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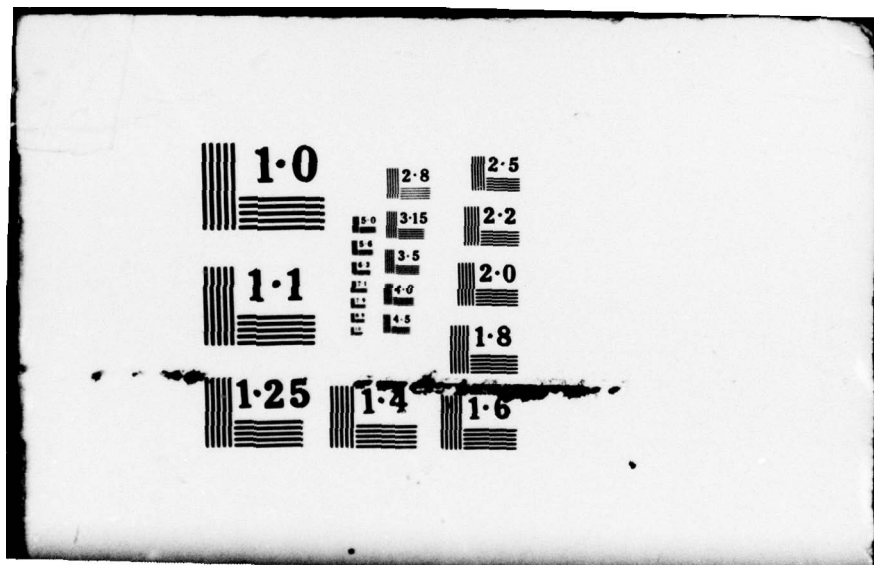
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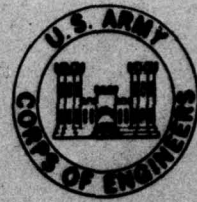
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Special Report 78-22

November 1978

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COMPUTER FILE FOR EXISTING LAND APPLICATION OF WASTEWATER SYSTEMS: A USER'S GUIDE

K. Iskandar, D. Robinson, W. Willcockson and E. Keefauver

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Two computer programs, both written in BASIC, have been developed to store and retrieve information on existing wastewater land treatment systems. The purpose of establishing these programs is to provide assistance to design engineers during the planning of new land treatment systems by making available the design criteria and performance characteristics of operating systems. The SEARCH program is designed to locate systems with specific design parameters, such as flow rate, waste type, application rate and mode, ground cover and length of operation. The printout from SEARCH includes a list of articles on similar systems in addition to the design parameters. The UPDATE program is used for the revision of information on file. Currently there are about 350 domestic and 75 foreign systems on file.		

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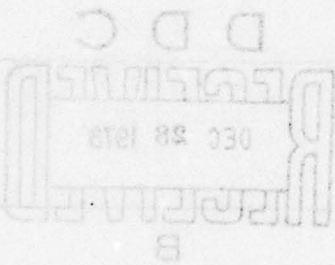
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Preface

This report was prepared by Dr. I.K. Iskandar, Research Chemist, D. Robinson, Computer Technician, W. Willcockson, Environmental Science Technician, and E. Keefauver, Environmental Science Technician, of the Earth Sciences Branch, Research Division, U.S. Army Cold Regions Research and Engineering Laboratory.

The study was funded by Corps of Engineers Civil Works Project 31280, *Evaluation of Existing Facilities for Wastewater Land Treatment*.

The technical content of the report was reviewed by Thomas Jenkins and James Martell of CRREL.



SUMMARY

Land application of wastewater has been practiced for centuries all over the world. In recent years there has been a trend toward use of land application systems for the purpose of wastewater treatment. This is essentially a result of more stringent water quality standards and an increased concern over environmental pollution.

Since 1972 CRREL has conducted extensive research on land treatment of wastewater. A portion of this program has been concerned with evaluating the design, operating performance and management characteristics of existing land application systems and assessing the reasons for system success or failure.

The experience and information gained from existing systems, for example, information on the long-term environmental effects and problems encountered with heavy metals, should be utilized in the design and management of new systems. Use of such information may lead to a better means of dealing with such problems.

Due to the large number of existing systems and available publications and the diversity of sites, a computer file has been established at CRREL and made available to the public. The file contains compiled information on both foreign and domestic systems. Two programs have been written in BASIC to manipulate the file. The SEARCH program is used to locate a system or systems with specific design parameters and UPDATE is used to revise the file. A listing of both programs is included and a listing of the systems on file as of February 1978 is available in CRREL Internal Report 561. (Currently there are approximately 400 domestic and 75 foreign systems in the file.) SEARCH can be used along with the *Design Process Manual for Land Treatment of Wastewater*, published recently by the Corps of Engineers and Environmental Protection Agency, in planning and design of land application systems.

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COMPUTER FILE FOR EXISTING LAND APPLICATION OF WASTEWATER SYSTEMS: A USER'S GUIDE

I.K. Iskandar, D. Robinson,
W. Willcockson and E. Keefauver

INTRODUCTION

Land application of wastewater is not new. The first documented wastewater and sludge applications on land were in Poland and Germany in the 16th century (Iskandar 1978, Wiezbicki 1977, Markland et al. 1974). In the United States, there have been systems in operation since the late 19th and early 20th centuries (Pound and Crites 1975). In recent years, wastewater application on land has been used for both the treatment of the wastewater and for water resources management (irrigation and recharging of underground water supplies). However, information on the performance and the long-term effects (if any) of older systems is needed for the design, operation and management of new systems.

Because of the large number of publications available and the diversity of sites and their environmental factors, a computer file has recently been established at CRREL in order to compile existing information and literature on both foreign and domestic systems. Information on these existing systems can be used in the design, operation and management of new land treatment systems. Also, an assessment of the long-term effects on the environment as a result of applying wastewater on land can be obtained. At the present time, information on more than 400 domestic and 75 foreign systems is stored in the computer. The purpose of this report is to describe to the user how to search for a system (or systems) and how to update systems on file. The two programs are named "SEARCH" and

"UPDATE," respectively. One of the limitations of these programs is that they are currently only available on the Dartmouth College Time Sharing system using BASIC or S BASIC languages. Efforts are being made, however, to make the programs available on other computer systems for use by the Corps of Engineers Districts and Divisions. In the meantime, the computer program and the information stored can be adapted by the user to other systems. Another means of obtaining information on similar systems is to write to CRREL (TIAC) for assistance.

The purpose of this report is to present a brief description of the SEARCH and UPDATE programs and examples from each. Also, examples on how to use the stored information in the planning and design of new land treatment systems are presented in CRREL Internal Report 561.

PROGRAM SEARCH

SEARCH is the computer program being used to retrieve basic data on wastewater systems and associated papers from the computer storage bank. Figure 1 is a flow chart of the computer program SEARCH.

Each system has the same information (search parameters) encoded with it. In order to find a system, any one or more of these search parameters can be used; the computer will then look through its files and pick out all systems which fit the specifications. The searching parameters are listed below.

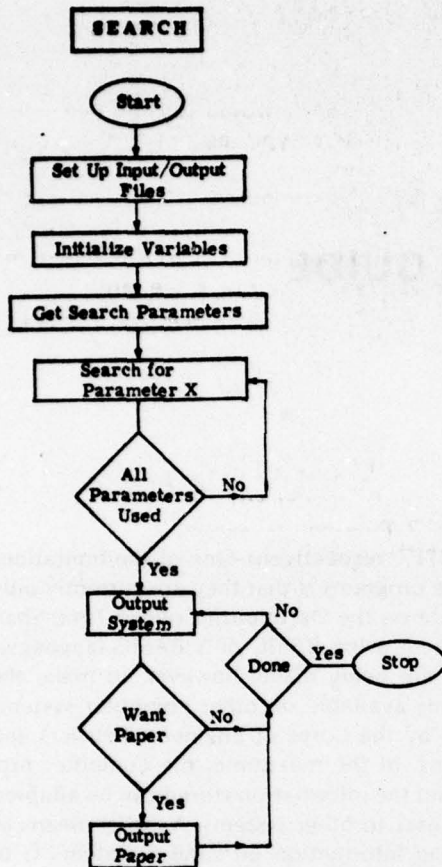


Figure 1. Flow chart of the computer program SEARCH.

Table I. System name abbreviations.

Air Force Academy	— USAF ACAD.
Air Force Base	— AFB
Croydon-Beddington	— Croydon-BEDD.
East	— E.
General	— GEN.
General-irrigation	— GEN-IRR.
General-overland flow	— GEN-OVE.
General-rapid infiltration	— GEN-RAP.
General-slow infiltration	— GEN-SLO.
North	— N.
Paper	— PAP.
Pietmaritzburg	— PIETERMARITZ.
River	— R.
Saint	— ST.
South	— S.
University	— U.
Valley	— VAL.
West	— W.

