UR1985-34

# 1985/34. CARS - A computer assisted records system (Revision 4)

*R.G. Richardson*

*Abstract*

The program suite described is used for adding entries to a data-base of Engineering Geology correspondence, sorting the data-base, and searching it. The data are entered in a simple fill-in-the spaces manner and part or all of the details entered may be searched. The new revision simplifies searching by area.

## USING THE PROGRAMS

The programs are run on the Geological Survey Perkin-Elmer mini-computer, and it is assumed that the user is familiar with the standard data editing facilities.

### *Data-base maintenance*

Data are put into a standard format (Appendix 1) before entry. Input is commenced by typing RECADD and continues until END is typed in response to the name prompt. Data are entered left justified in response to prompts, with the category and geology numbers being entered as either one or two digits on the same line.

At the end of input, a proof-sheet is output and the data saved in file RECTEMP.TMP. Any corrections should be made to this file using the standard editing facilities and a new proof sheet then printed and checked.

The new data in RECTEMP.TMP must be added to the end of the existing data-base by typing RECMERGE. To ensure that the file remains in records reference number order, it should be sorted periodically using the RECSORT command. As sorting is a slow process it should not be carried out more often than necessary.

### *Data-base searching*

The search phase is entered by typing RECSRCH. An entry will be retrieved only if one value in each search option specified is found.

The program requests the following data:

(i) Search type - F for a search on specified option values
- R for a search between a range of records reference numbers. If R is specified, the starting and ending record reference numbers are specified. *e.g.* 1234/78.

(ii) Name - one or more names on a single line, each name terminated by /. If a search by name is not required leave the line blank. *e.g.* BROWN/JONES/SMITH/

(iii) Job location - details as for name.

(iv) Agency name - details as for name.

(v) Agency type - one or more agency numbers on a single line, each terminated by /. If a search by agency type

is not required leave the line blank.
*e.g.* 0/ find agency type 0
0/2 find agency types 0 or 2

(vi) Year - one or more years on a single line, each terminated by a /. Leave blank if not required.
*e.g.* 82/ only year 1982
75/76/77/78/79/80/ years 1975 to 1980 inclusive.

(vii) Geologist - details as for name. *e.g.* PRW/WCC/DJJ/

(viii) Search also non-specified area/subject material - leave blank if this material is not to be included in a search by area.
- Y for searching material that may be of a general or non-area specific nature when searching by area. The map reference must be 0 0.
*e.g.* if this is the only search option specified a list of general reports is produced.
*e.g.* a search for work done by geologist CJK on landslides in north-east Tasmania (search by area) may have this option specified to detect any general work done by CJK on landslides as well.

(ix) Search by area - leave blank for no search by area.
- Y for finding entries inside a specified area. Entries on the boundary of the area will not be found. The program prompts for the number of vertices. If 2 is entered a simple rectangle parallel to the grid may be entered by specifying the co-ordinates of any two diagonally opposite corners. Otherwise the program prompts for the vertex co-ordinates. Co-ordinates should be in the same form as used on the input sheets.

(x) Category - one or more category numbers on a single line, each group terminated by /. Leave blank if not required.
*e.g.* 0/2/ groundwater or expansive soils
12/4 slope stability and expansive soils or miscellaneous.

(xi) Geology - one or more geology numbers on a single line, each group terminated by /. Leave blank if not required.
*e.g.* 0/9/ Quaternary or granite
17/ Tertiary sediments and Tertiary basalt.

(xii) Screen listing required - Y if required, N otherwise. At the end of each screen a choice is made as to whether to list any more data on the screen or not.

(xiii) Printout required - Y if the number of entries found can be realistically printed.
- N if the number of entries found is too great to want them printed.

## THE PROGRAMS

*RECADD (Appendix 2)*

This program accepts data from the keyboard and copies it to a file in a format suitable for editing. Prompts are used to guide the user. The file created (RECTEMP.TMP) is then edited using the standard edit facilities.

*RECMERGE (Appendix 3)*

The data from RECTEMP.TMP are converted to the format of the data-base. The data-base is copied to a temporary work file and the new data are added to the end of this. The combined file is then copied back to the original data-base file.

*RECSORT (Appendix 4)*

The data are sorted into ascending records reference number order and written to a temporary file in the new order. The temporary file is then copied back to the original data-base file.

*RECSRCH (Appendix 5)*

The data-base is searched for the occurrence of specified strings and a point-in-polygon algorithm is used to locate data from within a specified area.

[15 July 1985]

## APPENDIX 1

### Data input sheet

## CARS (COMPUTER ASSISTED RECORDS SYSTEM)

NAME: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ (24)

JOB LOCATION: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ (36)

AGENCY: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ (24)

0 □ GOVERNMENT     1 □ PROFESSIONAL     2 □ INDIVIDUAL

RECORDS REFERENCE NO.: _ _ _ _ _/_ _

GEOLOGIST: _ _ _ (3)

AMG MAP REFERENCE: _ _ _ _ 5 _ _ _ _ (9)

CATEGORY:*

0 □ GROUNDWATER
1 □ SLOPE STABILITY
2 □ EXPANSIVE SOILS
3 □ FOUNDATION INVESTIGATION
4 □ MISCELLANEOUS

GEOLOGY:*

Qu 0 □     Tert.Sed. 1 □     Triassic 2 □     Permian 3 □     L-Pal 4 □
C 5 □     Pre-C 6 □     Tb 7 □     Jdl 8 □     Granite 9 □

*Cross two (2) maximum

CARS (COMPUTER ASSISTED RECORDS SYSTEM)

NAME: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ (24)

JOB LOCATION: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ (36)

AGENCY: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ (24)

0 □ GOVERNMENT     1 □ PROFESSIONAL     2 □ INDIVIDUAL

RECORDS REFERENCE NO.: _ _ _ _ _/_ _

GEOLOGIST: _ _ _ (3)

AMG MAP REFERENCE: _ _ _ _ 5 _ _ _ _ (9)

CATEGORY:*

0 □ GROUNDWATER
1 □ SLOPE STABILITY
2 □ EXPANSIVE SOILS
3 □ FOUNDATION INVESTIGATION
4 □ MISCELLANEOUS

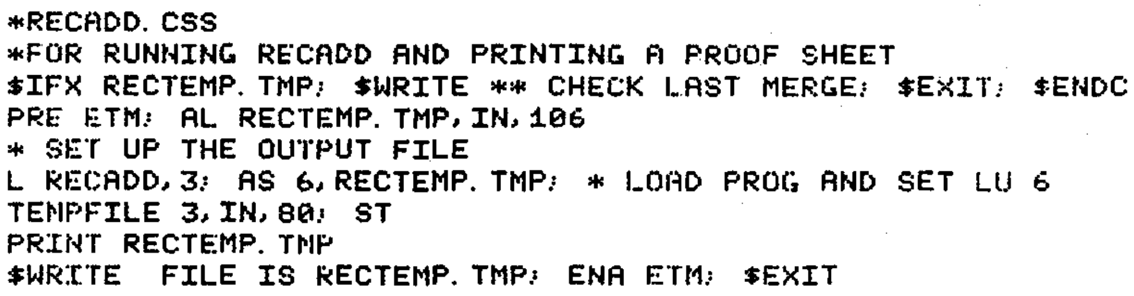
GEOLOGY:*

Qu 0 □     Tert.Sed. 1 □     Triassic 2 □     Permian 3 □     L-Pal 4 □
C 5 □     Pre-C 6 □     Tb 7 □     Jdl 8 □     Granite 9 □

*Cross two (2) maximum

## APPENDIX 2

## Program RECADD



```
*RECADD.CSS
*FOR RUNNING RECADD AND PRINTING A PROOF SHEET
$IFX RECTEMP.TMP; $WRITE ** CHECK LAST MERGE; $EXIT; $ENDC
PRE ETM; AL RECTEMP.TMP,IN,106
* SET UP THE OUTPUT FILE
L RECADD,3; AS 6,RECTEMP.TMP; * LOAD PROG AND SET LU 6
TEMPFILE 3,IN,80; ST
PRINT RECTEMP.TMP
$WRITE  FILE IS RECTEMP.TMP; ENA ETM; $EXIT
```

```
$TITL  RECADD.FTN  -  ADD LETTERS TO THE RECORDS FILE
C TAKES KEYBOARD INPUT AND PREPARES A PROOF SHEET
      CHARACTER*1 BUFF(9)
      INTEGER*4 MAPREF
      CHARACTER*24 NAME
      CHARACTER*36 LOCATN
      CHARACTER*24 AGNAME
      INTEGER*2 AGNO,RECNO,RECYR
      CHARACTER*3 GEOLST
      CHARACTER*2 CATG,GEOL
C INPUT IS NAME,LOCATION,AGENCY NAME,AGENCY TYPE(AGNO),
C             RECORDS FILE NO (RECNO/RECYR),GEOLOGIST,
C             CATEGORY(UP TO 2),GEOLOGY (UP TO 2)
C
      OPEN(UNIT=5,FILE='CON:')
C SET THE CONSOLE UP AS LU 5 FOR INPUT
C THE OUTPUT IS TO LU 6
   10 WRITE(5,100)
  100 FORMAT(' NAME OR END')
      READ(5,200) NAME
  200 FORMAT(A24)
      IF (INDEX(NAME,'END     ') .NE. 0) GOTO 20
C RECOGNISE END BY HAVING END ON ITS OWN AND PRINT PROOF SHEET
      WRITE(5,101)
  101 FORMAT(' LOCATION')
      READ(5,201) LOCATN
  201 FORMAT(A36)
      WRITE(5,102)
  102 FORMAT(' AGENCY')
      READ(5,202) AGNAME
  202 FORMAT(A24)
      WRITE(5,103)
  103 FORMAT(' AGENCY TYPE')
      READ(5,*) AGNO
   11 WRITE(5,104)
  104 FORMAT(' RECORDS REF NO')
      READ(5,109) BUFF
  109 FORMAT(9A1)
      DO 12 I=1,9
      IF (BUFF(I) .EQ. '/') BUFF(I)=','
   12 CONTINUE
C CHANGE / TO , TO COPE WITH FREE FORMAT READ
      REWIND 3
      WRITE(3,109) BUFF
      REWIND 3
      READ(3,*,END=11,ERR=11) RECNO,RECYR
      WRITE(5,105)
  105 FORMAT(' GEOLOGIST')
      READ(5,203) GEOLST
  203 FORMAT(A3)
      WRITE(5,106)
  106 FORMAT(' MAP REF')
      READ(5,*) MAPREF
      WRITE(5,107)
  107 FORMAT(' CATEGORY')
      READ(5,204) CATG
  204 FORMAT(A2)
      WRITE(5,108)
  108 FORMAT(' GEOLOGY')
```

