WRD Data Reports Preparation Guide

By Charles E. Novak

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CONTENTS

Page

Introduction........ 1
  Acknowledgments........ 3
Covers and preliminary pages........ 3
  Covers, title page, back-of-title page, preface, report documentation page........ 3
  Table of contents, illustrations, tables........ 5
  List of surface-water stations........ 5
  List of ground-water wells........ 7
    Water-level sites........ 7
    Water-quality sites........ 9
Introductory text........ 9
  Introduction........ 9
  Cooperation........ 11
  Acknowledgments........ 13
  Summary of hydrologic conditions........ 14
  Special networks and programs........ 16
  Explanation of records........ 17
    Station identification numbers........ 17
      Downstream order and station numbers........ 17
      Numbering system for wells and miscellaneous sites........ 21
    Records of stage and water discharge........ 21
      Data collection and computation........ 22
      Data presentation........ 22
      Identifying estimated daily discharge........ 23
      Accuracy of data........ 25
      Other data available........ 26
    Records of surface-water quality........ 27
      Classification of records........ 27
      Arrangement of records........ 27
      On-site measurements and sample collection........ 28
      Water temperature........ 28
      Sediment........ 28
      Laboratory measurements........ 28
      Data presentation........ 28
      Remark codes........ 28
    Records of ground-water levels........ 29
      Data collection and computation........ 29
      Data presentation........ 29
    Records of ground-water quality........ 30
      Data collection and computation........ 30
      Data presentation........ 30
    Records of precipitation quality........ 30
      Data collection and computation........ 30
      Data presentation........ 31
  Access to WATSTORE data........ 31
  Definition of terms........ 32
  Publications on techniques of water-resources investigations........ 32
  Illustrations........ 32
    Maps of hydrologic data sites........ 33
    Schematic diagrams........ 33
    Hydrologic-conditions bar graph........ 34
    Ground-water-level hydrographs........ 34

Surface-water-quantity data 35
Records provided by other agencies 35
Inclusion of records for stations in adjoining States 35
Manuscript station description 35
Basin name (running head) 36
Station number and name 37
Location 39
Latitude and longitude 40
Landlines 40
County name 40
Hydrologic-unit number 40
Dams 41
Bridges and stream banks 41
Towns and other culture 41
Tributaries 42
River mileage 42
Drainage area 43
Water-discharge records 47
Period of record 47
Records other than daily discharge or contents 48
Fragmentary records 49
Seasonal records 49
Direct reference to compilation reports 49
Criteria for equivalence of records 50
Name changes 51
Nonequivalent records 52
Qualifications for tributaries or diversions 53
Discredited records 53
Discharge measurements only 53
Gage heights published by other agencies 54
Unpublished records 55
Reference to operation as a partial-record station 55
Preferred order 56
Revised records 56
Gage 57
Type of gage 58
Datum of gage 59
History of changes 62
Auxiliary gage 63
Supplementary gage 64
Remarks 64
Accuracy 65
Identifying estimated daily record and assigning accuracy 65
Special methods of computation 67
Descriptive data for reservoirs 68
Regulation 70
Diversions 72
Miscellaneous data 75
Cooperation 76
U.S. Army Corps of Engineers 77
Average discharge 78
Effect of diversion or regulation 80
Corrections 80

Surface-water-quantity data--continued
Manuscript station description (continued)
Average discharge (continued)
Medians.......... 81
Extremes for period of record.......... 81
Extremes outside the period of record.......... 87
Extremes for current year.......... 90
Format.......... 90
Special conditions.......... 90
Peaks greater than a base discharge.......... 91
Criteria for selecting stations.......... 91
Criteria for selecting base discharge.......... 92
Criteria for selecting independent peaks greater than a base discharge.......... 93
Tabular format for peaks greater than a base discharge.......... 94
Special conditions.......... 95
Qualifying maximums and minimums.......... 96
Revisions.......... 103
Criteria for revisions.......... 103
Publication of revisions.......... 104
Extremes.......... 105
Peaks greater than base discharge.......... 106
Daily and monthly discharge.......... 107
Corrections.......... 109
General notes.......... 109
Discredited records.......... 110
Discontinued stations.......... 112
Skeleton rating table.......... 113
Tables of daily and monthly discharge.......... 115
Adjustments for effect of regulation or diversion.......... 115
Combined records of streamflow and diversion.......... 118
Records of discharge for periods greater than 1 year.......... 119
Extremes.......... 119
Tables of daily and monthly discharge.......... 120
Significant figures and rounding limits.......... 120
Inch-pound units.......... 120
International System (SI) units.......... 123
Footnotes and reference marks.......... 127
Records of gage height.......... 129
Remarks.......... 130
Extremes.......... 130
Daily table.......... 130
Reservoir records.......... 130
Criteria for publishing daily reservoir records.......... 131
Criteria for publishing records separately or in groups.......... 131
Format for daily reservoir records.......... 132
Format for monthly reservoir records.......... 133
Skeleton capacity tables.......... 134
Revisions of capacity tables.......... 134
Publication as supplement to streamflow record.......... 135
Details of publication.......... 135
Partial-record stations and miscellaneous sites.......... 136
Station name and number.......... 137