Searching Parameters

1. System name—the name to be used for the system. An important constraint in the program is that the system name not exceed 14 characters in length. A character is a letter, space or punctuation mark. See Table I for a list of system abbreviations.

2. Location—the location of the system, either the country (if foreign) or the state (if in the U.S.). As with the system name this must be 14 characters or less. See Table II for a list of abbreviations.

3. System type—whether the system is operational or a prototype.

4. Flow rate—treatment capacity in millions of gallons per day (mgd) of system (N/A if not available). If only a range of flow rates is given in a paper, the maximum rate is used and the flow rate range is placed in the abstract following the information about the paper.

5. Waste type—the kind of sewage used. The choices are *municipal, industrial, agricultural, or general* (a combination).

6. Ground cover—the vegetation, in general, present at the treatment or disposal. The choices are *grass, trees, vegetable-crop, forage-crop and none*. None is used if there is no ground cover present, and N/A is used if ground cover information is available.

7. Treatment type—the choices are *slow infiltration, rapid infiltration, overland flow, all, or N/A*.

8. Application mode—the choices are *spray, flood, both, or N/A*.

9. Application rate—the number of inches per week of wastewater application (to convert to cm/wk multiply by 2.54). For varied application rates, the maximum is used and the application rate range placed in the abstract following the information about the paper.

10. Purpose of the system—the choices are *treatment, irrigation, recharge, or general* (if multipurpose).

11. Year of initiation—the calendar year in which operations began, if available; otherwise N/A is used.

Notice that in items 4, 9 and 11 a series of numbers, a range of values or both may be entered. For instance, the following is an acceptable input for parameter 11 (year of initiation): 1967, 1932, 1951-1956, 1926. The numbers don't have to be in any particular order except when a range of values is entered (as in 1951-1956 above), in which case the first number must be

Table II. Location abbreviations.

Two-letter state abbreviations

Alaska	AK
Alabama	AL
Arizona	AZ
Arkansas	AR
California	CA
Colorado	CO
Connecticut	CT
Delaware	DE
District of Columbia	DC
Florida	FL
Georgia	GA
Guam	GU
Hawaii	HI
Idaho	ID
Illinois	IL
Indiana	IN
Iowa	IA
Kansas	KS
Kentucky	KY
Louisiana	LA
Maine	ME
Maryland	MD
Massachusetts	MA
Michigan	MI
Minnesota	MN
Mississippi	MS
Missouri	MO
Montana	MT
Nebraska	NE
Nevada	NV
New Hampshire	NH
New Jersey	NJ
New Mexico	NM
New York	NY
North Carolina	NC
North Dakota	ND
Ohio	OH
Oklahoma	OK
Oregon	OR
Pennsylvania	PA
Puerto Rico	PR
Rhode Island	RI
South Carolina	SC
South Dakota	SD
Tennessee	TN
Texas	TX
Utah	UT
Vermont	VT
Virginia	VA
Virgin Islands	VI
Washington	WA
West Virginia	WV
Wisconsin	WI
Wyoming	WY
British Columbia	BC
Union of Soviet Socialist Republic	USSR
United States	USA

less than the second. In running the program the user first selects the desired search parameters by typing in their numbers. For example, a response of 3, 8, 11 would tell the machine to search by system type, application mode and year of initiation.

After this the computer will then ask for the information for each parameter. Note that the responses in parameters 3, 5, 6, 7, 8 and 10 may be abbreviated to the first three letters.

Example 1

Problem: Design a land treatment system for a city of 20,000 (1980) in Maryland. Most of the wastewater is municipal.

1. Assume that we would like to design a system for a town or city in Maryland. The projected population is 20,000 (in 1980). If we assume that each person uses 100 gal./day, the flow rate for this town would be 2.0 mgd.

2. The searching parameters in this case would be the location (Maryland) which is parameter 2 and the flow rate (1-3 mgd), which is parameter 4. The computer printout, using SEARCH and the indicated parameters 2 and 4, is presented in Table III.

3. If the information from the computer printout is not sufficient for the design purposes, the associated literature should be obtained and examined.

Example 2

Problem: What are the design parameters of the systems in Australia using the overland flow method of land treatment?

The searching parameters would be the Australia location (2), and the treatment type (7). The printout obtained from this search is presented in Table IV.

PROGRAM UPDATE

UPDATE is the program used to place new information into the system data bank. The program has two sections: ADD, which is used to put new systems in or add papers to systems already stored, and REVISE, which is used to change existing information. Figure 2 is a flow chart of this program.

ADD

Some preparation is required before going to the computer to add a new system. For each system the following information will be requested and should be known in advance.

Table III. A computer printout including existing systems in Maryland, wastewater flow rate less than 3 mgd.

SYSTEM NAME	LOCATION	SYSTEM TYPE	FLOW RATE m.g.d.	WASTE TYPE	GROUND COVER	TREATMENT TYPE	APPLIC. MODE	APPLIC. RATE in./wk.	PURPOSE	DATE
BERLIN	MD	OPERATING	0.9	INDUSTRIAL	N/A	N/A	SPRAY	N/A	TREATMENT	1953
WESTMINSTER	MD	OPERATING	2	INDUSTRIAL	N/A	N/A	N/A	N/A	TREATMENT	1972

Table IV. A computer printout for systems in Australia utilizing the overland flow method.

SYSTEM NAME	LOCATION	SYSTEM TYPE	FLOW RATE m.g.d.	WASTE TYPE	GROUND COVER	TREATMENT TYPE	APPLIC. MODE	APPLIC. RATE in./wk.	PURPOSE	DATE
MELBOURNE	AUSTRALIA	OPERATING	150	MUNICIPAL	GRASS	ALL	BOTH	N/A	TREATMENT	1897

AUTHOR-SEABROOK, B.L.
TITLE-LAND APPLICATION OF WASTEWATER IN AUSTRALIA, THE WERRIBEE FARM SYSTEM, MELBOURNE, VICTORIA
PUBLICATION-EPA, 27FP.
PUB. DATE-MAY 1975
ARE USING CROP IRRIGATION, OVERLAND FLOW AND A LAGOON SYSTEM FOR TREATMENT.

AUTHOR-SEARLE, S.S AND C.F. KIRBY
TITLE-WASTE INTO WEALTH
PUBLICATION-WATER SPECTRUM, P. 15-21
PUB. DATE-1972

AUTHOR-KEENEY, D.
TITLE-THE WERRIBEE (MELBOURNE, AUSTRALIA) SEWAGE TREATMENT FARM: REPORT OF A VISIT BY DENNIS KEENEY ON DEC. 9, 1976
PUBLICATION-
PUB. DATE-

AUTHOR-JOHNSON, R.D., R.L. JONES, T.D. HINESLY, AND D.J. DAVID
TITLE-SELECTED CHEMICAL CHARACTERISTICS OF SOILS, FORAGES, AND DRAINAGE WATER FROM THE SEWAGE FARM SERVING MELBOURNE, AUSTRALIA
PUBLICATION-DEPT. OF ARMY, CORPS OF ENGINEERS, 54PP.
PUB. DATE-JAN. 1974

1. System name—see Table I for a list of abbreviations
2. System location—see Table II for a list of abbreviations
3. System type
4. Flow Rate
5. Waste type
6. Ground cover
7. Treatment type
8. Application mode
9. Application rate
10. System purpose
11. Year of initiation

It should be noted that all of the above 11 questions must be answered and that the only acceptable answers to questions 3, 5, 6, 7, 8 and 10 are those that are given in the *Searching Parameters*. For questions 4, 9 and 11 N/A may be entered if the information is unknown. In addition, if reports are available, the following information should be supplied for each one:

1. Author(s) — using the following format: Last name of the principal author first, followed by his or her initials, then followed by the other authors' initials and last names (for example: Iskandar, I.K., R.S. Sletten, D.C. Leggett and T.F. Jenkins).
2. Title of the paper.
3. Publication in which report appeared, including volume number and pages if applicable.
4. Publication date: Month (if known) and year.
5. Brief abstract describing the paper (if desired).