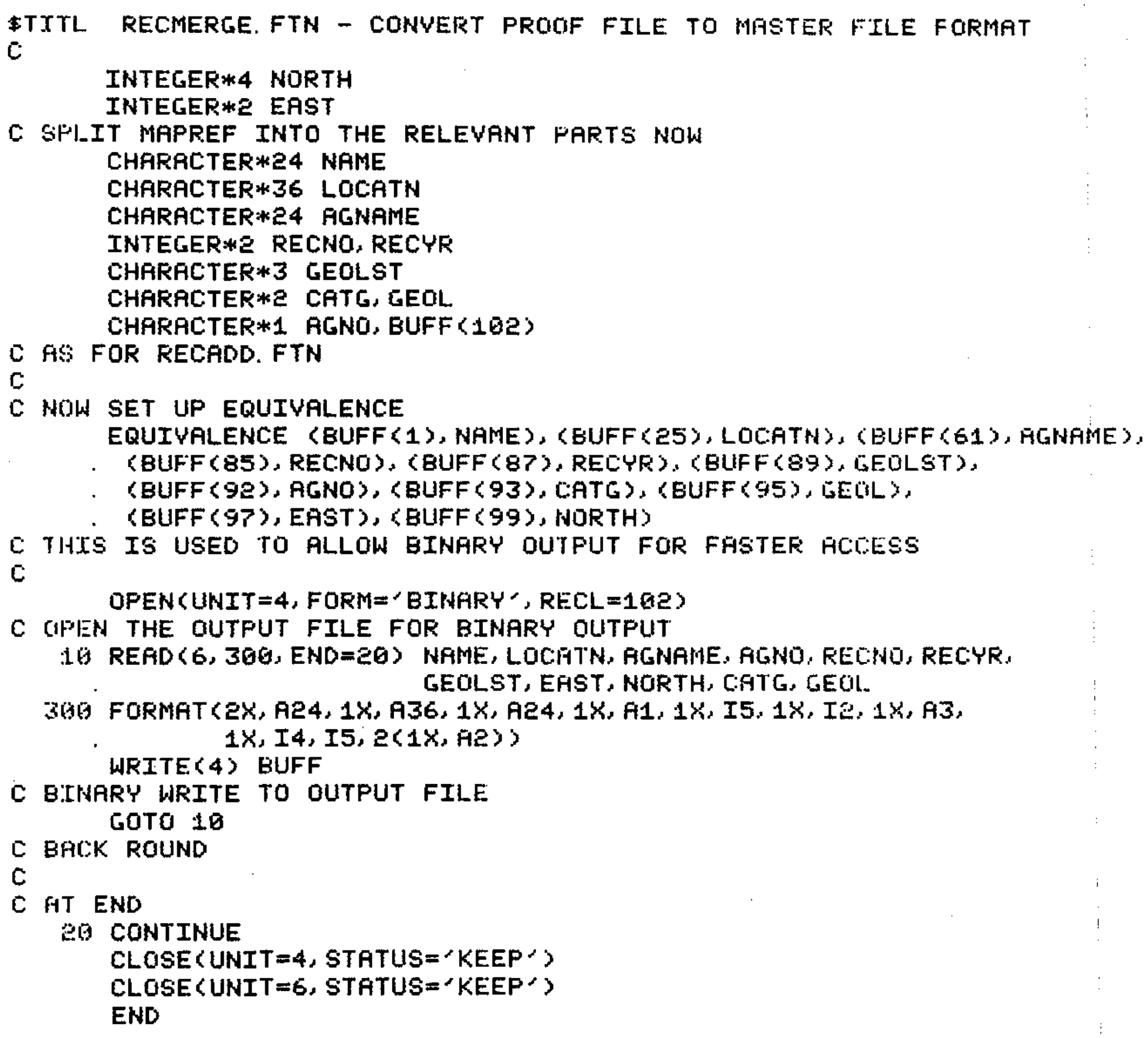
```
      READ(5,204) GEOL
C READ ONE COMPLETE DATA SHEET
C
C SO WRITE TO OUTPUT FILE
      WRITE(6,300) NAME,LOCATN,AGNAME,AGNO,RECNO,RECYR,GEOLST,MAPREF,
     .         CATG,GEOL
  300 FORMAT(1X,'@',A24,'@',A36,'@',A24,'@',I1,'@',I5,'/',
     .       I2,'@',A3,'@',I9,2('@',A2),'@')
C WRITE WITH DELIMITERS AFTER EACH FIELD
      GOTO 10
C BACK AROUND
C
C OTHERWISE CLOSE UP AND STOP
   20 CONTINUE
      CLOSE(UNIT=6,STATUS='KEEP')
      END
```

8/38

APPENDIX 3

Program RECMERGE

```
*RECMERGE. CSS
* FOR MERGING CORRECTED FILE WITH MAIN FILE
PRE ETM; XDE MRGTMP. TMP; *DELETE SCRATCH FILE
AL MRGTMP. TMP, IN, 88; L RECMERGE, 10; * AL SCRATCH FILE AND LOAD PROG
REP RECTEMP. TMP, FF00; AS 6, RECTEMP. TMP, ERO; AS 4, MRGTMP. TMP; ST
$IFNE 0; $WRITE TRANSLATE ERROR; ENA ETM;  $EXIT; $ENDC
REP MRGTMP. TMP, FF00
$BUILD COPY. CMD
IN JOBREC. DAT
AL TEMP:TEMP. DAT, IN, 88/6/5
OUT TEMP:TEMP. DAT
COPY *,*
IN MRGTMP. TMP
COPY *,*
END
$ENDB
L COPY32, 50; ST , COM=COPY. CMD, LI=NULL:, LO=NULL:
$IFNE 0; $WRITE COPY-MERGE ERROR; ENA ETM; $EXIT; $ENDC
REP JOBREC. DAT, 0; REP TEMP:TEMP. DAT, FF00
DE COPY. CMD, JOBREC. DAT
$BUILD COPY. CMD
IN TEMP:TEMP. DAT
AL JOBREC. DAT, IN, 88/10/3
OUT JOBREC. DAT
COPY *,*
REW I
REW O
VERIFY *,*
END
$ENDB
L COPY32, 50; ST , COM=COPY. CMD, LI=NULL:, LO=NULL:
$IFNE 0; $WRITE COPY BACK FAILED; ENA ETM; $EXIT; $ENDC
REP JOBREC. DAT, FF00; REP TEMP:TEMP. DAT, 0; REP RECTEMP. TMP, 0
REP MRGTMP. TMP, 0
DE COPY. CMD, MRGTMP. TMP, RECTEMP. TMP, TEMP:TEMP. DAT
ENA ETM
$EXIT
```



```
$TITL  RECMERGE.FTN - CONVERT PROOF FILE TO MASTER FILE FORMAT
C
      INTEGER*4 NORTH
      INTEGER*2 EAST
C SPLIT MAPREF INTO THE RELEVANT PARTS NOW
      CHARACTER*24 NAME
      CHARACTER*36 LOCATN
      CHARACTER*24 AGNAME
      INTEGER*2 RECNO,RECYR
      CHARACTER*3 GEOLST
      CHARACTER*2 CATG,GEOL
      CHARACTER*1 AGNO,BUFF(102)
C AS FOR RECADD.FTN
C
C NOW SET UP EQUIVALENCE
      EQUIVALENCE (BUFF(1),NAME),(BUFF(25),LOCATN),(BUFF(61),AGNAME),
     . (BUFF(85),RECNO),(BUFF(87),RECYR),(BUFF(89),GEOLST),
     . (BUFF(92),AGNO),(BUFF(93),CATG),(BUFF(95),GEOL),
     . (BUFF(97),EAST),(BUFF(99),NORTH)
C THIS IS USED TO ALLOW BINARY OUTPUT FOR FASTER ACCESS
C
      OPEN(UNIT=4,FORM='BINARY',RECL=102)
C OPEN THE OUTPUT FILE FOR BINARY OUTPUT
   10 READ(6,300,END=20) NAME,LOCATN,AGNAME,AGNO,RECNO,RECYR,
     .                   GEOLST,EAST,NORTH,CATG,GEOL
  300 FORMAT(2X,A24,1X,A36,1X,A24,1X,A1,1X,I5,1X,I2,1X,A3,
     .      1X,I4,I5,2(1X,A2))
      WRITE(4) BUFF
C BINARY WRITE TO OUTPUT FILE
      GOTO 10
C BACK ROUND
C
C AT END
   20 CONTINUE
      CLOSE(UNIT=4,STATUS='KEEP')
      CLOSE(UNIT=6,STATUS='KEEP')
      END
```

## APPENDIX 4

## Program RECSORT

```
*RECSORT.CSS
* FOR SORTING JOB FILE INTO CHRONOLOGICAL ORDER
PRE ETM
L RECSORT,10; AS 4,JOBREC.DAT,ERO; AL TEMP:TEMP.DAT,IN,88/5/2
AS 6,TEMP:TEMP.DAT; ST
$IFNE 0; $WRITE SORT ERROR; ENA ETM; $EXIT; $ENDC
$BUILD COPY.CMD
IN TEMP:TEMP.DAT
AL JOBREC.DAT,IN,88/10/5
OUT JOBREC.DAT
COPY *,*
REW I
REW O
VERIFY *,*
END
$ENDB
REP TEMP:TEMP.DAT,FF00; REP JOBREC.DAT,0; DE JOBREC.DAT
L COPY32,50; ST ,COM=COPY.CMD,LI=NULL:,LO=NULL:
$IFNE 0; $WRITE SORT-COPY ERROR; ENA ETM; $EXIT; $ENDC
REP JOBREC.DAT,FF00; REP TEMP:TEMP.DAT,0; DE TEMP:TEMP.DAT,COPY.CMD
ENA ETM; $EXIT
```

```
$TITL  RECSORT.FTN - SORT THE JOB FILE INTO CALENDAR ORDER
C
      INTEGER*4 NORTH
      INTEGER*2 EAST
C SPLIT MAPREF INTO THE RELEVANT PARTS NOW
      CHARACTER*24 NAME
      CHARACTER*36 LOCATN
      CHARACTER*24 AGNAME
      INTEGER*2 RECNO,RECYR
      CHARACTER*3 GEOLST
      CHARACTER*2 CATG,GEOL
      CHARACTER*1 AGNO,BUFF(102)
C AS FOR RECADD.FTN
C
C FOLLOWING ARE FOR THE SORT
      INTEGER*2 INDEX(8000)
      INTEGER*4 IA(8000)
C ALLOW FOR 8000 ENTRIES
C
C NOW SET UP EQUIVALENCE
      EQUIVALENCE (BUFF(1),NAME),(BUFF(25),LOCATN),(BUFF(61),AGNAME),
     . (BUFF(85),RECNO),(BUFF(87),RECYR),(BUFF(89),GEOLST),
     . (BUFF(92),AGNO),(BUFF(93),CATG),(BUFF(95),GEOL),
     . (BUFF(97),EAST),(BUFF(99),NORTH)
C THIS IS USED TO ALLOW BINARY OUTPUT FOR FASTER ACCESS
C
      OPEN(UNIT=4,FORM='BINARY',ACCESS='DIRECT',RECL=102)
C OPEN THE INPUT FILE FOR RANDOM AND SEQUENTIAL ACCESS
      REWIND 4
      IREC=0
C COUNTER FOR NUMBER OF RECORDS
   10 READ(4,END=20) BUFF
      IREC=IREC+1
      IF (IREC .GT. 8000) STOP 'MORE THAN 8000 ENTRIES'
      INDEX(IREC)=IREC
C FILL SORT INDEX
      IA(IREC)=RECNO+(RECYR*100000)
C COMBINE RECNO AND RECYR TO GET CHRONOLOGICAL NUMER
      GOTO 10
C BACK AROUND
C
C NOW FOR THE WORK
   20 CONTINUE
      IF (IREC .EQ. 0) STOP 'NO RECORDS'
      CALL BUBSTI(INDEX,IA,1,IREC)
C SORT INTO ASCENDING NUMBER - I.E. CHRON ORDER
      OPEN(UNIT=6,FORM='BINARY',RECL=102)
C OPEN OUTPUT FILE
      DO 30 I=1,IREC
      READ(4,REC=INDEX(I)) BUFF
      WRITE(6) BUFF
C COPY TO NEW ORDER
   30 CONTINUE
      CLOSE(UNIT=6,STATUS='KEEP')
      CLOSE(UNIT=4,STATUS='KEEP')
      END
      SUBROUTINE BUBSTI(IR,IA,IBASE,N)
      INTEGER*4 IA(N)
      INTEGER*2 IR(N)
      LOGICAL NSWAP
      IF (N .LE. 1) RETURN
C NOTHING TO SORT
      NM1=N-1
      DO 30 J=IBASE,NM1
      NSWAP=.TRUE.
      IRI=IR(1)
      DO 40 I=IBASE,NM1
      IP1=I+1
      IRIP1=IR(IP1)
      IF (IA(IRI) .LE. IA(IRIP1)) GOTO 40
      NSWAP=.FALSE.
      IR(I)=IRIP1
      IR(IP1)=IRI
      IRIP1=IRI
   40 IRI=IRIP1
      IF (NSWAP) RETURN
   30 CONTINUE
      RETURN
      END
```

