 file (example._b3):

```
         8         6         0         2         1         0
G1           G2           G3           G4           G5           G6
  HK_1         HK_2
  2.85654      11.9957      4.53921      2.14079      1.27045      3.20279
 0.381022     -2.30827
 0.96394832E-03 0.13820746E-02 0.16109805E-02 0.20488864E-02 0.30321409E-02
0.16732761E-02  0.0000000      0.0000000
 -2.84418    -0.123538E-01
 -5.29811     -6.69752
 -4.37059    -0.168617
 -2.13973    -0.106125E-02
 -1.27031    -0.137881E-03
 -3.16943    -0.333658E-01
  1.00000      0.00000
  0.00000      1.00000
   45.6380       15.9890       46.9660       45.4920       45.4770
45.8750
   45.4730       10.6680
 THE PARAMETER SETS FOLLOW
  1.82832     0.818010E-01
  1.17192     0.120866
  1.44237     0.111757
  1.48551     0.884681E-01
  1.83400     0.819924E-01
  1.16830     0.120583
  1.82767     0.817822E-01
  1.17234     0.120893
  1.82760     0.817804E-01
  1.17238     0.120896
  1.82936     0.818321E-01
  1.17126     0.120820
  1.17239     0.120897
  1.82759     0.817798E-01
  1.58544     0.875319E-01
  1.35145     0.112952
```

_b4 file (example._b4):

```
  1.82832     0.818010E-01
  14.7031      14.5883      14.4106      13.9490      13.7463      13.7301
  3.83359      4.03804      4.43404      8.34384      11.8579      12.2337
  3.04753      3.04903      3.01155      2.89900      2.78433      2.74775
  2.18610      2.15054      2.10289      2.06339      2.06235      2.06468
  1.42344      1.41320      1.40288      1.39314      1.38505      1.38092
 0.699981     0.697227     0.694390     0.691413     0.688442     0.686534
  2.29123
  1.17192     0.120866
  14.8142      14.6905      14.4912      13.9546      13.7038      13.6772
  5.97744      6.20061      6.64103      9.13822      11.4268      11.8017
  4.70650      4.69607      4.63942      4.50362      4.38650      4.36281
  3.38693      3.33566      3.26840      3.21743      3.23023      3.24517
  2.21175      2.19841      2.18516      2.17367      2.16539      2.16223
```

```
 1.08887      1.08568      1.08239      1.07904      1.07577      1.07355
 3.56090
 1.44237     0.111757
 13.8048      13.6878      13.5018      13.0087      12.7843      12.7628
 4.85767      5.06823      5.48016      8.25290      10.7782      11.1389
 3.83863      3.83402      3.78730      3.66483      3.55091      3.52183
 2.75907      2.71604      2.65919      2.61444      2.62048      2.62922
 1.79967      1.78799      1.77638      1.76594      1.75790      1.75430
0.885609     0.882716     0.879694     0.876626     0.873547     0.871495
 11.3327
 1.48551     0.884681E-01
 15.3788      15.2506      15.0503      14.5253      14.2911      14.2707
 4.71698      4.94540      5.38994      8.95448      12.1801      12.5825
 3.73883      3.73768      3.69200      3.56306      3.43687      3.39986
 2.68481      2.64204      2.58503      2.53892      2.54111      2.54671
 1.74967      1.73767      1.72564      1.71458      1.70570      1.70139
0.860568     0.857560     0.854368     0.851076     0.847743     0.845575
 12.7448
 1.83400     0.819924E-01
 14.6641      14.5494      14.3722      13.9116      13.7094      13.6933
 3.82153      4.02530      4.42007      8.32080      11.8267      12.2014
 3.03798      3.03949      3.00215      2.88999      2.77559      2.73910
 2.17938      2.14389      2.09638      2.05699      2.05588      2.05819
 1.41909      1.40891      1.39851      1.38883      1.38071      1.37654
0.697785     0.695042     0.692217     0.689299     0.686325     0.684411
 3.67501
 1.16830     0.120583
 14.8549      14.7309      14.5310      13.9929      13.7415      13.7148
 5.99579      6.21957      6.66124      9.16414      11.4580      11.8340
 4.72094      4.71058      4.65378      4.51760      4.40014      4.37634
 3.39745      3.34600      3.27849      3.22733      3.24017      3.25521
 2.21855      2.20513      2.19184      2.18036      2.17210      2.16895
 1.09215      1.08902      1.08574      1.08239      1.07911      1.07688
 5.59279
 1.82767     0.817822E-01
 14.7071      14.5921      14.4143      13.9522      13.7493      13.7331
 3.83480      4.03922      4.43524      8.34582      11.8606      12.2365
 3.04848      3.04998      3.01250      2.89997      2.78520      2.74860
 2.18690      2.15128      2.10361      2.06408      2.06299      2.06532
 1.42397      1.41377      1.40334      1.39364      1.38550      1.38132
0.700185     0.697445     0.694615     0.691690     0.688705     0.686784
 1.71507
 1.17234     0.120893
 14.8097      14.6861      14.4868      13.9503      13.6996      13.6731
 5.97510      6.19822      6.63859      9.13533      11.4235      11.7984
 4.70472      4.69442      4.63782      4.50206      4.38493      4.36117
 3.38579      3.33450      3.26720      3.21620      3.22897      3.24395
 2.21092      2.19753      2.18428      2.17283      2.16460      2.16146
 1.08839      1.08527      1.08200      1.07866      1.07538      1.07316
 2.67229
 1.82760     0.817804E-01
 14.7076      14.5926      14.4148      13.9527      13.7498      13.7336
 3.83486      4.03932      4.43540      8.34612      11.8609      12.2369
 3.04855      3.05003      3.01255      2.89998      2.78521      2.74862
 2.18688      2.15123      2.10356      2.06405      2.06301      2.06537
 1.42387      1.41370      1.40331      1.39364      1.38554      1.38138
```

```
0.700138     0.697450     0.694631     0.691702     0.688741     0.686813
 1.01752
 1.17238     0.120896
 14.8094      14.6857      14.4864      13.9499      13.6993      13.6727
 5.97499      6.19809      6.63841      9.13506      11.4232      11.7980
 4.70460      4.69424      4.63764      4.50189      4.38479      4.36106
 3.38564      3.33438      3.26712      3.21614      3.22892      3.24387
 2.21088      2.19752      2.18426      2.17279      2.16453      2.16138
 1.08840      1.08524      1.08196      1.07862      1.07534      1.07313
 1.58623
 1.82936     0.818321E-01
 14.6962      14.5812      14.4036      13.9419      13.7392      13.7231
 3.83115      4.03541      4.43112      8.33939      11.8521      12.2277
 3.04560      3.04711      3.00969      2.89727      2.78262      2.74605
 2.18484      2.14928      2.10167      2.06218      2.06110      2.06341
 1.42266      1.41247      1.40205      1.39235      1.38422      1.38004
0.699548     0.696803     0.693973     0.691048     0.688069     0.686150
 2.57305
 1.17126     0.120820
 14.8212      14.6975      14.4980      13.9611      13.7102      13.6837
 5.98058      6.20385      6.64455      9.14273      11.4323      11.8074
 4.70899      4.69870      4.64208      4.50623      4.38903      4.36527
 3.38891      3.33760      3.27026      3.21921      3.23200      3.24697
 2.21301      2.19960      2.18633      2.17485      2.16660      2.16346
 1.08942      1.08627      1.08300      1.07965      1.07638      1.07415
 3.98442
 1.17239     0.120897
 14.8092      14.6856      14.4863      13.9498      13.6992      13.6726
 5.97494      6.19805      6.63837      9.13499      11.4231      11.7979
 4.70457      4.69421      4.63759      4.50184      4.38474      4.36101
 3.38560      3.33434      3.26708      3.21610      3.22889      3.24384
 2.21085      2.19750      2.18424      2.17277      2.16452      2.16136
 1.08839      1.08523      1.08195      1.07861      1.07534      1.07312
0.159044
 1.82759     0.817798E-01
 14.7081      14.5931      14.4153      13.9533      13.7504      13.7341
 3.83506      4.03960      4.43576      8.34654      11.8614      12.2374
 3.04889      3.05034      3.01284      2.90027      2.78548      2.74884
 2.18712      2.15151      2.10380      2.06422      2.06315      2.06546
 1.42406      1.41382      1.40341      1.39367      1.38556      1.38139
0.700221     0.697469     0.694638     0.691677     0.688748     0.686813
0.602998
 1.58544     0.875319E-01
 15.0249      14.9012      14.7088      14.2056      13.9821      13.9632
 4.42082      4.64083      5.06867      8.68673      11.9547      12.3465
 3.50652      3.50644      3.46367      3.34027      3.21826      3.18160
 2.51721      2.47698      2.42324      2.37953      2.38072      2.38536
 1.64010      1.62869      1.61732      1.60674      1.59826      1.59412
0.806684     0.803738     0.800670     0.797407     0.794164     0.792197
-2.43575
 1.35145     0.112952
 14.1905      14.0700      13.8780      13.3672      13.1334      13.1104
 5.18382      5.40041      5.82518      8.55177      11.0393      11.4081
 4.09258      4.08664      4.03706      3.90959      3.79305      3.76468
 2.94271      2.89710      2.83698      2.79010      2.79766      2.80790
 1.92002      1.90771      1.89553      1.88469      1.87651      1.87290
```

```
0.944902      0.941932      0.938851      0.935610      0.932412      0.930263
-2.18079
```

BEALE2-2k Output File

#be Output File (example.#be):

```
                                NLBEALE

          MODFLOW-2000 POST-PROCESSING PROGRAM TO CALCULATE
      MEASURES OF TOTAL, INTRINSIC, AND COMBINED INTRINSIC NONLINEARITY
                        Version 1.0.0 31/10/2003

 NUMBER OF ESTIMATED PARAMETERS...................:    2
 NUMBER OF HEAD OBSERVATIONS......................:   36
 NUMBER OF ALL OTHER OBSERVATIONS.................:    0
 TOTAL NUMBER OF OBSERVATIONS.....................:   36

 NUMBER OF PRIOR-INFORMATION EQUATIONS............:    0
 NUMBER OF PRIOR INFORMATION W/ FULL WEIGHT MATRIX:    0
 NUMBER OF DATA SETS USED FOR BEALES MEASURE......:    4

 CALCULATED ERROR VARIANCE.......................: 0.41296E-03

 CORRECTION FACTOR FOR CONFIDENCE REGION..........:  33.243

                     OPTIMUM PARAMETERS
   NO. NAME          BOPT        NO. NAME          BOPT
    1  HK_1        1.4638         2  HK_2       0.99433E-01

     DEPENDENT VARIABLES COMPUTED WITH OPTIMUM PARAMETERS
   NO. OBSERVATION     FOPT        NO. OBSERVATION     FOPT
    1  F1            14.550        19  F19           2.7217
    2  F2            14.427        20  F20           2.6788
    3  F3            14.233        21  F21           2.6219
    4  F4            13.723        22  F22           2.5764
    5  F5            13.493        23  F23           2.5804
    6  F6            13.473        24  F24           2.5875
    7  F7            4.7866        25  F25           1.7746
    8  F8            5.0066        26  F26           1.7627
    9  F9            5.4356        27  F27           1.7508
   10  F10           8.5815        28  F28           1.7401
   11  F11           11.438        29  F29           1.7316
   12  F12           11.819        30  F30           1.7276
   13  F13           3.7884        31  F31          0.87309
   14  F14           3.7856        32  F32          0.87008
   15  F15           3.7394        33  F33          0.86697
   16  F16           3.6135        34  F34          0.86370
   17  F17           3.4931        35  F35          0.86052
   18  F18           3.4599        36  F36          0.85841

          OBSERVED VALUES OF THE DEPENDENT VARIABLES
   NO. OBSERVATION     FOBS        NO. OBSERVATION     FOBS
    1  F1            14.880        19  F19           2.3700
    2  F2            14.780        20  F20           1.9100
    3  F3            14.860        21  F21           1.7600
```

4	F4	13.870	22	F22	1.9600
5	F5	13.010	23	F23	1.8200
6	F6	12.970	24	F24	2.0600
7	F7	5.6100	25	F25	1.5400
8	F8	5.6300	26	F26	1.6600
9	F9	5.9400	27	F27	1.7800
10	F10	8.8300	28	F28	1.5400
11	F11	11.080	29	F29	1.7000
12	F12	11.350	30	F30	1.5500
13	F13	3.7000	31	F31	0.94000
14	F14	3.7500	32	F32	1.4100
15	F15	3.5200	33	F33	1.2200
16	F16	3.3500	34	F34	1.4700
17	F17	3.4200	35	F35	1.0800
18	F18	3.7100	36	F36	0.88000

RELIABILITY WEIGHTS FOR SAMPLE INFORMATION

NO.	OBSERVATION	W	NO.	OBSERVATION	W
HEADS:					
1	F1	0.13712E-02	19	F19	0.18247E-02
2	F2	0.14478E-02	20	F20	0.18831E-02
3	F3	0.14970E-02	21	F21	0.18994E-02
4	F4	0.14299E-02	22	F22	0.18821E-02
5	F5	0.13725E-02	23	F23	0.18302E-02
6	F6	0.13390E-02	24	F24	0.18429E-02
7	F7	0.15546E-02	25	F25	0.23594E-02
8	F8	0.15004E-02	26	F26	0.23368E-02
9	F9	0.14539E-02	27	F27	0.23298E-02
10	F10	0.13864E-02	28	F28	0.23468E-02
11	F11	0.13934E-02	29	F29	0.23141E-02
12	F12	0.13671E-02	30	F30	0.22475E-02
13	F13	0.15609E-02	31	F31	0.65308E-02
14	F14	0.15425E-02	32	F32	0.50689E-02
15	F15	0.16152E-02	33	F33	0.50705E-02
16	F16	0.16453E-02	34	F34	0.49490E-02
17	F17	0.15658E-02	35	F35	0.47052E-02
18	F18	0.15886E-02	36	F36	0.49441E-02

SENSITIVITIES FOR OPTIMUM PARAMETERS

PARAMETER	F1	F2	F3	F4	F5
HK_1	-6.9553	-6.8862	-6.7680	-6.4357	-6.2694
HK_2	-7.5943	-7.5403	-7.4649	-7.2874	-7.2240

PARAMETER	F6	F7	F8	F9	F10
HK_1	-6.2474	-4.7841	-4.9121	-5.1701	-4.9616
HK_2	-7.2252	-0.24065E-02	-0.94500E-01	-0.26552	-3.6199

PARAMETER	F11	F12	F13	F14	F15
HK_1	-4.8416	-5.0216	-3.7424	-3.7276	-3.6835
HK_2	-6.5959	-6.7971	-0.46064E-01	-0.58003E-01	-0.55950E-01

PARAMETER	F16	F17	F18	F19	F20

```
----------  ------------ ------------ ------------ ------------ ------------
HK_1         -3.5960      -3.5357      -3.5350      -2.6989      -2.6604
HK_2        -0.17414E-01  0.42648E-01  0.75081E-01 -0.22793E-01 -0.18438E-01

PARAMETER   F21          F22          F23          F24          F25
----------  ------------ ------------ ------------ ------------ ------------
HK_1         -2.6105      -2.5755      -2.5937      -2.6120      -1.7658
HK_2        -0.11382E-01 -0.91977E-03  0.13256E-01  0.24498E-01 -0.87592E-02

PARAMETER   F26          F27          F28          F29          F30
----------  ------------ ------------ ------------ ------------ ------------
HK_1         -1.7564      -1.7475      -1.7404      -1.7364      -1.7359
HK_2        -0.63051E-02 -0.33146E-02  0.34987E-03  0.48428E-02  0.83541E-02

PARAMETER   F31          F32          F33          F34          F35
----------  ------------ ------------ ------------ ------------ ------------
HK_1        -0.87024     -0.86810     -0.86599     -0.86389     -0.86208
HK_2        -0.28466E-02 -0.19825E-02 -0.98384E-03  0.18664E-03  0.15656E-02

PARAMETER   F36
----------  ------------
HK_1        -0.86102
HK_2         0.26143E-02

        PARAMETER
  NO.     NAME       LN
    1   HK_1          1
    2   HK_2          1

                    PARAMETERS FOR SAMPLE NO.   1
   NO. NAME            B         NO. NAME            B
    1  HK_1        1.1192          2  HK_2       0.12594

        DEPENDENT VARIABLES COMPUTED FOR SAMPLE NO.   1
   NO. OBSERVATION      FC          NO. OBSERVATION      FC
    1  F1            14.913         19  F19           3.5436
    2  F2            14.790         20  F20           3.4904
    3  F3            14.591         21  F21           3.4209
    4  F4            14.053         22  F22           3.3687
    5  F5            13.799         23  F23           3.3840
    6  F6            13.772         24  F24           3.4010
    7  F7            6.2583         25  F25           2.3148
    8  F8            6.4802         26  F26           2.3011
    9  F9            6.9192         27  F27           2.2876
   10  F10           9.2923         28  F28           2.2761
   11  F11           11.471         29  F29           2.2680
   12  F12           11.842         30  F30           2.2651
   13  F13           4.9220         31  F31           1.1397
   14  F14           4.9097         32  F32           1.1366
   15  F15           4.8507         33  F33           1.1332
   16  F16           4.7136         34  F34           1.1299
   17  F17           4.5987         35  F35           1.1266
   18  F18           4.5777         36  F36           1.1244

                    PARAMETERS FOR SAMPLE NO.   2
   NO. NAME            B         NO. NAME            B
```