To add a paper to a system which is already stored, the name and location of that system must be given. The computer will then print out the system data and ask if the correct system is described. If the wrong data appear, "No" should be entered and the computer will print out different system data which have the same system name and location. Once the correct

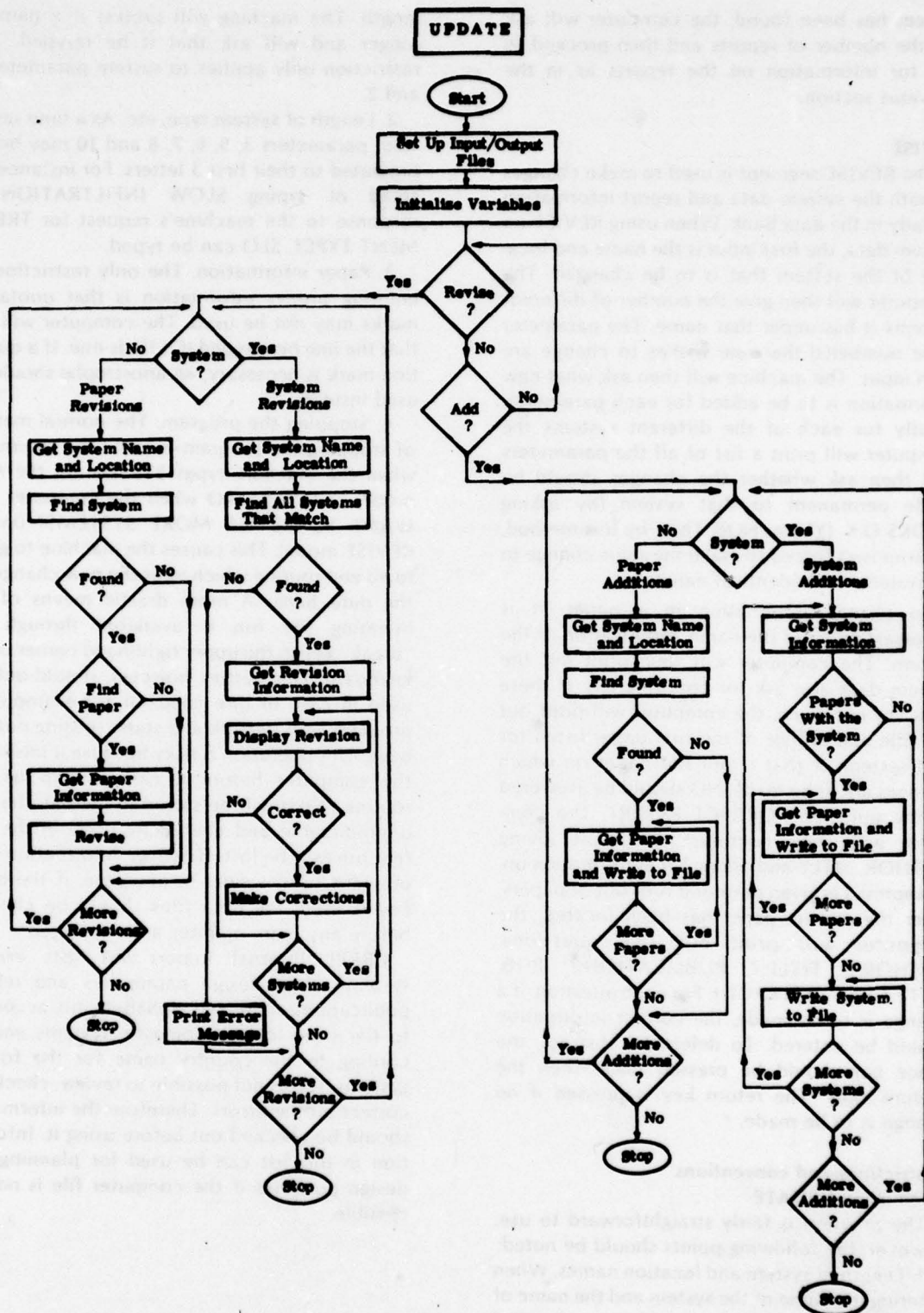


Figure 2. Flow chart of the computer program UPDATE.

system has been found, the computer will ask for the number of reports and then proceed to ask for information on the reports as in the previous section.

REVISE

The REVISE segment is used to make changes to both the system data and report information already in the data bank. When using REVISE on system data, the first input is the name and location of the system that is to be changed. The computer will then give the number of different systems it has under that name. The parameter code number(s) that one wishes to change are then input. The machine will then ask what new information is to be added for each parameter. Finally for each of the different systems the computer will print a list of all the parameters and then ask whether the changes should be made permanent to that system (by asking LOOKS O.K. (YES or NO)). Thus, by this method, the user isn't forced to make the same change to all systems with identical names.

To change information in a paper, it is necessary to input the name and location of the system. The computer will then print out the system data and ask for confirmation. If these data are not given, the computer will print out the title and author of the first paper listed for that system. If that is not the paper on which changes are to be made, NO should be answered to the question CORRECT PAPER?. The computer will then continue to repeat giving AUTHOR, TITLE and asking for confirmation until approval is given or until it runs out of papers. After the correct paper has been located, the computer will print out five questions: AUTHOR:?, TITLE:?, PUBLICATION:?, PUB. DATE:?, and ABSTRACT:?. For each question, if a change is to be made, the correct information should be entered. To delete an abstract, the space bar should be pressed once, then the "return" key. The return key is pressed if no change is to be made.

Restrictions and conventions when using UPDATE

The program is fairly straightforward to use; however, the following points should be noted:

1. Length of system and location names. When entering the name of the system and the name of the state or country in which it is located (parameters 1, and 2), the user should remember that each may not exceed 14 characters in

length. The machine will protest if a name is longer and will ask that it be retyped. This restriction only applies to system parameters 1 and 2.

2. Length of system type, etc. As a time saving step, parameters 3, 5, 6, 7, 8 and 10 may be abbreviated to their first 3 letters. For instance, instead of typing SLOW INFILTRATION in response to the machine's request for TREATMENT TYPE?, SLO can be typed.

3. Paper information. The only restriction on entering proper information is that quotation marks may not be used. The computer will ask that the line be retyped if it finds one. If a quotation mark is necessary, an apostrophe should be used instead.

4. Stopping the program. The normal method of stopping the program is to hit the return key when the machine types SYSTEM (in the ADD mode) or to type NO when the computer asks WANT TO REVISE MORE SYSTEMS? (in the REVISE mode). This causes the machine to go into an end routine which adds the new changes to the data bank. A more drastic means of terminating the run is available through the "break" key in the upper right-hand corner of the keyboard. This button, however, should only be used in case of dire need—if for example the program goes berserk and starts spitting out garbage. This operation is risky because it interrupts the computer before it can go into its end routine. What will be stored in the data bank is unpredictable and everything done in the current run may be lost. However, information from previous runs is safe. In any case, if the break key is used, the data files should be checked before any more updates are attempted.

CRREL Internal Report 561 lists existing systems, their design parameters and related publications organized alphabetically according to the state for the domestic systems and according to the country name for the foreign systems. It was not possible to review, check and correct all the errors. Therefore the information should be checked out before using it. Information in this list can be used for planning and design purposes if the computer file is not accessible.

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- Pound, C.E. and R.W. Crites (1975) Treatment of municipal wastewater by land application. *Wastewater Disposal*, p. 45-56.
- Wierzbicki, J. (1977) Disadvantages and advantages of sewage disposal in connection with agricultural utilization. CRREL Draft Translation 645. AD A044767.

APPENDIX A: COMPUTER LISTING OF PROGRAM SEARCH

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1010 MARGIN(133)
1020 DIM S(10), C$(10), Y$(20), Y(40,2), C(10), S$(10,7), L$(11)
1030 DIM B$(500), F(500), L(500), R(500), X(500)
1040 DIM D$(500)
1050 DIM U$(10,10)
1060 MAT Y=ZER
1070 DIM V$(10), M$(10), X$(10), Z(10)
1080 MAT C=ZER
1090 MAT L=ZER
1100 MAT R=ZER
1110 MAT C$=NULL$
1120 MAT Y$=NULL$
1130 MAT S$=NULL$
1140 LET K=0
1150 LET E1=2 'indicator variable to show whether a search has failed
1160 LET E2=10 'no. of elements per record in file #1 (----,NAM)
1170 'no. of elements per record in file #2 (----,NUM)
1180 REM CHECK TO SEE WHAT FILES WE SHOULD USE.
1190 PRINT "FOREIGN OR DOMESTIC";
1200 DO
1210 INPUT Z$
1220 LET Z$ = SEG$( Z$, 1, 3 )
1230 SELECT CASE Z$
1240 CASE "DOM"
1250 FILE #1: " DOM.NAM" 'master file containing string information
1260 FILE #2: " DOM.NUM"
1270 FILE #3: " DOM.PAP" 'master file containing all paper information (term. format)
1280 CASE "FOR"
1290 FILE #1: ". FOR.NAM"
1300 FILE #2: ". FOR.NUM"
1310 FILE #3: ". FOR.PAP"
1320 DEFAULT
1330 PRINT "INCORRECT FORMAT. REENTER--";
1340 CONTINUE
1350 LOOP UNTIL Z$ = "DOM" OR Z$ = "FOR"
1360
1370 FILE #4: "e"
1380 FILE #5: "a" 'working file to store locations of found systems
1390 'EJECT