# APPENDIX 5

## Program RECSRCH

```
*RECSRCH.CSS - SEARCH THE JOB FILE
L RECSRCH,10; AS 4,JOBREC.DAT,ERO; XAL SYSF:ENGJOBS.TMP,IN,132/3/2
AS 6,SYSF:ENGJOBS.TMP; REW 6; AS 5,CON:; TEMPFILE 3,IN,80; ST
$IFX SYSF:ENGJOBS.TMP; PRI SYSF:ENGJOBS.TMP,DEL; $ENDO; $EXIT
```

```
$TITL  RECSRCH.FTN - SEARCH JOB FILE
C
      INTEGER*4 NORTH
      INTEGER*2 EAST,FCOUNT,SCOUNT
      REAL*4 ALINE(124)
C USED WHEN COPYING FROM OUTPUT FILE TO SCREEN
C SPLIT MAPREF INTO THE RELEVANT PARTS NOW
      CHARACTER*24 NAME
      CHARACTER*36 LOCATN
      CHARACTER*24 AGNAME
      INTEGER*2 RECNO,RECYR
      CHARACTER*3 GEOLST
      CHARACTER*2 CATG,GEOL
      CHARACTER*1 AGNO,BUFF(102),AREGN
C AS FOR RECADD.FTN
C
C NOW SET UP EQUIVALENCE
      EQUIVALENCE (BUFF(1),NAME),(BUFF(25),LOCATN),(BUFF(61),AGNAME),
     . (BUFF(85),RECNO),(BUFF(87),RECYR),(BUFF(89),GEOLST),
     . (BUFF(92),AGNO),(BUFF(93),CATG),(BUFF(95),GEOL),
     . (BUFF(97),EAST),(BUFF(99),NORTH)
C THIS IS USED TO ALLOW BINARY OUTPUT FOR FASTER ACCESS
C
      CHARACTER*80 SNAME,SLOCN,SAGNAM,SAGNO,SYEAR,SGEOLT,SCAT,SGEOL
      INTEGER*2 IYR(30),RNOSTA,YRSTA,RNOSTO,YRSTO,STYPE
      INTEGER*2 FFEED
C USED TO PUT FORM FEEDS INTO OUTPUT FILE
      REAL X(100),Y(100),YINTVL(100),RSLOPE(100)
      INTEGER*2 SWATH(100,25)
C ABOVE 2 LINES USED FOR FSTJDN POINT IN POLYGON SEARCH
      LOGICAL NOTIN,INOUT
      DATA FFEED/3072/
C THE FORM FEED CHARACTER IN A1
      OPEN(UNIT=4,FORM='BINARY',RECL=102)
C OPEN THE INPUT FILE
   10 WRITE(5,100)
  100 FORMAT(' SEARCHING JOB RECORDS'//' DO YOU NEED A',
     . ' FULL SEARCH (F) OR RECORDS NO.  SEARCH (R)?')
      READ(5,200) STYPE
  200 FORMAT(A1)
      IF (STYPE .EQ. 'R') GOTO 30
C WANT SEARCH ON RECORDS NUMBER
      IF (STYPE .NE. 'F') GOTO 10
C PROMPT AGAIN IF NOT ONE OF THE TWO DESIRED OPTIONS
C
C NOW FOR A FULL SEARCH
      WRITE(6,400)
  400 FORMAT(' SEARCH OPTIONS ARE:')
      WRITE(5,101)
  101 FORMAT(' FOR EACH OPTION ENTER EITHER A BLANK LINE OR'/
     . ' THE DESIRED VALUES FOR THE OPTION, EACH TERMINATED BY'
     . ,' A /''/' E.G.  FRED/BILL/TOM/SMITH/')
      WRITE(5,102)
  102 FORMAT(' NAME?')
      READ(5,201) SNAME
  201 FORMAT(A80)
      IF (SNAME(1:1) .NE. ' ') WRITE(6,401) SNAME
  401 FORMAT(' NAME',10X,A80)
      WRITE(5,103)
  103 FORMAT(' JOB LOCATION?')
      READ(5,201) SLOCN
      IF (SLOCN(1:1) .NE. ' ') WRITE (6,402) SLOCN
  402 FORMAT(' JOB LOCATION',10X,A80)
      WRITE(5,104)
  104 FORMAT(' AGENCY NAME?')
      READ(5,201) SAGNAM
      IF (SAGNAM(1:1) .NE. ' ') WRITE(6,403) SAGNAM
  403 FORMAT('AGENCY NAME',10X,A80)
      WRITE(5,105)
  105 FORMAT(' AGENCY TYPE (0,1,2)?')
      READ(5,201) SAGNO
      IF (SAGNO(1:1) .NE. ' ') WRITE(6,404) SAGNO
  404 FORMAT(' AGENCY NO. ',10X,A80)
      WRITE(5,106)
  106 FORMAT(' YEAR?')
      READ(5,201) SYEAR
      NYEAR=0
C COUNTER FOR NUMBER OF YEAR OPTIONS INPUT
      IF (SYEAR(1:2) .EQ. '  ') GOTO 21
C NO YEAR SEARCH DESIRED
      WRITE(6,405) SYEAR
  405 FORMAT(' YEAR',10X,A80)
      ILAST=1
C COUNT POSITION ALONG INPUT LINE
   20 ICHAR=INDEX(SYEAR(ILAST:80),'/')
C LOOK FOR / AS TERMINATOR OF A YEAR
      IF (ICHAR .EQ. 0) GOTO 21
C NO MORE /
      ENCODE(BUFF,300) SYEAR(ILAST:ILAST+1)
  300 FORMAT(A2)
      NYEAR=NYEAR+1
      DECODE(BUFF,301) IYR(NYEAR)
  301 FORMAT(I2)
C CONVERTED TO AN INTEGER
      ILAST=ILAST+ICHAR
C POSITION TO AFTER THE /
      IF (ILAST .NE. 79) GOTO 20
C ROUND FOR NEXT YEAR
C
C NOW GTE THE NEXT SEARCH OPTION
   21 CONTINUE
      WRITE(5,107)
  107 FORMAT(' GEOLOGIST?')
      READ(5,201) SGEOLT
      IF (SGEOLT(1:1) .NE. ' ') WRITE(6,406) SGEOLT
  406 FORMAT(' GEOLOGIST',10X,A80)
      WRITE(5,416)
  416 FORMAT(' SEARCH ALSO NON-SPECIFIED AREA/SUBJECT MATERIAL (Y)')
      READ(5,200) AREGN
      IF (AREGN .EQ. 'Y') WRITE(6,417)
  417 FORMAT(' SEARCHING ALSO NON-SPECIFIED AREA/SUBJECT MATERIAL')
      WRITE(5,108)
  108 FORMAT(' SEARCH FOR SITES WITHIN A SPECIFIED AREA (Y)?')
      READ(5,200) STYPE
      IF (STYPE .EQ. 'Y') GOTO 23
C WANT TO READ COORDS
      NCOORD=0
      GOTO 26
C DONT WANT TO SEARCH FOR SITES IN AN AREA
```

```
C
   23 CONTINUE
C READ VERTICES
      WRITE(5,109)
  109 FORMAT(' NUMBER OF VERTICES OF AREA?'/
     .   ' ENTER 2 TO SPECIFY A RECTANGLE')
      READ(5,*) NCOORD
      IF (NCOORD .LT. 2) GOTO 23
C NEED AT LEAST 3 VERTICES TO DEFINE AN AREA
      IF (NCOORD .EQ. 2) THEN
      WRITE(5,515)
  515 FORMAT(' ENTER COORDS OF TWO DIAGONALLY OPPOSITE CORNERS OF ',
     .  'THE RECTANGLE'/' ONE PER LINE IN THE FORM EASTNORTH')
      ELSE
      WRITE(5,110)
  110 FORMAT(' ENTER VERTEX COORDS IN CLOCKWISE ORDER'/
     .' ONE PER LINE IN FORM EASTNORTH')
      ENDIF
      IXMAX=-999999999
      IXMIN=-IXMAX
      IYMAX=IXMAX
      IYMIN=IXMIN
C USE THESE TO STORE THE RANGE OF THE AREA
      DO 24 I=1,NCOORD
      READ(5,303) IX,IY
  303 FORMAT(I4,I5)
C GET INTO 100'S OF METRES EAST AND NORTH
      IXMAX=MAX0(IX,IXMAX)
      IXMIN=MIN0(IX,IXMIN)
      IYMAX=MAX0(IY,IYMAX)
      IYMIN=MIN0(IY,IYMIN)
C FIND THE RANGE
      X(I)=IX*0.1
      Y(I)=IY*0.1
C CONVERT TO KM BEFORE STORING
   24 CONTINUE
      IF (NCOORD .GT. 2) THEN
      IF (X(1) .NE. X(NCOORD) .OR. Y(1) .NE. Y(NCOORD)) THEN
       NCOORD=NCOORD+1
       X(NCOORD)=X(1)
       Y(NCOORD)=Y(1)
C CLOSE AREA
      ENDIF
      WRITE(6,407)
  407 FORMAT(' AREA COORDINATES (KM)')
      WRITE(6,408) (X(I),Y(I),I=1,NCOORD)
  408 FORMAT(20X,4(F14.2,F9.2))
      NCOORD=NCOORD-1
C ROUTINE FOR LOCATING POINTS DOESNT REQUIRE CLOSURE
      CALL PREPLY(X,Y,NCOORD,YINTVL,INTVLS,SWATH,RSLOPE)
C CUT THE SEARCH AREA UP INTO SWATHS
      ELSE
      WRITE(6,516) IXMIN,IXMAX,IYMIN,IYMAX
  516 FORMAT(' SEARCH RECTANGLE FROM',I5,'00ME TO',I5,'00ME AND FROM',
     .       I6,'00MN TO',I6,'00MN')
      ENDIF
C
   26 CONTINUE
      WRITE(5,111)
  111 FORMAT(' CATEGORY (0-5)?')
```

```
      READ(5,201) SCAT
      IF(SCAT(1:1) .NE. ' ') WRITE(6,409) SCAT
  409 FORMAT(' CATEGORY',10X,A80)
      WRITE(5,112)
  112 FORMAT(' GEOLOGY (0-9)?')
      READ(5,201) SGEOL
      IF (SGEOL(1:1) .NE. ' ') WRITE(6,410) SGEOL
  410 FORMAT(' GEOLOGY',10X,A80)
C END OF OPTION INPUT
C
C*****************************************************************
C NOW FOR THE SEARCH
      FCOUNT=0
C COUNTER FOR NUMBER OF FOUND ENTRIES
   27 READ(4,END=40) BUFF
C READ ONE ENTRY
      IF (NOTIN(SNAME,NAME)) GOTO 27
C NOT THE RIGHT NAME
      IF(NOTIN(SLOCN,LOCATN)) GOTO 27
C NOT THE RIGHT LOCATION
      IF(NOTIN(SAGNAM,AGNAME)) GOTO 27
C NOT THE AGENCY
      IF (SAGNO(1:1) .NE. ' ' .AND. INDEX(SAGNO,AGNO) .EQ. 0) GOTO 27
C NOT THE DESIRED AGENCY NUMBER
      IF (NYEAR .NE. 0) THEN
       DO 28 I=1,NYEAR
        IF (IYR(I) .EQ. RECYR) GOTO 29
   28  CONTINUE
        GOTO 27
C NOT FOUND SO FALL OUT
   29  CONTINUE
      ENDIF
C LOOKED FOR YEAR
      IF (NOTIN(SGEOLT,GEOLST)) GOTO 27
C NOT THE GEOLOGIST
      IF (AREGN .EQ. 'Y') THEN
      IF (EAST .EQ. 0 .AND. NORTH .EQ. 0) GOTO 41
C IF FOUND A GENERAL REPORT DONT ALSO DO A COORDINATE SEARCH
      IF (NCOORD .EQ. 0) GOTO 27
C IF NOT CHECKING COORDS AS WELL AND IT WASNT A GENERAL GO BACK ROUND
      ENDIF
C NOT AN AREA OR SUBJECT SPECIFIC REPORT
      IF (NCOORD .NE. 0) THEN
       IF (EAST .LT. IXMIN .OR. EAST .GT. IXMAX) GOTO 27
       IF (NORTH .LT. IYMIN .OR. NORTH .GT. IYMAX) GOTO 27
C CANT POSSIBLY BE IN AREA
      IF (NCOORD .GT. 2) THEN
       XTMP=EAST*0.1
       YTMP=NORTH*0.1
C CONVERT TO KM
       IF (.NOT. INOUT(XTMP,YTMP,X,Y,YINTVL,INTVLS,SWATH,RSLOPE))
     . GOTO 27
C NOT IN THE SPECIFIED AREA
      ENDIF
C FOR THE SIMPLE RECTANGLE DONT NEED THE POLYGON SEARCH
      ENDIF
   41 IF (NOTIN(SCAT,CATG)) GOTO 27
C NOT RIGHT CATEGORY
      IF (NOTIN(SGEOL,GEOL)) GOTO 27
C NOT RIGHT GEOLOGY
```

```
C IF FINALLY GET TO HERE HAVE FOUND AN ENTRY THAT MATCHES THE
C SEARCH OPTIONS
C
      IF (MOD(FCOUNT,53) .EQ. 0) CALL HEAD
C HEAD PAGE
      FCOUNT=FCOUNT+1
C INCREMENT FOUND ENTRY COUNTER
      WRITE(6,412) NAME,LOCATN,AGNAME,AGNO,RECNO,RECYR,GEOLST,EAST,
     .             NORTH,CATG,GEOL
  412 FORMAT(A24,'|',A36,'|',A24,'|',2X,A1,' |',I5,'/',I2,
     .       ' |',1X,A3,' |',2I5,' |',1X,A2,1X,'|',1X,A2)
      GOTO 27
C BACK AROUND