1	HK_1	1.9144	2	HK_2	0.78504E-01

DEPENDENT VARIABLES COMPUTED FOR SAMPLE NO. 2

NO.	OBSERVATION	FC	NO.	OBSERVATION	FC
1	F1	14.798	19	F19	2.0890
2	F2	14.685	20	F20	2.0547
3	F3	14.512	21	F21	2.0088
4	F4	14.061	22	F22	1.9705
5	F5	13.864	23	F23	1.9687
6	F6	13.849	24	F24	1.9704
7	F7	3.6613	25	F25	1.3597
8	F8	3.8614	26	F26	1.3499
9	F9	4.2486	27	F27	1.3398
10	F10	8.3366	28	F28	1.3304
11	F11	12.004	29	F29	1.3224
12	F12	12.377	30	F30	1.3183
13	F13	2.9129	31	F31	0.66851
14	F14	2.9149	32	F32	0.66590
15	F15	2.8790	33	F33	0.66317
16	F16	2.7695	34	F34	0.66034
17	F17	2.6566	35	F35	0.65741
18	F18	2.6199	36	F36	0.65553

PARAMETERS FOR SAMPLE NO. 3

NO.	NAME	B	NO.	NAME	B
1	HK_1	1.7866	2	HK_2	0.72330E-01

DEPENDENT VARIABLES COMPUTED FOR SAMPLE NO. 3

NO.	OBSERVATION	FC	NO.	OBSERVATION	FC
1	F1	15.982	19	F19	2.2388
2	F2	15.861	20	F20	2.2021
3	F3	15.674	21	F21	2.1529
4	F4	15.190	22	F22	2.1117
5	F5	14.979	23	F23	2.1098
6	F6	14.962	24	F24	2.1114
7	F7	3.9234	25	F25	1.4572
8	F8	4.1389	26	F26	1.4467
9	F9	4.5554	27	F27	1.4359
10	F10	8.9943	28	F28	1.4257
11	F11	12.975	29	F29	1.4172
12	F12	13.378	30	F30	1.4126
13	F13	3.1218	31	F31	0.71638
14	F14	3.1242	32	F32	0.71363
15	F15	3.0858	33	F33	0.71063
16	F16	2.9682	34	F34	0.70745
17	F17	2.8469	35	F35	0.70440
18	F18	2.8071	36	F36	0.70263

PARAMETERS FOR SAMPLE NO. 4

NO.	NAME	B	NO.	NAME	B
1	HK_1	1.1993	2	HK_2	0.13669

DEPENDENT VARIABLES COMPUTED FOR SAMPLE NO. 4

NO.	OBSERVATION	FC	NO.	OBSERVATION	FC
1	F1	13.838	19	F19	3.3065
2	F2	13.725	20	F20	3.2569

3	F3	13.540	21	F21	3.1920
4	F4	13.041	22	F22	3.1436
5	F5	12.806	23	F23	3.1579
6	F6	12.780	24	F24	3.1741
7	F7	5.8404	25	F25	2.1600
8	F8	6.0457	26	F26	2.1470
9	F9	6.4522	27	F27	2.1345
10	F10	8.6355	28	F28	2.1239
11	F11	10.641	29	F29	2.1164
12	F12	10.984	30	F30	2.1139
13	F13	4.5924	31	F31	1.0635
14	F14	4.5807	32	F32	1.0605
15	F15	4.5258	33	F33	1.0575
16	F16	4.3984	34	F34	1.0545
17	F17	4.2921	35	F35	1.0515
18	F18	4.2733	36	F36	1.0494

TOTAL NONLINEARITY (BNT)..... = 0.63930E-01
INTRINSIC NONLINEARITY (BNI)..... = 0.45443E-03

****** NONLINEARITY MEASURES FOR CONFIDENCE INTERVALS

TOTAL NUMBER OF INTERVALS (NOINT).....: 8
NUMBER OF INTERVALS FOR HEAD (NHI).....: 6
NUMBER OF INTERVALS FOR HEAD DEPENDENT FLOWS (NQI).....: 0
NUMBER OF INTERVALS FOR PARAMETERS (NPI).....: 2
INTERVAL TYPE (1=CONFIDENCE,2=PREDICTION).....: 1
HEAD AND FLOW INTERVALS ON DIFFERENCES (0,1)=(NO,YES)..: 0

INTERVAL VARIABLES COMPUTED WITH OPTIMUM PARAMETERS

NO.	INTERVAL	GOPT	NO.	INTERVAL	GOPT
1	G1	2.8565	5	G5	1.2704
2	G2	11.996	6	G6	3.2028
3	G3	4.5392	7	HK_1	0.38102
4	G4	2.1408	8	HK_2	-2.3083

RELIABILITY WEIGHTS FOR INTERVAL SAMPLE

NO.	INTERVAL	W	NO.	INTERVAL	W
1	G1	0.0000	5	G5	0.0000
2	G2	0.0000	6	G6	0.0000
3	G3	0.0000	7	HK_1	0.0000
4	G4	0.0000	8	HK_2	0.0000

SENSITIVITIES FOR OPTIMUM PARAMETERS

PARAMETER	G1	G2	G3	G4	G5
HK_1	-2.8442	-5.2981	-4.3706	-2.1397	-1.2703
HK_2	-0.12354E-01	-6.6975	-0.16862	-0.10612E-02	-0.13788E-03

PARAMETER	G6	HK_1	HK_2
HK_1	-3.1694	1.0000	0.0000
HK_2	-0.33366E-01	0.0000	1.0000

CORRECTION FACTORS

1	G1	45.638	5	G5	45.477
2	G2	15.989	6	G6	45.875
3	G3	46.966	7	HK_1	45.473
4	G4	45.492	8	HK_2	10.668

*** INTERVAL NO. 1

PARAMETERS FOR SAMPLE NO. 1

NO.	NAME	B	NO.	NAME	B
1	HK_1	1.8283	2	HK_2	0.81801E-01

DEPENDENT VARIABLES COMPUTED FOR SAMPLE NO. 1

NO.	OBSERVATION	FC	NO.	OBSERVATION	FC
1	F1	14.703	19	F19	2.1861
2	F2	14.588	20	F20	2.1505
3	F3	14.411	21	F21	2.1029
4	F4	13.949	22	F22	2.0634
5	F5	13.746	23	F23	2.0624
6	F6	13.730	24	F24	2.0647
7	F7	3.8336	25	F25	1.4234
8	F8	4.0380	26	F26	1.4132
9	F9	4.4340	27	F27	1.4029
10	F10	8.3438	28	F28	1.3931
11	F11	11.858	29	F29	1.3851
12	F12	12.234	30	F30	1.3809
13	F13	3.0475	31	F31	0.69998
14	F14	3.0490	32	F32	0.69723
15	F15	3.0115	33	F33	0.69439
16	F16	2.8990	34	F34	0.69141
17	F17	2.7843	35	F35	0.68844
18	F18	2.7478	36	F36	0.68653

PREDICTED VALUE, GP= 2.2912

PARAMETERS FOR SAMPLE NO. 2

NO.	NAME	B	NO.	NAME	B
1	HK_1	1.1719	2	HK_2	0.12087

DEPENDENT VARIABLES COMPUTED FOR SAMPLE NO. 2

NO.	OBSERVATION	FC	NO.	OBSERVATION	FC
1	F1	14.814	19	F19	3.3869
2	F2	14.691	20	F20	3.3357
3	F3	14.491	21	F21	3.2684
4	F4	13.955	22	F22	3.2174
5	F5	13.704	23	F23	3.2302
6	F6	13.677	24	F24	3.2452
7	F7	5.9774	25	F25	2.2118
8	F8	6.2006	26	F26	2.1984

9	F9	6.6410	27	F27	2.1852
10	F10	9.1382	28	F28	2.1737
11	F11	11.427	29	F29	2.1654
12	F12	11.802	30	F30	2.1622
13	F13	4.7065	31	F31	1.0889
14	F14	4.6961	32	F32	1.0857
15	F15	4.6394	33	F33	1.0824
16	F16	4.5036	34	F34	1.0790
17	F17	4.3865	35	F35	1.0758
18	F18	4.3628	36	F36	1.0735

PREDICTED VALUE, GP= 3.5609

*** INTERVAL NO. 2

PARAMETERS FOR SAMPLE NO. 1

NO.	NAME	B	NO.	NAME	B
1	HK_1	1.4424	2	HK_2	0.11176

DEPENDENT VARIABLES COMPUTED FOR SAMPLE NO. 1

NO.	OBSERVATION	FC	NO.	OBSERVATION	FC
1	F1	13.805	19	F19	2.7591
2	F2	13.688	20	F20	2.7160
3	F3	13.502	21	F21	2.6592
4	F4	13.009	22	F22	2.6144
5	F5	12.784	23	F23	2.6205
6	F6	12.763	24	F24	2.6292
7	F7	4.8577	25	F25	1.7997
8	F8	5.0682	26	F26	1.7880
9	F9	5.4802	27	F27	1.7764
10	F10	8.2529	28	F28	1.7659
11	F11	10.778	29	F29	1.7579
12	F12	11.139	30	F30	1.7543
13	F13	3.8386	31	F31	0.88561
14	F14	3.8340	32	F32	0.88272
15	F15	3.7873	33	F33	0.87969
16	F16	3.6648	34	F34	0.87663
17	F17	3.5509	35	F35	0.87355
18	F18	3.5218	36	F36	0.87150

PREDICTED VALUE, GP= 11.333

PARAMETERS FOR SAMPLE NO. 2

NO.	NAME	B	NO.	NAME	B
1	HK_1	1.4855	2	HK_2	0.88468E-01

DEPENDENT VARIABLES COMPUTED FOR SAMPLE NO. 2

NO.	OBSERVATION	FC	NO.	OBSERVATION	FC
1	F1	15.379	19	F19	2.6848
2	F2	15.251	20	F20	2.6420
3	F3	15.050	21	F21	2.5850
4	F4	14.525	22	F22	2.5389
5	F5	14.291	23	F23	2.5411

6	F6	14.271	24	F24	2.5467
7	F7	4.7170	25	F25	1.7497
8	F8	4.9454	26	F26	1.7377
9	F9	5.3899	27	F27	1.7256
10	F10	8.9545	28	F28	1.7146
11	F11	12.180	29	F29	1.7057
12	F12	12.583	30	F30	1.7014
13	F13	3.7388	31	F31	0.86057
14	F14	3.7377	32	F32	0.85756
15	F15	3.6920	33	F33	0.85437
16	F16	3.5631	34	F34	0.85108
17	F17	3.4369	35	F35	0.84774
18	F18	3.3999	36	F36	0.84557

PREDICTED VALUE, GP= 12.745

*** INTERVAL NO. 3

PARAMETERS FOR SAMPLE NO. 1

NO.	NAME	B	NO.	NAME	B
1	HK_1	1.8340	2	HK_2	0.81992E-01

DEPENDENT VARIABLES COMPUTED FOR SAMPLE NO. 1

NO.	OBSERVATION	FC	NO.	OBSERVATION	FC
1	F1	14.664	19	F19	2.1794
2	F2	14.549	20	F20	2.1439
3	F3	14.372	21	F21	2.0964
4	F4	13.912	22	F22	2.0570
5	F5	13.709	23	F23	2.0559
6	F6	13.693	24	F24	2.0582
7	F7	3.8215	25	F25	1.4191
8	F8	4.0253	26	F26	1.4089
9	F9	4.4201	27	F27	1.3985
10	F10	8.3208	28	F28	1.3888
11	F11	11.827	29	F29	1.3807
12	F12	12.201	30	F30	1.3765
13	F13	3.0380	31	F31	0.69779
14	F14	3.0395	32	F32	0.69504
15	F15	3.0022	33	F33	0.69222
16	F16	2.8900	34	F34	0.68930
17	F17	2.7756	35	F35	0.68633
18	F18	2.7391	36	F36	0.68441

PREDICTED VALUE, GP= 3.6750

PARAMETERS FOR SAMPLE NO. 2

NO.	NAME	B	NO.	NAME	B
1	HK_1	1.1683	2	HK_2	0.12058

DEPENDENT VARIABLES COMPUTED FOR SAMPLE NO. 2

NO.	OBSERVATION	FC	NO.	OBSERVATION	FC
1	F1	14.855	19	F19	3.3974
2	F2	14.731	20	F20	3.3460

3	F3	14.531	21	F21	3.2785
4	F4	13.993	22	F22	3.2273
5	F5	13.741	23	F23	3.2402
6	F6	13.715	24	F24	3.2552
7	F7	5.9958	25	F25	2.2185
8	F8	6.2196	26	F26	2.2051
9	F9	6.6612	27	F27	2.1918
10	F10	9.1641	28	F28	2.1804
11	F11	11.458	29	F29	2.1721
12	F12	11.834	30	F30	2.1690
13	F13	4.7209	31	F31	1.0921
14	F14	4.7106	32	F32	1.0890
15	F15	4.6538	33	F33	1.0857
16	F16	4.5176	34	F34	1.0824
17	F17	4.4001	35	F35	1.0791
18	F18	4.3763	36	F36	1.0769

PREDICTED VALUE, GP= 5.5928

*** INTERVAL NO. 4

PARAMETERS FOR SAMPLE NO. 1

NO.	NAME	B	NO.	NAME	B
1	HK_1	1.8277	2	HK_2	0.81782E-01

DEPENDENT VARIABLES COMPUTED FOR SAMPLE NO. 1

NO.	OBSERVATION	FC	NO.	OBSERVATION	FC
1	F1	14.707	19	F19	2.1869
2	F2	14.592	20	F20	2.1513
3	F3	14.414	21	F21	2.1036
4	F4	13.952	22	F22	2.0641
5	F5	13.749	23	F23	2.0630
6	F6	13.733	24	F24	2.0653
7	F7	3.8348	25	F25	1.4240
8	F8	4.0392	26	F26	1.4138
9	F9	4.4352	27	F27	1.4033
10	F10	8.3458	28	F28	1.3936
11	F11	11.861	29	F29	1.3855
12	F12	12.236	30	F30	1.3813
13	F13	3.0485	31	F31	0.70019
14	F14	3.0500	32	F32	0.69744
15	F15	3.0125	33	F33	0.69462
16	F16	2.9000	34	F34	0.69169
17	F17	2.7852	35	F35	0.68871
18	F18	2.7486	36	F36	0.68678

PREDICTED VALUE, GP= 1.7151

PARAMETERS FOR SAMPLE NO. 2

NO.	NAME	B	NO.	NAME	B
1	HK_1	1.1723	2	HK_2	0.12089

DEPENDENT VARIABLES COMPUTED FOR SAMPLE NO. 2

NO.	OBSERVATION	FC	NO.	OBSERVATION	FC
1	F1	14.810	19	F19	3.3858
2	F2	14.686	20	F20	3.3345
3	F3	14.487	21	F21	3.2672
4	F4	13.950	22	F22	3.2162
5	F5	13.700	23	F23	3.2290
6	F6	13.673	24	F24	3.2439
7	F7	5.9751	25	F25	2.2109
8	F8	6.1982	26	F26	2.1975
9	F9	6.6386	27	F27	2.1843
10	F10	9.1353	28	F28	2.1728
11	F11	11.424	29	F29	2.1646
12	F12	11.798	30	F30	2.1615
13	F13	4.7047	31	F31	1.0884
14	F14	4.6944	32	F32	1.0853
15	F15	4.6378	33	F33	1.0820
16	F16	4.5021	34	F34	1.0787
17	F17	4.3849	35	F35	1.0754
18	F18	4.3612	36	F36	1.0732

PREDICTED VALUE, GP= 2.6723

*** INTERVAL NO. 5

PARAMETERS FOR SAMPLE NO. 1

NO.	NAME	B	NO.	NAME	B
1	HK_1	1.8276	2	HK_2	0.81780E-01

DEPENDENT VARIABLES COMPUTED FOR SAMPLE NO. 1

NO.	OBSERVATION	FC	NO.	OBSERVATION	FC
1	F1	14.708	19	F19	2.1869
2	F2	14.593	20	F20	2.1512
3	F3	14.415	21	F21	2.1036
4	F4	13.953	22	F22	2.0640
5	F5	13.750	23	F23	2.0630
6	F6	13.734	24	F24	2.0654
7	F7	3.8349	25	F25	1.4239
8	F8	4.0393	26	F26	1.4137
9	F9	4.4354	27	F27	1.4033
10	F10	8.3461	28	F28	1.3936
11	F11	11.861	29	F29	1.3855
12	F12	12.237	30	F30	1.3814
13	F13	3.0485	31	F31	0.70014
14	F14	3.0500	32	F32	0.69745
15	F15	3.0126	33	F33	0.69463
16	F16	2.9000	34	F34	0.69170
17	F17	2.7852	35	F35	0.68874
18	F18	2.7486	36	F36	0.68681

PREDICTED VALUE, GP= 1.0175

PARAMETERS FOR SAMPLE NO. 2

NO.	NAME	B	NO.	NAME	B

1	HK_1	1.1724	2	HK_2	0.12090

DEPENDENT VARIABLES COMPUTED FOR SAMPLE NO. 2

NO.	OBSERVATION	FC	NO.	OBSERVATION	FC
1	F1	14.809	19	F19	3.3856
2	F2	14.686	20	F20	3.3344
3	F3	14.486	21	F21	3.2671
4	F4	13.950	22	F22	3.2161
5	F5	13.699	23	F23	3.2289
6	F6	13.673	24	F24	3.2439
7	F7	5.9750	25	F25	2.2109
8	F8	6.1981	26	F26	2.1975
9	F9	6.6384	27	F27	2.1843
10	F10	9.1351	28	F28	2.1728
11	F11	11.423	29	F29	2.1645
12	F12	11.798	30	F30	2.1614
13	F13	4.7046	31	F31	1.0884
14	F14	4.6942	32	F32	1.0852
15	F15	4.6376	33	F33	1.0820
16	F16	4.5019	34	F34	1.0786
17	F17	4.3848	35	F35	1.0753
18	F18	4.3611	36	F36	1.0731