Surface-water-quantity data--continued
Partial-record stations and miscellaneous sites (continued)
Crest-stage partial-record stations.......... 137
Low-flow partial-record stations.......... 138
Discharge measurements at miscellaneous sites.......... 138
Format for publication.......... 139
Conversion from partial-record to continuous-record station.......... 141
Conversion from continuous-record to partial-record station.......... 142
Seepage and low-flow investigations.......... 142
Surface-water-quality data.......... 144
Records to be published.......... 144
Policy on publishing constituents with both field and laboratory values.......... 144
Procedures for retrieval of data for publication.......... 145
Surface-water-quality records.......... 145
Data-collection-site classification.......... 145
Arrangement of records.......... 146
Description headings.......... 149
Location.......... 149
Drainage area.......... 149
Period of record.......... 150
Period of daily record.......... 151
Instrumentation.......... 152
Remarks.......... 152
Cooperation.......... 154
Extremes.......... 154
Extremes for period of daily record.......... 156
Extremes outside period of daily record.......... 158
Extremes for current year.......... 159
Revisions.......... 159
Biological data.......... 160
Zooplankton.......... 160
Periphyton.......... 161
Primary productivity.......... 163
Phytoplankton.......... 164
Benthic invertebrates.......... 165
Analyses of samples, partial-record stations and miscellaneous sites.......... 166
Remark Codes.......... 167
Table titles.......... 169
Ground-water-level data.......... 170
Records to be published.......... 170
Arrangement of water-level data.......... 170
Description headings.......... 170
Well number.......... 171
Location.......... 171
Aquifer.......... 171
Well characteristics.......... 171
Instrumentation.......... 171
Datum.......... 172
Remarks.......... 172
Period of record.......... 173
Extremes for period of record.......... 173
Data tables.......... 173

Ground-water-quality data 175
    Arrangement of records 175
    Data tables 175
Precipitation-quality data 176
    Arrangement of records 176
    Description headings 176
        Location 177
        Period of record 177
        Instrumentation 177
        Remarks 178
    Data tables 178
Indexing the report 179
Preparation of camera-ready copy for direct-image offset printing 187
    Format 187
    Station description 188
    Daily tables 189
    Footnotes 189
    Surface-water partial-record stations and miscellaneous sites 190
    Contents, list of stations, and introductory text 190
    Illustrations 191
    Index 191
    Manual procedures for preparation of camera-ready copy 192
        Typing camera-ready copy 192
        Laying out a camera-ready sheet 193
Printing State annual hydrologic-data reports 195
References 199

ILLUSTRATIONS

Figure 1. Map showing downstream order and station numbers of gaging stations in hypothetical river basin........ 20
2. Sketch showing alinement of station manuscript sheet with computer printout........ 194

TABLES

Table 1. Significant figures and rounding limits for daily discharge........ 121
2. Significant figures and rounding limits for monthly and yearly means and average discharge........ 121
3. Significant figures and rounding limits for discharge per square mile.... 122
4. Significant figures and rounding limits for monthly and yearly runoff (acre-feet)........ 122
5. Data-table format (typed) for publishing zooplankton data........ 161
6A. Data-table format (typed) for publishing periphyton data........ 162
6B. Data-table format (typed) for publishing periphyton data........ 163
7. Data-table format (typed) for publishing primary productivity data....... 164
8. Data-table format (typed) for publishing phytoplankton data........ 164
9. Data-table format (typed) for publishing benthic-invertebrate data....... 165
10. Data-table format (typed) for publishing precipitation-quality data...... 178

APPENDIX A

Example

1. Title page....A-1
2. Back-of-title page....A-2
3. Preface....A-3
4. Report documentation page (Optional Form 272)....A-4
5. Table of contents, illustrations, and tables....A-5
6. List of surface-water stations....A-7
7. List of ground-water wells....A-9
8. Introductory text....A-10
9. Introductory page to surface-water records (with REMARK CODES)....A-33
10. Introductory page to ground-water-quality records (with REMARK CODES)....A-34
11. Supplemental water-quality data for gaging stations....A-35
12. Table showing summary of floods at selected sites....A-36
13. Flood hydrographs at selected sites....A-37
14. Map showing location of observation wells (recording and nonrecording)....A-38

15A. Water-discharge station only (data-table flagged)....A-39

15B. Water-discharge station only (data-table not flagged)....A-40

16. Water-quality station at nongaged site (with daily record)....A-41
17. Water-quality station at nongaged site....A-44

18A. Water-discharge and water-quality stations interleafed....A-46

18B. Water-discharge and water-quality stations interleafed (with water-quality monitor)....A-50

19. Daily reservoir record....A-58
20. Monthly reservoir record....A-59

21A. Group reservoir records (large reservoirs)....A-60

21B. Group reservoir records (small reservoirs)....A-61

22. Daily gage-height station....A-62
23. Crest-stage partial-record stations....A-63
24. Low-flow partial-record stations....A-63
25. Discharge measurements at miscellaneous sites....A-64
26. Seepage investigation....A-64
27. Water-quality partial-record stations and miscellaneous sites....A-65
28. Ground-water levels, 12-column format (skeleton, every 5th day-eom)....A-68
29. Ground-water levels, 6-column format....A-68
30. Ground-water record with three-year hydrograph....A-69
31. Ground-water levels, multiple-station line format....A-70
32. Ground-water-level record with 5-year hydrograph....A-72
33. Ground-water record with long-term hydrograph (Max-Min)....A-73
34. Quality of ground water....A-74
35. Quality of precipitation....A-76
36. Index....A-77