C
C******************************************************************
C NOW FOR THE CASE OF SEARCHING ONLY ON A RANGE OF RECORD NOS
   30 CONTINUE
      WRITE(5,113)
  113 FORMAT(' ENTER STARTING RECORD NO.  IN FORM NNNNN/YR')
      CALL RNOIN(RNOSTA,YRSTA)
      WRITE(5,114)
  114 FORMAT(' ENTER ENDING RECORDS NUMBER')
      CALL RNOIN(RNOSTO,YRSTO)
      IF (YRSTA .GT. YRSTO .OR. YRSTA .EQ. YRSTO .AND.
     .          RNOSTA .GT. RNOSTO) GOTO 30
C NOT IN CHRONOLOGICAL SEQUENCE
      WRITE(6,413) RNOSTA,YRSTA,RNOSTO,YRSTO
  413 FORMAT(' SEARCHING RECORDS NUMBERS FROM',
     .         I6,'/',I2,' TO',I6,'/',I2)
      FCOUNT=0
   31 READ(4,END=40) BUFF
      IF (RECYR .LT. YRSTA .OR. RECYR .GT. YRSTO) GOTO 31
C NOT IN THE YEAR RANGE
      IF (RECYR .EQ. YRSTA .AND. RECNO .LT. RNOSTA) GOTO 31
C IN STARTING YEAR BUT BEFORE NUMBER REQUIRED
      IF (RECYR .EQ. YRSTO .AND. RECNO .GT. RNOSTO) GOTO 31
C IN ENDING YEAR BUT AFTER THE RANGE OF INTEREST
      IF (MOD(FCOUNT,53) .EQ. 0) CALL HEAD
C HEAD UP PAGE
      FCOUNT=FCOUNT+1
      WRITE(6,412) NAME,LOCATN,AGNAME,AGNO,RECNO,RECYR,GEOLST,
     .  EAST,NORTH,CATG,GEOL
      GOTO 31
C ROUND AGAIN
C
C NOW AT THE END OF THE RUN
   40 CONTINUE
      WRITE(6,414) FFEED
  414 FORMAT(1A1,
     . /' AGENCY TYPE'
     . /'         0  GOVT.         1 PROF.          2 INDIV.'//
     . /' CATEGORY'
     . /'         0 GROUNDWATER    1 SLOPE          2 EXPANSIVE'
     . /'                            STABILITY        SOILS'
     . /'         3 FOUNDATION     4 MISCELLANEOUS'
     . /'           INVESTIGATION'//
     . /' GEOLOGY'
     . /'         0 QUATERNARY     1 TERTIARY       2 TRIASSIC'
     . /'                            SEDIMENTS'
     . /'         3 PERMIAN        4 LOWER          5 CAMBRIAN'
     . //                                   PALAEOZOIC'
     . //          6 PRECAMBRIAN    7 TERTIARY        8 JURASSIC'
     . //                                   BASALT           DOLERITE'
     . //          9 GRANITE')
C NOW DECIDE IF IT IS GOING TO BE PUT OUT ON THE SCREEN
      WRITE(5,115) FCOUNT
  115 FORMAT(I7,' RECORDS WERE FOUND'/' DO YOU WANT A',
     .       ' SCREEN LISTING (Y OR N)?')
      READ(5,200) STYPE
      IF (STYPE .EQ. 'N') GOTO 47
C NO SCREEN LIST WANTED
      REWIND (6)
C BACK TO THE START
      SCOUNT=0
C COUNTER FOR NUMBER OF LINES ON SCREEN
   45 READ(6,415) ALINE
  415 FORMAT(2A4,124A1)
      IF (ALINE(1) .EQ. ' AGE' .AND. ALINE(2) .EQ. 'NCY ') GOTO 47
C TEST FOR THE END OF THE ENTRIES
      WRITE(5,116) ALINE
  116 FORMAT(1X,2A4,54A1/8X,70A1)
      SCOUNT=SCOUNT+1
      IF (SCOUNT .LT. 10) GOTO 45
C ALLOW 10 ENTRIES PER SCREENFULL
      SCOUNT=0
C RESET
      WRITE(5,117)
  117 FORMAT(' LIST MORE ENTRIES ON SCREEN (Y OR N)?')
      READ(5,200) STYPE
      IF (STYPE .EQ. 'Y') GOTO 45
C ROUND AGAIN FOR ANOTHER SCREEN FULL
   47 WRITE(5,118)
  118 FORMAT(' DO YOU WANT A PRINTOUT (Y OR N)?')
      READ(5,200) STYPE
      IF (STYPE .NE. 'Y' .OR. FCOUNT .EQ. 0) THEN
       CLOSE(UNIT=6,STATUS='DELETE')
       STOP
C CLOSE FILE AND DELETE IT THEN STOP
      ENDIF
      CLOSE(UNIT=6,STATUS='KEEP')
      STOP
      END
      LOGICAL FUNCTION NOTIN(SSTRNG,RSTRNG)
C SSTRNG CONTAINS A SERIES OF STRINGS TERMINATED BY /
C E.G.    FRED/BILL/TOM/
C AND RSTRNG IS SEARCHED FOR THE OCCURENCE OF ONE OF THESE STRINGS
C IF ONE IS FOUND TO MATCH NOTIN IS .FALSE.
C IF STRNG IS EMPTY NOTIN IS .FALSE.
      CHARACTER*80 SSTRNG
      CHARACTER* (*) RSTRNG
      NOTIN=.FALSE.
      IF (SSTRNG(1:1) .EQ. ' ') RETURN
C NO NEED TO LOOK
      ILAST=1
C COUNTER FOR POSITION IN SSTRNG
   20 ICHAR=INDEX(SSTRNG(ILAST:80),'/')
C LOOK FOR / AS TERMINATOR OF STRING
      IF (ICHAR .EQ. 0) GOTO 25
C HAVENT FOUND A MATCH BY THE END OF THE LINE
      IF (INDEX(RSTRNG,SSTRNG(ILAST:ILAST+ICHAR-2)) .NE. 0) RETURN
```

```
C LOOK BETWEEN /S IN SSTRNG AND IF FIND A MATCH RETURN
      ILAST=ILAST+ICHAR
C POSITION AFTER THE /
      IF (ILAST .LE. 79) GOTO 20
C BACK ROUND IF NOT AT END OF LINE
C
C ELSE END
   25 CONTINUE
      NOTIN=.TRUE.
C NO MATCH
      RETURN
      END
      SUBROUTINE HEAD
C HEAD UP PAGES FROM SEARCH
      INTEGER*2 FFEED
      DATA FFEED/3072/
C USED TO PUT FORM FEEDS IN OUTPUT FILE
      WRITE(6,100) FFEED
  100 FORMAT(1A1/9X,'NAME',11X,'¦',11X,'JOB  LOCATION',12X,'¦',13X,
     . 'AGENCY',10X,'¦ RECORDS ¦ INIT¦  MAPREF   ¦',
     . ' CAT¦ GEOL'/24X,'¦',36X,'¦',10X,'NAME',10X,'¦',
     . ' NO ¦',4X,'NO',3X,'¦',5X,'¦',11X,'¦',4X,'¦'/1X,
     . 130('-'))
      RETURN
      END
      SUBROUTINE RNOIN(RNO,RYR)
C USE TO READ RECORDS NO AND YEAR AND AVOID HAVING TO MANUALLY
C REPLACE / WITH , IN 1234/76
      INTEGER*2 RNO,RYR
      CHARACTER*1 BUFF(9)
      READ(5,115) BUFF
  115 FORMAT(9A1)
      DO 10 I=1,9
      IF (BUFF(I) .EQ. '/') BUFF(I)=','
   10 CONTINUE
      REWIND 3
      WRITE(3,115) BUFF
      REWIND 3
      READ(3,*) RNO,RYR
C PUT OUT TO TEMPORARY FILES AND READ BACK IN IN FREE FORMAT
      RETURN
      END
$TITL  FSTJDN.FTN - POINT IN POLYGON
C PROGRAM COLLECTION FASTJORDAN
C    SALOMON,K.B., 1978. AN EFFICIENT POINT-IN-POLYGON ALGORITHM
C      COMPUTERS AND GEOSCIENCES, V4, NO. 2, P. 173-178
C
C USE BY READING VERTICES OF POLYGON IN ORDER (BUT NOT CLOSING IT)
C AND CALLING PREPLY ONCE BEFORE THE SEARCH IS BEGUN.  THE ACTUAL
C SEARCHING IS DONE BY MEANS OF THE LOGICAL FUNCTION INOUT.
C
      SUBROUTINE PREPLY(X,Y,NUVERT,YINTVL,INTVLS,SWATH,RSLOPE)
C
C*******************************************************************************
C  THIS ROUTINE PREPARES THE POLYGON CONSISTING OF THE NUVERT VERTICES
C  (X(I),Y(I)) BY FIRST SORTING THE SEGMENT Y-END POINTS INTO
C  DECREASING ORDER AND FORMING AN INTERVAL FOR EACH CONSECUTIVE PAIR:
C  (YINTVL(I),YINTVL(I+1)), I=1,INTVLS. THIS IS PERFORMED BY CALLING
C  SORT.
C       THE CODE CONSISTING OF THE DO 100 AND DO 200 LOOPS CONSTRUCTS,
C  FOR EACH INTERVAL I, THE LIST OF SEGMENTS TO BE TESTED BY INOUT.
C  THIS LIST IS PLACED IN THE I-TH ROW OF SWATH.  THE FIRST ENTRY,
C  SWATH(I,1), WILL BE SET TO THE NUMBER OF SEGMENTS IN THE ROW.  NOTE
C  THAT AS YINTVL CONTAINS NO REDUNDANCIES, I.E.  YINTVL(I) IS STRICTLY
C  GREATER THAN YINTVL(I+1), NO HORIZONTAL SEGMENTS WILL BE PLACED IN
C  THE LIST.
C       THE CODE CONSISTING OF THE DO 300 LOOP ESTABLISHES THE
C  RECIPROCAL SLOPE FOR EACH NON-HORIZONTAL SEGMENT.  THIS IS TO BE
C  USED BY INOUT.  FINALLY, THE SEGMENTS WITHIN A ROW OF SWATH ARE
C  OREDERED FROM LEFT-TO-RIGHT.
C
C*****************************************************************************
C
      INTEGER*2 SWATH(100,25)
      REAL X(100),Y(100),YINTVL(100),RSLOPE(100)
      CALL SORT(Y,NUVERT,YINTVL,INTVLS)
      IF (INTVLS .LE. 0) GOTO 400
      X(NUVERT+1)=X(1)
      Y(NUVERT+1)=Y(1)
      DO 100 I=1,INTVLS
  100 SWATH(I,1)=0
      DO 200 I=1,INTVLS
         DO 200 J=1,NUVERT
         IF (Y(J).GE.YINTVL(I) .AND. YINTVL(I+1).GE.Y(J+1) .OR.
     *       Y(J+1).GE.YINTVL(I) .AND. YINTVL(I+1).GE.Y(J))
     *                                        CALL INCLUD(SWATH,I,J)
  200 CONTINUE
      DO 300 I=1,NUVERT
      IF (Y(I).EQ.Y(I+1)) GOTO 300
      RSLOPE(I)=(X(I+1)-X(I))/(Y(I+1)-Y(I))
  300 CONTINUE
      CALL ORDER(X,Y,YINTVL,INTVLS,SWATH,RSLOPE)
      RETURN
  400 WRITE(7,401)
  401 FORMAT(' ******* PREP OF POLYGON ABORTED SINCE NO INTERVALS',
     * ' CONSTRUCTED')
      STOP
      END
      SUBROUTINE SORT(Y,NUVERT,YINTVL,INTVLS)
C
C*****************************************************************************
C
C  ROUTINE ESTABLISHES THE INTERVALS OF THE Y-AXIS DEFINED BY THE
C  ENDPOINTS OF THE POLYGON'S SEGMENTS.  THE DO 100 LOOP INITIALLISES
C  YSORT FROM THE SEGMENT Y-END POINTS.  THE DO 200 LOOPS SORT YSORT
C  INTO DESCENDING ORDER.  THE DO 300 LOOP ELIMINATES REDUNDANCIES IN
C  YSORT AND PLACES IRREDUNDANT SORTED Y'S INTO YINTVL.  IT ALSO SETS
C  INTVLS TO THE TRUE NUMBER OF Y INTERVALS.  JUST PRIOR TO RETURNING
C  A FINAL INTERVAL EXTENDING TO '-INFINITY' IS ESTABLISHED.
C
C*****************************************************************************
C
      REAL Y(100),YINTVL(100),YSORT(100)
      INTEGER*2 UPPER
      DO 100 I=1,NUVERT
  100 YSORT(I)=Y(I)