PREDICTED VALUE, GP= 1.5862

*** INTERVAL NO. 6

PARAMETERS FOR SAMPLE NO. 1

NO.	NAME	B	NO.	NAME	B
1	HK_1	1.8294	2	HK_2	0.81832E-01

DEPENDENT VARIABLES COMPUTED FOR SAMPLE NO. 1

NO.	OBSERVATION	FC	NO.	OBSERVATION	FC
1	F1	14.696	19	F19	2.1848
2	F2	14.581	20	F20	2.1493
3	F3	14.404	21	F21	2.1017
4	F4	13.942	22	F22	2.0622
5	F5	13.739	23	F23	2.0611
6	F6	13.723	24	F24	2.0634
7	F7	3.8312	25	F25	1.4227
8	F8	4.0354	26	F26	1.4125
9	F9	4.4311	27	F27	1.4021
10	F10	8.3394	28	F28	1.3923
11	F11	11.852	29	F29	1.3842
12	F12	12.228	30	F30	1.3800
13	F13	3.0456	31	F31	0.69955
14	F14	3.0471	32	F32	0.69680
15	F15	3.0097	33	F33	0.69397
16	F16	2.8973	34	F34	0.69105
17	F17	2.7826	35	F35	0.68807
18	F18	2.7460	36	F36	0.68615

PREDICTED VALUE, GP= 2.5731

PARAMETERS FOR SAMPLE NO. 2

NO.	NAME	B	NO.	NAME	B
1	HK_1	1.1713	2	HK_2	0.12082

DEPENDENT VARIABLES COMPUTED FOR SAMPLE NO. 2

NO.	OBSERVATION	FC	NO.	OBSERVATION	FC
1	F1	14.821	19	F19	3.3889
2	F2	14.698	20	F20	3.3376
3	F3	14.498	21	F21	3.2703
4	F4	13.961	22	F22	3.2192
5	F5	13.710	23	F23	3.2320
6	F6	13.684	24	F24	3.2470
7	F7	5.9806	25	F25	2.2130
8	F8	6.2038	26	F26	2.1996
9	F9	6.6445	27	F27	2.1863
10	F10	9.1427	28	F28	2.1748
11	F11	11.432	29	F29	2.1666
12	F12	11.807	30	F30	2.1635
13	F13	4.7090	31	F31	1.0894
14	F14	4.6987	32	F32	1.0863
15	F15	4.6421	33	F33	1.0830
16	F16	4.5062	34	F34	1.0797
17	F17	4.3890	35	F35	1.0764
18	F18	4.3653	36	F36	1.0741

PREDICTED VALUE, GP= 3.9844

*** INTERVAL NO. 7

PARAMETERS FOR SAMPLE NO. 1

NO.	NAME	B	NO.	NAME	B
1	HK_1	1.1724	2	HK_2	0.12090

DEPENDENT VARIABLES COMPUTED FOR SAMPLE NO. 1

NO.	OBSERVATION	FC	NO.	OBSERVATION	FC
1	F1	14.809	19	F19	3.3856
2	F2	14.686	20	F20	3.3343
3	F3	14.486	21	F21	3.2671
4	F4	13.950	22	F22	3.2161
5	F5	13.699	23	F23	3.2289
6	F6	13.673	24	F24	3.2438
7	F7	5.9749	25	F25	2.2109
8	F8	6.1981	26	F26	2.1975
9	F9	6.6384	27	F27	2.1842
10	F10	9.1350	28	F28	2.1728
11	F11	11.423	29	F29	2.1645
12	F12	11.798	30	F30	2.1614
13	F13	4.7046	31	F31	1.0884
14	F14	4.6942	32	F32	1.0852
15	F15	4.6376	33	F33	1.0819
16	F16	4.5018	34	F34	1.0786
17	F17	4.3847	35	F35	1.0753
18	F18	4.3610	36	F36	1.0731

PREDICTED VALUE, GP= 0.15904

PARAMETERS FOR SAMPLE NO. 2

NO.	NAME	B	NO.	NAME	B
1	HK_1	1.8276	2	HK_2	0.81780E-01

DEPENDENT VARIABLES COMPUTED FOR SAMPLE NO. 2

NO.	OBSERVATION	FC	NO.	OBSERVATION	FC
1	F1	14.708	19	F19	2.1871
2	F2	14.593	20	F20	2.1515
3	F3	14.415	21	F21	2.1038
4	F4	13.953	22	F22	2.0642
5	F5	13.750	23	F23	2.0631
6	F6	13.734	24	F24	2.0655
7	F7	3.8351	25	F25	1.4241
8	F8	4.0396	26	F26	1.4138
9	F9	4.4358	27	F27	1.4034
10	F10	8.3465	28	F28	1.3937
11	F11	11.861	29	F29	1.3856
12	F12	12.237	30	F30	1.3814
13	F13	3.0489	31	F31	0.70022
14	F14	3.0503	32	F32	0.69747
15	F15	3.0128	33	F33	0.69464
16	F16	2.9003	34	F34	0.69168
17	F17	2.7855	35	F35	0.68875
18	F18	2.7488	36	F36	0.68681

PREDICTED VALUE, GP= 0.60300

*** INTERVAL NO. 8

PARAMETERS FOR SAMPLE NO. 1

NO.	NAME	B	NO.	NAME	B
1	HK_1	1.5854	2	HK_2	0.87532E-01

DEPENDENT VARIABLES COMPUTED FOR SAMPLE NO. 1

NO.	OBSERVATION	FC	NO.	OBSERVATION	FC
1	F1	15.025	19	F19	2.5172
2	F2	14.901	20	F20	2.4770
3	F3	14.709	21	F21	2.4232
4	F4	14.206	22	F22	2.3795
5	F5	13.982	23	F23	2.3807
6	F6	13.963	24	F24	2.3854
7	F7	4.4208	25	F25	1.6401
8	F8	4.6408	26	F26	1.6287
9	F9	5.0687	27	F27	1.6173
10	F10	8.6867	28	F28	1.6067
11	F11	11.955	29	F29	1.5983
12	F12	12.347	30	F30	1.5941
13	F13	3.5065	31	F31	0.80668
14	F14	3.5064	32	F32	0.80374
15	F15	3.4637	33	F33	0.80067

16	F16	3.3403	34	F34	0.79741
17	F17	3.2183	35	F35	0.79416
18	F18	3.1816	36	F36	0.79220

PREDICTED VALUE, GP= -2.4358

PARAMETERS FOR SAMPLE NO. 2

NO.	NAME	B	NO.	NAME	B
1	HK_1	1.3514	2	HK_2	0.11295

DEPENDENT VARIABLES COMPUTED FOR SAMPLE NO. 2

NO.	OBSERVATION	FC	NO.	OBSERVATION	FC
1	F1	14.191	19	F19	2.9427
2	F2	14.070	20	F20	2.8971
3	F3	13.878	21	F21	2.8370
4	F4	13.367	22	F22	2.7901
5	F5	13.133	23	F23	2.7977
6	F6	13.110	24	F24	2.8079
7	F7	5.1838	25	F25	1.9200
8	F8	5.4004	26	F26	1.9077
9	F9	5.8252	27	F27	1.8955
10	F10	8.5518	28	F28	1.8847
11	F11	11.039	29	F29	1.8765
12	F12	11.408	30	F30	1.8729
13	F13	4.0926	31	F31	0.94490
14	F14	4.0866	32	F32	0.94193
15	F15	4.0371	33	F33	0.93885
16	F16	3.9096	34	F34	0.93561
17	F17	3.7931	35	F35	0.93241
18	F18	3.7647	36	F36	0.93026

PREDICTED VALUE, GP= -2.1808

COMBINED INTRINSIC NONLINEARITY

INTERVAL NO.		BMI	INTERVAL NO.		BMI
1	G1	0.91136E-01	5	G5	0.92165E-01
2	G2	0.13976E-04	6	G6	0.89142E-01
3	G3	0.80532E-01	7	HK_1	0.37137E-01
4	G4	0.92049E-01	8	HK_2	0.22188E-01

COMBINED INTRINSIC NONLINEARITY AS IF F WERE LINEAR

INTERVAL NO.		BMF0	INTERVAL NO.		BMF0
1	G1	0.12232E-01	5	G5	0.12491E-01
2	G2	0.37404E-02	6	G6	0.11832E-01
3	G3	0.99148E-02	7	HK_1	0.58584E-12
4	G4	0.12468E-01	8	HK_2	0.59462E-10

COMBINED INTRINSIC NONLINEARITY AS IF G WERE LINEAR

INTERVAL NO.		BMG0	INTERVAL NO.		BMG0
1	G1	0.36826E-01	5	G5	0.37051E-01
2	G2	0.40559E-02	6	G6	0.36261E-01
3	G3	0.34126E-01	7	HK_1	0.37137E-01
4	G4	0.37003E-01	8	HK_2	0.22186E-01

```
      COMBINED INTRINSIC NONLINEARITY - MAX. SUM
 INTERVAL NO.      BMIMAX        INTERVAL NO.      BMIMAX
1  G1           0.11560         5  G5           0.11715
2  G2           0.80979E-02     6  G6           0.11280
3  G3           0.10036         7    HK_1       0.37137E-01
4  G4           0.11699         8    HK_2       0.22188E-01
```

RESAN2-2k Input Files

Modified _rs file (example._rs):

```
    2   36   36    0    0    0 1000     10059   1.2028920299866620D-02
.01    0    0    1    1
HK_1       HK_2
   1.5984446317565970D-02  -9.3897459008995630D-02
   1.2171445371320360D+00
 3.70299257E-02 3.80506031E-02 3.86905819E-02 3.78140099E-02 3.70474569E-02
3.65929864E-02 3.94278727E-02 3.87343839E-02 3.81299071E-02 3.72347161E-02
3.73285078E-02 3.69736925E-02 3.95077951E-02 3.92752253E-02 4.01894972E-02
4.05620262E-02
 3.95699181E-02 3.98577228E-02 4.27163243E-02 4.33942601E-02 4.35817763E-02
4.33828235E-02 4.27807719E-02 4.29287367E-02 4.85740304E-02 4.83402126E-02
4.82680798E-02 4.84433360E-02 4.81047295E-02 4.74082753E-02 8.08135197E-02
7.11964741E-02
 7.12072998E-02 7.03493059E-02 6.85945898E-02 7.03145191E-02
-7.04659367E+00-1.50004828E+00
-7.06339741E+00-1.48310077E+00
-7.10597181E+00-1.43996620E+00
-7.27100706E+00-1.27518404E+00
-7.40044165E+00-1.14634621E+00
-7.43134212E+00-1.11610472E+00
-6.84805489E+00-8.78273845E-02
-6.79571819E+00-1.33685842E-01
-6.68890238E+00-2.35920116E-01
-6.33737326E+00-5.86289763E-01
-6.05908632E+00-8.68575454E-01
-5.98694611E+00-9.47160363E-01
-5.29238510E+00-6.16868287E-02
-5.25664139E+00-5.80927134E-02
-5.23037148E+00-3.93029377E-02
-5.26140881E+00 1.06110601E-02
-5.35310459E+00 5.58182150E-02
-5.40344524E+00 6.14485182E-02
-3.86938190E+00-2.47615427E-02
-3.83271551E+00-1.77744813E-02
-3.78756404E+00-8.75341985E-03
-3.77330446E+00 2.30506901E-03
-3.84462976E+00 1.46126971E-02
-3.90307307E+00 2.25643124E-02
-2.55457449E+00-8.90955608E-03
-2.54985857E+00-6.12230739E-03
-2.54753423E+00-2.92208139E-03
-2.54963517E+00 7.52098567E-04
-2.55824447E+00 4.94222483E-03
-2.56872201E+00 8.00079107E-03
-1.26404727E+00-2.83111562E-03
-1.26398706E+00-1.93543814E-03
-1.26431274E+00-9.20786173E-04
-1.26529419E+00 2.35229818E-04
-1.26728976E+00 1.55798520E-03
```

```
-1.26906574E+00 2.53848336E-03
  0.66151  0.57163  0.57791  0.65444  0.70896  0.78005  0.59267  0.58384
  0.54952  0.43816  0.37298  0.38888  0.47908  0.43970  0.40578  0.41702
  0.43077  0.42120  0.32116  0.30408  0.29091  0.27985  0.28804  0.26147
  0.12901  0.15028  0.15210  0.16090  0.16435  0.17098 -.048154 -.018498
-.0080944 .0071884  .033326  .055387
729.28    667.57    615.68    586.33    557.59    534.25    584.85    598.77
591.88    569.46    549.34    541.11    477.64    485.80    477.81    474.03
490.18    486.31    326.73    325.31    323.54    332.79    344.61    339.91
208.67    221.75    226.29    225.34    240.21    245.61    68.870    101.52
103.49    110.91    118.31    98.075
667.57    690.68    654.63    620.72    586.71    561.51    589.59    601.63
595.99    577.41    559.76    549.42    478.84    483.95    474.92    467.99
483.29    478.43    321.55    318.49    315.94    322.14    333.98    331.21
214.14    224.01    227.44    222.64    233.67    236.83    72.997    106.27
108.19    114.37    119.57    96.373
615.68    654.63    668.02    651.43    618.29    587.79    577.61    590.09
588.78    576.27    558.71    553.40    467.96    471.16    460.22    452.06
465.32    460.42    308.79    303.50    300.50    304.75    314.61    312.42
202.47    210.94    215.14    210.02    220.51    221.90    72.489    104.27
105.26    110.19    114.24    92.439
586.33    620.72    651.43    699.35    686.13    649.67    562.03    574.93
574.79    566.42    550.59    553.37    452.96    452.53    440.17    430.63
441.05    439.34    293.55    290.00    287.19    289.52    297.87    293.66
193.48    201.20    204.83    198.65    206.20    206.93    69.506    99.734
99.477    103.72    107.11    87.286
557.59    586.71    618.29    686.13    728.59    707.08    543.25    559.94
561.06    555.06    538.05    538.75    443.24    442.05    428.49    417.27
424.38    421.98    288.46    285.79    281.38    283.14    288.82    282.64
192.57    200.60    204.67    197.13    203.52    203.09    69.115    99.001
98.459    104.13    107.79    87.132
534.25    561.51    587.79    649.67    707.08    746.80    525.38    543.55
547.06    545.23    529.14    527.88    437.16    436.68    423.31    411.63
418.82    415.31    289.42    286.38    280.51    281.62    286.86    279.57
191.49    200.05    202.37    193.86    198.61    197.71    65.800    95.801
95.834    100.16    103.22    82.084
584.85    589.59    577.61    562.03    543.25    525.38    643.27    632.46
614.20    600.57    577.59    562.10    507.35    507.86    491.01    477.72
483.99    476.30    331.83    326.31    325.01    329.89    338.91    334.53
216.78    225.84    232.23    227.82    238.01    242.82    71.272    107.29
108.79    114.71    123.51    104.54
598.77    601.63    590.09    574.93    559.94    543.55    632.46    666.51
657.18    644.11    618.41    599.20    524.83    525.59    509.64    499.58
510.39    501.63    346.45    338.31    333.05    337.30    349.23    345.68
221.67    230.89    237.21    232.60    242.72    247.01    73.206    109.94
110.31    115.26    124.50    105.37
591.88    595.99    588.78    574.79    561.06    547.06    614.20    657.18
687.81    686.21    659.29    637.88    537.68    541.81    526.18    517.05
531.07    522.43    362.45    354.14    347.07    349.82    361.59    358.58
232.67    240.53    246.07    242.48    250.68    254.24    78.717    114.03
114.30    119.04    127.26    106.76
569.46    577.41    576.27    566.42    555.06    545.23    600.57    644.11
686.21    721.28    701.42    676.61    554.47    562.74    551.08    543.76
558.91    552.38    379.87    372.12    363.43    363.69    375.96    372.75
242.19    249.08    254.99    254.22    261.06    263.36    84.298    120.19
120.19    124.31    131.48    110.02
```

```
549.34    559.76    558.71    550.59    538.05    529.14    577.59    618.41
659.29    701.42    717.66    702.17    553.51    566.83    558.53    551.51
566.99    560.49    382.08    375.64    366.97    367.21    378.36    374.44
245.30    252.08    257.29    255.75    261.15    262.41    88.611    121.30
120.89    124.28    131.52    112.32
541.11    549.42    553.40    553.37    538.75    527.88    562.10    599.20
637.88    676.61    702.17    731.50    549.20    564.90    560.42    557.96
574.98    566.97    382.48    378.58    371.67    371.59    381.56    374.77
248.91    256.43    261.51    258.12    261.74    261.68    91.934    123.40
123.28    127.11    134.16    113.32
477.64    478.84    467.96    452.96    443.24    437.16    507.35    524.83
537.68    554.47    553.51    549.20    640.67    626.22    591.51    563.61
555.08    535.82    453.45    447.14    440.73    438.31    441.10    423.05
295.30    305.66    312.49    311.97    316.94    320.88    105.64    144.94
148.93    153.49    165.66    142.97
485.80    483.95    471.16    452.53    442.05    436.68    507.86    525.59
541.81    562.74    566.83    564.90    626.22    648.28    618.24    588.02
580.79    558.88    460.96    454.52    448.96    446.67    449.88    432.98
303.50    313.53    320.28    319.66    325.02    328.34    111.31    149.19
151.82    155.30    165.42    142.83
477.81    474.92    460.22    440.17    428.49    423.31    491.01    509.64
526.18    551.08    558.53    560.42    591.51    618.24    619.12    597.36
588.69    566.62    452.11    449.96    444.33    443.98    453.68    439.92
300.25    308.91    315.03    313.82    319.76    324.34    108.06    145.56
148.64    152.55    161.93    139.60
474.03    467.99    452.06    430.63    417.27    411.63    477.72    499.58
517.05    543.76    551.51    557.96    563.61    588.02    597.36    607.80
599.81    577.83    445.39    443.84    438.99    440.63    456.72    446.56
296.70    305.68    312.57    310.46    316.16    321.64    106.61    144.37
146.88    150.81    159.16    137.11
490.18    483.29    465.32    441.05    424.38    418.82    483.99    510.39
531.07    558.91    566.99    574.98    555.08    580.79    588.69    599.81
638.66    617.67    438.33    438.82    437.99    440.62    458.55    449.80
292.93    303.57    309.94    308.99    313.48    315.66    105.79    143.49
145.72    148.31    155.68    131.83
486.31    478.43    460.42    439.34    421.98    415.31    476.30    501.63
522.43    552.38    560.49    566.97    535.82    558.88    566.62    577.83
617.67    629.47    428.62    428.57    430.59    437.01    456.18    447.76
288.83    299.85    307.41    307.76    311.41    313.08    105.58    143.63
146.56    150.52    156.68    132.63
326.73    321.55    308.79    293.55    288.46    289.42    331.83    346.45
362.45    379.87    382.08    382.48    453.45    460.96    452.11    445.39
438.33    428.62    548.04    522.35    500.04    484.78    471.74    454.53
379.15    390.62    392.18    383.88    378.94    379.17    137.98    179.29
184.21    190.21    201.84    174.92
325.31    318.49    303.50    290.00    285.79    286.38    326.31    338.31
354.14    372.12    375.64    378.58    447.14    454.52    449.96    443.84
438.82    428.57    522.35    531.05    515.27    499.46    486.02    465.12
377.99    389.36    391.95    384.08    380.66    379.82    139.14    177.36
182.01    187.59    198.06    171.04
323.54    315.94    300.50    287.19    281.38    280.51    325.01    333.05
347.07    363.43    366.97    371.67    440.73    448.96    444.33    438.99
437.99    430.59    500.04    515.27    526.49    517.52    502.76    477.30
381.07    395.46    399.39    394.44    392.14    390.23    145.44    183.03
188.11    193.42    204.07    177.28
332.79    322.14    304.75    289.52    283.14    281.62    329.89    337.30
```

```
349.82    363.69    367.21    371.59    438.31    446.67    443.98    440.63
440.62    437.01    484.78    499.46    517.52    531.33    522.51    497.03
371.13    389.59    396.26    394.86    398.34    402.69    143.86    182.63
188.43    193.53    205.17    179.10
344.61    333.98    314.61    297.87    288.82    286.86    338.91    349.23
361.59    375.96    378.36    381.56    441.10    449.88    453.68    456.72
458.55    456.18    471.74    486.02    502.76    522.51    546.39    526.83
360.58    381.27    390.93    393.82    401.50    409.36    141.58    181.57
187.82    192.83    203.97    177.63
339.91    331.21    312.42    293.66    282.64    279.57    334.53    345.68
358.58    372.75    374.44    374.77    423.05    432.98    439.92    446.56
449.80    447.76    454.53    465.12    477.30    497.03    526.83    542.63
346.27    367.35    378.05    383.54    394.49    404.22    134.42    174.09
180.86    186.84    198.00    171.15
208.67    214.14    202.47    193.48    192.57    191.49    216.78    221.67
232.67    242.19    245.30    248.91    295.30    303.50    300.25    296.70
292.93    288.83    379.15    377.99    381.07    371.13    360.58    346.27
423.83    409.60    393.71    366.08    338.05    324.23    170.89    210.96
207.57    202.51    198.52    162.88
221.75    224.01    210.94    201.20    200.60    200.05    225.84    230.89
240.53    249.08    252.08    256.43    305.66    313.53    308.91    305.68
303.57    299.85    390.62    389.36    395.46    389.59    381.27    367.35
409.60    427.94    417.14    392.68    365.92    350.74    173.99    216.39
216.19    214.18    214.04    179.48
226.29    227.44    215.14    204.83    204.67    202.37    232.23    237.21
246.07    254.99    257.29    261.51    312.49    320.28    315.03    312.57
309.94    307.41    392.18    391.95    399.39    396.26    390.93    378.05
393.71    417.14    429.22    411.90    388.36    372.38    172.20    216.59
217.49    217.96    221.48    188.33
225.34    222.64    210.02    198.65    197.13    193.86    227.82    232.60
242.48    254.22    255.75    258.12    311.97    319.66    313.82    310.46
308.99    307.76    383.88    384.08    394.44    394.86    393.82    383.54
366.08    392.68    411.90    426.12    411.10    395.28    165.65    211.41
215.82    218.80    226.66    197.82
240.21    233.67    220.51    206.20    203.52    198.61    238.01    242.72
250.68    261.06    261.15    261.74    316.94    325.02    319.76    316.16
313.48    311.41    378.94    380.66    392.14    398.34    401.50    394.49
338.05    365.92    388.36    411.10    432.14    425.39    160.29    207.36
214.39    219.04    231.88    204.96
245.61    236.83    221.90    206.93    203.09    197.71    242.82    247.01
254.24    263.36    262.41    261.68    320.88    328.34    324.34    321.64
315.66    313.08    379.17    379.82    390.23    402.69    409.36    404.22
324.23    350.74    372.38    395.28    425.39    444.93    153.77    201.63
210.36    217.26    232.57    206.41
68.870    72.997    72.489    69.506    69.115    65.800    71.272    73.206
78.717    84.298    88.611    91.934    105.64    111.31    108.06    106.61
105.79    105.58    137.98    139.14    145.44    143.86    141.58    134.42
170.89    173.99    172.20    165.65    160.29    153.77    153.12    155.86
140.83    128.13    111.47    93.066
101.52    106.27    104.27    99.734    99.001    95.801    107.29    109.94
114.03    120.19    121.30    123.40    144.94    149.19    145.56    144.37
143.49    143.63    179.29    177.36    183.03    182.63    181.57    174.09
210.96    216.39    216.59    211.41    207.36    201.63    155.86    197.28
185.59    173.70    156.95    128.51
103.49    108.19    105.26    99.477    98.459    95.834    108.79    110.31
114.30    120.19    120.89    123.28    148.93    151.82    148.64    146.88
```