APPENDIX B

Example

1. Summary of Hydrologic Conditions (WDR: NV-82-1)...............B-1
2. Summary of Hydrologic Conditions (WDR: UT-83-1)...............B-7
3. List of water-related reports for (State)....................B-21
4. List of discontinued gaging stations.........................B-22
5. List of discontinued surface-water-quality stations...........B-23
6. Computer-generated 5-year hydrographs for four representative gaging stations..........................B-24
7. Hydrographs for four wells showing long-term ground-water-level trends.................................B-25
8. Schematic diagram showing diversion of streamflow.............B-26
9. Transmittal letter to U.S. Government Printing Office (GPO)..B-27
10. Printing and binding requisition (SF-1)--Uncompleted, numerically coded form...................................B-28
11. Printing and binding requisition (SF-1)--Sample completed from..B-29
12. Printer's instructions.......................................B-30
13. Map of Federal printing regions..............................B-31
14. Addresses of GPO Regional Printing Procurement Offices........B-32
15. Annual questionnaire for State data reports..................B-33
16. Revision of daily discharge (one month of record).............B-34
17. Revision of peak discharges and daily discharges for high-water periods during a water year..................B-35
18. Revision of peak discharges and/or annual maximum discharge (24 water years)..............................B-36
19. Format for publishing records of water discharge for periods greater than 1 year.............................B-37
20. Revision of daily discharge (8 water years)..................B-38
21. Explanation of local well numbers (one State).................B-39
22. Explanation of ground-water-level records (two States)........B-40
23. Summary of hydrologic conditions--ground-water-levels section (two States)....................................B-42

INTRODUCTION

These instructions relate to the preparation of the hydrologic data reports in the annual series titled "U.S. Geological Survey Water-Data Reports." This series, containing streamflow data, water-quality data for precipitation, surface, and ground water, and ground-water-level data, superseded the three series of water-supply papers titled "Surface-Water Supply of the United States" (1900-1970); "Quality of Surface Waters of the United States (1941-1970); and "Ground Water Levels in the United States (1940-1974)." In effect, this series granted official status to the hydrologic-data State releases.

This report, which supersedes the 1976 publication "Preparation of Water-Resources Data Reports," has been updated with two principal goals in mind. The first goal was to make the report easier to use by improving the layout, content, and clarity of the guidelines for those personnel involved in preparing State data reports. To help accomplish this, many suggestions from field and District offices have been incorporated into the guidelines. As one major consequence, more examples have been included, with virtually all of the full-page examples appearing in the appendices being selected from previously published data reports, as requested by those in the field. The second goal was to have future published State data reports reflect the principles of policy, good usage, and custom as set forth in the "Water Resources Division Publication Guide," 1982 edition, and "Suggestions to Authors of the Reports of the United States Geological Survey," fifth edition, 1958, and sixth edition, 1978. Wherever possible, appropriate changes have been made to the guidelines to accomplish this end.

The general format for State data reports remains virtually the same as in the 1976 publication. Surface-water-discharge and surface-water-quality data for the same collection site will be interleaved as before, whereas in the ground-water-records section, ground-water-quality data will still follow ground-water-level data. Interleaving of ground-water-level and ground-water-quality data usually is not appropriate because the two types of data generally are not obtained from the same well, and each individually printed analysis would require a separate set of space-consuming headings. Instructions for presenting ground-water-quality data are given immediately after the instructions for presenting ground-water-level data.

Two major policy changes should make the annual hydrologic-data reports easier to prepare. Revisions of water-quality data will no longer be published and the use of International System (SI) units in the station manuscript will no longer be required. A "Revisions" paragraph will still be required, when appropriate, in the station manuscript of water-discharge stations. A District's decision to include dual units in station manuscripts should be made in consideration of District and cooperators' preferences.

One major policy change will make the annual data report more useful, particularly to those involved in analytical work such as rainfall-runoff modeling or daily-flow correlations and in regulatory monitoring of streamflow. Beginning with the 1985 water-year report, all estimated daily discharges will be identified. The identification will apply to all daily discharges that were estimated using any method other than the normal application of a stage, velocity, or stage-fall rating at the gaging station, such as comparison of hydrographs with nearby stations, interpolation between sites on the same stream, interpolation between discharges on a recession, and use of weather records. Both periods of lost record and periods for which the stage-discharge relation is invalid because of backwater or other reasons will be identified. The estimated values either will be flagged in the daily-discharge table or identified by date in the REMARKS paragraph of the station description.