      UPPER=NUVERT-1
      DO 200 I=1,UPPER
         IPLS1=I+1
         DO 200 J=IPLS1,NUVERT
         IF (YSORT(I).GE.YSORT(J)) GOTO 200
             TEMP=YSORT(I)
             YSORT(I)=YSORT(J)
             YSORT(J)=TEMP
  200 CONTINUE
      YINTVL(1)=YSORT(1)
      INTVLS=0
      DO 300 I=1,UPPER
         IF (YSORT(I).EQ.YSORT(I+1)) GOTO 300
         INTVLS=INTVLS+1
         YINTVL(INTVLS+1)=YSORT(I+1)
  300 CONTINUE
      YINTVL(INTVLS+2)=-1.0E75
      RETURN
      END
      SUBROUTINE INCLUD(SWATH,I,J)
C
C******************************************************************************
C  ROUTINE PLACES THE J-TH POLYGON SEGMENT INTO THE NEXT AVAILABLE
C  LOCATION IN ROW I OF SWATH.
C
C******************************************************************************
C
      INTEGER*2 SWATH(100,25),POINTR
      SWATH(I,1)=SWATH(I,1)+1
      POINTR=SWATH(I,1)
      SWATH(I,POINTR+1)=J
      RETURN
      END
      SUBROUTINE ORDER(X,Y,YINTVL,INTVLS,SWATH,RSLOPE)
C
C*******************************************************************************
C
C  FOR EACH INTERVAL, A HORIZONTAL LINE IS PASSED THROUGH THE MIDDLE
C  (YMID) OF THE INTERVAL.  THE DO 100 LOOP PLACES THE X-INTERSECTION
C  OF EACH SEGMENT IN THIS SWATH SO THAT THESE INTERSECTIONS OCCUR
C  FROM LEFT-TO-RIGHT.
C
C*******************************************************************************
C
      REAL X(100),Y(100),YINTVL(100),RSLOPE(100),XINTSC(25)
      INTEGER*2 SWATH(100,25),POINTR,SEGNO,UPPER
      LOGICAL VERTSG
      DO 200 INTVAL=1,INTVLS
         NMBSEG=SWATH(INTVAL,1)
         YMID=(YINTVL(INTVAL)+YINTVL(INTVAL+1))/2.0
         DO 100 POINTR=1,NMBSEG
            SEGNO=SWATH(INTVAL,POINTR+1)
            VERTSG=ABS(X(SEGNO+1)-X(SEGNO)) .LT.  1.0E-5
            IF (VERTSG) XINTSC(POINTR)=X(SEGNO)
            IF (.NOT.  VERTSG) XINTSC(POINTR)=X(SEGNO)+
     *                                 RSLOPE(SEGNO)*(YMID-Y(SEGNO))
  100    CONTINUE
         IF (NMBSEG.LT.2 .OR.  MOD(NMBSEG,2).NE.0) GOTO 300
         UPPER=NMBSEG-1
         DO 200 I=1,UPPER
            IPLS1=I+1
            DO 200 J=IPLS1,NMBSEG
               IF (XINTSC(I).LE.XINTSC(J)) GOTO 200
               TEMP=XINTSC(I)
               XINTSC(I)=XINTSC(J)
               XINTSC(J)=TEMP
               ITEMP=SWATH(INTVAL,I+1)
               SWATH(INTVAL,I+1)=SWATH(INTVAL,J+1)
               SWATH(INTVAL,J+1)=ITEMP
  200 CONTINUE
      RETURN
  300 WRITE(7,301) INTVAL
  301 FORMAT(' ** PREP OF POLYGON ABORTED.  INTERVAL ',I5/
     * ' HAS EITHER LESS THAN TWO SEGMENTS OR AN ODD NUMBER OF THEM')
      STOP
      END
      LOGICAL FUNCTION INOUT(XP,YP,X,Y,YINTVL,INTVLS,SWATH,RSLOPE)
C
C*************************************************************************
C
C  THE FOUR LINES ENCLOSED IN DASHES DETERMINE THE INTERVAL CONTAINING
C  YP.  THE DO 400 LOOP CONTINUES UNTIL THE FIRST SEGMENT WITHIN THE
C  INTERVAL FALL TO THE LEFT OF (XP,YP).  IN THIS EVENT, INOUT IS SET
C  .TRUE.  IFF AN EVEN NUMBER OF SEGMENTS HAS BEEN TESTED.
C
C*****************************************************************************
C
      REAL X(100),Y(100),YINTVL(100),RSLOPE(100)
      INTEGER*2 SWATH(100,25),SEGNO
      INOUT=.FALSE.
C-------------------------------------------------
      INTVAL=0
  100 INTVAL=INTVAL+1
      IF (YINTVL(INTVAL) .GT.  YP) GOTO 100
      INTVAL=INTVAL-1
C---------------------------------------------------
  300 IF (INTVAL.LT.1 .OR.  INTVAL.GT.INTVLS) RETURN
      NMBSEG=SWATH(INTVAL,1)+1
      DO 400 I=2,NMBSEG
         SEGNO=SWATH(INTVAL,I)
         IF(XP-X(SEGNO).LE.(YP-Y(SEGNO))*RSLOPE(SEGNO)) GOTO 500
  400 CONTINUE
      RETURN
  500 INOUT=MOD(I,2) .EQ.  1
      RETURN
      END
```

```
$TITL  WATSRCH.FTN - SEARCH WATER BORE FILE
C
      INTEGER*2 QUADS,EAST,CARDS,AOK,IBASE,FCOUNT,FOUND(5000)
      LOGICAL CHANGE,CHGE
      REAL*4 DEPSTR,ANUM(2),SWL,CHEM(17)
      INTEGER*4 NORTH,TDSC,CONDF
      CHARACTER*24 NAME
      CHARACTER*30 LOCATN
      CHARACTER*8 DRILCO,PROMPT(17)
      INTEGER*2 CARD,QUAD,YEAR,TOTDEP,CASDEP,YIELD,ANAL,INANAL,RECCNT
      CHARACTER*3 GEOLST
      CHARACTER*2 GEOL
C INPUT IS OWNER,LOACTION,DRILL CO.,QUADRANGLE NO.,CARD NO.,
C           YEAR,GEOLOGIST,MAPREF,TOTAL DEPTH,CASING DEPTH,
C           DEPTH STRUCK,STANDING WATER LEVEL,YIELD,CONDUCTIVITY (FIELD
C           MEASUREMENT),NO. OF ANALYSES OF WATER SAMPLES,GEOLOGY
C           (UP TO 2). IF THERE HAS BEEN AN ANALYSIS MADE THEN ONE
C           ANALYSIS IN THE FORM-
C                                  PH,CONDUCTIVITY,CO3,HCO3,CL,SO4,
C                                  SIO2,CA,MG,FE,AL,K,NA,TDS(LAB),
C                                  ALKALINITY,PERM. HARDNESS,
C                                  TEMP. HARDNESS.
C                                   (THESE ARE EQUIVALENT TO CHEM(17))
      CHARACTER*1 BUFF(108)
      EQUIVALENCE (BUFF(1),NAME),(BUFF(25),LOCATN),(BUFF(55),DRILCO),
     . (BUFF(65),TDSC),(BUFF(69),CONDF),(BUFF(73),NORTH),
     . (BUFF(77),DEPSTR),(BUFF(81),SWL),(BUFF(85),GEOLST),
     . (BUFF(89),TOTDEP),(BUFF(91),CASDEP),(BUFF(93),YEAR),
     . (BUFF(95),YIELD),(BUFF(97),QUAD),(BUFF(99),CARD),
     . (BUFF(101),ANAL),(BUFF(103),GEOL),(BUFF(105),INANAL),
     . (BUFF(107),EAST)
      INTEGER*2 FFEED
C USED TO PUT FORM FEEDS INTO OUTPUT FILE
      REAL X(100),Y(100),YINTVL(100),RSLOPE(100)
      INTEGER*2 SWATH(100,25)
C ABOVE 2 LINES USED FOR FSTJDN POINT IN POLYGON SEARCH
      LOGICAL NOTIN,INOUT,SANAL,STDM,SYM,STDC,SCDF,SCH(14),IER
      REAL*4 CHMAX(14),CHMIN(14),YMIN,YMAX
      INTEGER*2 IQUAD(30),IYR(30),NQUAD,NYEAR,ITDMIN,ITDMAX,
     .  YLMIN,YLMAX,STYPE
      INTEGER*4 TDCMIN,TDCMAX,CDFMIN,CDFMAX
      CHARACTER*80 SNAME,SLOCN,SQUAD,SYEAR,SGEOL,SGEOLT
      DATA FFEED/3072/
C THE FORM FEED CHARACTER IN A1
      DATA PROMPT/'pH','CONDUCT','CO3','HCO3','Cl','SO4','SiO2',
     .   'Ca','Mg','Fe','Al','K','Na','TDS(Lab)','Alk','P Hard',
     .   'T Hard'/
C USED FOR PROMPTS
      OPEN(UNIT=4,FORM='BINARY',ACCESS='DIRECT',RECL=108,SHARE='ERO')
C OPEN THE WATMAIN.DAT FILE
      OPEN(UNIT=2,FORM='BINARY',ACCESS='DIRECT',RECL=68,SHARE='ERO')
C OPEN WATANAL.DAT FILE
      WRITE(5,101)
  101 FORMAT(' FOR CHARACTER OPTIONS ENTER EITHER A BLANK LINE OR'/
     . ' THE DESIRED VALUES FOR THE OPTION, EACH TERMINATED BY'
     . ,' A /''/' E.G. FRED/BILL/TOM/SMITH/''/' FOR NUMERIC OPTIONS',
     .  ' ENTER EITHER THE RANGE REQUESTED'/' OR A BLANK LINE')
      WRITE(5,102)
  102 FORMAT(' OWNER?')
```

```
      READ(5,201) SNAME
  201 FORMAT(A80)
      WRITE(5,103)
  103 FORMAT(' LOCATION?')
      READ(5,201) SLOCN
      WRITE(5,104)
  104 FORMAT(' QUADRANGLE NO.?')
      READ(5,201) SQUAD
      CALL NMERIC(SQUAD,IQUAD,NQUAD)
      WRITE(5,106)
  106 FORMAT(' YEAR?')
      READ(5,201) SYEAR
      NYEAR=0
C COUNTER FOR NUMBER OF YEAR OPTIONS INPUT
      IF (SYEAR(1:2) .EQ. '  ') GOTO 21
C NO YEAR SEARCH DESIRED
      CALL NMERIC(SYEAR,IYR,NYEAR)
C
C NOW GET THE NEXT SEARCH OPTION
   21 CONTINUE
      WRITE(5,107)
  107 FORMAT(' GEOLOGIST?')
      READ(5,201) SGEOLT
      WRITE(5,108)
  108 FORMAT(' SEARCH FOR SITES WITHIN A SPECIFIED AREA (Y)?')
      READ(5,200) STYPE
      IF (STYPE .EQ. 'Y') GOTO 23
C WANT TO READ COORDS
      NCOORD=0
      GOTO 26
C DONT WANT TO SEARCH FOR SITES IN AN AREA
C
   23 CONTINUE
C READ VERTICES
      WRITE(5,109)
  109 FORMAT(' NUMBER OF VERTICES OF AREA?'/
     . ' ENTER 2 TO SPECIFY A RECTANGLE')
      READ(5,*) NCOORD
      IF (NCOORD .LT. 2) GOTO 23
C NEED AT LEAST 3 VERTICES TO DEFINE AN AREA
      IF (NCOORD .EQ. 2) THEN
      WRITE(5,515)
  515 FORMAT(' ENTER COORDS OF TWO DIAGONALLY OPPOSITE CORNERS OF ',
     .  'THE RECTANGLE'/' ONE PER LINE IN THE FORM EASTNORTH')
      ELSE
      WRITE(5,110)
  110 FORMAT(' ENTER VERTEX COORDS IN CLOCKWISE ORDER'/
     .' ONE PER LINE IN FORM EASTNORTH')
      ENDIF
      IXMAX=-999999999
      IXMIN=-IXMAX
      IYMAX=IXMAX
      IYMIN=IXMIN
C USE THESE TO STORE THE RANGE OF THE AREA
      DO 24 I=1,NCOORD
      READ(5,503) IX,IY
  503 FORMAT(I4,I5)
C GET INTO 100'S OF METRES EAST AND NORTH
      IXMAX=MAX0(IX,IXMAX)
      IXMIN=MIN0(IX,IXMIN)
      IYMAX=MAX0(IY,IYMAX)
      IYMIN=MIN0(IY,IYMIN)