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145.72    146.56    184.21    182.01    188.11    188.43    187.82    180.86
207.57    216.19    217.49    215.82    214.39    210.36    140.83    185.59
197.22    190.73    175.32    147.00
110.91    114.37    110.19    103.72    104.13    100.16    114.71    115.26
119.04    124.31    124.28    127.11    153.49    155.30    152.55    150.81
148.31    150.52    190.21    187.59    193.42    193.53    192.83    186.84
202.51    214.18    217.96    218.80    219.04    217.26    128.13    173.70
190.73    202.06    192.15    162.93
118.31    119.57    114.24    107.11    107.79    103.22    123.51    124.50
127.26    131.48    131.52    134.16    165.66    165.42    161.93    159.16
155.68    156.68    201.84    198.06    204.07    205.17    203.97    198.00
198.52    214.04    221.48    226.66    231.88    232.57    111.47    156.95
175.32    192.15    212.53    188.12
98.075    96.373    92.439    87.286    87.132    82.084    104.54    105.37
106.76    110.02    112.32    113.32    142.97    142.83    139.60    137.11
131.83    132.63    174.92    171.04    177.28    179.10    177.63    171.15
162.88    179.48    188.33    197.82    204.96    206.41    93.066    128.51
147.00    162.93    188.12    202.26
```

_ws file (example._ws):

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  0.5387840       0.1222136E-01     1  F1
  0.5489494       0.1343849E-01     1  F2
  0.5506946       0.2424740E-01     1  F3
  0.5189314       0.5548934E-02     1  F4
  0.4998959      -0.1790851E-01     1  F5
  0.4930008      -0.1838977E-01     1  F6
  0.1887295       0.3246087E-01     1  F7
  0.1939302       0.2414436E-01     1  F8
  0.2072599       0.1923179E-01     1  F9
  0.3195286       0.9253923E-02     1  F10
  0.4269593      -0.1335947E-01     1  F11
  0.4369872      -0.1733579E-01     1  F12
  0.1496757      -0.3496893E-02     1  F13
  0.1486864      -0.1404292E-02     1  F14
  0.1502898      -0.8822737E-02     1  F15
  0.1465700      -0.1068726E-01     1  F16
  0.1382196      -0.2890517E-02     1  F17
  0.1379032       0.9968983E-02     1  F18
  0.1162644      -0.1502673E-01     1  F19
  0.1162447      -0.3336162E-01     1  F20
  0.1142654      -0.3756152E-01     1  F21
  0.1117733      -0.2674299E-01     1  F22
  0.1103901      -0.3252914E-01     1  F23
  0.1110804      -0.2264722E-01     1  F24
  0.8620078E-01  -0.1139677E-01     1  F25
  0.8520906E-01  -0.4964315E-02     1  F26
  0.8450945E-01   0.1407734E-02     1  F27
  0.8429423E-01  -0.9691494E-02     1  F28
  0.8329535E-01  -0.1517311E-02     1  F29
  0.8189733E-01  -0.8414512E-02     1  F30
  0.7055598E-01   0.5408723E-02     1  F31
  0.6194711E-01   0.3843991E-01     1  F32
  0.6173658E-01   0.2513633E-01     1  F33
```

```
0.6075818E-01   0.4265530E-01     1  F34
0.5902952E-01   0.1505264E-01     1  F35
0.6035101E-01   0.1525764E-02     1  F36
```

RESAN2-2k Output Files

#nr file (example.#nr):

```
                                    RESAN2-2k

                    MODFLOW-2000 POST-PROCESSING PROGRAM
                TO PERFORM ANALYSIS OF NON-LINEARITY AND RESIDUALS
                            Version 1.0.0 25/06/2003

 WEIGHTED RESIDUALS WILL BE READ FROM FILE Example._ws


 NUMBER OF ESTIMATED PARAMETERS.............      2
 NUMBER OF OBSERVATIONS ....................     36
 NUMBER OF HEADS ...........................     36
 NUMBER OF OBSERVATIONS OTHER THAN HEADS ....      0
 NUMBER OF PRIOR EQUATIONS..................      0
 NUMBER OF PRIOR WITH FULL WEIGHT MATRIX.....      0
 NUMBER OF SETS OF RANDOM DEVIATES ..........   1000
 NUMBER FOR RANDOM NUMBER GENERATOR .........      -10059
 CALCULATED ERROR VARIANCE ..................  0.120289E-01
 THEORETICAL ERROR VARIANCE .................  0.100000E-01
 PRINT (I-R) MATRIX.........................      0
 PRINT SIMULATED RESIDUALS..................      0
 READ MEAN TRUE ERRORS......................      1
 READ OBSERVATION ERROR COVARIANCE MATRIX....      1


 COVARIANCE MATRIX FOR ESTIMATED PARAMETERS

             HK_1         HK_2
 ..................................
 HK_1         1.59844E-02 -9.38975E-02
 HK_2        -9.38975E-02   1.2171

              RELIABILITY WEIGHTS FOR SAMPLE INFORMATION
        OBSERVATION                       OBSERVATION
  OBS#     NAME       W**.5       OBS#     NAME       W**.5
     1   F1           0.37030E-01    19   F19          0.42716E-01
     2   F2           0.38051E-01    20   F20          0.43394E-01
     3   F3           0.38691E-01    21   F21          0.43582E-01
     4   F4           0.37814E-01    22   F22          0.43383E-01
     5   F5           0.37047E-01    23   F23          0.42781E-01
     6   F6           0.36593E-01    24   F24          0.42929E-01
     7   F7           0.39428E-01    25   F25          0.48574E-01
     8   F8           0.38734E-01    26   F26          0.48340E-01
     9   F9           0.38130E-01    27   F27          0.48268E-01
    10   F10          0.37235E-01    28   F28          0.48443E-01
    11   F11          0.37329E-01    29   F29          0.48105E-01
    12   F12          0.36974E-01    30   F30          0.47408E-01
    13   F13          0.39508E-01    31   F31          0.80814E-01
    14   F14          0.39275E-01    32   F32          0.71196E-01
```

```
   15  F15          0.40189E-01    33  F33          0.71207E-01
   16  F16          0.40562E-01    34  F34          0.70349E-01
   17  F17          0.39570E-01    35  F35          0.68595E-01
   18  F18          0.39858E-01    36  F36          0.70315E-01

 SENSITIVITIES FOR OPTIMUM PARAMETERS

 PARAMETER   F1           F2           F3           F4           F5
 ----------  ------------ ------------ ------------ ------------ ------------
 HK_1         -7.0466      -7.0634      -7.1060      -7.2710      -7.4004
 HK_2         -1.5000      -1.4831      -1.4400      -1.2752      -1.1463

 PARAMETER   F6           F7           F8           F9           F10
 ----------  ------------ ------------ ------------ ------------ ------------
 HK_1         -7.4313      -6.8481      -6.7957      -6.6889      -6.3374
 HK_2         -1.1161     -0.87827E-01 -0.13369     -0.23592     -0.58629

 PARAMETER   F11          F12          F13          F14          F15
 ----------  ------------ ------------ ------------ ------------ ------------
 HK_1         -6.0591      -5.9869      -5.2924      -5.2566      -5.2304
 HK_2        -0.86858     -0.94716     -0.61687E-01 -0.58093E-01 -0.39303E-01

 PARAMETER   F16          F17          F18          F19          F20
 ----------  ------------ ------------ ------------ ------------ ------------
 HK_1         -5.2614      -5.3531      -5.4034      -3.8694      -3.8327
 HK_2         0.10611E-01  0.55818E-01  0.61449E-01 -0.24762E-01 -0.17774E-01

 PARAMETER   F21          F22          F23          F24          F25
 ----------  ------------ ------------ ------------ ------------ ------------
 HK_1         -3.7876      -3.7733      -3.8446      -3.9031      -2.5546
 HK_2        -0.87534E-02  0.23051E-02  0.14613E-01  0.22564E-01 -0.89096E-02

 PARAMETER   F26          F27          F28          F29          F30
 ----------  ------------ ------------ ------------ ------------ ------------
 HK_1         -2.5499      -2.5475      -2.5496      -2.5582      -2.5687
 HK_2        -0.61223E-02 -0.29221E-02  0.75210E-03  0.49422E-02  0.80008E-02

 PARAMETER   F31          F32          F33          F34          F35
 ----------  ------------ ------------ ------------ ------------ ------------
 HK_1         -1.2640      -1.2640      -1.2643      -1.2653      -1.2673
 HK_2        -0.28311E-02 -0.19354E-02 -0.92079E-03  0.23523E-03  0.15580E-02

 PARAMETER   F36
 ----------  ------------
 HK_1         -1.2691
 HK_2         0.25385E-02

MEAN WEIGHTED RESIDUAL (EM) --------- = -.50018E-03
SLOPE OF WEIGHTED RESIDUAL PLOT (SLP) = 0.35753E-02
INTRINSIC NONLINEARITY MEASURE (QINT) = 0.19544E-03 (SHOULD BE <<0.14039E-01)

         ORDERED, WEIGHTED RESIDUALS
          OBSERVATION
    NO.      NAME            E          FRQ. (%)
      1   F21            -.37562E-01     1.3889
      2   F20            -.33362E-01     4.1667
```

3	F23	-.32529E-01	6.9444
4	F22	-.26743E-01	9.7222
5	F24	-.22647E-01	12.500
6	F6	-.18390E-01	15.278
7	F5	-.17909E-01	18.056
8	F12	-.17336E-01	20.833
9	F19	-.15027E-01	23.611
10	F11	-.13359E-01	26.389
11	F25	-.11397E-01	29.167
12	F16	-.10687E-01	31.944
13	F28	-.96915E-02	34.722
14	F15	-.88227E-02	37.500
15	F30	-.84145E-02	40.278
16	F26	-.49643E-02	43.056
17	F13	-.34969E-02	45.833
18	F17	-.28905E-02	48.611
19	F29	-.15173E-02	51.389
20	F14	-.14043E-02	54.167
21	F27	0.14077E-02	56.944
22	F36	0.15258E-02	59.722
23	F31	0.54087E-02	62.500
24	F4	0.55489E-02	65.278
25	F10	0.92539E-02	68.056
26	F18	0.99690E-02	70.833
27	F1	0.12221E-01	73.611
28	F2	0.13438E-01	76.389
29	F35	0.15053E-01	79.167
30	F9	0.19232E-01	81.944
31	F8	0.24144E-01	84.722
32	F3	0.24247E-01	87.500
33	F33	0.25136E-01	90.278
34	F7	0.32461E-01	93.056
35	F32	0.38440E-01	95.833
36	F34	0.42655E-01	98.611

MEAN ORDERED, SIMULATED WEIGHTED RESIDUALS

NO.	OBSERVATION NAME	D	FRQ. (%)
1	F21	-.10938	1.3889
2	F20	-.92706E-01	4.1667
3	F23	-.81207E-01	6.9444
4	F22	-.71524E-01	9.7222
5	F24	-.63615E-01	12.500
6	F6	-.57005E-01	15.278
7	F5	-.50915E-01	18.056
8	F12	-.45545E-01	20.833
9	F19	-.40679E-01	23.611
10	F11	-.35812E-01	26.389
11	F25	-.31282E-01	29.167
12	F16	-.26841E-01	31.944
13	F28	-.22280E-01	34.722
14	F15	-.18282E-01	37.500
15	F30	-.14528E-01	40.278
16	F26	-.10723E-01	43.056
17	F13	-.67828E-02	45.833
18	F17	-.30485E-02	48.611

19	F29	0.91987E-03	51.389
20	F14	0.45571E-02	54.167
21	F27	0.85930E-02	56.944
22	F36	0.12630E-01	59.722
23	F31	0.16606E-01	62.500
24	F4	0.20888E-01	65.278
25	F10	0.25444E-01	68.056
26	F18	0.30108E-01	70.833
27	F1	0.34861E-01	73.611
28	F2	0.39605E-01	76.389
29	F35	0.44706E-01	79.167
30	F9	0.50015E-01	81.944
31	F8	0.56072E-01	84.722
32	F3	0.62882E-01	87.500
33	F33	0.70577E-01	90.278
34	F7	0.80583E-01	93.056
35	F32	0.92808E-01	95.833
36	F34	0.10747	98.611