Reports for some Districts may be too cumbersome to handle or to bind. Reports exceeding approximately 600 pages should be divided into two or more volumes. The criterion for publishing multiple volumes should be based on natural drainage boundaries, if practical. All such divisions into more than one volume should be submitted to the WRD Publications Planning Unit in Reston for appropriate updating of the cover negatives.[1]

Instructions and examples included in this manual illustrate preferred text for station descriptions and formats for data presentation. However, it is likely that some State records from the many thousands of hydrologic data sites cannot be standardized and deviations from the standard should be made where necessary. Most of the examples have been placed in two appendices rather than in the text of this report. The examples in Appendix A generally parallel those in the 1976 instruction manual although additional examples have been added to reflect the expanded instructions for publishing ground-water-level data and the new section of instructions for publishing precipitation-quality data. The sample introductory text (Appendix A, example 8) is a slightly modified version of the introductory text in the 1976 instruction manual and may be used beginning with the 1984 data reports but should be adopted as the standard text for the 1985 reports. The examples in Appendix B have been selected from suggestions received from field offices. Of primary importance, because of the increased emphasis on making the hydrologic conditions statement more interesting and informative to the reader, are the examples showing how two Districts prepared their "Summary of Hydrologic Conditions." (See Appendix B, examples 1 and 2.)

When practical, the availability of computer programs and telecommunication equipment for data presentation has been taken into account in modifying procedures and formats. This manual is punched to fit into a three-ring binder to enable Districts to insert changes in procedures and policy and their own comments and references.

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[1]Submit information to Chief, Publications Planning Unit, MS 418 National Center, Reston, Virginia 22092.

Acknowledgments

Appreciation is extended to those individuals who contributed their time and effort in writing, reviewing, and editing this report. They include Earl L. Skinner, Richard A. Engberg, and Michael C. Yurewicz for their help with the water-quality guidelines; Ernest D. Cobb and H. C. Riggs for their assistance with the surface-water guidelines; and Ralph D. Cotter who, with the aid of Hank J. Oswick, Jr., updated and expanded the ground-water-level guidelines. Thanks is extended to the Districts supplying the examples in the appendices that were modified to reflect the new guidelines. Special thanks is given to Clairiece G. Humphrey of the Mid-Atlantic District's Virginia field office in Charlottesville, Virginia, who, with the experience and knowledge gained from her many years of involvement in preparing the Virginia data report, provided many valuable insights and suggestions for improving the guidelines from the perspective of those in the field. In that regard, the assistance of many individuals, too numerous to mention, from field offices throughout the country who supplied reference material and made helpful suggestions is gratefully acknowledged.

COVERS AND PRELIMINARY PAGES

Covers, Title Page, Back-of-Title Page, Preface, Report Documentation Page

For uniformity, a cover negative is prepared by the Publications Planning Unit and is provided to each District for each volume to be printed soon after the end of the water year. Districts must provide the Publications Planning Unit by December 1 of each year all information on cover changes (cooperation, return address, and volume designations, if used) from the preceding year. Negatives will be supplied for cover 1 (front), cover 2 (inside front), cover 3 (inside back), cover 4 (back), and the spine strip. A water-year calendar will be on cover 2 and an inch-pound to metric conversion table will be on cover 3. Both the calendar and the conversion table will be supplied by Headquarters along with the cover negatives. Further detailed information on cover paper stock, ink color, and so forth, is provided in the section "Printing State Annual Hydrologic-Data Reports."

The order and pagination[1] of the first few pages of the data report should be:

- i Title page
- ii Back-of-title page (Cooperators are not listed on this page)
- iii Preface
- iv Report documentation page (Formerly Form NTIS-35)
- v Contents

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[1]Use lowercase Roman numerals for the preliminary pages. The title page, back-of-title page, and the report documentation page should not show numbers ("no folio"). (See the examples in Appendix A for placement of the numbers on the preface and contents pages.)

Examples of these preliminary pages are given in Appendix A (examples 1-5). The title page is page i (Roman numeral). It contains the same information as given on the cover plus authors' names and is supplied as a positive film by the Publications Planning Unit.

Authorship has been assigned to State data reports beginning with the 1982 water-year reports. The authors are listed on the title page as shown in Appendix A, example 1. The title page cannot be fowarded to the District until after the list of authors is submitted to Headquarters; therefore, the authors' names should be sent to Publications Planning Unit as soon as possible after the end of the water year. The guidelines for assigning authorship to annual State data reports are:

1. Final determination and approval of authorship will be made by the District Chief.

2. Authorship will be assigned to those who contributed very substantially to the preparation of the report--generally, the person or persons who compiled the data and are responsible for its accuracy, completeness, and adherence to established guidelines. Coauthors should not include those who performed only routine technical assistance or figureheads--individuals in general administrative or supervisory control of the report-preparation team.

3. In general, authors will include the Chief, Hydrologic Data Section, (or equivalent), in the originating District or Subdistrict office, and those persons responsible for compiling the various types of data--surface water, water quality, and ground water. The order of listing authors other than the Chief, Hydrologic Data Section, should be based on the relative quantity of the various kinds of data in the report or report volume.

4. Generally, no more than four authors will be identified. Authorship will be indicated in standard Survey style, as follows:

   Author(s), 1983, Water-Resources Data - New York, Water year 1982, volume 2--Long Island: U.S. Geological Survey Water-Data Report NY-82-2 (published annually), 317 p.