C FIND THE RANGE
      X(I)=IX*0.1
      Y(I)=IY*0.1
C CONVERT TO KM BEFORE STORING
   24 CONTINUE
      IF (NCOORD .GT. 2) THEN
      IF (X(1) .NE. X(NCOORD) .OR. Y(1) .NE. Y(NCOORD)) THEN
       NCOORD=NCOORD+1
       X(NCOORD)=X(1)
       Y(NCOORD)=Y(1)
C CLOSE AREA
      ENDIF
      NCOORD=NCOORD-1
C ROUTINE FOR LOCATING POINTS DOESNT REQUIRE CLOSURE
      CALL PREPLY(X,Y,NCOORD,YINTVL,INTVLS,SWATH,RSLOPE)
C CUT THE SEARCH AREA UP INTO SWATHS
      ENDIF
C
   26 CONTINUE
      WRITE(5,105)
  105 FORMAT(' TOTAL DEPTH RANGE - MIN,MAX (REAL)')
      CALL RANGE(ANUM,IER,5)
      TDMIN=ANUM(1)
      TDMAX=ANUM(2)
      ITDMIN=TDMIN*10.0+0.1
      ITDMAX=TDMAX*10.0+0.1
      STDM=ITDMAX .GE. ITDMIN .AND. ITDMAX .NE. 0
      WRITE(5,111)
  111 FORMAT(' YIELD RANGE - MIN,MAX (REAL)')
      CALL RANGE(ANUM,IER,5)
      YMIN=ANUM(1)
      YMAX=ANUM(2)
      YLMIN=YMIN*100.0+0.1
      YLMAX=YMAX*100.0+0.1
      SYM=YLMAX .GE. YLMIN .AND. YLMAX .NE. 0
      WRITE(5,121)
  121 FORMAT(' CONDUCTIVITY (FIELD) RANGE - MIN,MAX (INTEGER)')
      CALL RANGE(ANUM,IER,5)
      CDFMIN=ANUM(1)
      CDFMAX=ANUM(2)
      SCDF=CDFMAX .GE. CDFMIN .AND. CDFMAX .NE. 0
      WRITE(5,113)
  113 FORMAT(' TDS RANGE - MIN,MAX (INTEGER)')
      CALL RANGE(ANUM,IER,5)
      TDCMIN=ANUM(1)
      TDCMAX=ANUM(2)
      STDC=TDCMAX .GE. TDCMIN .AND. TDCMAX .NE. 0
      WRITE(5,112)
  112 FORMAT(' GEOLOGY (0-9)?')
      READ(5,201) SGEOL
      WRITE(5,114)
  114 FORMAT(' SEARCH ON ANALYSIS (Y OR N)?')
      READ(5,200) STYPE
  200 FORMAT(A1)
      SANAL=STYPE .EQ. 'Y'
      IF (SANAL) THEN
      DO 20 I=1,14
      WRITE(5,115) PROMPT(I)
  115 FORMAT(' RANGE MIN,MAX FOR ',A8)
      CALL RANGE(ANUM,IER,5)
      CHMIN(I)=ANUM(1)
      CHMAX(I)=ANUM(2)
      SCH(I)=CHMAX(I) .GE. CHMIN(I) .AND. CHMAX(I) .NE. 0
   20 CONTINUE
      ENDIF
      IF (.NOT. STDC .AND. SCH(14)) THEN
C LOOKING FOR TDS SO MAKE IT LOOK AT THE FRONT OF THE VIRTUAL
C CARD TO SAVE TIME RUSHING OFF TO GET THE BACK OF THE CARD
      STDC=.TRUE.
      TDCMIN=CHMIN(14)
      TDCMAX=CHMAX(14)
      ENDIF
C STORED RANGE FOR TDS
C END OF OPTION INPUT
C
C**************************************************************
C NOW FOR THE SEARCH
      FCOUNT=0
C COUNTER FOR NUMBER OF FOUND ENTRIES
      RECCNT=0
C COUNTER FOR POSITION IN WATMAIN.DAT
   27 READ(4,END=40) BUFF
C READ ONE ENTRY
      RECCNT=RECCNT+1
C READ ONE MORE RECORD FROM WATMAIN
      IF (SANAL .AND. ANAL .EQ. 0) GOTO 27
C SEARCHING BY ANALYSIS BUT THERE IS NO ANALYSIS
      IF (NOTIN(SNAME,NAME)) GOTO 27
C NOT THE RIGHT NAME
      IF(NOTIN(SLOCN,LOCATN)) GOTO 27
C NOT THE RIGHT LOCATION
      IF (NQUAD .NE. 0) THEN
      DO 32 I=1,NQUAD
      IF (IQUAD(I) .EQ. QUAD) GOTO 25
   32 CONTINUE
      GOTO 27
C NOT FOUND SO FALL OUT
   25 CONTINUE
      ENDIF
C END LOOK FOR QUADRANGLE
      IF (NYEAR .NE. 0) THEN
       DO 28 I=1,NYEAR
        IF (IYR(I) .EQ. YEAR) GOTO 29
   28  CONTINUE
        GOTO 27
C NOT FOUND SO FALL OUT
   29  CONTINUE
      ENDIF
C LOOKED FOR YEAR
      IF (NOTIN(SGEOLT,GEOLST)) GOTO 27
C NOT THE GEOLOGIST
      IF (NCOORD .NE. 0) THEN
       IF (EAST .LT. IXMIN .OR. EAST .GT. IXMAX) GOTO 27
       IF (NORTH .LT. IYMIN .OR. NORTH .GT. IYMAX) GOTO 27
C CANT POSSIBLY BE IN AREA
      IF (NCOORD .GT. 2) THEN
       XTMP=EAST*0.1
       YTMP=NORTH*0.1
```

```
C CONVERT TO KM
       IF (.NOT. INOUT(XTMP,YTMP,X,Y,YINTVL,INTVLS,SWATH,RSLOPE))
     . GOTO 27
C NOT IN THE SPECIFIED AREA
      ENDIF
C FOR THE SIMPLE RECTANGLE DONT NEED THE POLYGON SEARCH
      ENDIF
      IF (STDM) THEN
      IF (TOTDEP .LT. ITDMIN .OR. TOTDEP .GT. ITDMAX) GOTO 27
      ENDIF
C CHECK FOR TOTAL DEPTH IN RANGE
      IF (SYM) THEN
      IF (YIELD .LT. YLMIN .OR. YIELD .GT. YLMAX) GOTO 27
      ENDIF
C CHECK YIELD IN RANGE
      IF (SCDF) THEN
      IF (CONDF .LT. CDFMIN .OR. CONDF .GT. CDFMAX) GOTO 27
      ENDIF
C CHECK FIELD CONDUCTIVITY
      IF (STDC) THEN
      IF (TDSC .LT. TDCMIN .OR. TDSC .GT. TDCMAX) GOTO 27
      ENDIF
C CHECK TDS
      IF (NOTIN(SGEOL,GEOL)) GOTO 27
C NOT RIGHT GEOLOGY
      IF (SANAL) THEN
      DO 30 I=1,13
C ONLY 13 AS HAVE LOOKED AT TDS ON FRONT OF CARD
      IF (SCH(I)) THEN
      IF (CHEM(I) .LT. CHMIN(I) .OR. CHEM(I) .GT. CHMAX(I)) GOTO 27
C THAT PARTICULAR ITEM NOT IN RANGE
      ENDIF
   30 CONTINUE
C GO ROUND ONE ITEM AT A TIME
      ENDIF
C BEEN THROUGH ANALYSIS
C IF FINALLY GET TO HERE HAVE FOUND AN ENTRY THAT MATCHES THE
C SEARCH OPTIONS
C
C PUT RECORD NUMBER INTO STORAGE
      FCOUNT=FCOUNT+1
C NO. OF FOUND ENTRIES
      IF (FCOUNT .EQ. 5001) STOP 'SEEK HELP - 5000 ENTRY ERROR'
      FOUND(FCOUNT)=RECCNT
C STORE REC NO IN WATMAIN.DAT
      GOTO 27
C BACK ROUND
C BACK AROUND
C
C
C NOW AT THE END OF THE RUN
   40 CONTINUE
C NOW DECIDE IF IT IS GOING TO BE PUT OUT ON THE SCREEN
      WRITE(5,123) FCOUNT
  123 FORMAT(I7,' RECORDS WERE FOUND'/' DO YOU WANT A',
     .       ' SCREEN LISTING (Y OR N)?')
      READ(5,200) STYPE
      IF (FCOUNT .EQ. 0) STOP
C NO ENTRIES FOUND SO EXIT ASAP
      IF (STYPE .EQ. 'N') GOTO 47
```

```
C NO SCREEN LIST WANTED
C
C TO SCREEN LIST USE DIRECT I/O
      SCOUNT=0
C NO. OF ENTRIES SENT TO SCREEN
      DO 41 I=1,FCOUNT
      READ(4,REC=FOUND(I)) BUFF
      TOTDP=TOTDEP*0.1
      CASDP=CASDEP*0.1
      AYIELD=YIELD*0.01
C CONVERT BACK TO LITRES/SEC FROM HUNDREDTHS OF LITRES/SEC
C AND BACK TO METRES FROM DECIMETRES
      IF (TDSC .GT. 0) THEN
      WRITE(5,116) NAME,LOCATN,DRILCO,QUAD,CARD,YEAR,GEOLST,EAST,
     .     NORTH,TOTDP,CASDP,DEPSTR,SWL,AYIELD,CONDF,TDSC,ANAL,GEOL
  116 FORMAT(1X,A24,'|',A30,'|',A8,2('|',I3)/5X,I2,'|',
     .       A3,'|',I4,I5,'|',4(F5.1,'m|'),
     .       F5.2,'l/s|',I5,'|',I5,'mg/l|',I2,'|',A2)
      ELSE
      WRITE(5,122) NAME,LOCATN,DRILCO,QUAD,CARD,YEAR,GEOLST,EAST,
     .     NORTH,TOTDP,CASDP,DEPSTR,SWL,AYIELD,CONDF,ANAL,GEOL
  122 FORMAT(1X,A24,'|',A30,'|',A8,2('|',I3)/5X,I2,'|',
     .       A3,'|',I4,I5,'|',4(F5.1,'m|'),
     .       F5.2,'l/s|',I5,'|',5X,'mg/l|',I2,'|',A2)
      ENDIF
      SCOUNT=SCOUNT+1
      IF (SCOUNT .LT. 10) GOTO 41
C ALLOW 10 ENTRIES PER SCREENFULL
      SCOUNT=0
C RESET
      WRITE(5,117)
  117 FORMAT(' LIST MORE ENTRIES ON SCREEN (Y OR N)?')
      READ(5,200) STYPE
      IF (STYPE .EQ. 'N') GOTO 47
C ROUND AGAIN FOR ANOTHER SCREEN FULL
   41 CONTINUE
   47 WRITE(5,118)
  118 FORMAT(' DO YOU WANT A PRINTOUT (Y OR N)?')
      READ(5,200) STYPE
      IF (STYPE .NE. 'Y') STOP
C STOP IF NOTHING FOUND
C
C OTHERWISE WRITE TO PRINTER
C FIRST WRITE THE SEARCH OPTIONS
      WRITE(6,400)
  400 FORMAT(' SEARCH OPTIONS ARE:')
      IF (SNAME(1:1) .NE. ' ') WRITE(6,401) SNAME
  401 FORMAT(' NAME',10X,A80)
      IF (SLOCN(1:1) .NE. ' ') WRITE (6,402) SLOCN
  402 FORMAT(' LOCATION',10X,A80)
      IF (NQUAD .NE. 0) WRITE(6,403) SQUAD
  403 FORMAT(' QUADRANGLE NO.',10X,A80)
      IF (NYEAR .NE. 0) WRITE(6,405) SYEAR
  405 FORMAT(' YEAR',10X,A80)
      IF (SGEOLT(1:1) .NE. ' ') WRITE(6,406) SGEOLT
  406 FORMAT(' GEOLOGIST',10X,A80)
      IF (NCOORD .NE. 0) THEN
      IF (NCOORD .GT. 2) THEN
      WRITE(6,407)
  407 FORMAT(' AREA COORDINATES (KM)')
```

```
      NCOORD=NCOORD+1
C ROUTINE FOR LOCATING POINTS DOESNT REQUIRE CLOSURE
      WRITE(6,408) (X(I),Y(I),I=1,NCOORD)
  408 FORMAT(20X,4(F14.2,F9.2))
C ROUTINE FOR LOCATING POINTS DOESNT REQUIRE CLOSURE
      ELSE
      WRITE(6,516) IXMIN,IXMAX,IYMIN,IYMAX
  516 FORMAT(' SEARCH RECTANGLE FROM',I5,'00ME TO',I5,'00ME AND FROM',
     .       I6,'00MN TO',I6,'00MN')
      ENDIF
      ENDIF
      IF (STDM) WRITE(6,409) TDMIN,TDMAX
  409 FORMAT(' TOTAL DEPTH RANGE',F6.1,' TO',F6.1)
      IF (SYM) WRITE(6,411) YMIN,YMAX
  411 FORMAT(' YIELD RANGE',F6.2,' TO',F6.2)
      IF (SCDF) WRITE(6,412) CDFMIN,CDFMAX
  412 FORMAT(' CONDUCTIVITY (FIELD) RANGE',I6,' TO',I6)
      IF (STDC) WRITE(6,413) TDCMIN,TDCMAX
  413 FORMAT(' TDS  RANGE',I6,' TO',I6)
      IF (SGEOL(1:1) .NE. ' ') WRITE(6,410) SGEOL
  410 FORMAT(' GEOLOGY',10X,A80)
      DO 35 I=1,13
      IF (SCH(I)) WRITE(6,414) PROMPT(I),CHMIN(I),CHMAX(I)
  414 FORMAT(' RANGE FOR ',A8,' IS',F7.1,' TO',F7.1)
   35 CONTINUE
      LINE=0
C COUNTER FOR NUMBER OF LINES PRINTED