STD. DVS. OF ORDERED, SIMULATED WEIGHTED RESIDUALS

NO.	OBSERVATION NAME	D	FRQ. (%)
1	F21	0.37500E-01	1.3889
2	F20	0.33337E-01	4.1667
3	F23	0.30846E-01	6.9444
4	F22	0.27941E-01	9.7222
5	F24	0.25728E-01	12.500
6	F6	0.24604E-01	15.278
7	F5	0.23011E-01	18.056
8	F12	0.22052E-01	20.833
9	F19	0.21242E-01	23.611
10	F11	0.20091E-01	26.389
11	F25	0.19207E-01	29.167
12	F16	0.17644E-01	31.944
13	F28	0.16257E-01	34.722
14	F15	0.15356E-01	37.500
15	F30	0.14826E-01	40.278
16	F26	0.14434E-01	43.056
17	F13	0.14270E-01	45.833
18	F17	0.14161E-01	48.611
19	F29	0.14106E-01	51.389
20	F14	0.14000E-01	54.167
21	F27	0.14133E-01	56.944
22	F36	0.14548E-01	59.722
23	F31	0.14758E-01	62.500
24	F4	0.14946E-01	65.278
25	F10	0.15909E-01	68.056
26	F18	0.16967E-01	70.833
27	F1	0.17980E-01	73.611
28	F2	0.19061E-01	76.389
29	F35	0.20546E-01	79.167
30	F9	0.21745E-01	81.944
31	F8	0.23228E-01	84.722
32	F3	0.24758E-01	87.500
33	F33	0.26490E-01	90.278
34	F7	0.30245E-01	93.056

```
     35   F32            0.34256E-01    95.833
     36   F34            0.37263E-01    98.611

CORRELATION (CED) ---------------- = 0.99559
PROBABILITY OF CORRELATION (PROB) = 0.98800
99% CONFIDENCE LIMIT (CL99) ----- = 0.99571
95% CONFIDENCE LIMIT (CL95) ----- = 0.99380
90% CONFIDENCE LIMIT (CL90) ----- = 0.99229
```

_md file (example._md):

```
  "ORD.WEIGHT.RES."  "ORD.SIM.WT.RES."  "STDVS.O.S.W.RS."  "2*STDV.O.S.W.R."  "FREQUENCY/PROB."
"PROB.PLOT.POSI."  "OBSERVATION"   "PLOT-SYMBOL"
       -0.37562E-01       -0.10938            0.37500E-01        0.75001E-01         1.3889
-2.2003      F21               1
       -0.33362E-01       -0.92706E-01        0.33337E-01        0.66674E-01         4.1667
-1.7322      F20               1
       -0.32529E-01       -0.81207E-01        0.30846E-01        0.61693E-01         6.9444
-1.4804      F23               1
       -0.26743E-01       -0.71524E-01        0.27941E-01        0.55881E-01         9.7222
-1.2976      F22               1
       -0.22647E-01       -0.63615E-01        0.25728E-01        0.51455E-01         12.500
-1.1505      F24               1
       -0.18390E-01       -0.57005E-01        0.24604E-01        0.49208E-01         15.278
-1.0251      F6                1
       -0.17909E-01       -0.50915E-01        0.23011E-01        0.46023E-01         18.056
-0.91363      F5               1
       -0.17336E-01       -0.45545E-01        0.22052E-01        0.44103E-01         20.833
-0.81256      F12              1
       -0.15027E-01       -0.40679E-01        0.21242E-01        0.42484E-01         23.611
-0.71912      F19              1
       -0.13359E-01       -0.35812E-01        0.20091E-01        0.40183E-01         26.389
-0.63155      F11              1
       -0.11397E-01       -0.31282E-01        0.19207E-01        0.38414E-01         29.167
-0.54865      F25              1
       -0.10687E-01       -0.26841E-01        0.17644E-01        0.35289E-01         31.944
-0.46943      F16              1
       -0.96915E-02       -0.22280E-01        0.16257E-01        0.32514E-01         34.722
-0.39295      F28              1
       -0.88227E-02       -0.18282E-01        0.15356E-01        0.30712E-01         37.500
-0.31878      F15              1
       -0.84145E-02       -0.14528E-01        0.14826E-01        0.29652E-01         40.278
-0.24619      F30              1
       -0.49643E-02       -0.10723E-01        0.14434E-01        0.28868E-01         43.056
-0.17499      F26              1
       -0.34969E-02       -0.67828E-02        0.14270E-01        0.28540E-01         45.833
-0.10487      F13              1
       -0.28905E-02       -0.30485E-02        0.14161E-01        0.28322E-01         48.611
-0.34955E-01  F17              1
       -0.15173E-02        0.91987E-03        0.14106E-01        0.28213E-01         51.389
0.34955E-01  F29               1
       -0.14043E-02        0.45571E-02        0.14000E-01        0.28000E-01         54.167
0.10487      F14               1
```

```
        0.14077E-02       0.85930E-02       0.14133E-01       0.28266E-01       56.944
0.17499      F27               1
        0.15258E-02       0.12630E-01       0.14548E-01       0.29096E-01       59.722
0.24619      F36               1
        0.54087E-02       0.16606E-01       0.14758E-01       0.29516E-01       62.500
0.31878      F31               1
        0.55489E-02       0.20888E-01       0.14946E-01       0.29892E-01       65.278
0.39295      F4                1
        0.92539E-02       0.25444E-01       0.15909E-01       0.31818E-01       68.056
0.46943      F10               1
        0.99690E-02       0.30108E-01       0.16967E-01       0.33933E-01       70.833
0.54865      F18               1
        0.12221E-01       0.34861E-01       0.17980E-01       0.35960E-01       73.611
0.63155      F1                1
        0.13438E-01       0.39605E-01       0.19061E-01       0.38123E-01       76.389
0.71912      F2                1
        0.15053E-01       0.44706E-01       0.20546E-01       0.41093E-01       79.167
0.81256      F35               1
        0.19232E-01       0.50015E-01       0.21745E-01       0.43490E-01       81.944
0.91363      F9                1
        0.24144E-01       0.56072E-01       0.23228E-01       0.46457E-01       84.722
1.0251       F8                1
        0.24247E-01       0.62882E-01       0.24758E-01       0.49517E-01       87.500
1.1505       F3                1
        0.25136E-01       0.70577E-01       0.26490E-01       0.52980E-01       90.278
1.2976       F33               1
        0.32461E-01       0.80583E-01       0.30245E-01       0.60491E-01       93.056
1.4804       F7                1
        0.38440E-01       0.92808E-01       0.34256E-01       0.68513E-01       95.833
1.7322       F32               1
        0.42655E-01       0.10747           0.37263E-01       0.74526E-01       98.611
2.2003       F34               1
```

MODFLOW-2000 Input Files For Confidence Interval Calculation

Name File (example.nam):

```
GLOBAL          4 mf2k.global_listing
LIST            3 output.dat
DIS            95 discret.dat
BAS6            1 bas6.dat
ZONE           93 zone.dat
MULT           94 multiple.dat
LPF            31 lpf6.dat
RCH            11 rech6.dat
WEL            12 wel6.dat
PCG            23 pcg2.dat
OC             22 oc.dat
DATA           10 inithead.dat
OBS            40 obs.dat
HOB            41 hob.dat
PES            47 pes.dat
SEN            46 sen.dat
UNC            60 unc.dat
DATAGLO        61 confint.dat
DATAGLO        62 weight-res.dat
```

UNC File (unc.dat):

```
    0    2    0   00    1    0   61  1    1    0    62    0
.001 .0 .0
  .0919  .0413  .0941  .0916  .0916  .0923  .0916  .0323
HK_1 .0
HK_2 .0
```

SEN File (sen.dat):

```
# SEN file for MODFLOW-2000, UNC1NLI1 Report Example
#
 2  0  0  2                          Item 1
 1  0   0  0                         Item 2
HK_1 1  1   1.46378  .01  100  1E-10  Item 3
HK_2 1  1   .099433  .01  100  1E-10  Item 3
```

HOB File (hob.dat):

```
# HOBS file for MODFLOW-2000, UNC1NLI1 Report Example
 42  0  0  6
 1  1
F1   1  37  13  1  0  0  0  14.88  729.28  0  1
F2   1  30  13  1  0  0  0  14.78  690.68  0  1
F3   1  25  13  1  0  0  0  14.86  668.02  0  1
```

```
F4   1  20  13  1  0  0  0  13.87  699.35  0  1
F5   1  14  13  1  0  0  0  13.01  728.59  0  1
F6   1   8  13  1  0  0  0  12.97  746.80  0  1
F7   1  37  26  1  0  0  0   5.61  643.27  0  1
F8   1  30  26  1  0  0  0   5.63  666.51  0  1
F9   1  25  26  1  0  0  0   5.94  687.81  0  1
F10  1  20  26  1  0  0  0   8.83  721.28  0  1
F11  1  14  26  1  0  0  0  11.08  717.66  0  1
F12  1   8  26  1  0  0  0  11.35  731.50  0  1
F13  1  37  39  1  0  0  0    3.7  640.67  0  1
F14  1  30  39  1  0  0  0   3.75  648.28  0  1
F15  1  25  39  1  0  0  0   3.52  619.12  0  1
F16  1  20  39  1  0  0  0   3.35  607.80  0  1
F17  1  14  39  1  0  0  0   3.42  638.66  0  1
F18  1   8  39  1  0  0  0   3.71  629.47  0  1
F19  1  37  52  1  0  0  0   2.37  548.04  0  1
F20  1  30  52  1  0  0  0   1.91  531.05  0  1
F21  1  25  52  1  0  0  0   1.76  526.49  0  1
F22  1  20  52  1  0  0  0   1.96  531.33  0  1
F23  1  14  52  1  0  0  0   1.82  546.39  0  1
F24  1   8  52  1  0  0  0   2.06  542.63  0  1
F25  1  37  65  1  0  0  0   1.54  423.83  0  1
F26  1  30  65  1  0  0  0   1.66  427.94  0  1
F27  1  25  65  1  0  0  0   1.78  429.22  0  1
F28  1  20  65  1  0  0  0   1.54  426.12  0  1
F29  1  14  65  1  0  0  0    1.7  432.14  0  1
F30  1   8  65  1  0  0  0   1.55  444.93  0  1
F31  1  37  78  1  0  0  0    .94  153.12  0  1
F32  1  30  78  1  0  0  0   1.41  197.28  0  1
F33  1  25  78  1  0  0  0   1.22  197.22  0  1
F34  1  20  78  1  0  0  0   1.47  202.06  0  1
F35  1  14  78  1  0  0  0   1.08  212.53  0  1
F36  1   8  78  1  0  0  0    .88  202.26  0  1
G1   1  22  46  1  0  0  0      0  1037.4  0  1
G2   1  21  20  1  0  0  0      0  723.55  0  1
G3   1  21  33  1  0  0  0      0  620.74  0  1
G4   1  21  59  1  0  0  0      0  488.07  0  1
G5   1  21  72  1  0  0  0      0  329.80  0  1
G6   1  40  46  1  0  0  0      0  597.63  0  1
```