The back-of-title page is page ii, and contains the Department of the Interior name with the name of the Secretary, and the Geological Survey name with the Director. The address of the District office from which users may obtain additional information is placed near the bottom of page ii. The year the data report was printed is placed at the bottom of page ii. Page iii is the Preface, which, like the title page, was redesigned for the 1982 water year. Individuals who provided assistance to the authors in preparing the report, including collecting, processing, and tabulating the data and typing the manuscript, will be noted in the PREFACE to the report rather than in the ACKNOWLEDGMENTS section, as was previously done. A sample PREFACE is shown in Appendix A, page A-3. Page iv contains the National Technical Information Service (NTIS) bibliographic data form that serves as the report documentation page. Pages ii, iii, and iv are to be prepared by each District.

Table of Contents, Illustrations, Tables

The table of contents always begins on a right-hand page (generally p. v). All section headings for the introductory text are listed in order; also listed are references to the page on which the list of stations begins and the page on which the hydrologic data begins. A list of illustrations follows the table of contents and is followed by a list of the numbered tables contained in the introduction. All illustrations are listed as figures. Samples of the table of contents, list of figures, and list of tables are shown in Appendix A, example 5.

List of Surface-Water Stations

The list of surface-water stations generally begins on page vi and includes a complete listing of all water-discharge gaging stations and continuing-record water-quality stations for which data are being published. (See Appendix A, example 6.) The continuing-record water-quality stations usually are located at water-discharge gaging stations and the water-quality data are published immediately after the water-discharge data using the identical station number and name. (See Appendix A, examples 18A and 18B.) The station name will be entered only once in the list of surface-water-data stations even though both water-discharge and water-quality data are published. At non-gaged sites, a continuing-record water-quality station is published with its own station number and name in the regular downstream-order sequence. (See Appendix A, examples 16 and 17.) Water-quality data from partial-record stations or miscellaneous sites collected at continuous water-discharge stations also should be published immediately after the water-discharge data, using the same station number and name.

The water-quality data collected at a partial-record station or miscellaneous site not located at a continuous-record water-discharge station are published in a separate section of the report immediately after the section titled "Discharge at Partial-Record Stations and Miscellaneous Sites." All the partial-record stations and miscellaneous sites that are published in separate sections in the latter part of the data report should not be included in the list of surface-water stations; only a general reference to the sections themselves is necessary at the end of the list, such as:

Discharge at partial-record stations and miscellaneous sites.... 360
Crest-stage partial-record stations.......................... 360
Low-flow partial-record stations............................ 371
Special study and miscellaneous sites........................ 387
Analyses of samples collected at partial-record, special study, and miscellaneous sites.................................... 398

Prepare the list of surface-water stations so that the river basins and station names are listed in downstream order (Appendix A, example 6). The rank of each tributary is shown by indention (each three-space indention represents a change in heading rank). The main stem or other designation of principal basins is not indented. Intervening tributaries (even though ungaged) should be listed, as necessary, to indicate the proper rank. The type of data collected at each site will be indicated by symbols placed within parentheses immediately after the station name. The type of data and corresponding symbols to be indicated are: discharge (d), gage height (g), contents (v), chemical (c), biological (b), microbiological (m), water temperature (t), sediment (s), radiochemical (r), pesticide (p), and elevation (e). Other single letters may be used at the District's discretion. However, use of double letters is discouraged. Placing commas between the symbols is now recommended. No indication of Part (drainage basin) numbers should be made in the table of contents. However, States in more than one Part should arrange the parts with lower Part numbers first. The major basins have equal rank as far as indention is concerned. A skeleton list of stations is shown below to illustrate the listing of gaging-station records for a State with more than one Part.

Page

LOWER MISSISSIPPI RIVER BASIN
Mississippi River:
   ARKANSAS RIVER BASIN
   Arkansas River:
      Cimarron River near Guy (d,c)............................

*   *   *   *   *   *

WESTERN GULF OF MEXICO BASINS
   RIO GRANDE BASIN
   Rio Grande at Colorado-New Mexico State line (d,t)..........

*   *   *   *   *   *

COLORADO RIVER BASIN
Colorado River:
   SAN JUAN RIVER BASIN
   San Juan River:
   Navajo Reservoir near Archuleta (e)........................

*   *   *   *   *   *

For clarity, the capitalized basin names are used for running heads at the top of each page that contains records for gaging stations within that basin. For coastal drainage basins, the capitalized basin names are those for streams that flow directly into the coastal waters (ocean, gulf, and so forth). For interior drainage basins like the Ohio River, Missouri River, and Snake River, the capitalized basin names are those for streams that flow directly into the main stem. For example, SAN JUAN RIVER BASIN is capitalized because the San Juan River is a direct tributary to the Colorado River. Exceptions are those in the St. Lawrence River basin and the Great Basin. In the St. Lawrence River basin, the capitalized basins (and running heads) are "STREAMS TRIBUTARY TO LAKE______," using the appropriate name of one of the Great Lakes. In The Great Basin, the downstream order and listing sequence are arbitrary.

The full station name, including the State, is shown on the page giving the station records; however, to save space and prevent overruns on some lines in the list of stations, the State name is omitted except for those stations in other States.

For discussion of carryovers on succeeding pages of the list of stations, see the section "Preparation of Camera-Ready Copy for Direct-Image Offset Printing."

List of Ground-Water Wells

A list of ground-water wells should follow the list of surface-water stations. Because interleaving of ground-water-level and ground-water-quality data usually is not done, the list of ground-water wells normally will consist of two parts, one part listing ground-water-level wells and the other quality-of-ground-water wells. (See Appendix A, example 7.)