      WRITE(5,119)
  119 FORMAT(' PRINT ANALYSIS WHERE AVAILABLE (Y OR N)?')
      READ(5,200) STYPE
      IF (STYPE .NE. 'Y') THEN
C USE DIFFERENT FORMAT IF NOT WORRIED ABOUT ANALYSIS
      DO 42 I=1,FCOUNT
      READ(4,REC=FOUND(I)) BUFF
      AYIELD=YIELD*0.01
      TOTDP=TOTDEP*0.1
      CASDP=CASDEP*0.1
C CONVERT TO LITRES/SEC AND METRES
      IF (MOD(LINE,53) .EQ. 0) CALL HEAD
C HEAD PAGE
      LINE=LINE+1
      IF (TDSC .GT. 0) THEN
      WRITE(6,300) NAME,LOCATN,DRILCO,QUAD,CARD,YEAR,GEOLST,EAST,
     .     NORTH,TOTDP,CASDP,DEPSTR,SWL,AYIELD,CONDF,TDSC,ANAL,GEOL
  300 FORMAT(1X,A22,'¦',A27,'¦',A8,'¦',I2,'¦',I3,'¦',I2,'¦',
     .       A3,'¦',I4,I5,4('¦',F5.1),'¦',F5.2,'¦',I5,'¦',I5,
     .       '¦',I2,'¦',A2)
      ELSE
      WRITE(6,301) NAME,LOCATN,DRILCO,QUAD,CARD,YEAR,GEOLST,EAST,
     .     NORTH,TOTDP,CASDP,DEPSTR,SWL,AYIELD,CONDF,ANAL,GEOL
  301 FORMAT(1X,A22,'¦',A27,'¦',A8,'¦',I2,'¦',I3,'¦',I2,'¦',
     .       A3,'¦',I4,I5,4('¦',F5.1),'¦',F5.2,'¦',I5,'¦',5X,
     .       '¦',I2,'¦',A2)
      ENDIF
C USE DIFFERENT FORMAT IF THERE IS NO TDS
   42 CONTINUE
      ELSE
      DO 43 I=1,FCOUNT
      READ(4,REC=FOUND(I)) BUFF
C READ THE BASIC DATA
```

```
      AYIELD=YIELD*0.01
      TOTDP=TOTDEP*0.1
      CASDP=CASDEP*0.1
C CONVERT BACK TO LITRES/SEC  AND METRES
      IF (ANAL .NE. 0) THEN
      READ(2,REC=INANAL) CHEM
      IF (MOD(LINE,55) .EQ. 0) CALL HEAD2
C HEAD PAGE
      LINE=LINE+5
      IF (TDSC .GT. 0) THEN
      WRITE(6,302) NAME,LOCATN,EAST,NORTH,QUAD,CARD,GEOLST,GEOL,YEAR,
     . TOTDP,DEPSTR,SWL,CASDP,AYIELD,TDSC,CONDF,ANAL,
     . DRILCO
  302 FORMAT(' OWNER:  ',A24,' LOCN:  ',A30,' AMG:',2I5,
     . ' QUAD:',I3,'  CARD:',I3,' INIT:  ',A3, ' GEOLOGY:',A2,' YR:',I3
     . /' DEPTH:-TOTAL:',F5.1,' STRUCK:',F5.1,' SWL:',F5.1,
     . '  CASING:',F5.1,'  YIELD:',F5.2,'  TDS:',I5,
     . '  COND(FIELD):',I6,'  ANALYSES:',I2,'  DRILL CO:',A8)
      ELSE
      WRITE(6,303) NAME,LOCATN,EAST,NORTH,QUAD,CARD,GEOLST,GEOL,YEAR,
     . TOTDP,DEPSTR,SWL,CASDP,AYIELD,CONDF,ANAL,
     . DRILCO
  303 FORMAT(' OWNER:  ',A24,' LOCN:  ',A30,' AMG:',2I5,
     . ' QUAD:',I3,'  CARD:',I3,' INIT:  ',A3, ' GEOLOGY:',A2,' YR:',I3
     . /' DEPTH:-TOTAL:',F5.1,' STRUCK:',F5.1,' SWL:',F5.1,
     . '  CASING:',F5.1,'  YIELD:',F5.2,'  TDS:',5X,
     . '  COND(FIELD):',I6,'  ANALYSES:',I2,'  DRILL CO:',A8)
      ENDIF
      WRITE(6,304) CHEM
  304 FORMAT(' pH:',F4.1,'  CONDUCTIVITY:',F7.1,'  CO3:',F7.1,
     . '  HCO3:',F7.1,'  Cl:',F7.1,'  SO4:',F7.1,'  SiO2:',F7.1,
     . '  Ca:',F7.1,'  Mg:',F7.1/' Fe:',F7.1,'  Al:',F7.1,
     . '  K:',F7.1,'  Na:',F7.1,'  TDS:',F7.1,'  Alk:',F7.1,
     . '  TOT OR PERM HARDNESS:',F7.1,'  TEMP HARDNESS:',F7.1)
      ELSE
      IF (MOD(LINE,54) .EQ. 0) CALL HEAD2
      LINE=LINE+3
C HEAD PAGE
      IF (TDSC .GE. 0) THEN
      WRITE(6,302) NAME,LOCATN,EAST,NORTH,QUAD,CARD,GEOLST,GEOL,YEAR,
     . TOTDP,DEPSTR,SWL,CASDP,AYIELD,TDSC,CONDF,ANAL,
     . DRILCO
      ELSE
      WRITE(6,303) NAME,LOCATN,EAST,NORTH,QUAD,CARD,GEOLST,GEOL,YEAR,
     . TOTDP,DEPSTR,SWL,CASDP,AYIELD,CONDF,ANAL,
     . DRILCO
      ENDIF
      ENDIF
      WRITE(6,305)
  305 FORMAT(1X)
   43 CONTINUE
      ENDIF
C END PRINT EITHER CLOSE SPACED SHORT LIST OR FULL LIST
      WRITE(6,415) FFEED
  415 FORMAT(1A1,
     . /' ALL DEPTHS IN METRES'//
     . /' ALL ANALYSES IN mg/l'//
     . /' ALL CONDUCTIVITIES IN uS/cm'//
     . /' ALL YIELDS IN l/sec'//
     . /' GEOLOGY'
     . /'         0 COASTAL         1 QUATERNARY     2 TERTIARY'
     . /'           SANDS             ALLUVIUM         SEDIMENTS'
     . /'         3 TRIASSIC        4 PERMIAN        5 MATHINNA'
     . /'                                              SEDIMENTS'
     . /'         6 ORDOVICIAN      7 GORDON         8 CAMBRIAN'
     . /'                             LIMESTONE'
     . /'         9 PRECAMBRIAN     A PRECAMBRIAN    B TERTIARY'
     . /'                             DOLOMITE         BASALT'
     . /'         C JURASSIC        D GRANITE'
     . /'           DOLERITE')
      WRITE(6,416)
  416 FORMAT(1X)
      STOP
      END
      SUBROUTINE NMERIC(STRING,IVAR,NVAR)
      CHARACTER* (*) STRING
      INTEGER*2 IVAR(2),NVAR
      NVAR=0
      ILAST=1
C COUNT POSITION ALONG INPUT LINE
   20 ICHAR=INDEX(STRING(ILAST:80),'/')
C LOOK FOR / AS TERMINATOR OF A STRING
      IF (ICHAR .EQ. 0) GOTO 21
C NO MORE /
      ENCODE(BUFF,300) STRING(ILAST:ILAST+1)
  300 FORMAT(A2)
      NNVAR=NNVAR+1
      DECODE(BUFF,301) IVAR(NVAR)
  301 FORMAT(I2)
C CONVERTED TO AN INTEGER
      ILAST=ILAST+ICHAR
C POSITION TO AFTER THE /
      IF (ILAST .NE. 79) GOTO 20
C ROUND FOR NEXT IVAR
  21  RETURN
      END
      LOGICAL FUNCTION NOTIN(SSTRNG,RSTRNG)
C SSTRNG CONTAINS A SERIES OF STRINGS TERMINATED BY /
C E.G.    FRED/BILL/TOM/
C AND RSTRNG IS SEARCHED FOR THE OCCURENCE OF ONE OF THESE STRINGS
C IF ONE IS FOUND TO MATCH NOTIN IS .FALSE.
C IF STRNG IS EMPTY NOTIN IS .FALSE.
      CHARACTER*80 SSTRNG
      CHARACTER* (*) RSTRNG
      NOTIN=.FALSE.
      IF (SSTRNG(1:1) .EQ. ' ') RETURN
C NO NEED TO LOOK
      ILAST=1
C COUNTER FOR POSITION IN SSTRNG
   20 ICHAR=INDEX(SSTRNG(ILAST:80),'/')
C LOOK FOR / AS TERMINATOR OF STRING
      IF (ICHAR .EQ. 0) GOTO 25
C HAVENT FOUND A MATCH BY THE END OF THE LINE
      IF (INDEX(RSTRNG,SSTRNG(ILAST:ILAST+ICHAR-2)) .NE. 0) RETURN
C LOOK BETWEEN /S IN SSTRNG AND IF FIND A MATCH RETURN
      ILAST=ILAST+ICHAR
C POSITION AFTER THE /
      IF (ILAST .LE. 79) GOTO 20
C BACK ROUND IF NOT AT END OF LINE
C
```

```
C ELSE END
   25 CONTINUE
      NOTIN=.TRUE.
C NO MATCH
      RETURN
      END
      SUBROUTINE HEAD
C HEAD UP PAGES FROM SEARCH
      INTEGER*2 FFEED
      DATA FFEED/3072/
C USED TO PUT FORM FEEDS IN OUTPUT FILE
      WRITE(6,100) FFEED
  100 FORMAT(1A1/9X,'OWNER',9X,'¦',9X,'LOCATION',10X,'¦ DRILCO ¦',
     . 2X,'CARD¦  INIT¦',9X,'¦ TOT ¦ CAS ¦DEPTH¦',11X,'¦FIELD¦',5X,'¦',
     . 'AN¦',/23X,'¦',27X,'¦',8X,'QUAD ↑ YEAR ↑ ¦ MAPREF  ',
     . '¦ DEP ¦ DEP ¦ STR ¦ SWL ¦ YLD ¦COND ¦ TDS ¦AL¦GEO',
     . /1X,131('-'))
      RETURN
      END
      SUBROUTINE RNOIN(RNO,RYR)
C USE TO READ RECORDS NO AND YEAR AND AVOID HAVING TO MANUALLY
C REPLACE / WITH , IN 1234/76
      INTEGER*2 RNO,RYR
      CHARACTER*1 BUFF(9)
      READ(5,115) BUFF
  115 FORMAT(9A1)
      DO 10 I=1,9
      IF (BUFF(I) .EQ. '/') BUFF(I)=','
   10 CONTINUE
      REWIND 3
      WRITE(3,115) BUFF
      REWIND 3
      READ(3,*) RNO,RYR
C PUT OUT TO TEMPORARY FILES AND READ BACK IN IN FREE FORMAT
      RETURN
      END
      SUBROUTINE HEAD2
C PUT A FORM FEED AT THE HEAD OF THE PAGE
      INTEGER*2 FFEED
      DATA FFEED/3072/
      WRITE(6,100) FFEED
  100 FORMAT(A1)
      RETURN
      END
$TITL  RANGE - FREE FORMAT OF 2 POSITIVE REALS SEPARATED BY , OR -
      SUBROUTINE RANGE(ANUM,IER,ILUN)
C A ROUTINE FOR INPUTTING 2 REAL VALUES IN ANUM.
C THE INPUT FILE IS SCANNED UNTIL 2 VALUES ARE READ OR THERE IS AN
C END OF LINE.  NUMBERS ON THE SAME LINE MAY BE SEPARATED BY , OR -.
C THE ROUTINE REQUIRES POSITIVE NUMBERS.  THE MAXIMUM LENGTH IS 80 CHAR
C ANUM(2)  REAL
C ILUN  INTEGER*4
C IER LOGICAL
C IER IS TRUE IF THERE IS AN ERROR OR EOF
C COUNT IS THE ACTUAL NUMBER OF VALUES SUCCESSFULLY TRANSFERRED
C USES ENCODE TO REFORMAT SUITABLE FOR F10.0
C
      REAL ANUM(2)
      INTEGER*2 A(10),ALINE(80),PLUS,MINUS,
     . DPOINT,AL,K,I,J,IBOT,ZERO,NINE,POINT
```

```
      INTEGER*4 ILUN,COUNT
      REAL*4 BUFF(4)
      LOGICAL IER
      DATA PLUS/1H+/,MINUS/1H-/,DPOINT/1H./,ZERO/1H0/,NINE/1H9/
      IER=.TRUE.
      COUNT=0
C USED TO KEEP TRACK OF NUMBER OF VALUES FOUND
      READ(ILUN,100,END=101,ERR=101) ALINE
  100 FORMAT(80A1)
C READ IN CHARACTER FORMAT - 80 CHARS
      IBOT=1
C USED OT MOVE STEADILY ALONG THE LINE
   29 CONTINUE
C TO HERE TO LOOK FURTHER ALONG A LINE
      IF (IBOT .GE. 81) GOTO 28
      DO 10 I=IBOT,80
      AL=ALINE(I)
      IF (AL .EQ. PLUS .OR. AL .EQ. DPOINT
     . .OR. (AL .GE. ZERO .AND. AL .LE. NINE)) GOTO 20
C LOOK FOR +,.,0,1,2,3,4,5,6,7,8,9 AS THE START OF A NUMBER
   10 CONTINUE
C IF FALL THROUGH HERE ARE AT THE END OF A LINE
      GOTO 28
C ONLY ONE NUMBER ON LINE WHEN SHOULD BE 2 SO SET BOTH TO 0
C