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1400
1410 REM PROCEDURE TO READ TAB SETTINGS FOR OUTPUT FORMAT
1420 FOR C=1 TO 10
1430 READ T(C)
1440 NEXT C
1450 DATA 15,29,39,45,59
1460 DATA 69,85,94,102,115
1470
1480 REM ESTABLISH SEARCH PARAMETERS
1490 LET L$(1)="NAME OF SYSTEM"
1500 LET L$(2)="LOCATION (NAME OF STATE OR COUNTRY)"
1510 LET L$(3)="TYPE OF SYSTEM (PROTOTYPE, OPERATING)"
1520 LET L$(4)="FLOW RATE (MILLIONS OF GALLONS PER DAY, ZERO IF N/A)"
1530 LET L$(5)="TYPE OF WASTE (MUNICIPAL, INDUSTRIAL, AGRICULTURAL, GENERAL)"
1540 LET L$(6)="CHARACTERISTIC GROUND COVER (GRASS, TREES, VEG.-CROP, FORAGE, NONE, N/A)"
1550 LET L$(7)="TREATMENT TYPE (SLOW INFILT., RAPID INFILT., OVERLAND FLOW, ALL, N/A)"
1560 LET L$(8)="APPLICATION MODE (SPRAY, FLOOD, BOTH, N/A)"
1570 LET L$(9)="APPLICATION RATE (INCHES PER WEEK ZERO IF N/A)"
1580 LET L$(10)="PURPOSE OF SYSTEM (TREATMENT, IRRIGATION, RECHARGE, GENERAL)"
1590 LET L$(11)="YEAR OF INITIATION"
1600 'EJECT

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1610 REM ESTABLISH ANSWERS TO PARAMETERS #3,5,6,7,8,10
1620 READ S$(3,1), S$(3,2), S$(3,3)
1630 DATA "2", "PROTOTYPE", "OPERATING"
1640 READ S$(5,1), S$(5,2), S$(5,3), S$(5,4), S$(5,5)
1650 DATA "4", "MUNICIPAL", "INDUSTRIAL", "AGRICULTURAL", "GENERAL"
1660 READ S$(6,1), S$(6,2), S$(6,3), S$(6,4), S$(6,5), S$(6,6), S$(6,7)
1670 DATA "6", "GRASS", "TREES", "VEG -CROP", "FORAGE", "NONE", "N/A"
1680 READ S$(7,1), S$(7,2), S$(7,3), S$(7,4), S$(7,5), S$(7,6)
1690 DATA "5", "SLOW INFILT", "RAPID INFILT", "OVERLAND FLOW", "ALL", "N/A"
1700 READ S$(8,1), S$(8,2), S$(8,3), S$(8,4), S$(8,5)
1710 DATA "4", "SPRAY", "FLOOD", "BOTH", "N/A"
1720 READ S$(10,1), S$(10,2), S$(10,3), S$(10,4), S$(10,5)
1730 DATA "4", "TREATMENT", "IRRIGATION", "RECHARGE", "GENERAL"
1740
1750
1760 IF ( INT( (LOF(#2) - 1)/10 ) <> (LOF(#2) - 1)/10 )
1770 THEN PRINT "START-UP ERROR: FILE #2 (---- NUM) NOT OF CORRECT LENGTH."
1780 STOP
1790 CONTINUE
1800
1810
1820 REM INPUT & CHECKOUT OF SEARCH PARAMETER NUMBERS
1830 PRINT "SEARCH PARAMETERS (TYPE 0 FOR A LIST)":
1840 DO
1850 LET C9=0 'flag variable for incorrect input
1860 MAT B=ZER
1870 MAT INPUT S 'search parameters
1880 LET N=NUM 'number of search parameters
1890 FOR X=1 TO N
1900 IF S(X)<>INT(S(X)) OR S(X)>11 OR S(X)<1 'check for correct format
1910 THEN IF S(X)=0 'if a list is desired
1920 THEN PRINT
1930 PRINT "THE POSSIBLE PARAMETERS ARE:"
1940 FOR X1=1 TO 11 'print the list of parameters
1950 PRINT " ",X1,"-",L$(X1)
1960 NEXT X1
1970 PRINT "ENTER SEARCH PARAMETERS":
1980 LET X=N
1990 LET C9=1
2000 ELSE PRINT "NO SUCH PARAMETER AS ", S(X)
2010 PRINT "TRY RETYPING IT":
2020 INPUT S(X)
2030 LET X=X-1
2040 CONTINUE
2050 NEXT X
2060 NEXT X
2070 LOOP WHILE C9=1
2080 'EJECT

```

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2090 REM SEARCH PARAMETER INPUT & SEARCH ROUTINES
2100 LET X=1 'counter
2110 DO
2120 PRINT L$(S(X)): 'print heading
2130 IF END #4 'is file #4 empty?
2140 THEN LET F1=1 ' yes (no systems have been found yet)
2150 ELSE LET F1=0 ' no (file contains locations of found systems)
2160 CONTINUE
2170
2180 SELECT CASE S(X)
2190
2200
2210 REM SYSTEM NAME & LOCATION
2220 CASE 1,2
2230 INPUT C$(S(X)) 'input system name or location
2240
2250 RESET #1:0 'reset ----.NAM
2260 LET F=1
2270 PERFORM ENDCHECK
2280 DO WHILE S=1
2290 IF F1=1 'was file #4 empty at the start of this routine?
2300 THEN INPUT #4:P 'if not, pick a system location from file #4
2310 RESET #1:(P-1)/E1 'reset ----.NAM to pick up that system
2320 CONTINUE
2330 READ #1:D$(1), D$(2) 'readout the system name & location from ----.NAM
2340 IF C$(S(X))=D$(S(X)) 'if the existing system matches the desired system
2350 THEN PRINT #5:LOC(#1)/E1 'store its location
2360 CONTINUE
2370 LET F=1 'file no. to be examined in ENDCHECK (i.e. ----.NAM)
2380 PERFORM ENDCHECK 'check whether we're done (if so, set S equal to 0)
2390 LOOP
2400 PERFORM RESET 'dump results from file #5 to #4 & reset #4
2410 'EJECT

```

```

2420 REM SYSTEM TYPE, WASTE TYPE, GROUND COVER, ETC.
2430 CASE 3,5,6,7,8,10
2440 LET Z=S(X)-1 'set up numbering system compatible with ----.NUM
2450 DO
2460 INPUT A$ 'input search parameter
2470 LET A1$=BEG$(A$,0,3) 'abbreviate it to the first 3 letters
2480 LET X1=VAL$(B$(S(X),1))+1 'location of last acceptable answer
2490 LET X2=2 'location of first possible answer
2500 DO
2510 IF A1$=BEG$(B$(S(X),X2),0,3) THEN LET C(Z)=X2-1 'if answer is acceptable, store its number code
2520 LET X2=X2+1
2530 LOOP UNTIL X2>X1 OR C(Z)>0
2540 IF C(Z)=0 'if no acceptable answer was found
2550 THEN PRINT "NO SUCH SPECIFICATION AS: " A$
2560 PRINT "THE POSSIBILITIES ARE:"
2570 FOR X2=2 TO X1
2580 PRINT " ", B$(S(X),X2) 'give the list of acceptable answers
2590 NEXT X2
2600 PRINT "TRY RETYPING IT";
2610 CONTINUE
2620 LOOP UNTIL C(Z)>0
2630
2640
2650 REBET #2:0 'reset ----.NUM
2660 LET F=2 'file no. to be examined in ENDCHECK (2=----.NUM)
2670 DO
2680 IF F1<0 'was file #4 empty at the start of this routine?
2690 THEN INPUT #4:P 'if not, pick a system location from file #4
2700 REBET #2:(P-1)*E2 'reset ----.NUM to pick up that system
2710 CONTINUE
2720 READ #2:D(1), D(2), D(3), D(4), D(5), D(6), D(7), D(8), D(9), D(10) 'read out all system parameters
2730 IF C(Z)=D(Z) THEN PRINT #5:LOC(#2)/E2 'if a match on the parameter you're searching under, store its location
2740 PERFORM ENDCHECK 'check to see if done (if so let S=0)
2750 LOOP WHILE S=1
2760 PERFORM REBET 'dump results from file #5 into #4 & reset #4
2770 'EJECT

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2780 REM FLOW RATE, APPLIC. RATE, DATE
2790 CASE 4,9,11
2800 LET Z=S(X)-1 'set up numbering system compatible with ----.NUM
2810 LET F=2 'file no. to be examined in ENDCHECK (2=----.NUM)
2820 MAT INPUT Y$ 'enter all the years, rates, etc. that will be used for searching
2830 LET V1=NUM 'no. of distinct entries (example: 1920, 1938-1952 would be 2)
2840 FOR X1=1 TO V1
2850 LET P=POS(Y$(X1),"-",0) 'position of dash if present (as in 1938-1952)
2860 IF P>0 'if there is a dash
2870 THEN LET C$=BEG$(Y$(X1),0,P-1) 'first number (string value)
2880 LET D$=BEG$(Y$(X1),P+1,LEN(Y$(X1))) 'second number (string value)
2890 LET C=VAL$(C$) 'first number (numeric value)
2900 LET D=VAL$(D$) 'second number (numeric value)
2910 LET Y(X1,1)=C 'first number
2920 LET Y(X1,2)=D-C 'difference between first & second numbers
2930 ELSE LET Y(X1,1)=VAL$(Y$(X1)) 'there is only one value, convert to numeric
2940 CONTINUE
2950 NEXT X1
2960
2970 REBET #2:0 'reset ----.NUM
2980 DO
2990 IF F1<0 'was file #4 empty at the start of this routine?
3000 THEN INPUT #4:P 'if not, pick a system location from file #4
3010 REBET #2:(P-1)*E2 'reset ----.NUM to pick up that system
3020 CONTINUE
3030 READ #2:D(1), D(2), D(3), D(4), D(5), D(6), D(7), D(8), D(9), D(10) 'read out all system parameters
3040 LET X1=1 'counter
3050 LET C7=0 'flag variable to indicate a find (0 indicates no find)
3060 DO WHILE C7=0 AND X1 <= V1
3070 IF D(Z)<=Y(X1,1)+Y(X1,2) 'test whether value from ----.NUM is less than the upper bound
3080 THEN IF D(Z)>=Y(X1,1) 'test whether value from ----.NUM is greater than lower bound
3090 THEN PRINT #5:LOC(#2)/E2 'store its location
3100 LET C7=1 'reset flag variable
3110 ELSE LET X1 = X1 + 1
3120 CONTINUE
3130 ELSE LET X1=X1+1 'otherwise go to the next value inputed
3140 CONTINUE
3150 LOOP
3160 PERFORM ENDCHECK 'check to see if we're done & set S equal to 0 if so
3170 LOOP WHILE S=1
3180 PERFORM REBET 'dump results from file #5 into file #4 & reset #4
3190
3200 CONTINUE
3210 LET I=I+1
3220
3230 LOOP UNTIL I>N OR K=1 'go to the next parameter
3240 'EJECT 'K=1 indicates a search failed & thus terminates program