For some Districts, the listing of each individual well may not be practical, especially when data are published for "ephemeral" projects involving literally hundreds of wells. In these instances, Districts may limit the individual listing to only the wells in the regular network, and provide only a general reference to the other ground-water data that are published. If, in some States, this limited list of network wells is considered too long, an alternative would be to list only the counties (or other geographic unit) for which ground-water records are published. Many Districts are now publishing a complete list of ground-water wells, and all States are encouraged to do the same, where practical. However, because of widely divergent circumstances, it is recognized that States must be given a wide latitude of choice in this matter. The following sections will provide guidelines on how the list of ground-water wells should be formatted.

Water-Level Sites

A list of wells for which water levels are included should follow the list of surface-water sites. They should be grouped by county, parish, basin, or other significant geographic division in the State. Under each geographic division, the wells should be ordered alphabetically by name, in similar format to what is done in Massachusetts (WDR-MA-RI-79, p. 306);

GROUND-WATER WELLS, BY COUNTY, FOR WHICH RECORDS ARE PUBLISHED

GROUND-WATER LEVELS

MASSACHUSETTS	Page
BARNSTABLE COUNTY	
Barnstable Well A1W 230.....	307
Barnstable Well A1W 247.....	307
Bourne Well BHW 198.........	307
Brewster Well BMW 21........	308
Brewster Well BMW 22........	308
Chatham Well CGW 138........	308
Falmouth Well FSW 5.........	309
Sandwich Well SDW 252.......	309
Sandwich Well SDW 253.......	309
Truro Well TSW 1............	310

MASSACHUSETTS--Continued	Page
MIDDLESEX COUNTY--Continued	
Townsend Well TRW 13......	325
Wakefield Well WAW 38.....	326
Wayland Well WKW 2........	326
Wilmington Well XMW 78....	326
Winchester Well XOW 14....	327
NANTUCKET COUNTY	
Nantucket Well NBW 228....	327
NORFOLK COUNTY	
Dedham Well DDW 231.......	327
Dover Well DVW 10.........	328

or sequentially by increasing number, in similar format to what is done in Minnesota (WDR-MN-80-2, p VII):

GROUND-WATER WELLS, BY COUNTY, FOR WHICH RECORDS ARE PUBLISHED

GROUND-WATER LEVELS

	Page
<u>AITKIN</u>	
Well 045N23W05ADD01..	331
Well 045N23W05ADD02..	331
Well 045N23W05ADD03..	331
Well 047N27W26BBC01..	332
<u>ANOKA</u>	
Well 031N22W18AAA01..	332
Well 031N22W18AAA02..	332
Well 031N22W18AAA03..	333
Well 031N22W18AAA05..	333
Well 031N22W23CBC01..	333
Well 031N22W23CBC02..	334
Well 031N22W23CBC03..	334
Well 032N23W04AAD02..	335
<u>BECKER</u>	
Well 140N36W26AAD01..	335
<u>BELTRAMI</u>	
Well 147N34W35ADC01..	336

Counties or other geographic divisions for which ground-water levels are included should be listed alphabetically in the INDEX at the end of the data report or collectively under a heading titled "Ground-Water-Level Records, by Counties," without reference to individual wells.

Water-Quality Sites

A list of wells for which water-quality analyses are included should follow the list of water-level sites. The format should be similar to that used for the list of wells for which water levels are reported. (See Appendix A, example 7.)

INTRODUCTORY TEXT

The introductory text of each State data report follows a standard format that describes the data collection and processing program, identifies cooperating agencies, defines the technical terms used in the report, explains how the station records are arranged and formatted, cites the reports containing data for preceding years, indicates supplementary information that can be obtained from office files, and includes a summary statement of hydrologic conditions for the water year.

The introductory text always begins on a right-hand page and is numbered page 1 (Arabic). The text will be in the same general format for all State reports, presenting the explanatory material discussed in the previous paragraph. Although the formats should be similar, some latitude is permitted in the way information is presented. The sample introductory text for a State report shown in Appendix A is a slightly modified version of the standard introductory text presented in the 1976 instruction manual. It may be used as an optional presentation, beginning with the 1984 data reports, but should be adopted as the new standard introductory text for the 1985 reports. The principal change in format is the introduction of a new section, "Data Presentation," which utilizes the paragraph headings as they normally appear in the station manuscript to present an explanation of the records to users of the reports. This modified text is recommended because the material has been reorganized under simplified section headings that focus the reader's attention on concise explanations of the purpose of each paragraph.

Each section heading of the introductory text follows. Under each of the section headings is a brief statement of the contents and an example from a published report or a reference to an example in Appendix A.

<u>Introduction</u>[1]

The introduction identifies the types of hydrologic data published in the report, and states the number of data-collection sites for each type of data. It provides a short history on the several series of hydrologic-data publications and information regarding report availability. The introduction for each State report should be similar to the following example for North Carolina (WDR-NC-82-1, p. 1):

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[1]The heading for the introduction that appears in the State data report will be first order (ALL CAPS, CENTERED). See the sample "contents" (example 5) and the sample introductory text (example 8) in Appendix A for the proper ranks and format to be used for the section headings appearing in the data report introductory text.