GLOBAL Output File For Confidence Interval Calculation

GLOBAL Output File (mf2k.global_listing):

```
     U.S. GEOLOGICAL SURVEY MODULAR FINITE-DIFFERENCE GROUND-WATER FLOW MODEL
                       VERSION 1.6SC1 ¨25/02/2003


 This model run produced both GLOBAL and LIST files.  This is the GLOBAL file.

 GLOBAL LISTING FILE: mf2k.global_listing
                         UNIT   4

 OPENING output.dat
 FILE TYPE:LIST   UNIT   3   STATUS:REPLACE
 FORMAT:FORMATTED             ACCESS:SEQUENTIAL

 OPENING discret.dat
 FILE TYPE:DIS   UNIT  95   STATUS:OLD
 FORMAT:FORMATTED             ACCESS:SEQUENTIAL

 OPENING bas6.dat
 FILE TYPE:BAS6   UNIT   1   STATUS:OLD
 FORMAT:FORMATTED             ACCESS:SEQUENTIAL

 OPENING zone.dat
 FILE TYPE:ZONE   UNIT  93   STATUS:OLD
 FORMAT:FORMATTED             ACCESS:SEQUENTIAL

 OPENING multiple.dat
 FILE TYPE:MULT   UNIT  94   STATUS:OLD
 FORMAT:FORMATTED             ACCESS:SEQUENTIAL

 OPENING lpf6.dat
 FILE TYPE:LPF   UNIT  31   STATUS:OLD
 FORMAT:FORMATTED             ACCESS:SEQUENTIAL

 OPENING rech6.dat
 FILE TYPE:RCH   UNIT  11   STATUS:OLD
 FORMAT:FORMATTED             ACCESS:SEQUENTIAL

 OPENING wel6.dat
 FILE TYPE:WEL   UNIT  12   STATUS:OLD
 FORMAT:FORMATTED             ACCESS:SEQUENTIAL

 OPENING pcg2.dat
 FILE TYPE:PCG   UNIT  23   STATUS:OLD
 FORMAT:FORMATTED             ACCESS:SEQUENTIAL

 OPENING oc.dat
 FILE TYPE:OC   UNIT  22   STATUS:OLD
 FORMAT:FORMATTED             ACCESS:SEQUENTIAL
```

```
OPENING inithead.dat
FILE TYPE:DATA   UNIT  10   STATUS:UNKNOWN
FORMAT:FORMATTED             ACCESS:SEQUENTIAL

OPENING obs.dat
FILE TYPE:OBS   UNIT  40   STATUS:OLD
FORMAT:FORMATTED             ACCESS:SEQUENTIAL

OPENING hob.dat
FILE TYPE:HOB   UNIT  41   STATUS:OLD
FORMAT:FORMATTED             ACCESS:SEQUENTIAL

OPENING pes.dat
FILE TYPE:PES   UNIT  47   STATUS:OLD
FORMAT:FORMATTED             ACCESS:SEQUENTIAL

OPENING sen.dat
FILE TYPE:SEN   UNIT  46   STATUS:OLD
FORMAT:FORMATTED             ACCESS:SEQUENTIAL

OPENING unc.dat
FILE TYPE:UNC   UNIT  60   STATUS:OLD
FORMAT:FORMATTED             ACCESS:SEQUENTIAL

OPENING confint.dat
FILE TYPE:DATAGLO   UNIT  61   STATUS:UNKNOWN
FORMAT:FORMATTED             ACCESS:SEQUENTIAL

OPENING weight-res.dat
FILE TYPE:DATAGLO   UNIT  62   STATUS:UNKNOWN
FORMAT:FORMATTED             ACCESS:SEQUENTIAL
THE FREE FORMAT OPTION HAS BEEN SELECTED

DISCRETIZATION INPUT DATA READ FROM UNIT 95
# Discretization file for MODFLOW-2000, UNC1NLI1 Report Example
   1 LAYERS        41 ROWS        91 COLUMNS
  1 STRESS PERIOD(S) IN SIMULATION
MODEL TIME UNIT IS SECONDS
MODEL LENGTH UNIT IS UNDEFINED
THE GROUND-WATER TRANSPORT PROCESS IS INACTIVE

THE OBSERVATION PROCESS IS ACTIVE
THE SENSITIVITY PROCESS IS ACTIVE
THE PARAMETER-ESTIMATION PROCESS IS ACTIVE

MODE: PARAMETER ESTIMATION


ZONE OPTION, INPUT READ FROM UNIT 93
# Zone file for MODFLOW-2000, UNC1NLI1 Report Example
    2 ZONE ARRAYS

MULTIPLIER OPTION, INPUT READ FROM UNIT 94
# Multiplier file for MODFLOW-2000, UNC1NLI1 Report Example
  2 MULTIPLIER ARRAYS
 Confining bed flag for each layer:
```

```
  0

     41173  ELEMENTS OF GX ARRAY USED OUT OF      41173
      3731  ELEMENTS OF GZ ARRAY USED OUT OF       3731
     11193  ELEMENTS OF IG ARRAY USED OUT OF      11193



                              DELR
READING ON UNIT  95 WITH FORMAT: (16G5.0)



                              DELC
READING ON UNIT  95 WITH FORMAT: (16G5.0)

TOP ELEVATION OF LAYER 1 =   1.00000

  MODEL LAYER BOTTOM EL. =   0.00000     FOR LAYER   1


STRESS PERIOD     LENGTH       TIME STEPS     MULTIPLIER FOR DELT    SS FLAG
------------------------------------------------------------------------------
       1         1.000000          1                    1.000         SS

STEADY-STATE SIMULATION



 MULT. ARRAY: HK1        =   1.00000

 MULT. ARRAY: VK1        =   1.00000



            ZONE ARRAY: ZHK1
READING ON UNIT  93 WITH FORMAT: (91I1)

  ZONE ARRAY: ZVK1       =            999

LPF1 -- LAYER PROPERTY FLOW PACKAGE, VERSION 1, 1/11/2000
        INPUT READ FROM UNIT 31
# Layer-Property Flow file for MODFLOW-2000, UNC1NLI1 Report Example
HEAD AT CELLS THAT CONVERT TO DRY=   999.00
    3 Named Parameters

  LAYER FLAGS:
LAYER       LAYTYP        LAYAVG         CHANI        LAYVKA        LAYWET
------------------------------------------------------------------------------
   1             0             0     1.000E+00             0             0

  INTERPRETATION OF LAYER FLAGS:
                      INTERBLOCK     HORIZONTAL    DATA IN
       LAYER TYPE   TRANSMISSIVITY   ANISOTROPY   ARRAY VKA   WETTABILITY
LAYER      (LAYTYP)      (LAYAVG)       (CHANI)      (LAYVKA)      (LAYWET)
```

```
-----------------------------------------------------------------------
   1      CONFINED      HARMONIC     1.000E+00    VERTICAL K  NON-WETTABLE

      7462 ELEMENTS IN X ARRAY ARE USED BY LPF
         6 ELEMENTS IN IX ARRAY ARE USED BY LPF

PCG2 -- CONJUGATE GRADIENT SOLUTION PACKAGE, VERSION 2.4, 12/29/98
MAXIMUM OF     50 CALLS OF SOLUTION ROUTINE
MAXIMUM OF     30 INTERNAL ITERATIONS PER CALL TO SOLUTION ROUTINE
MATRIX PRECONDITIONING TYPE :    1
     14193 ELEMENTS IN X ARRAY ARE USED BY PCG
     10500 ELEMENTS IN IX ARRAY ARE USED BY PCG
      7462 ELEMENTS IN Z ARRAY ARE USED BY PCG

SEN1BAS6 -- SENSITIVITY PROCESS, VERSION 1.0, 10/15/98
INPUT READ FROM UNIT  46
# SEN file for MODFLOW-2000, UNC1NLI1 Report Example
#

NUMBER OF PARAMETER VALUES TO BE READ FROM SEN FILE:    2
ISENALL.....................................:    0
SENSITIVITIES WILL BE STORED IN MEMORY
FOR UP TO   2 PARAMETERS

      3745 ELEMENTS IN X ARRAY ARE USED FOR SENSITIVITIES
      3731 ELEMENTS IN Z ARRAY ARE USED FOR SENSITIVITIES
         4 ELEMENTS IN IX ARRAY ARE USED FOR SENSITIVITIES

PES1BAS6 -- PARAMETER-ESTIMATION PROCESS, VERSION 1.0, 07/22/99
INPUT READ FROM UNIT  47
# PES file for MODFLOW-2000, UNC1NLI1 Report Example
#

MAXIMUM NUMBER OF PARAMETER-ESTIMATION ITERATIONS (MAX-ITER)  =    50
MAXIMUM PARAMETER CORRECTION (MAX-CHANGE) ------------------- =  2.0000
CLOSURE CRITERION (TOL) ------------------------------------- = 0.10000E-01
SUM OF SQUARES CLOSURE CRITERION (SOSC) --------------------- =  0.0000

FLAG TO GENERATE INPUT NEEDED BY BEALE-2000 (IBEFLG) -------- =     0
FLAG TO GENERATE INPUT NEEDED BY YCINT-2000 (IYCFLG) -------- =     0
OMIT PRINTING TO SCREEN (IF = 1) (IOSTAR) ------------------- =     0
ADJUST GAUSS-NEWTON MATRIX WITH NEWTON UPDATES (IF = 1)(NOPT) =     0
NUMBER OF FLETCHER-REEVES ITERATIONS (NFIT) ----------------- =     0
CRITERION FOR ADDING MATRIX R (SOSR) ------------------------ =  0.0000
VALUE USED TO INCREMENT MARQUARDT PARAMETER (RMAR) ---------- = 0.10000E-02
MARQUARDT PARAMETER MULTIPLIER (RMARM) ---------------------- =  1.5000
APPLY MAX-CHANGE IN REGRESSION SPACE (IF = 1) (IAP) --------- =     0

FORMAT CODE FOR COVARIANCE AND CORRELATION MATRICES (IPRCOV)  =     1
PRINT PARAMETER-ESTIMATION STATISTICS
    EACH ITERATION (IF > 0)  (IPRINT) ----------------------- =     0
PRINT EIGENVALUES AND EIGENVECTORS OF
    COVARIANCE MATRIX (IF > 0)  (LPRINT) -------------------- =     0

SEARCH DIRECTION ADJUSTMENT PARAMETER (CSA) ----------------- = 0.80000E-01
MODIFY CONVERGENCE CRITERIA (IF > 0) (FCONV) ---------------- =  0.0000
```

```
CALCULATE SENSITIVITIES USING FINAL
    PARAMETER ESTIMATES (IF > 0) (LASTX) -------------------- =     1

NUMBER OF USUALLY POS. PARAMETERS THAT MAY BE NEGATIVE (NPNG) =     0
NUMBER OF PARAMETERS WITH CORRELATED PRIOR INFORMATION (IPR)  =     0
NUMBER OF PRIOR-INFORMATION EQUATIONS (MPR) ----------------- =     0

   479 ELEMENTS IN X ARRAY ARE USED FOR PARAMETER ESTIMATION
    81 ELEMENTS IN Z ARRAY ARE USED FOR PARAMETER ESTIMATION
    52 ELEMENTS IN IX ARRAY ARE USED FOR PARAMETER ESTIMATION

OBS1BAS6 -- OBSERVATION PROCESS, VERSION 1.0, 4/27/99
INPUT READ FROM UNIT  40
# OBS file for MODFLOW-2000, UNC1NLI1 Report Example
OBSERVATION GRAPH-DATA OUTPUT FILES
WILL BE PRINTED AND NAMED USING THE BASE: Example
DIMENSIONLESS SCALED OBSERVATION SENSITIVITIES WILL BE PRINTED

HEAD OBSERVATIONS -- INPUT READ FROM UNIT  41
# HOBS file for MODFLOW-2000, UNC1NLI1 Report Example

NUMBER OF HEADS.....................................:   42
  NUMBER OF MULTILAYER HEADS........................:    0
  MAXIMUM NUMBER OF LAYERS FOR MULTILAYER HEADS....:    0
NUMBER OF HEADS USED FOR INTERVAL CALCULATION......:    6

    826 ELEMENTS IN X ARRAY ARE USED FOR OBSERVATIONS
      2 ELEMENTS IN Z ARRAY ARE USED FOR OBSERVATIONS
    423 ELEMENTS IN IX ARRAY ARE USED FOR OBSERVATIONS

COMMON ERROR VARIANCE FOR ALL OBSERVATIONS SET TO:       1.000

UNC1NLI1 -- UNCERTAINTY-ESTIMATION PROCESS, VERSION 1.0, 03/08/02
INPUT READ FROM UNIT  60
IACT=0: COMPUTE CONFIDENCE OR PREDICTION INTERVALS
NUMBER OF HEAD INTERVALS..............................:    6
NUMBER OF PARAMETER INTERVALS.........................:    2
TOTAL NUMBER OF INTERVALS.............................:    8
HEAD AND FLOW INTERVALS ON DIFFERENCES (0,1)=(NO,YES)..:    0
INTERVAL LIMITS? (1=UPPER,-1=LOWER,O=UPPER & LOWER)....:    0
INTERVAL TYPE (1=CONFIDENCE,2=PREDICTION).............:    1
NUMBER OF INITIAL PARAMETER SETS (0=USE DATASET 8).....:    0
RESULT SUMMARY IS WRITTEN TO UNIT NO (1=NOT WRITTEN)...:   61
CRITICAL VALUE CONST./VAR. (IDSQ=0/1).................:    1
PRINT ITERATION LOG (1=YES,ELSE=NO)...................:    1
USE APPROXIMATE INCREMENTAL ADJUSTMENT? (1=YES,0=NO)...:    0
WEIGHTED RESIDUALS ARE WRITTEN TO UNIT NO (O=NOT WRIT.):   62
SCALING VALUES BS (1=READ VALUES, 0=COPY START. VAL.)..:    0
TOLP (CONVERGENCE CRITERIA FOR PARAMETER CHANGE).......: 0.100000E-02
TOLS (CONV. CRIT. FOR CHANGE OF OBJECTIVE FUNCTION)....:  0.00000
TOLY (CONV. CRIT. FOR CHANGE OF COMPUTED LIMIT VALUE)..:  0.00000

    24 ELEMENTS IN X ARRAY ARE USED FOR PARAMETER ESTIMATION
     6 ELEMENTS IN Z ARRAY ARE USED FOR PARAMETER ESTIMATION
    48 ELEMENTS IN IX ARRAY ARE USED FOR PARAMETER ESTIMATION
```

```
     26729  ELEMENTS OF X ARRAY USED OUT OF      26729
     11282  ELEMENTS OF Z ARRAY USED OUT OF      11282
     11033  ELEMENTS OF IX ARRAY USED OUT OF      11033
      7462  ELEMENTS OF XHS ARRAY USED OUT OF       7462

INFORMATION ON PARAMETERS LISTED IN SEN FILE
                                          LOWER         UPPER       ALTERNATE
                        VALUE IN SEN   REASONABLE    REASONABLE     SCALING
   NAME     ISENS  LN   INPUT FILE      LIMIT         LIMIT         FACTOR
----------  -----  --  ------------  ------------  ------------  ------------
HK_1          1     1    1.4638       0.10000E-01    100.00       0.10000E-09
HK_2          1     1   0.99433E-01   0.10000E-01    100.00       0.10000E-09
-----------------------------------------------------------------------------
FOR THE PARAMETERS LISTED IN THE TABLE ABOVE, PARAMETER VALUES IN INDIVIDUAL
PACKAGE INPUT FILES ARE REPLACED BY THE VALUES FROM THE SEN INPUT FILE.  THE
ALTERNATE SCALING FACTOR IS USED TO SCALE SENSITIVITIES IF IT IS LARGER THAN
THE PARAMETER VALUE IN ABSOLUTE VALUE AND THE PARAMETER IS NOT LOG-TRANSFORMED.

ISENS IS GREATER THAN ZERO FOR    2 PARAMETERS

HEAD OBSERVATION VARIANCES ARE MULTIPLIED BY:       1.000

OBSERVED HEAD DATA -- TIME OFFSETS ARE MULTIPLIED BY:   1.0000

                   REFER.
      OBSERVATION  STRESS    TIME                                STATISTIC   PLOT
 OBS#    NAME      PERIOD   OFFSET    OBSERVATION  STATISTIC      TYPE      SYM.
    1 F1               1    0.000       14.88       729.3      VARIANCE       1
    2 F2               1    0.000       14.78       690.7      VARIANCE       1
    3 F3               1    0.000       14.86       668.0      VARIANCE       1
    4 F4               1    0.000       13.87       699.3      VARIANCE       1
    5 F5               1    0.000       13.01       728.6      VARIANCE       1
    6 F6               1    0.000       12.97       746.8      VARIANCE       1
    7 F7               1    0.000       5.610       643.3      VARIANCE       1
    8 F8               1    0.000       5.630       666.5      VARIANCE       1
    9 F9               1    0.000       5.940       687.8      VARIANCE       1
   10 F10              1    0.000       8.830       721.3      VARIANCE       1
   11 F11              1    0.000       11.08       717.7      VARIANCE       1
   12 F12              1    0.000       11.35       731.5      VARIANCE       1
   13 F13              1    0.000       3.700       640.7      VARIANCE       1
   14 F14              1    0.000       3.750       648.3      VARIANCE       1
   15 F15              1    0.000       3.520       619.1      VARIANCE       1
   16 F16              1    0.000       3.350       607.8      VARIANCE       1
   17 F17              1    0.000       3.420       638.7      VARIANCE       1
   18 F18              1    0.000       3.710       629.5      VARIANCE       1
   19 F19              1    0.000       2.370       548.0      VARIANCE       1
   20 F20              1    0.000       1.910       531.0      VARIANCE       1
   21 F21              1    0.000       1.760       526.5      VARIANCE       1
   22 F22              1    0.000       1.960       531.3      VARIANCE       1
   23 F23              1    0.000       1.820       546.4      VARIANCE       1
   24 F24              1    0.000       2.060       542.6      VARIANCE       1
   25 F25              1    0.000       1.540       423.8      VARIANCE       1
   26 F26              1    0.000       1.660       427.9      VARIANCE       1
   27 F27              1    0.000       1.780       429.2      VARIANCE       1
   28 F28              1    0.000       1.540       426.1      VARIANCE       1
   29 F29              1    0.000       1.700       432.1      VARIANCE       1
```

30	F30	1	0.000	1.550	444.9	VARIANCE	1
31	F31	1	0.000	0.9400	153.1	VARIANCE	1
32	F32	1	0.000	1.410	197.3	VARIANCE	1
33	F33	1	0.000	1.220	197.2	VARIANCE	1
34	F34	1	0.000	1.470	202.1	VARIANCE	1
35	F35	1	0.000	1.080	212.5	VARIANCE	1
36	F36	1	0.000	0.8800	202.3	VARIANCE	1
37	G1	1	0.000	0.000	1037.	VARIANCE	1
38	G2	1	0.000	0.000	723.5	VARIANCE	1
39	G3	1	0.000	0.000	620.7	VARIANCE	1
40	G4	1	0.000	0.000	488.1	VARIANCE	1
41	G5	1	0.000	0.000	329.8	VARIANCE	1
42	G6	1	0.000	0.000	597.6	VARIANCE	1