```

```

3250 REM THIS SECTION ORDERS THE RANDOM ACCESS ADDRESSES OF THE FOUND SYSTEMS( TO THIS POINT
3260 REM UNORDERED AND IN FILE #4) . THE ADDRESSES ARE REORDERED ALPHABETICALLY ACCORDING
3270 REM TO THE STATE (OR COUNTRY) OF THEIR RESPECTIOVE SYSTEMS. THE ORDERING PROCESS IS
3280 REM ACHEIVED BY A STANDARD BINARY TREE SORT.
3290 LET N=0
3300 DO WHILE MORE #4
3310 INPUT #4: X
3320 RESET #1: (X-1)*E1
3330 READ #1: C19,C0
3340 LET N=N+1
3350 CALL "BILDTREE": B0(),L(),R(),C0,N,X,X() 'build an alphabetically ordered tree(left son<father<right son)
3360 LOOP
3370
3380
3390 CALL "TREESORT": L(),R(),I,L,F(),X() 'send completed tree x() to tree sort. return the ordered vector f()
3400 'EJECT

```

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3410 REM F IS A VECTOR OF RANDOM ACCESS ADDRESSES OF FOUND SYSTEMS, ALPHABETICALLY ORDERED
3420 REM BY STATE. IN THIS SECTION, THE ADDRESSES OF THE SYSTEMS WITHIN EACH STATEARE
3430 REM ORDERED ALPHABETICALLY. A STANDARD BINARY TREESORTIS AGAIN USED FOR THE
3440 REM ORDERING PROCESS. T
3450 MAT L=ZER
3460 MAT R=ZER
3470 MAT D0=NUL0
3480 LET L(0)=0
3490 LET R(0)=0
3500
3510 LET I=0 'count of systems read from vector F
3520 LET K=0 'count of systems ordered by system name
3530 PERFORM GET NAMEDATA 'get a system
3540 DO UNTIL B0(I)="" 'end of file marker
3550 DO
3560 CALL "BILDTREE": D0(),L(),R(),D0(I),I,X,X() 'build an alphabetically ordered tree(left son<father<right son)
3570 PERFORM GET NAMEDATA
3580 LOOP WHILE B0(I)=B0(I-1) 'i.e. loop until all systems of the same state have been read
3590 IF B0(I-1)<>B0(I-2) 'if there is only one system for the state
3600 THEN LET F(I-1)=X(I-1) 'then do not bother sorting tree,there is only one system from that state
3610 ELSE LET L=N+1 'else un,load the tree composed of all systems in one state
3620 LET N=N+1
3630 CALL "TREESORT": L(),R(),N,L,F(),X()
3640 CONTINUE
3650
3660 LET K=I-1 'save the vector F address of the last sys in a particular state
3670 MAT L=ZER
3680 MAT R=ZER
3690 LET L(0)=0
3700 LET R(0)=0
3710 LET D0(I)=""
3720 LOOP
3730
3740
3750 REM THE VECTOR OF ALPHABETICALLY ORDERED ADDRESSES ARE READ BACK INTO
3760 REM FILE #4
3770 SCRATCH #4
3780 FOR K=1 TO N
3790 PRINT #4: F(K)
3800 NEXT K
3810 RESET #4
3820 'EJECT

```

```

3830 REM READOUT OF RESULTS
3840 LET V9=0 'count of lines (already printed)
3850 LET V9=0 'count of lines to be printed
3860 IF K<>0
3870 THEN PRINT
3880 PRINT "DO YOU WISH A READOUT OF AVAILABLE PAPERS",
3890 INPUT R9
3900 PRINT CHR$(ASC(FF)) 'form feed
3910
3920
3930
3940 REM PRINT HEADERS
3950 PRINT
3960 PRINT "SYSTEM NAME", TAB(T(1)); "LOCATION", TAB(T(2)); "SYSTEM",
3970 PRINT TAB(T(3)); "FLOW", TAB(T(4)); "WASTE TYPE", TAB(T(5)); "GROUND",
3980 PRINT TAB(T(6)); "TREATMENT", TAB(T(7)); "APPLIC.", TAB(T(8)); "APPLIC.",
3990 PRINT TAB(T(9)); "PURPOSE", TAB(T(10)); "DATE"
4000 PRINT TAB(T(2)); "TYPE", TAB(T(3)); "RATE", TAB(T(5)); "COVER",
4010 PRINT TAB(T(6)); "TYPE", TAB(T(7)); "MODE", TAB(T(8)); "RATE"
4020 PRINT TAB(T(3)); "m.g.d.", TAB(T(8)); "in./wt."
4030 PRINT
4040 LET V9=7
4050
4060
4070 REM READOUT OF FOUND SYSTEMS
4080
4090 DO WHILE MORE #4
4100 INPUT #4: I
4110 RESET #1: (I-1)*E1
4120 RESET #2: (I-1)*E2
4130 LET C3=C26
4140 READ #1: C19, C26
4150 READ #2: D(1), D(2), D(3), D(4), D(5), D(6), D(7), D(8), D(9), D(10)
4160 IF C3<> C26 'if state (or country) of adjoining system is different
4170 THEN PERFORM LINE
4180 LET V9=V9+1
4190 CONTINUE
4200 PRINT
4210 PRINT
4220 LET V9=V9+7
4230
4240
4250 REM READOUT OF PAPER INFORMATION
4260 IF R9="YES"
4270 THEN IF D(1)>0 'D(1) is the paper location pointer in ----. NUM. 0 indicates no papers
4280 THEN RESET #3
4290 LET V1=0
4300 DO
4310 INPUT #3: A, 'A is the paper location pointer in ----. PAP
4320 IF A=D(1)
4330 THEN LET V1=V1+1 'count of papers
4340 INPUT #3: V9(V1), M9(V1), X9(V1), E9(V1), Z(V1), 'author, title, publication, date, no. lines of abstract
4350 FOR V3= 1 TO Z(V1)
4360 INPUT #3: U9(V1, V3),

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4370 NEXT V3
4380 LET V9=V9+Z(V1)+5
4390 ELSE INPUT #3: Z9 'in effect, a carriage return
4400 CONTINUE
4410 LOOP WHILE MORE #3
4420 CONTINUE
4430 CONTINUE
4440 'EJECT

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4450
4460
4470 REM PRINTOUT OF FOUND SYSTEMS
4480 IF V9<V55
4490 THEN LET V=V9 'reset line counter
4500 LET V9=0
4510 PRINT CHR$(ABC(FF)) 'form feed
4520 ELSE PRINT 'print a line
4530 LET V=V+V9
4540 LET V9=0
4550 CONTINUE
4560 PRINT C19, TAB(T(1)), C29: 'dump out the system
4570 FOR X1=2 TO 10
4580 PRINT TAB(T(X1)),
4590 SELECT CASE X1
4600 CASE 3,8,10
4610 IF D(X1)<>0 '0 signals that the category is not applicable or unknown
4620 THEN PRINT D(X1),
4630 ELSE PRINT " N/A ",
4640 CONTINUE
4650 DEFAULT
4660 PRINT B$(X1+1, 1+D(X1)),
4670 CONTINUE
4680 NEXT X1
4690 PRINT
4700
4710 REM PRINTOUT OF PAPERS OF FOUND SYSTEMS
4720 IF R8="YES"
4730 THEN PRINT
4740 FOR V2 = 1 TO V1
4750 PRINT "AUTHOR-", M$(V2)
4760 PRINT "TITLE-", V$(V2)
4770 PRINT "PUBLICATION-", X$(V2)
4780 PRINT "PUB. DATE-", E$(V2)
4790
4800 REM READOUT & PRINTING OF ABSTRACT
4810 FOR V3= 1 TO Z(V2)
4820 PRINT U$(V2,V3)
4830 NEXT V3
4840 PRINT
4850 NEXT V2
4860 CONTINUE
4870 LOOP
4880
4890 ELSE PRINT "COULDN'T FIND ANYTHING THAT FITS THOSE SPECIFICATIONS"
4900 CONTINUE
4910 PRINT CHR$(ABC(FF))
4920 'EJECT