Water-resources data for the 1982 water year for North Carolina consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and ground-water levels. This report contains discharge records for 143 gaging stations and stage and contents for 25 lakes and reservoirs; water quality for 86 gaging stations and 3 miscellaneous sites; and water levels for 56 observation wells. Additional water data were collected at various sites not involved in the systematic data-collection program, and are published as miscellaneous measurements in this report. The collection of water-resources data in North Carolina is a part of the National Water-Data System operated by the U.S. Geological Survey in cooperation with State, municipal, and Federal agencies.

Records of discharge of streams, and contents and stage of lakes or reservoirs, were first published in a series of U.S. Geological Survey water-supply papers entitled, "Surface Water Supply of the United States." Through September 30, 1960, these water-supply papers were in an annual series and then in a 5-year series for 1961-65 and 1966-70. Records of chemical quality, water temperatures, and suspended sediment were published from 1941 to 1970 in an annual series of water-supply papers entitled, "Quality of Surface Waters of the United States." Records of ground-water levels were published from 1935 to 1974 in a series of water-supply papers titled "Ground-Water Levels in the United States." Water-supply papers may be consulted in the libraries of the principal cities and universities in the United States or may be purchased from Branch of Distribution, U.S. Geological Survey, 604 South Pickett Street, Alexandria, Virginia 22304.

Since the 1961 water year, streamflow data, and since the 1964 water year, water-quality data have been released by the Geological Survey in annual reports on a State-boundary basis. These reports provided rapid release of water data in each State shortly after the end of the water year. Through 1970 the data were also released in the water-supply paper series mentioned above.

Streamflow and water-quality data beginning with the 1971 water year, and ground-water data beginning with the 1975 water year are published only in reports on a State-boundary basis. Beginning with the 1975 water year, these Survey reports carry an identification number consisting of the two-letter State abbreviation, the last two digits of the water year, and the volume number. For example, this report is identified as "U.S. Geological Survey Water-Data Report NC-82-1." Water-data reports are for sale in paper copy or in microfiche by the National Technical Information Service, U.S. Department of Commerce, Springfield, Virginia 22161.

Additional information, including current prices for ordering specific reports, may be obtained from the District Chief at the address given on the back of the title page or by telephone (919) 755-4510.

Cooperation

It is particularly important that the statement of cooperation be correct and complete to avoid embarrassment to the Survey and to the cooperator(s). It may be difficult at times to decide whether acknowledgment of assistance should be given in the introductory text of the report or in the station description. The basic distinction is the responsibility for the record. If the responsibility for the data (collection and computation of data) lies with the cooperator, the cooperation is classed "record"; and is not acknowledged in the introductory text.

Record cooperation is shown only in the COOPERATION paragraph of the station description, and instructions for that paragraph are given on subsequent pages containing instructions for station descriptions. If the responsibility for the data lies with the Survey--that is, the data were collected by the Geological Survey at the expense of the cooperating party or by employees of the cooperating party under the supervision of the Survey and according to Survey methods, or the cooperating agency provided assistance in collecting data--the cooperator must be acknowledged in the introductory text.

Acknowledgments of cooperation are in three general classes:

1. List names of organizations with which the Survey has formal cooperative agreements; State agencies first, in order of program size, followed by other public agencies such as flood-control, drainage, irrigation, or conservancy Districts, then county agencies in alphabetical order, and finally municipalities in alphabetical order. Immediately following each agency or organization, give the name and title of the head of the organization, preferably using two initials (without personal title such as "Dr.", "General", and so forth); if the individual has no middle initial, give first name in full. If the head of the organization has been replaced during the water year, first give the name of the official in charge at the beginning of the water year, followed by the name of his replacement using the phrase, "succeeded by ___________." Do not give date of personnel change.

2. In the second paragraph, acknowledge assistance in the form of funds or services from other Federal agencies. List agencies in order of program size and show the number of gaging stations supported by each agency, counting only those stations for which records actually are submitted for publication.

The preferred method of designating Federal agencies, but not necessarily the order of listing is:

Corps of Engineers, U.S. Army
Bureau of Reclamation, U.S. Department of the Interior
Soil Conservation Service, U.S. Department of Agriculture
National Weather Service, U.S. Department of Commerce
Nuclear Regulatory Commission
Tennessee Valley Authority
U.S. Department of State
U.S. Environmental Protection Agency

3. List other organizations that aided in collecting records and that provided assistance for which there is no formal cooperative agreement. Do not mention organizations whose cooperation consisted of furnishing records collected by its own methods and for its own use, because such record, if accepted for publication by the Survey, is acknowledged in the COOPERATION paragraph of the station description. It is not necessary to acknowledge such minor assistance as inspection of a water-stage recorder periodically by an employee of another organization, or the collection of a few water samples for analyses.