OBS#	OBSERVATION NAME	LAY	ROW	COL	ROW OFFSET	COL OFFSET	HEAD CHANGE REFERENCE OBSERVATION (IF > 0)
1	F1	1	37	13	0.000	0.000	0
2	F2	1	30	13	0.000	0.000	0
3	F3	1	25	13	0.000	0.000	0
4	F4	1	20	13	0.000	0.000	0
5	F5	1	14	13	0.000	0.000	0
6	F6	1	8	13	0.000	0.000	0
7	F7	1	37	26	0.000	0.000	0
8	F8	1	30	26	0.000	0.000	0
9	F9	1	25	26	0.000	0.000	0
10	F10	1	20	26	0.000	0.000	0
11	F11	1	14	26	0.000	0.000	0
12	F12	1	8	26	0.000	0.000	0
13	F13	1	37	39	0.000	0.000	0
14	F14	1	30	39	0.000	0.000	0
15	F15	1	25	39	0.000	0.000	0
16	F16	1	20	39	0.000	0.000	0
17	F17	1	14	39	0.000	0.000	0
18	F18	1	8	39	0.000	0.000	0
19	F19	1	37	52	0.000	0.000	0
20	F20	1	30	52	0.000	0.000	0
21	F21	1	25	52	0.000	0.000	0
22	F22	1	20	52	0.000	0.000	0
23	F23	1	14	52	0.000	0.000	0
24	F24	1	8	52	0.000	0.000	0
25	F25	1	37	65	0.000	0.000	0
26	F26	1	30	65	0.000	0.000	0
27	F27	1	25	65	0.000	0.000	0
28	F28	1	20	65	0.000	0.000	0
29	F29	1	14	65	0.000	0.000	0
30	F30	1	8	65	0.000	0.000	0
31	F31	1	37	78	0.000	0.000	0
32	F32	1	30	78	0.000	0.000	0
33	F33	1	25	78	0.000	0.000	0
34	F34	1	20	78	0.000	0.000	0
35	F35	1	14	78	0.000	0.000	0
36	F36	1	8	78	0.000	0.000	0
37	G1	1	22	46	0.000	0.000	0
38	G2	1	21	20	0.000	0.000	0

```
   39  G3              1   21   33   0.000   0.000        0
   40  G4              1   21   59   0.000   0.000        0
   41  G5              1   21   72   0.000   0.000        0
   42  G6              1   40   46   0.000   0.000        0


CRITICAL VALUE (DSQ) FOR INTERVALS
   0.0919    0.0413    0.0941    0.0916    0.0916    0.0923    0.0916    0.0323


CONFIDENCE INTERVAL TO BE CALCULATED FOR THE FOLLOWING PARAMETERS
PAR. NO
  HK_1
  HK_2
SCALING VALUES FOR DAMPING PARAMETER CHANGES:
1.4638      0.99433E-01



                                  SOLUTION BY THE CONJUGATE-GRADIENT METHOD
                                 -----------------------------------------
                  MAXIMUM NUMBER OF CALLS TO PCG ROUTINE =       50
                      MAXIMUM ITERATIONS PER CALL TO PCG =       30
                             MATRIX PRECONDITIONING TYPE =        1
       RELAXATION FACTOR (ONLY USED WITH PRECOND. TYPE 1) =    0.10000E+01
PARAMETER OF POLYNOMIAL PRECOND. = 2 (2) OR IS CALCULATED :        1
                       HEAD CHANGE CRITERION FOR CLOSURE =    0.10000E-02
                   RESIDUAL CHANGE CRITERION FOR CLOSURE =    0.10000E-02
           PCG HEAD AND RESIDUAL CHANGE PRINTOUT INTERVAL =        1
    PRINTING FROM SOLVER IS LIMITED(1) OR SUPPRESSED (>1) =        0
                                    DAMPING PARAMETER =    0.10000E+01

CONVERGENCE CRITERIA FOR SENSITIVITIES
PARAMETER      HCLOSE        RCLOSE
----------  ------------  ------------
HK_1         0.68316E-05   0.68316E-05
HK_2         0.10057E-03   0.10057E-03
-------------------------------------

WETTING CAPABILITY IS NOT ACTIVE IN ANY LAYER

PARAMETERS DEFINED IN THE LPF PACKAGE

PARAMETER NAME:HK_1         TYPE:HK     CLUSTERS:   1
Parameter value from package file is:    1.0000
This value has been changed to:          1.4638    , as read from
the Sensitivity Process file
               LAYER:  1    MULTIPLIER ARRAY: HK1    ZONE ARRAY: ZHK1
               ZONE VALUES:    1

PARAMETER NAME:HK_2         TYPE:HK     CLUSTERS:   1
Parameter value from package file is:    1.0000
This value has been changed to:         9.94330E-02, as read from
the Sensitivity Process file
               LAYER:  1    MULTIPLIER ARRAY: HK1    ZONE ARRAY: ZHK1
               ZONE VALUES:    2
```

```
 PARAMETER NAME:VK_0         TYPE:VK     CLUSTERS:   1
 Parameter value from package file is:    1.0000
               LAYER:  1    MULTIPLIER ARRAY: VK1    ZONE ARRAY: ZVK1
               ZONE VALUES:  999

    HYD. COND. ALONG ROWS FOR LAYER   1 WILL BE DEFINED BY PARAMETERS
 (PRINT FLAG=  31)

      VERTICAL HYD. COND. FOR LAYER   1 WILL BE DEFINED BY PARAMETERS
 (PRINT FLAG=  31)


 ****************************************************************************


 CALCULATION OF CONFIDENCE INTERVAL NO.    1
   STARTING PARAMETER SET NO.  1
 OBSNAM: G1


     1 Well parameters

 PARAMETER NAME:WEL_0_1      TYPE:Q
 Parameter value from package file is:    1.0000
   NUMBER OF ENTRIES:      1

 WELL NO.  LAYER   ROW   COL   STRESS FACTOR
 ---------------------------------------------
      1      1     21     46      -1.000


     0 Recharge parameters

   4 PARAMETERS HAVE BEEN DEFINED IN ALL PACKAGES.
 (SPACE IS ALLOCATED FOR  500 PARAMETERS.)

 C.I. LIMIT FOR INTERVAL    1: FL=   4.1361

****************************************************************************




 CALCULATION OF CONFIDENCE INTERVAL NO.    2
   STARTING PARAMETER SET NO.  1
 OBSNAM: G2


     1 Well parameters

 PARAMETER NAME:WEL_0_1      TYPE:Q
 Parameter value from package file is:    1.0000
   NUMBER OF ENTRIES:      1

 WELL NO.  LAYER   ROW   COL   STRESS FACTOR
```

```
 -------------------------------------------
      1      1     21     46      -1.000


     0 Recharge parameters

   4 PARAMETERS HAVE BEEN DEFINED IN ALL PACKAGES.
 (SPACE IS ALLOCATED FOR  500 PARAMETERS.)

 C.I. LIMIT FOR INTERVAL    2: FL=   13.439

*******************************************************************************




 CALCULATION OF CONFIDENCE INTERVAL NO.    3
   STARTING PARAMETER SET NO.  1
 OBSNAM: G3


     1 Well parameters

 PARAMETER NAME:WEL_0_1      TYPE:Q
 Parameter value from package file is:    1.0000
   NUMBER OF ENTRIES:      1

 WELL NO.  LAYER   ROW   COL   STRESS FACTOR
 -------------------------------------------
      1      1     21     46      -1.000


     0 Recharge parameters

   4 PARAMETERS HAVE BEEN DEFINED IN ALL PACKAGES.
 (SPACE IS ALLOCATED FOR  500 PARAMETERS.)

 C.I. LIMIT FOR INTERVAL    3: FL=   6.4088

*******************************************************************************




 CALCULATION OF CONFIDENCE INTERVAL NO.    4
   STARTING PARAMETER SET NO.  1
 OBSNAM: G4


     1 Well parameters

 PARAMETER NAME:WEL_0_1      TYPE:Q
 Parameter value from package file is:    1.0000
   NUMBER OF ENTRIES:      1

 WELL NO.  LAYER   ROW   COL   STRESS FACTOR
```

```
 -------------------------------------------
      1      1     21     46      -1.000


     0 Recharge parameters

   4 PARAMETERS HAVE BEEN DEFINED IN ALL PACKAGES.
 (SPACE IS ALLOCATED FOR  500 PARAMETERS.)

 C.I. LIMIT FOR INTERVAL    4: FL=   3.1090

*******************************************************************************




 CALCULATION OF CONFIDENCE INTERVAL NO.    5
   STARTING PARAMETER SET NO.  1
 OBSNAM: G5


     1 Well parameters

 PARAMETER NAME:WEL_0_1      TYPE:Q
 Parameter value from package file is:    1.0000
   NUMBER OF ENTRIES:      1

 WELL NO.  LAYER   ROW   COL   STRESS FACTOR
 -------------------------------------------
      1      1     21     46      -1.000


     0 Recharge parameters

   4 PARAMETERS HAVE BEEN DEFINED IN ALL PACKAGES.
 (SPACE IS ALLOCATED FOR  500 PARAMETERS.)

 C.I. LIMIT FOR INTERVAL    5: FL=   1.8458

*******************************************************************************




 CALCULATION OF CONFIDENCE INTERVAL NO.    6
   STARTING PARAMETER SET NO.  1
 OBSNAM: G6


     1 Well parameters

 PARAMETER NAME:WEL_0_1      TYPE:Q
 Parameter value from package file is:    1.0000
   NUMBER OF ENTRIES:      1

 WELL NO.  LAYER   ROW   COL   STRESS FACTOR
```

```
 -------------------------------------------
      1      1     21     46      -1.000


     0 Recharge parameters

   4 PARAMETERS HAVE BEEN DEFINED IN ALL PACKAGES.
 (SPACE IS ALLOCATED FOR  500 PARAMETERS.)

 C.I. LIMIT FOR INTERVAL    6: FL=   4.6167

*******************************************************************************




 CALCULATION OF CONFIDENCE INTERVAL NO.    7
   STARTING PARAMETER SET NO.  1
 PARNAM: HK_1


     1 Well parameters

 PARAMETER NAME:WEL_0_1      TYPE:Q
 Parameter value from package file is:    1.0000
   NUMBER OF ENTRIES:      1

 WELL NO.  LAYER   ROW   COL   STRESS FACTOR
 -------------------------------------------
      1      1     21     46      -1.000


     0 Recharge parameters

   4 PARAMETERS HAVE BEEN DEFINED IN ALL PACKAGES.
 (SPACE IS ALLOCATED FOR  500 PARAMETERS.)

 C.I. LIMIT FOR INTERVAL    7: FL=  0.42100

*******************************************************************************




 CALCULATION OF CONFIDENCE INTERVAL NO.    8
   STARTING PARAMETER SET NO.  1
 PARNAM: HK_2


     1 Well parameters

 PARAMETER NAME:WEL_0_1      TYPE:Q
 Parameter value from package file is:    1.0000
   NUMBER OF ENTRIES:      1

 WELL NO.  LAYER   ROW   COL   STRESS FACTOR
```

```
 -------------------------------------------
      1      1     21     46      -1.000


     0 Recharge parameters

   4 PARAMETERS HAVE BEEN DEFINED IN ALL PACKAGES.
 (SPACE IS ALLOCATED FOR  500 PARAMETERS.)

 C.I. LIMIT FOR INTERVAL    8: FL= -0.87902

*******************************************************************************




 CALCULATION OF CONFIDENCE INTERVAL NO.   -1
   STARTING PARAMETER SET NO.  1
 OBSNAM: G1


     1 Well parameters

 PARAMETER NAME:WEL_0_1      TYPE:Q
 Parameter value from package file is:    1.0000
   NUMBER OF ENTRIES:      1

 WELL NO.  LAYER   ROW   COL   STRESS FACTOR
 -------------------------------------------
      1      1     21     46      -1.000


     0 Recharge parameters

   4 PARAMETERS HAVE BEEN DEFINED IN ALL PACKAGES.
 (SPACE IS ALLOCATED FOR  500 PARAMETERS.)

 C.I. LIMIT FOR INTERVAL   -1: FL=   1.5895

*******************************************************************************




 CALCULATION OF CONFIDENCE INTERVAL NO.   -2
   STARTING PARAMETER SET NO.  1
 OBSNAM: G2


     1 Well parameters

 PARAMETER NAME:WEL_0_1      TYPE:Q
 Parameter value from package file is:    1.0000
   NUMBER OF ENTRIES:      1

 WELL NO.  LAYER   ROW   COL   STRESS FACTOR
```

```
 -------------------------------------------
      1      1     21     46      -1.000


     0 Recharge parameters

   4 PARAMETERS HAVE BEEN DEFINED IN ALL PACKAGES.
 (SPACE IS ALLOCATED FOR  500 PARAMETERS.)

 C.I. LIMIT FOR INTERVAL   -2: FL=   10.581

*******************************************************************************




 CALCULATION OF CONFIDENCE INTERVAL NO.   -3
   STARTING PARAMETER SET NO.  1
 OBSNAM: G3


     1 Well parameters

 PARAMETER NAME:WEL_0_1      TYPE:Q
 Parameter value from package file is:    1.0000
   NUMBER OF ENTRIES:      1

 WELL NO.  LAYER   ROW   COL   STRESS FACTOR
 -------------------------------------------
      1      1     21     46      -1.000


     0 Recharge parameters

   4 PARAMETERS HAVE BEEN DEFINED IN ALL PACKAGES.
 (SPACE IS ALLOCATED FOR  500 PARAMETERS.)

 C.I. LIMIT FOR INTERVAL   -3: FL=   2.5599

*******************************************************************************




 CALCULATION OF CONFIDENCE INTERVAL NO.   -4
   STARTING PARAMETER SET NO.  1
 OBSNAM: G4


     1 Well parameters

 PARAMETER NAME:WEL_0_1      TYPE:Q
 Parameter value from package file is:    1.0000
   NUMBER OF ENTRIES:      1

 WELL NO.  LAYER   ROW   COL   STRESS FACTOR
```

```
 -------------------------------------------
      1      1     21     46      -1.000


     0 Recharge parameters

   4 PARAMETERS HAVE BEEN DEFINED IN ALL PACKAGES.
 (SPACE IS ALLOCATED FOR  500 PARAMETERS.)

 C.I. LIMIT FOR INTERVAL   -4: FL=   1.1892

*******************************************************************************




 CALCULATION OF CONFIDENCE INTERVAL NO.   -5
   STARTING PARAMETER SET NO.  1
 OBSNAM: G5


     1 Well parameters

 PARAMETER NAME:WEL_0_1      TYPE:Q
 Parameter value from package file is:    1.0000
   NUMBER OF ENTRIES:      1

 WELL NO.  LAYER   ROW   COL   STRESS FACTOR
 -------------------------------------------
      1      1     21     46      -1.000


     0 Recharge parameters

   4 PARAMETERS HAVE BEEN DEFINED IN ALL PACKAGES.
 (SPACE IS ALLOCATED FOR  500 PARAMETERS.)

 C.I. LIMIT FOR INTERVAL   -5: FL=  0.70517

*******************************************************************************




 CALCULATION OF CONFIDENCE INTERVAL NO.   -6
   STARTING PARAMETER SET NO.  1
 OBSNAM: G6


     1 Well parameters

 PARAMETER NAME:WEL_0_1      TYPE:Q
 Parameter value from package file is:    1.0000
   NUMBER OF ENTRIES:      1

 WELL NO.  LAYER   ROW   COL   STRESS FACTOR
```

```
 -------------------------------------------
      1      1     21     46      -1.000


     0 Recharge parameters

   4 PARAMETERS HAVE BEEN DEFINED IN ALL PACKAGES.
 (SPACE IS ALLOCATED FOR  500 PARAMETERS.)

 C.I. LIMIT FOR INTERVAL   -6: FL=   1.7864

*******************************************************************************




 CALCULATION OF CONFIDENCE INTERVAL NO.   -7
   STARTING PARAMETER SET NO.  1
 PARNAM: HK_1


     1 Well parameters

 PARAMETER NAME:WEL_0_1      TYPE:Q
 Parameter value from package file is:    1.0000
   NUMBER OF ENTRIES:      1

 WELL NO.  LAYER   ROW   COL   STRESS FACTOR
 -------------------------------------------
      1      1     21     46      -1.000


     0 Recharge parameters

   4 PARAMETERS HAVE BEEN DEFINED IN ALL PACKAGES.
 (SPACE IS ALLOCATED FOR  500 PARAMETERS.)

 C.I. LIMIT FOR INTERVAL   -7: FL=  0.32539E-02

*******************************************************************************




 CALCULATION OF CONFIDENCE INTERVAL NO.   -8
   STARTING PARAMETER SET NO.  1
 PARNAM: HK_2


     1 Well parameters

 PARAMETER NAME:WEL_0_1      TYPE:Q
 Parameter value from package file is:    1.0000
   NUMBER OF ENTRIES:      1

 WELL NO.  LAYER   ROW   COL   STRESS FACTOR
```

```
 -----------------------------------------
      1      1     21     46      -1.000


     0 Recharge parameters

   4 PARAMETERS HAVE BEEN DEFINED IN ALL PACKAGES.
 (SPACE IS ALLOCATED FOR  500 PARAMETERS.)

 C.I. LIMIT FOR INTERVAL   -8: FL=  -1.1052

*******************************************************************************


 PROCESS STARTED: 20040305  124557.200
 PROCESS STOPPED: 20040305  124657.840
```

Summary And Weighted Residuals Output Files

Summary Output File (confint.dat):

```
C.I.    1: FL=   4.1361    ;  SSE=0.91894E-01; ITER=  4;  PAR:    1.007     0.1538
C.I.    2: FL=   13.439    ;  SSE=0.41351E-01; ITER=  3;  PAR:    1.519     0.7981E-01
C.I.    3: FL=   6.4088    ;  SSE=0.94127E-01; ITER=  4;  PAR:    1.003     0.1496
C.I.    4: FL=   3.1090    ;  SSE=0.91639E-01; ITER=  4;  PAR:    1.008     0.1541
C.I.    5: FL=   1.8458    ;  SSE=0.91618E-01; ITER=  4;  PAR:    1.007     0.1542
C.I.    6: FL=   4.6167    ;  SSE=0.92338E-01; ITER=  4;  PAR:    1.006     0.1531
C.I.    7: FL=  0.42100    ;  SSE=0.91608E-01; ITER=  4;  PAR:    2.636     0.6966E-01
C.I.    8: FL= -0.87902    ;  SSE=0.32298E-01; ITER=  4;  PAR:    1.264     0.1321
C.I.   -1: FL=   1.5895    ;  SSE=0.91861E-01; ITER=  4;  PAR:    2.641     0.6964E-01
C.I.   -2: FL=   10.581    ;  SSE=0.41295E-01; ITER=  4;  PAR:    1.436     0.1282
C.I.   -3: FL=   2.5599    ;  SSE=0.94083E-01; ITER=  4;  PAR:    2.671     0.6945E-01
C.I.   -4: FL=   1.1892    ;  SSE=0.91594E-01; ITER=  4;  PAR:    2.636     0.6967E-01
C.I.   -5: FL=  0.70517    ;  SSE=0.91630E-01; ITER=  4;  PAR:    2.636     0.6967E-01
C.I.   -6: FL=   1.7864    ;  SSE=0.92292E-01; ITER=  4;  PAR:    2.646     0.6961E-01
C.I.   -7: FL=  0.32539E-02;  SSE=0.91624E-01; ITER=  4;  PAR:    1.008     0.1542
C.I.   -8: FL=  -1.1052    ;  SSE=0.32343E-01; ITER=  3;  PAR:    1.750     0.7849E-01
```

Weighted Residuals Output File (weight-res.dat):

```
WEIGHTED RESIDUALS AT LIMIT FOR INTERVAL     1; STARTING VALUES  1
 OBSNO    OBS. NAME  WEIGHT. RES.
     1 F1             0.167E-01
     2 F2             0.171E-01
     3 F3             0.266E-01
     4 F4             0.460E-02
     5 F5            -0.201E-01
     6 F6            -0.206E-01
     7 F7             0.316E-01
     8 F8             0.250E-01
     9 F9             0.230E-01
    10 F10            0.808E-02
    11 F11           -0.178E-01
    12 F12           -0.198E-01
    13 F13           -0.336E-02
    14 F14           -0.103E-02
    15 F15           -0.847E-02
    16 F16           -0.110E-01
    17 F17           -0.428E-02
    18 F18            0.805E-02
    19 F19           -0.151E-01
    20 F20           -0.335E-01
    21 F21           -0.378E-01
    22 F22           -0.272E-01
    23 F23           -0.333E-01
    24 F24           -0.236E-01
    25 F25           -0.116E-01
    26 F26           -0.521E-02
    27 F27            0.110E-02
```

28	F28	-0.101E-01
29	F29	-0.198E-02
30	F30	-0.895E-02
31	F31	0.521E-02
32	F32	0.382E-01
33	F33	0.249E-01
34	F34	0.423E-01
35	F35	0.147E-01
36	F36	0.117E-02

WEIGHTED RESIDUALS AT LIMIT FOR INTERVAL 2; STARTING VALUES 1

OBSNO	OBS. NAME	WEIGHT. RES.
1	F1	0.129E-01
2	F2	0.140E-01
3	F3	0.247E-01
4	F4	0.564E-02
5	F5	-0.180E-01
6	F6	-0.184E-01
7	F7	0.337E-01
8	F8	0.255E-01
9	F9	0.209E-01
10	F10	0.968E-02
11	F11	-0.138E-01
12	F12	-0.176E-01
13	F13	-0.248E-02
14	F14	-0.381E-03
15	F15	-0.780E-02
16	F16	-0.974E-02
17	F17	-0.208E-02
18	F18	0.108E-01
19	F19	-0.143E-01
20	F20	-0.326E-01
21	F21	-0.368E-01
22	F22	-0.260E-01
23	F23	-0.319E-01
24	F24	-0.220E-01
25	F25	-0.108E-01
26	F26	-0.441E-02
27	F27	0.195E-02
28	F28	-0.916E-02
29	F29	-0.100E-02
30	F30	-0.791E-02
31	F31	0.587E-02
32	F32	0.388E-01
33	F33	0.255E-01
34	F34	0.430E-01
35	F35	0.154E-01
36	F36	0.189E-02

WEIGHTED RESIDUALS AT LIMIT FOR INTERVAL 3; STARTING VALUES 1

OBSNO	OBS. NAME	WEIGHT. RES.
1	F1	0.124E-01
2	F2	0.128E-01
3	F3	0.223E-01

```
    4 F4             0.618E-03
    5 F5            -0.239E-01
    6 F6            -0.243E-01
    7 F7             0.318E-01
    8 F8             0.250E-01
    9 F9             0.228E-01
   10 F10            0.622E-02
   11 F11           -0.211E-01
   12 F12           -0.234E-01
   13 F13           -0.329E-02
   14 F14           -0.987E-03
   15 F15           -0.843E-02
   16 F16           -0.110E-01
   17 F17           -0.412E-02
   18 F18            0.826E-02
   19 F19           -0.151E-01
   20 F20           -0.335E-01
   21 F21           -0.378E-01
   22 F22           -0.271E-01
   23 F23           -0.332E-01
   24 F24           -0.235E-01
   25 F25           -0.115E-01
   26 F26           -0.516E-02
   27 F27            0.116E-02
   28 F28           -0.100E-01
   29 F29           -0.191E-02
   30 F30           -0.887E-02
   31 F31            0.525E-02
   32 F32            0.383E-01
   33 F33            0.249E-01
   34 F34            0.424E-01
   35 F35            0.148E-01
   36 F36            0.123E-02


WEIGHTED RESIDUALS AT LIMIT FOR INTERVAL     4; STARTING VALUES  1
OBSNO    OBS. NAME  WEIGHT. RES.
    1 F1             0.170E-01
    2 F2             0.175E-01
    3 F3             0.270E-01
    4 F4             0.490E-02
    5 F5            -0.198E-01
    6 F6            -0.203E-01
    7 F7             0.317E-01
    8 F8             0.250E-01
    9 F9             0.230E-01
   10 F10            0.824E-02
   11 F11           -0.175E-01
   12 F12           -0.195E-01
   13 F13           -0.333E-02
   14 F14           -0.101E-02
   15 F15           -0.847E-02
   16 F16           -0.111E-01
   17 F17           -0.431E-02
   18 F18            0.802E-02
   19 F19           -0.151E-01
```