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4930 DEFINE ENDCHECK 'routine to test for the end of --- (NUM OR NAM) or file #4 where applicable
4940 IF F1<>1 'if true then we're using file #4 as a key
4950 THEN IF END #4 'test whether #4 is through
4960 THEN LET B=0 'yes
4970 ELSE LET B=1 'no
4980 CONTINUE
4990 ELSE IF LOC(0F)=LOC(0F)-(F-1) 'otherwise, test for the end of Master File (F=1, ---, NAM, F=2, ---, NUM)
5000 THEN LET B=0 'yes, file has ended
5010 ELSE LET B=1 'no, it hasn't
5020 CONTINUE
5030
5040 DEFEND
5050
5060 DEFINE RESET 'procedure to dump file #5 into #4 & reset #4
5070 SCRATCH #4
5080 RESET #5
5090
5100 DO WHILE MORE #5 'loop to dump #5 into #4
5110 INPUT #5 A
5120 PRINT #4 A
5130 LOOP
5140 SCRATCH #5
5150 RESET #4
5160 IF END #4 THEN LET K=1 'search turned up nothing
5170 DEFEND
5180
5190 DEFINE LINE
5200 FOR X1=1 TO 133
5210 PRINT "--",
5220 NEXT X1
5230 PRINT
5240 DEFEND LINE
5250
5260 DEFINE GET NAMEDATA
5270 LET I=I+1 'increase the count of processed systems by one
5280 IF I=N+1 'if the count of processed systems is greater than the actual number
5290 THEN LET B$(I)="X" 'then set the flag
5300 ELSE LET X=F(I) 'else get the actual data
5310 RESET #1: (X-1)*E1
5320 READ #1: D$(I),B$(I)
5330 CONTINUE
5340 DEFEND
5350 'EJECT

```



```

1510 RESET #1: LDF(#1)
1520 RESET #2: LDF(#2)-1
1530 READ #2: P
1540 RESET #2: LDF(#2)-1
1550
1560
1570 REM PROCEDURE TO READ TAB SETTINGS FOR OUTPUT FORMAT
1580 FOR C=1 TO 10
1590 READ T(C)
1600 NEXT C
1610 DATA 16, 31, 43, 51, 66 'tab settings
1620 DATA 78, 94, 104, 114, 127 'tab settings
1630
1640
1650 REM ESTABLISH SEARCH PARAMETERS
1660 LET L$(1)="NAME OF SYSTEM"
1670 LET L$(2)="LOCATION (NAME OF STATE OR COUNTRY)"
1680 LET L$(3)="TYPE OF SYSTEM (PROTOTYPE, OPERATING)"
1690 LET L$(4)="FLOW RATE (MILLIONS OF GALLONS PER DAY, ZERO IF N/A)"
1700 LET L$(5)="TYPE OF WASTE (MUNICIPAL, INDUSTRIAL, AGRICULTURAL, GENERAL)"
1710 LET L$(6)="CHARACTERISTIC GROUND COVER (GRASS, TREES, VEG -CROP, FORAGE, NONE, N/A)"
1720 LET L$(7)="TREATMENT TYPE (SLOW INFILT., RAPID INFILT., OVERLAND FLOW, ALL, N/A)"
1730 LET L$(8)="APPLICATION MODE (SPRAY, FLOOD, BOTH, N/A)"
1740 LET L$(9)="APPLICATION RATE (INCHES PER WEEK, ZERO IF N/A)"
1750 LET L$(10)="PURPOSE OF SYSTEM (TREATMENT, IRRIGATION, RECHARGE, GENERAL)"
1760 LET L$(11)="YEAR OF INITIATION"
1770 LET L$(12)="NO. OF PAPERS (0 IF NONE)"
1780
1790 REM ESTABLISH ANSWERS TO PARAMETERS #3,5,6,7,8,10
1800 READ S$(3,1), S$(3,2), S$(3,3)
1810 DATA "2", "PROTOTYPE", "OPERATING"
1820 READ S$(5,1), S$(5,2), S$(5,3), S$(5,4), S$(5,5)
1830 DATA "4", "MUNICIPAL", "INDUSTRIAL", "AGRICULTURAL", "GENERAL"
1840 READ S$(6,1), S$(6,2), S$(6,3), S$(6,4), S$(6,5), S$(6,6), S$(6,7)
1850 DATA "6", "GRASS", "TREES", "VEG -CROP", "FORAGE", "NONE", "N/A"
1860 READ S$(7,1), S$(7,2), S$(7,3), S$(7,4), S$(7,5), S$(7,6)
1870 DATA "5", "SLOW INFILT.", "RAPID INFILT.", "OVERLAND FLOW", "ALL", "N/A"
1880 READ S$(8,1), S$(8,2), S$(8,3), S$(8,4), S$(8,5)
1890 DATA "4", "SPRAY", "FLOOD", "BOTH", "N/A"
1900 READ S$(10,1), S$(10,2), S$(10,3), S$(10,4), S$(10,5)
1910 DATA "4", "TREATMENT", "IRRIGATION", "RECHARGE", "GENERAL"
1920
1930 REM ABBREVIATED FORMS TO BE USED IN QUESTIONS
1940 READ M$(1), M$(2), M$(3), M$(4), M$(5), M$(6)
1950 READ M$(7), M$(8), M$(9), M$(10), M$(11), M$(12)
1960 DATA "SYSTEM", "LOCATION", "SYSTEM TYPE", "FLOW RATE", "WASTE TYPE", "GROUND COVER"
1970 DATA "TREAT TYPE", "APPLIC. MODE", "APPLIC. RATE", "PURPOSE", "DATE", "# OF PAPERS"
1980
1990 'EJECT

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2000 PRINT "DO YOU WISH TO 'ADD' NEW INFO. OR 'REVISE' OLD",
2010 DO
2020 INPUT I$
2030 LET I$ = SEG$(I$,1,3)
2040 IF I$ <> "ADD" AND I$ <> "REV"
2050 THEN PRINT "INCORRECT COMMAND 'ADD' OR 'REVISE'",
2060 CONTINUE
2070 LOOP UNTIL I$ = "ADD" OR I$ = "REV"
2080 IF I$="ADD"
2090 THEN
2100 DO
2110 PRINT "DO YOU WANT TO ADD A 'SYSTEM' OR A 'PAPER'?",
2120 INPUT I$
2130 IF SEG$(I$,1,3) = "SYS"
2140 THEN
2150 PRINT "DO YOU NEED A LIST OF THE CATEGORIES?",
2160 PERFORM ANSWER
2170 IF I1$="Y"
2180 THEN PRINT
2190 PRINT "YOU WILL BE ASKED TO PROVIDE THE FOLLOWING INFORMATION"
2200 FOR X1=1 TO 12
2210 PRINT "X1, ", L$(X1)
2220 NEXT X1
2230 PRINT "FOR CATEGORIES #4, 9 & 11 (FLOW RATE, APPLIC. RATE"
2240 PRINT "AND YEAR), IF THE INFORMATION IS NOT KNOWN OR NOT APPLICABLE"
2250 PRINT "TYPE A 0 (ZERO)"
2260 PRINT "YOU WILL THEN BE ASKED TO INPUT INFORMATION ON ANY PAPERS"
2270 PRINT "DOING ONE PAPER AT A TIME THE MACHINE WILL REQUEST THE TITLE,"
2280 PRINT "THE AUTHOR(S), PUBLICATION WHERE IT APPEARED, YEAR OF"
2290 PRINT "PUBLICATION AND AN ABSTRACT"
2300 PRINT "WHEN YOU ARE THROUGH ENTERING DATA, HIT RETURN WHEN THE"
2310 PRINT "MACHINE TYPES 'SYSTEM?'"
2320 CONTINUE
2330
2340 PRINT
2350 PRINT
2360 DO
2370 MAT C=ZER
2380 LET X=1
2390 DO
2400 PERFORM PARAMETER
2410 LET X=X+1
2420 LOOP UNTIL X>12 OR C$(1)="" 'when X=12 then P2 is returned by 'Parameter'
2430
2440 IF C$(1)="" AND H<>1 'means that we have to record an addition ( its name is
2450 THEN RESET #2: LDF(#2) - 1 'not null and we haven't seen it before )
2460 WRITE #1: C$(1), C$(2) 'name, then location
2470 WRITE #2: P2, C(2), C(3), C(4), C(5), C(6), C(7), C(8), C(9), C(10)
2480 WRITE #2: P
2490 PRINT
2500 CONTINUE
2510 LOOP WHILE C$(1)="" AND H <> 1 'terminate if either 1: H=1, or 2: C$(1) is null
2520 'EJECT

```