CNOW COPY THE NUMBER TO ITS END
   20 K=0
C COUNTER FOR A ARRAY
      POINT=0
C ENSURE HAVE ONE AND ONLY ONE DECIMAL POINT
      DO 11 J=I,80
      AL=ALINE(J)
      IF (AL .EQ. DPOINT .AND. POINT .EQ. 1) GOTO 21
C FIND A SECOND DEC PT SO AT THE END OF THE NUMBER
      IF (AL .EQ. DPOINT) POINT=1
C FOUND A DECIMAL POINT
      IF (AL .NE. PLUS .AND. AL .NE. DPOINT
     . .AND. (AL .LT. ZERO .OR. AL .GT. NINE)) GOTO 21
C TERMINATE NUMBER BY NOT A +,.,0,1,2,3,4,5,6,7,8,9
      K=K+1
      IF (K .GE. 11) GOTO 101
C TOO MANY CHARACTERS
      A(K)=AL
   11 CONTINUE
C AT END OF NUMBER
      J=81
   21 IBOT=J
C NOTE SCAN START FOR NEXT NUMBER
      IF (POINT .EQ. 1) GOTO 22
C ALREADY HAVE A DECIMAL POINT
      K=K+1
      A(K)=DPOINT
C ADD A DECIMAL POINT IF NEEDED
C
CAND WRITE TO BUFFER AND REFORMAT
   22 IF (K .EQ. 10) GOTO 24
C NUMBER IS 10 CHARACTERS LONG
      K=K+1
      DO 23 I=K,10
      A(I)=ZERO
   23 CONTINUE
C FILL WITH ZEROES
   24 CONTINUE
      ENCODE(BUFF,100) (A(I),I=1,10)
      DECODE(BUFF,111) ATMP
  111 FORMAT(F10.0)
C HAVE THE NUMBER
      COUNT=COUNT+1
      ANUM(COUNT)=ATMP
      IF (COUNT .LT. 2) GOTO 29
      IER=.FALSE.
  101 RETURN
   28 ANUM(1)=0.
      ANUM(2)=0.
      GOTO 101
      END
$TITL  FSTJDN.FTN - POINT IN POLYGON
C PROGRAM COLLECTION FASTJORDAN
C    SALOMON,K.B., 1978. AN EFFICIENT POINT-IN-POLYGON ALGORITHM
C      COMPUTERS AND GEOSCIENCES, V4, NO. 2, P. 173-178
C
C USE BY READING VERTICES OF POLYGON IN ORDER (BUT NOT CLOSING IT)
C AND CALLING PREPLY ONCE BEFORE THE SEARCH IS BEGUN.  THE ACTUAL
C SEARCHING IS DONE BY MEANS OF THE LOGICAL FUNCTION INOUT.
C
      SUBROUTINE PREPLY(X,Y,NUVERT,YINTVL,INTVLS,SWATH,RSLOPE)
C
C*******************************************************************************
C  THIS ROUTINE PREPARES THE POLYGON CONSISTING OF THE NUVERT VERTICES
C  (X(I),Y(I)) BY FIRST SORTING THE SEGMENT Y-END POINTS INTO
C  DECREASING ORDER AND FORMING AN INTERVAL FOR EACH CONSECUTIVE PAIR:
C  (YINTVL(I),YINTVL(I+1)), I=1,INTVLS.  THIS IS PERFORMED BY CALLING
C  SORT.
C       THE CODE CONSISTING OF THE DO 100 AND DO 200 LOOPS CONSTRUCTS,
C  FOR EACH INTERVAL I, THE LIST OF SEGMENTS TO BE TESTED BY INOUT.
C  THIS LIST IS PLACED IN THE I-TH ROW OF SWATH.  THE FIRST ENTRY,
C  SWATH(I,1), WILL BE SET TO THE NUMBER OF SEGMENTS IN THE ROW.  NOTE
C  THAT AS YINTVL CONTAINS NO REDUNDANCIES, I.E.  YINTVL(I) IS STRICTLY
C  GREATER THAN YINTVL(I+1), NO HORIZONTAL SEGMENTS WILL BE PLACED IN
C  THE LIST.
C       THE CODE CONSISTING OF THE DO 300 LOOP ESTABLISHES THE
C  RECIPROCAL SLOPE FOR EACH NON-HORIZONTAL SEGMENT.  THIS IS TO BE
C  USED BY INOUT.  FINALLY, THE SEGMENTS WITHIN A ROW OF SWATH ARE
C  OREDERED FROM LEFT-TO-RIGHT.
C
C*******************************************************************************
C
      INTEGER*2 SWATH(100,25)
      REAL X(100),Y(100),YINTVL(100),RSLOPE(100)
      CALL SORT(Y,NUVERT,YINTVL,INTVLS)
      IF (INTVLS .LE. 0) GOTO 400
      X(NUVERT+1)=X(1)
      Y(NUVERT+1)=Y(1)
      DO 100 I=1,INTVLS
  100 SWATH(I,1)=0
      DO 200 I=1,INTVLS
         DO 200 J=1,NUVERT
         IF (Y(J).GE.YINTVL(I) .AND.  YINTVL(I+1).GE.Y(J+1) .OR.
     *         Y(J+1).GE.YINTVL(I) .AND.  YINTVL(I+1).GE.Y(J))
     *                                     CALL INCLUD(SWATH,I,J)
  200 CONTINUE
      DO 300 I=1,NUVERT
      IF (Y(I).EQ.Y(I+1)) GOTO 300
      RSLOPE(I)=(X(I+1)-X(I))/(Y(I+1)-Y(I))
  300 CONTINUE
      CALL ORDER(X,Y,YINTVL,INTVLS,SWATH,RSLOPE)
      RETURN
  400 WRITE(7,401)
  401 FORMAT(' ******* PREP OF POLYGON ABORTED SINCE NO INTERVALS',
     * ' CONSTRUCTED')
      STOP
      END
      SUBROUTINE SORT(Y,NUVERT,YINTVL,INTVLS)
C
C******************************************************************************
C
C  ROUTINE ESTABLISHES THE INTERVALS OF THE Y-AXIS DEFINED BY THE
C  ENDPOINTS OF THE POLYGON'S SEGMENTS.  THE DO 100 LOOP INITIALLISES
C  YSORT FROM THE SEGMENT Y-END POINTS.  THE DO 200 LOOPS SORT YSORT
C INTO DESCENDING ORDER.  THE DO 300 LOOP ELIMINATES REDUNDANCIES IN
C  YSORT AND PLACES IRREDUNDANT SORTED Y'S INTO YINTVL.  IT ALSO SETS
C  INTVLS TO THE TRUE NUMBER OF Y INTERVALS.  JUST PRIOR TO RETURNING
C  A FINAL INTERVAL EXTENDING TO '-INFINITY' IS ESTABLISHED.
C
C******************************************************************************
C
      REAL Y(100),YINTVL(100),YSORT(100)
      INTEGER*2 UPPER
      DO 100 I=1,NUVERT
  100 YSORT(I)=Y(I)
      UPPER=NUVERT-1
      DO 200 I=1,UPPER
         IPLS1=I+1
         DO 200 J=IPLS1,NUVERT
         IF (YSORT(I).GE.YSORT(J)) GOTO 200
             TEMP=YSORT(I)
             YSORT(I)=YSORT(J)
             YSORT(J)=TEMP
  200 CONTINUE
      YINTVL(1)=YSORT(1)
      INTVLS=0
      DO 300 I=1,UPPER
         IF (YSORT(I).EQ.YSORT(I+1)) GOTO 300
         INTVLS=INTVLS+1
         YINTVL(INTVLS+1)=YSORT(I+1)
  300 CONTINUE
      YINTVL(INTVLS+2)=-1.0E75
      RETURN
      END
      SUBROUTINE INCLUD(SWATH,I,J)
C
C******************************************************************************
C  ROUTINE PLACES THE J-TH POLYGON SEGMENT INTO THE NEXT AVAILABLE
C  LOCATION IN ROW I OF SWATH.
C
C******************************************************************************
C
      INTEGER*2 SWATH(100,25),POINTR
      SWATH(I,1)=SWATH(I,1)+1
      POINTR=SWATH(I,1)
      SWATH(I,POINTR+1)=J
      RETURN
      END
      SUBROUTINE ORDER(X,Y,YINTVL,INTVLS,SWATH,RSLOPE)
C
C***********************************************************************************
C
C  FOR EACH INTERVAL, A HORIZONTAL LINE IS PASSED THROUGH THE MIDDLE
C  (YMID) OF THE INTERVAL.  THE DO 100 LOOP PLACES THE X-INTERSECTION
C  OF EACH SEGMENT IN THIS SWATH SO THAT THESE INTERSECTIONS OCCUR
C  FROM LEFT-TO-RIGHT.
C
C***********************************************************************************
C
      REAL X(100),Y(100),YINTVL(100),RSLOPE(100),XINTSC(25)
      INTEGER*2 SWATH(100,25),POINTR,SEGNO,UPPER
      LOGICAL VERTSG
      DO 200 INTVAL=1,INTVLS
         NMBSEG=SWATH(INTVAL,1)
         YMID=(YINTVL(INTVAL)+YINTVL(INTVAL+1))/2.0
         DO 100 POINTR=1,NMBSEG
            SEGNO=SWATH(INTVAL,POINTR+1)
            VERTSG=ABS(X(SEGNO+1)-X(SEGNO)) .LT. 1.0E-5
            IF (VERTSG) XINTSC(POINTR)=X(SEGNO)
            IF (.NOT. VERTSG) XINTSC(POINTR)=X(SEGNO)+
     *                                 RSLOPE(SEGNO)*(YMID-Y(SEGNO))
  100    CONTINUE
         IF (NMBSEG.LT.2 .OR. MOD(NMBSEG,2).NE.0) GOTO 300
         UPPER=NMBSEG-1
         DO 200 I=1,UPPER
            IPLS1=I+1
            DO 200 J=IPLS1,NMBSEG
               IF (XINTSC(I).LE.XINTSC(J)) GOTO 200
               TEMP=XINTSC(I)
               XINTSC(I)=XINTSC(J)
               XINTSC(J)=TEMP
               ITEMP=SWATH(INTVAL,I+1)
               SWATH(INTVAL,I+1)=SWATH(INTVAL,J+1)
               SWATH(INTVAL,J+1)=ITEMP
  200 CONTINUE
      RETURN
  300 WRITE(7,301) INTVAL
  301 FORMAT(' ** PREP OF POLYGON ABORTED.  INTERVAL ',I5/
     * ' HAS EITHER LESS THAN TWO SEGMENTS OR AN ODD NUMBER OF THEM')
      STOP
      END
      LOGICAL FUNCTION INOUT(XP,YP,X,Y,YINTVL,INTVLS,SWATH,RSLOPE)
C
C*****************************************************************************
C
C  THE FOUR LINES ENCLOSED IN DASHES DETERMINE THE INTERVAL CONTAINING
C  YP.  THE DO 400 LOOP CONTINUES UNTIL THE FIRST SEGMENT WITHIN THE
C  INTERVAL FALL TO THE LEFT OF (XP,YP).  IN THIS EVENT, INOUT IS SET
C  .TRUE.  IFF AN EVEN NUMBER OF SEGMENTS HAS BEEN TESTED.
C
C*******************************************************************************
C
      REAL X(100),Y(100),YINTVL(100),RSLOPE(100)
      INTEGER*2 SWATH(100,25),SEGNO
      INOUT=.FALSE.
```

```
C---------------------------------------------------------------
      INTVAL=0
  100 INTVAL=INTVAL+1
      IF (YINTVL(INTVAL) .GT.  YP) GOTO 100
      INTVAL=INTVAL-1
C-----------------------------------------------------------------
  300 IF (INTVAL.LT.1 .OR.  INTVAL.GT.INTVLS) RETURN
      NMBSEG=SWATH(INTVAL,1)+1
      DO 400 I=2,NMBSEG
         SEGNO=SWATH(INTVAL,I)
         IF(XP-X(SEGNO).LE.(YP-Y(SEGNO))*RSLOPE(SEGNO)) GOTO 500
  400 CONTINUE
      RETURN
  500 INOUT=MOD(I,2) .EQ. 1
      RETURN
      END
```