20	F20	-0.335E-01
21	F21	-0.378E-01
22	F22	-0.272E-01
23	F23	-0.333E-01
24	F24	-0.236E-01
25	F25	-0.116E-01
26	F26	-0.522E-02
27	F27	0.109E-02
28	F28	-0.101E-01
29	F29	-0.199E-02
30	F30	-0.895E-02
31	F31	0.520E-02
32	F32	0.382E-01
33	F33	0.249E-01
34	F34	0.424E-01
35	F35	0.147E-01
36	F36	0.117E-02

WEIGHTED RESIDUALS AT LIMIT FOR INTERVAL 5; STARTING VALUES 1

OBSNO	OBS. NAME	WEIGHT. RES.
1	F1	0.171E-01
2	F2	0.175E-01
3	F3	0.270E-01
4	F4	0.499E-02
5	F5	-0.197E-01
6	F6	-0.202E-01
7	F7	0.317E-01
8	F8	0.250E-01
9	F9	0.231E-01
10	F10	0.829E-02
11	F11	-0.174E-01
12	F12	-0.194E-01
13	F13	-0.333E-02
14	F14	-0.101E-02
15	F15	-0.846E-02
16	F16	-0.111E-01
17	F17	-0.431E-02
18	F18	0.802E-02
19	F19	-0.151E-01
20	F20	-0.335E-01
21	F21	-0.379E-01
22	F22	-0.272E-01
23	F23	-0.333E-01
24	F24	-0.236E-01
25	F25	-0.116E-01
26	F26	-0.523E-02
27	F27	0.108E-02
28	F28	-0.101E-01
29	F29	-0.199E-02
30	F30	-0.895E-02
31	F31	0.519E-02
32	F32	0.382E-01
33	F33	0.249E-01
34	F34	0.424E-01
35	F35	0.147E-01

```
   36 F36            0.117E-02


WEIGHTED RESIDUALS AT LIMIT FOR INTERVAL     6; STARTING VALUES  1
OBSNO    OBS. NAME  WEIGHT. RES.
    1 F1             0.159E-01
    2 F2             0.163E-01
    3 F3             0.259E-01
    4 F4             0.387E-02
    5 F5            -0.208E-01
    6 F6            -0.213E-01
    7 F7             0.317E-01
    8 F8             0.250E-01
    9 F9             0.230E-01
   10 F10            0.774E-02
   11 F11           -0.184E-01
   12 F12           -0.204E-01
   13 F13           -0.334E-02
   14 F14           -0.103E-02
   15 F15           -0.848E-02
   16 F16           -0.111E-01
   17 F17           -0.428E-02
   18 F18            0.806E-02
   19 F19           -0.151E-01
   20 F20           -0.335E-01
   21 F21           -0.378E-01
   22 F22           -0.272E-01
   23 F23           -0.333E-01
   24 F24           -0.236E-01
   25 F25           -0.116E-01
   26 F26           -0.521E-02
   27 F27            0.110E-02
   28 F28           -0.101E-01
   29 F29           -0.198E-02
   30 F30           -0.894E-02
   31 F31            0.521E-02
   32 F32            0.382E-01
   33 F33            0.249E-01
   34 F34            0.424E-01
   35 F35            0.147E-01
   36 F36            0.118E-02


WEIGHTED RESIDUALS AT LIMIT FOR INTERVAL     7; STARTING VALUES  1
OBSNO    OBS. NAME  WEIGHT. RES.
    1 F1             0.172E-01
    2 F2             0.177E-01
    3 F3             0.273E-01
    4 F4             0.573E-02
    5 F5            -0.187E-01
    6 F6            -0.192E-01
    7 F7             0.317E-01
    8 F8             0.249E-01
    9 F9             0.227E-01
   10 F10            0.885E-02
   11 F11           -0.161E-01
```

```
   12 F12           -0.183E-01
   13 F13           -0.332E-02
   14 F14           -0.103E-02
   15 F15           -0.847E-02
   16 F16           -0.110E-01
   17 F17           -0.418E-02
   18 F18            0.815E-02
   19 F19           -0.151E-01
   20 F20           -0.335E-01
   21 F21           -0.378E-01
   22 F22           -0.272E-01
   23 F23           -0.332E-01
   24 F24           -0.235E-01
   25 F25           -0.116E-01
   26 F26           -0.517E-02
   27 F27            0.114E-02
   28 F28           -0.100E-01
   29 F29           -0.195E-02
   30 F30           -0.892E-02
   31 F31            0.523E-02
   32 F32            0.383E-01
   33 F33            0.249E-01
   34 F34            0.424E-01
   35 F35            0.148E-01
   36 F36            0.120E-02


WEIGHTED RESIDUALS AT LIMIT FOR INTERVAL     8; STARTING VALUES  1
OBSNO    OBS. NAME  WEIGHT. RES.
    1 F1             0.146E-01
    2 F2             0.156E-01
    3 F3             0.261E-01
    4 F4             0.647E-02
    5 F5            -0.173E-01
    6 F6            -0.178E-01
    7 F7             0.331E-01
    8 F8             0.253E-01
    9 F9             0.211E-01
   10 F10            0.985E-02
   11 F11           -0.136E-01
   12 F12           -0.171E-01
   13 F13           -0.276E-02
   14 F14           -0.615E-03
   15 F15           -0.803E-02
   16 F16           -0.101E-01
   17 F17           -0.259E-02
   18 F18            0.101E-01
   19 F19           -0.145E-01
   20 F20           -0.329E-01
   21 F21           -0.371E-01
   22 F22           -0.263E-01
   23 F23           -0.322E-01
   24 F24           -0.224E-01
   25 F25           -0.110E-01
   26 F26           -0.463E-02
   27 F27            0.172E-02
```

```
   28 F28           -0.939E-02
   29 F29           -0.124E-02
   30 F30           -0.816E-02
   31 F31            0.569E-02
   32 F32            0.387E-01
   33 F33            0.254E-01
   34 F34            0.429E-01
   35 F35            0.152E-01
   36 F36            0.172E-02


WEIGHTED RESIDUALS AT LIMIT FOR INTERVAL    -1; STARTING VALUES  1
OBSNO    OBS. NAME  WEIGHT. RES.
    1 F1             0.168E-01
    2 F2             0.173E-01
    3 F3             0.269E-01
    4 F4             0.533E-02
    5 F5            -0.191E-01
    6 F6            -0.196E-01
    7 F7             0.317E-01
    8 F8             0.249E-01
    9 F9             0.227E-01
   10 F10            0.864E-02
   11 F11           -0.165E-01
   12 F12           -0.187E-01
   13 F13           -0.333E-02
   14 F14           -0.104E-02
   15 F15           -0.848E-02
   16 F16           -0.110E-01
   17 F17           -0.418E-02
   18 F18            0.814E-02
   19 F19           -0.151E-01
   20 F20           -0.335E-01
   21 F21           -0.378E-01
   22 F22           -0.272E-01
   23 F23           -0.332E-01
   24 F24           -0.235E-01
   25 F25           -0.116E-01
   26 F26           -0.517E-02
   27 F27            0.115E-02
   28 F28           -0.100E-01
   29 F29           -0.195E-02
   30 F30           -0.891E-02
   31 F31            0.522E-02
   32 F32            0.383E-01
   33 F33            0.249E-01
   34 F34            0.424E-01
   35 F35            0.148E-01
   36 F36            0.120E-02


WEIGHTED RESIDUALS AT LIMIT FOR INTERVAL    -2; STARTING VALUES  1
OBSNO    OBS. NAME  WEIGHT. RES.
    1 F1             0.131E-01
    2 F2             0.142E-01
    3 F3             0.249E-01
```

```
    4 F4             0.575E-02
    5 F5            -0.179E-01
    6 F6            -0.184E-01
    7 F7             0.345E-01
    8 F8             0.263E-01
    9 F9             0.217E-01
   10 F10            0.100E-01
   11 F11           -0.139E-01
   12 F12           -0.177E-01
   13 F13           -0.185E-02
   14 F14            0.258E-03
   15 F15           -0.715E-02
   16 F16           -0.909E-02
   17 F17           -0.145E-02
   18 F18            0.114E-01
   19 F19           -0.137E-01
   20 F20           -0.321E-01
   21 F21           -0.363E-01
   22 F22           -0.255E-01
   23 F23           -0.314E-01
   24 F24           -0.215E-01
   25 F25           -0.105E-01
   26 F26           -0.404E-02
   27 F27            0.232E-02
   28 F28           -0.879E-02
   29 F29           -0.624E-03
   30 F30           -0.754E-02
   31 F31            0.617E-02
   32 F32            0.391E-01
   33 F33            0.258E-01
   34 F34            0.433E-01
   35 F35            0.157E-01
   36 F36            0.217E-02


WEIGHTED RESIDUALS AT LIMIT FOR INTERVAL    -3; STARTING VALUES  1
OBSNO    OBS. NAME  WEIGHT. RES.
    1 F1             0.148E-01
    2 F2             0.152E-01
    3 F3             0.248E-01
    4 F4             0.326E-02
    5 F5            -0.212E-01
    6 F6            -0.216E-01
    7 F7             0.318E-01
    8 F8             0.249E-01
    9 F9             0.227E-01
   10 F10            0.763E-02
   11 F11           -0.184E-01
   12 F12           -0.206E-01
   13 F13           -0.331E-02
   14 F14           -0.102E-02
   15 F15           -0.846E-02
   16 F16           -0.110E-01
   17 F17           -0.416E-02
   18 F18            0.816E-02
   19 F19           -0.151E-01
```

```
   20 F20           -0.335E-01
   21 F21           -0.378E-01
   22 F22           -0.272E-01
   23 F23           -0.332E-01
   24 F24           -0.235E-01
   25 F25           -0.115E-01
   26 F26           -0.516E-02
   27 F27            0.116E-02
   28 F28           -0.100E-01
   29 F29           -0.194E-02
   30 F30           -0.890E-02
   31 F31            0.523E-02
   32 F32            0.383E-01
   33 F33            0.249E-01
   34 F34            0.424E-01
   35 F35            0.148E-01
   36 F36            0.121E-02


WEIGHTED RESIDUALS AT LIMIT FOR INTERVAL    -4; STARTING VALUES  1
OBSNO    OBS. NAME  WEIGHT. RES.
    1 F1             0.171E-01
    2 F2             0.176E-01
    3 F3             0.273E-01
    4 F4             0.566E-02
    5 F5            -0.188E-01
    6 F6            -0.193E-01
    7 F7             0.317E-01
    8 F8             0.249E-01
    9 F9             0.227E-01
   10 F10            0.880E-02
   11 F11           -0.162E-01
   12 F12           -0.184E-01
   13 F13           -0.332E-02
   14 F14           -0.103E-02
   15 F15           -0.848E-02
   16 F16           -0.110E-01
   17 F17           -0.418E-02
   18 F18            0.814E-02
   19 F19           -0.151E-01
   20 F20           -0.335E-01
   21 F21           -0.378E-01
   22 F22           -0.272E-01
   23 F23           -0.332E-01
   24 F24           -0.235E-01
   25 F25           -0.116E-01
   26 F26           -0.517E-02
   27 F27            0.114E-02
   28 F28           -0.100E-01
   29 F29           -0.195E-02
   30 F30           -0.892E-02
   31 F31            0.522E-02
   32 F32            0.383E-01
   33 F33            0.249E-01
   34 F34            0.424E-01
   35 F35            0.148E-01
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   36 F36            0.120E-02


WEIGHTED RESIDUALS AT LIMIT FOR INTERVAL    -5; STARTING VALUES  1
OBSNO    OBS. NAME  WEIGHT. RES.
    1 F1             0.171E-01
    2 F2             0.176E-01
    3 F3             0.273E-01
    4 F4             0.567E-02
    5 F5            -0.188E-01
    6 F6            -0.193E-01
    7 F7             0.317E-01
    8 F8             0.249E-01
    9 F9             0.227E-01
   10 F10            0.881E-02
   11 F11           -0.162E-01
   12 F12           -0.184E-01
   13 F13           -0.332E-02
   14 F14           -0.103E-02
   15 F15           -0.847E-02
   16 F16           -0.110E-01
   17 F17           -0.418E-02
   18 F18            0.814E-02
   19 F19           -0.151E-01
   20 F20           -0.335E-01
   21 F21           -0.378E-01
   22 F22           -0.272E-01
   23 F23           -0.332E-01
   24 F24           -0.236E-01
   25 F25           -0.115E-01
   26 F26           -0.516E-02
   27 F27            0.115E-02
   28 F28           -0.100E-01
   29 F29           -0.195E-02
   30 F30           -0.892E-02
   31 F31            0.522E-02
   32 F32            0.383E-01
   33 F33            0.249E-01
   34 F34            0.424E-01
   35 F35            0.148E-01
   36 F36            0.120E-02


WEIGHTED RESIDUALS AT LIMIT FOR INTERVAL    -6; STARTING VALUES  1
OBSNO    OBS. NAME  WEIGHT. RES.
    1 F1             0.165E-01
    2 F2             0.170E-01
    3 F3             0.267E-01
    4 F4             0.504E-02
    5 F5            -0.194E-01
    6 F6            -0.199E-01
    7 F7             0.317E-01
    8 F8             0.249E-01
    9 F9             0.227E-01
   10 F10            0.849E-02
   11 F11           -0.167E-01
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   12 F12           -0.189E-01
   13 F13           -0.334E-02
   14 F14           -0.104E-02
   15 F15           -0.848E-02
   16 F16           -0.110E-01
   17 F17           -0.418E-02
   18 F18            0.814E-02
   19 F19           -0.151E-01
   20 F20           -0.335E-01
   21 F21           -0.378E-01
   22 F22           -0.272E-01
   23 F23           -0.332E-01
   24 F24           -0.235E-01
   25 F25           -0.115E-01
   26 F26           -0.516E-02
   27 F27            0.115E-02
   28 F28           -0.100E-01
   29 F29           -0.195E-02
   30 F30           -0.892E-02
   31 F31            0.523E-02
   32 F32            0.383E-01
   33 F33            0.249E-01
   34 F34            0.424E-01
   35 F35            0.148E-01
   36 F36            0.120E-02


WEIGHTED RESIDUALS AT LIMIT FOR INTERVAL    -7; STARTING VALUES  1
OBSNO    OBS. NAME  WEIGHT. RES.
    1 F1             0.171E-01
    2 F2             0.175E-01
    3 F3             0.271E-01
    4 F4             0.499E-02
    5 F5            -0.197E-01
    6 F6            -0.202E-01
    7 F7             0.317E-01
    8 F8             0.250E-01
    9 F9             0.231E-01
   10 F10            0.829E-02
   11 F11           -0.174E-01
   12 F12           -0.194E-01
   13 F13           -0.333E-02
   14 F14           -0.101E-02
   15 F15           -0.846E-02
   16 F16           -0.111E-01
   17 F17           -0.431E-02
   18 F18            0.802E-02
   19 F19           -0.151E-01
   20 F20           -0.335E-01
   21 F21           -0.379E-01
   22 F22           -0.272E-01
   23 F23           -0.333E-01
   24 F24           -0.236E-01
   25 F25           -0.116E-01
   26 F26           -0.524E-02
   27 F27            0.108E-02
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   28 F28           -0.101E-01
   29 F29           -0.199E-02
   30 F30           -0.895E-02
   31 F31            0.519E-02
   32 F32            0.382E-01
   33 F33            0.249E-01
   34 F34            0.424E-01
   35 F35            0.147E-01
   36 F36            0.118E-02


WEIGHTED RESIDUALS AT LIMIT FOR INTERVAL    -8; STARTING VALUES  1
OBSNO    OBS. NAME  WEIGHT. RES.
    1 F1             0.140E-01
    2 F2             0.150E-01
    3 F3             0.255E-01
    4 F4             0.603E-02
    5 F5            -0.177E-01
    6 F6            -0.182E-01
    7 F7             0.328E-01
    8 F8             0.249E-01
    9 F9             0.206E-01
   10 F10            0.954E-02
   11 F11           -0.138E-01
   12 F12           -0.173E-01
   13 F13           -0.303E-02
   14 F14           -0.895E-03
   15 F15           -0.832E-02
   16 F16           -0.104E-01
   17 F17           -0.283E-02
   18 F18            0.990E-02
   19 F19           -0.147E-01
   20 F20           -0.331E-01
   21 F21           -0.373E-01
   22 F22           -0.265E-01
   23 F23           -0.324E-01
   24 F24           -0.226E-01
   25 F25           -0.112E-01
   26 F26           -0.477E-02
   27 F27            0.158E-02
   28 F28           -0.954E-02
   29 F29           -0.139E-02
   30 F30           -0.832E-02
   31 F31            0.556E-02
   32 F32            0.386E-01
   33 F33            0.253E-01
   34 F34            0.428E-01
   35 F35            0.152E-01
   36 F36            0.161E-02
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