```

2530 'section of code to add papers to existing systems
2540
2550 ELSE
2560 PRINT "NAME, LOCATION OF SYSTEM TO WHICH PAPER IS TO BE ADDED",
2570 INPUT C$(1), C$(2)
2580
2590 PERFORM HEADERS
2600 PERFORM LINE
2610 PRINT
2620
2630 PERFORM FIND SYSTEM
2640 IF I1# "Y"
2650 THEN PRINT "NO STATION FOUND WITH YOUR REQUIREMENTS PLEASE RECHECK YOUR DATA "
2660 ELSE
2670 PERFORM PAP NUM 'set up P2 and pointer in --- NUM
2680 PRINT "HOW MANY PAPERS TO BE ADDED TO THIS SYSTEM",
2690 INPUT P1
2700 PERFORM MANY PAPER ADD
2710 CONTINUE
2720
2730 CONTINUE
2740 PRINT "MORE ADDITIONS",
2750 INPUT I1#
2760 LOOP WHILE SEG$( I1#, 1, 1) = "Y"
2770 'EJECT
    
```

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2780 ELSE
2790 DO
2800 PRINT "DO YOU WANT TO REVISE A SYSTEM OR A PAPER",
2810 INPUT Z$
2820 LET Z$ = SEG$(Z$, 1, 3)
2830 IF Z$ = "SYS"
2840 THEN
2850 PRINT "NAME, LOCATION OF SYSTEM TO BE CHANGED",
2860 INPUT C$(1), C$(2) 'input system name and location
2870 LET N1=0
2880 RESET #1 0 'reset --- NAM
2890 DO
2900 READ #1 D$(1), D$(2) 'readout the system name & location from --- NAM
2910 IF C$(1)=D$(1) AND C$(2)=D$(2) 'if the existing system matches the desired system
2920 THEN PRINT #4 LOC(#1)/E1 'store its location
2930 LET N1=N1+1
2940 CONTINUE
2950 LOOP WHILE LOC(#1)<LOC(#1)
2960 RESET #4
2970
2980 PRINT
2990 PRINT N1, " SYSTEM(S) FOUND"
3000 PRINT
3010 PRINT
3020
3030 IF N1>0
3040 THEN
3050 PRINT "ENTER PARAMETER NUMBERS YOU WISH TO CHANGE"
3060 PRINT "(TYPE 0 FOR A LIST)",
3070 DO
3080 LET C9=0 'flag variable for incorrect input
3090 MAT S=ZER
3100 MAT INPUT S 'search parameters
3110 LET N=NUM 'number of search parameters
3120 FOR X=1 TO N
3130 IF S(X)<>INT(S(X)) OR S(X)>11 OR S(X)<1 'check for correct format
3140 THEN IF S(X)=0 'if a list is desired
3150 THEN PRINT
3160 PRINT "THE POSSIBLE PARAMETERS ARE "
3170 FOR X1=1 TO 11 'print the list of parameters
3180 PRINT " X1: ", L$(X1)
3190 NEXT X1
3200 PRINT "ENTER SEARCH PARAMETERS",
3210 LET X=N
3220 LET C9=1
3230 ELSE PRINT "NO SUCH PARAMETER AS ", S(X)
3240 PRINT "TRY RETYPING IT",
3250 INPUT S(X)
3260 LET X=X-1
3270 CONTINUE
3280 CONTINUE
3290 NEXT X
3300 LOOP WHILE C9=1
3310 'EJECT
    
```

```

3320      MAT C=ZER
3330      LET X9=1
3340      DO
3350          LET X=S(X9)
3360          PERFORM PARAMETER
3370          LET X9=X9+1
3380      LOOP UNTIL X9>N
3390      PERFORM HEADERS
3400      PERFORM LINE
3410      PRINT
3420      PRINT
3430      DO WHILE MORE #4
3440          INPUT #4: X
3450          RESET #1: (X-1)*E1
3460          RESET #2: (X-1)*E2
3470          READ #1: D#(1), D#(2)
3480          READ #2: D(1), D(2), D(3), D(4), D(5), D(6), D(7), D(8), D(9), D(10)
3490          FOR X2=1 TO N
3500              SELECT CASE S(X2)
3510                  CASE 1,2
3520                      LET D#(S(X2))=C#(S(X2))
3530                  DEFAULT
3540                      LET D(S(X2)-1)=C(S(X2)-1)
3550              CONTINUE
3560          NEXT X2
3570          PRINT D#(1), TAB(T(1)), D#(2)
3580          PERFORM DUMP STATION
3590          PRINT "LOOKS O.K. (YES OR NO)";
3600          INPUT A2#
3610          IF A2#="YES"
3620              THEN RESET #1: (X-1)*E1
3630                  RESET #2: (X-1)*E2
3640                  WRITE #1: D#(1), D#(2)
3650                  WRITE #2: D(1), D(2), D(3), D(4), D(5), D(6), D(7), D(8), D(9), D(10)
3660              ELSE PRINT "CHANGE NOT MADE"
3670              CONTINUE
3680              PRINT
3690              PRINT
3700          LOOP
3710      CONTINUE
3720      SCRATCH #4
3730      'EJECT

```

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```

3740      ELSE
3750          RESET #1: 0
3760          PRINT "NAME, LOCATION OF SYSTEM";
3770          INPUT C#(1), C#(2)
3780          PERFORM HEADERS
3790          PERFORM LINE
3800          PRINT
3810          PERFORM FIND SYSTEM
3820          IF I1# <> "Y"
3830              THEN PRINT "NO STATION FOUND WITH YOUR REQUIREMENTS "
3840          ELSE
3850              IF D(1) = 0
3860                  THEN PRINT "THERE ARE NO PAPERS ASSOCIATED WITH THAT STATION "
3870              ELSE
3880                  RESET #3
3890                  SCRATCH #5
3900                  LET I1# = ""
3910                  DO UNTIL I1# = "Y" OR END #3
3920                      INPUT #3: P2, P1#, P2#, P3#, P4#, P9
3930                      IF P2 = D(1)
3940                          THEN
3950                              PRINT "AUTHOR: ", P2#
3960                              PRINT "TITLE: ", P1#
3970                              PRINT
3980                              PRINT "CORRECT ARTICLE";
3990                              PERFORM ANSWER
4000                              PRINT
4010                              IF I1# = "N" THEN PERFORM DUMP.3 TO 5
4020                          ELSE
4030                              PERFORM DUMP.3 TO 5
4040                          CONTINUE
4050                  LOOP
4060
4070                  'this code will change an entry in a paper only if the user types in
4080                  'a non null response to the question.
4090                  IF I1# <> "Y"
4100                      THEN
4110                          PRINT "ALL PAPERS FOR THAT SYSTEM HAVE BEEN PRODUCED."
4120                          PRINT "NONE FIT YOUR REQUIREMENTS. PLEASE RECHECK YOUR DATA"
4130                      ELSE
4140                          PERFORM PAPER INFO
4150                          'EJECT

```

```

4160 IF X2 = 1 'then the abstract did not change
4170 THEN
4180   PERFORM DUMP 3 TO 5
4190 ELSE
4200   'if the abstract changed, we have to do everything the hard way
4210   PRINT #5: P2, " ", Z&P1&Z6, " ";
4220   PRINT #5: Z&P2&Z6, " ", Z&P3&Z6, " ";
4230   PRINT #5: Z&P4&Z6, " ", (X2-1);
4240   FOR X1 = 1 TO (X2-1)
4250     PRINT #5: " ", Z&A&(X1)&Z6;
4260   NEXT X1
4270   PRINT #5;
4280   IF P9 <> 0 THEN LINPUT #3: P5&
4290   CONTINUE
4300
4310 DO UNTIL END #3 'dump the rest of the papers to temp file #5
4320   LINPUT #3: P5&
4330   PRINT #5: P5&
4340 LOOP
4350
4360 SCRATCH #3 'be very careful. There goes the data
4370 RESET #5 'Scratch file with all the data
4380 DO UNTIL END #5 'completely copy file #5 into file #3
4390   LINPUT #5: T&
4400   PRINT #3: T&
4410 LOOP
4420
4430   CONTINUE
4440     CONTINUE
4450       CONTINUE
4460         CONTINUE
4470
4480 PRINT "MORE REVISIONS".
4490 PERFORM ANSWER
4500 LOOP WHILE I1&="Y"
4510 CONTINUE
4520
4530 'EJECT

```

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```

4540 DEFINE PARAMETER
4550 IF X <> 12 THEN PRINT M&(X); 'print header if not paper section
4560
4570 SELECT CASE X
4580
4590 CASE 1,2 'system name, location data
4600 DO
4610   LINPUT C&(X)
4620   IF LEN(C&(X))>14 THEN PRINT "TOO LONG! TRY AGAIN"; 'string can't be longer than 14 characters
4630   LOOP UNTIL LEN(C&(X))<=14
4640
4650 CASE 3,5,6,7,8,10 'system type, waste type, etc. data
4660 DO
4670   INPUT A& 'input parameter
4680   LET A1&=SEG$(A&,0,3) 'take first 3 letters
4690   LET X1=VAL(S&(X,1))+1 'number of choices plus 1 ( skip first S& since its not a choice)
4700   LET X2=2 'start with 2nd S& because of the above
4710   DO
4720     IF A1&=SEG$(S&(X,X2),0,3) THEN LET C(X-1)=X2-1 'if a hit is scored note which one it was
4730     LET X2=X2+1 'up the choice counter by one
4740     LOOP UNTIL X2>X1 OR C(X-1)>0
4750     IF C(X-1)=0 'if no hits
4760     THEN PRINT "NO SUCH SPECIFICATION AS "; A&
4770     PRINT "THE POSSIBILITIES ARE "
4780     FOR X2=2 TO X1
4790       PRINT " ", S&(X,X2)
4800     NEXT X2
4810     PRINT "TRY RETYPING IT";
4820     CONTINUE
4830     LOOP UNTIL C(X-1)>0 'loop until a choice has been made
4840
4850
4860 CASE 4,9,11 'flow rate, app. rate, year data
4870   INPUT C(X-1)
4880   IF X<>11
4890     THEN LET C(X-1)=INT(1000*C(X-1)+.5)/1000 'don't want more than 3 decimal places for these guys
4900     ELSE LET C(X-1)=INT(C(X-1)) 'only want whole nos. for years
4910   CONTINUE
4920
4930 'EJECT

```

```

4940 CASE 12 'paper data
4950 LET H=0 'flag variable to indicate existence of duplicate system (H=1 if so)
4960 'routine to search for a possible duplicate system
4970 LET L1=LOC(01) 'save present position in ----.NAM
4980 LET L2=LOC(02) 'save present position in ----.NUM
4990 RESET 01:0
5000 RESET 02:0
5010 DO WHILE LOC(01)<LOC(01) AND H<1
5020 READ 01:D10,D20
5030 READ 02:D(1),D(2),D(3),D(4),D(5),D(6),D(7),D(8), D(9), D(10)
5040 IF C0(1)=D10 AND C0(2)=D20 'test whether system name & location match
5050 THEN LET N2=1 'counter
5060 DO
5070 LET N2=N2+1
5080 LOOP UNTIL N2>10 OR C(N2)<>D(N2) 'test system type, flow rate, etc. for matches
5090 IF N2>10 'if true then there is a duplicate system already in the files
5100 THEN
5110 LET H = 1 'set flag for duplicate system found
5120 CONTINUE
5130 CONTINUE
5140 LOOP
5150 RESET 01:L1 'set ----.NAM to its original position
5160 RESET 02:L2 'set ----.NUM to its original position
5170
5180 IF H = 1 'if we found a duplicate system, then error message...
5190 THEN
5200 PRINT
5210 PRINT "DUPLICATE SYSTEM FOUND. ADDITIONS NOT MADE."
5220 PRINT "PLEASE ENTER PAPERS TO EXISTING SYSTEMS USING THE 'ADD PAPER' SECTION."
5230 PRINT
5240 ELSE 'if no duplicate system found, assign a new paper location no.
5250 PRINT H0(X);
5260 INPUT P1
5270 IF P1 > 0
5280 THEN
5290 PRINT
5300 PRINT "INFORMATION ON PAPER(S)"
5310 PRINT
5320 LET P = P + 1
5330 LET P2 = P
5340 PERFORM MANY.PAPER.ADD
5350
5360 ELSE LET P2 = 0 'set location no. to zero -- no papers with this system
5370
5380 CONTINUE
5390 CONTINUE
5400
5410 CONTINUE
5420 DEFEND
5430 'EJECT

```

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```

5440 DEFINE HEADERS
5450 'subroutine to print headers on terminal
5460 PRINT
5470 PRINT
5480 PRINT "SYSTEM NAME"; TAB(T(1)); "LOCATION"; TAB(T(2)); "SYSTEM";
5490 PRINT TAB(T(3)); "FLOW"; TAB(T(4)); "WASTE TYPE"; TAB(T(5)); "GROUND";
5500 PRINT TAB(T(6)); "TREATMENT"; TAB(T(7)); "APPLIC."; TAB(T(8)); "APPLIC.";
5510 PRINT TAB(T(9)); "PURPOSE"; TAB(T(10)); "DATE"
5520 PRINT TAB(T(2)); "TYPE"; TAB(T(3)); "RATE"; TAB(T(5)); "COVER";
5530 PRINT TAB(T(6)); "TYPE"; TAB(T(7)); "MODE"; TAB(T(8)); "RATE"
5540 PRINT TAB(T(3)); "m.g.d."; TAB(T(8)); "in./wk."
5550 DEFEND HEADERS
5560
5570 DEFINE DUMP.3 TO.5
5580 IF P9 < 0 'then there will be more on this line of entry.
5590 THEN 'because of the abstract.
5600 LINPUT 03: P50
5610 PRINT 05: P2; ", ", Z0&P10&Z0; ", ";
5620 PRINT 05: Z0&P20&Z0; ", ", Z0&P30&Z0; ", ";
5630 PRINT 05: Z0&P40&Z0; ", ", P9; ", ", P50
5640 ELSE
5650 PRINT 05: P2; ", ", Z0&P10&Z0; ", ";
5660 PRINT 05: Z0&P20&Z0; ", ", Z0&P30&Z0; ", ";
5670 PRINT 05: Z0&P40&Z0; ", ", P9
5680 CONTINUE
5690 DEFEND DUMP.3 TO.5
5700
5710 DEFINE DUMP.STATION
5720 FOR X1=2 TO 10 'dump out the station legibly
5730 PRINT TAB(T(X1));
5740 SELECT CASE X1
5750 CASE 3,9,10
5760 IF D(X1)<>0 '0 signals that the category is not applicable or unknown
5770 THEN PRINT D(X1);
5780 ELSE PRINT " N/A ";
5790 CONTINUE
5800 DEFAULT
5810 PRINT 05:(X1+1, 1+D(X1));
5820 CONTINUE
5830 NEXT X1
5840 PRINT
5850 DEFEND DUMP.STATION
5860 'EJECT

```

```

5870 DEFINE FIND.SYSTEM
5880 LET I18 = ""
5890 RESET #1: 0 'reset our question flag for this do-loop
5900 DO 'reset our name file(---.NAM)
5910 READ #1: D8(1), D8(2)
5920 IF C8(1) = D8(1) AND C8(2) = D8(2) 'did we find a station with the right name?
5930 THEN
5940 RESET #2: ( LOC(#1)/E1 - 1 ) * E2 'check to see if this is the right station
5950 READ #2: D(1),D(2),D(3),D(4),D(5),D(6),D(7),D(8),D(9),D(10)
5960 PRINT D8(1); TAB(T(1)); D8(2);
5970 PERFORM DUMP STATION
5980 PRINT
5990 PRINT "CORRECT SYSTEM";
6000 DO
6010 PERFORM ANSWER
6020 LOOP UNTIL I18 = "Y" OR I18 = "N"
6030 PRINT
6040 CONTINUE
6050 LOOP UNTIL I18 = "Y" OR LOC(#1) = LOF(#1)
6060 DEFEND FIND.SYSTEM
6070
6080 DEFINE PAP.NUM
6090 IF D(1) = 0 'when adding paper to system that previously had no papers.
6100 THEN 'we must remember to give the system a paper pointer
6110 LET P = P + 1
6120 LET P2 = P
6130 LET P3 = LOC(#2)
6140 RESET #2: P2 - 10
6150 WRITE #2: P2
6160 RESET #2: P3
6170 ELSE
6180 LET P2 = D(1)
6190 CONTINUE
6200 DEFEND PAP.NUM
6210
6220 DEFINE LINE
6230 FOR X1 = 1 TO 133
6240 PRINT "--";
6250 NEXT X1
6260 PRINT
6270 DEFEND LINE
6280
6290 DEFINE QUOTE
6300 PRINT "QUOTES ARE NOT ALLOWED IN TEXT. USE APOSTROPHIES. TRY AGAIN"
6310 DEFEND QUOTE
6320
6330 DEFINE ANSWER
6340 DO 'make sure we get a yes or no
6350 LINPUT I18
6360 LET I18=SEG0(I18,1,1)
6370 IF I18 <> "Y" AND I18 <> "N" THEN PRINT "YES" OR "NO". REENTER: ";
6380 LOOP UNTIL I18 = "Y" OR I18 = "N"
6390 DEFEND ANSWER
6400

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6410 'EJECT

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