The COOPERATION statement should be similar to the following example for North Carolina (WDR-NC-82-1, p. 1-2):

Cooperative agreements between the U.S. Geological Survey and organizations of the State of North Carolina for the systematic collection of streamflow records began in 1895 and continued through 1909. After a lapse of 8 years, the State of North Carolina resumed cooperation in October 1918. Organizations that assisted in collecting the data contained in this report through cooperative agreements with the Survey are:

State Department of Natural Resources and Community Development, Joseph W. Grimsley, Secretary, through the following: Division of Environmental Management, Robert T. Helms, Director.
State Board of Transportation, Division of Highways, Billy Rose, Highway Administrator.
City of Burlington, James D. Mackintosh, Jr., City Manager.
City of Charlotte, Eddie Knox, Mayor.
City of Durham, Barry L. Del-Castilho, City Manager.
City of Greensboro, Tom Z. Osborne, City Manager.
City of Rocky Mount, William H. Batchelor, City Manager.

The following Federal agencies assisted in the data-collection program by providing funds or services:

Corps of Engineers, U.S. Army
Tennessee Valley Authority
Soil Conservation Service, U.S. Department of Agriculture
National Weather Service, U.S. Department of Commerce

The following organizations aided in collection of records:

> **Cities of Danville, Virginia, and Raleigh, North Carolina; E. I. du Pont de Nemours and Co.,; Carolina Power and Light Co.,; Champion International Corp.; Duke Power Co.; Fiber Industries, Inc.; J. P. Stevens Co., Inc.; Olin Corp.; P. P. G. Industries; Virginia Electric and Power Co.; and Yadkin, Inc.**

If water-resources data have been collected by private contractors, then the following statement should also be included in the introductory text under "Cooperation":

> **Some records have been collected and computed by contractors in accordance with U.S. Geological Survey specifications and under U.S. Geological Survey quality control.**

No reference should be made to the contractor in the station description under the paragraph headed COOPERATION.

Acknowledgments

Water Resources Division policy now allows assignment of authorship to annual hydrologic-data reports. Authors will be cited on the title page. Credit for collecting, analyzing, tabulating the data and typing the report by District personnel should be cited in the PREFACE to the report, as shown in Appendix A, example 3. For most Districts an acknowledgment section will no longer be needed, for only non-Survey agencies or individuals who collected or supplied records or provided other significant assistance should normally be listed in this section. An example of how one State continues to use the "Acknowledgments" section follows:

> **In addition to data collected by the U.S. Geological Survey, there are included herein records for 103 gaging stations and 17 index wells operated by the Virginia State Water Control Board. These records are published as provided and are acknowledged in the "COOPERATION" paragraph of each individual station. The State Water Control Board is under the direction of Richard N. Burton, Acting Executive Director. Published material for the gaging-station records and the ground-water wells is supplied, respectively, through the Bureau of Surveillance and Field Studies. Raymond E. Bowles, Director, and the Bureau of Water Control Management, Dale F. Jones, Director.**

Summary of Hydrologic Conditions

A section on hydrologic conditions that includes summary statements for surface-water streamflow, quality of water, and ground-water levels is required. This section should be brief--generally only a few pages. The heading of the section will be "SUMMARY OF HYDROLOGIC CONDITIONS." The summary statement should be near the beginning of the report, following the COOPERATION and ACKNOWLEDGMENTS sections.

Interpretive material from published reports and new interpretations can be included in the "Summary of Hydrologic Conditions" section but new interpretations should be kept to a minimum. All summary statements must receive Regional approval, and may, at the discretion of the Regional Hydrologist, require Director's approval. If new interpretive material is used, it should be indicated in the transmittal memorandum to the Region. The criteria given in WRD Publications Guide article 11.01.2 (Open-File Reports--Definition and Categories) for distinguishing interpretive and noninterpretive hydrologic data must be followed. The purpose of permitting interpretive material to be included is to help make the hydrologic conditions statement more interesting and informative to the reader. Including material from recently published Geological Survey interpretive reports can help emphasize the major part the Survey has in addressing the problems of acid precipitation, soil erosion, ground-water contamination, declining water tables, ground-water recharge, droughts, and floods, among others.

It is suggested that the surface-water section begin with discussion of the range of percentages of yearly runoff for key gaging stations, compared with the median, and a brief explanation of possible reasons for the variation, if appropriate. Comparison with long-term averages for other representative stations also might be given here; however, the length of record should be mentioned for each station. Mention should be made of extended periods of excessive or deficient runoff and of record-high or record-low monthly or yearly flows. Storms and flooding that produced noteworthy peak discharges or flood volumes or that caused extensive damage or loss of life should be described. The text may contain an abbreviated flood-description and maximum-discharge table. Unit rates of runoff and recurrence intervals should be given, if significant. Periods of widespread drought, especially those having economic importance, also should be reported.

A statement pertaining to reservoir storage is worthy of note. This statement should relate reservoir storage to average storage and perhaps to total capacity, and should indicate gain or loss during the water year. The effect of storage on flood peaks or on water supply should be mentioned, if appropriate.

The inclusion of bar graphs or hydrographs in the hydrologic-conditions summary for a few key discharge stations may be used to show the within-year distribution of flow and its relation to medians of record. The option to include computer-generated discharge hydrographs for those Districts with the capability to easily do so can provide a useful addition to the annual data report. An example of a computer-generated hydrograph for each of four key gaging stations, comparing monthly mean discharges (five water years) to a 30-

year median, is shown in Appendix B, example 6. Inclusion of hydrographs for water-discharge stations should be limited to several key stations and must be placed in the "Summary of Hydrologic Conditions" section of the data report.

The water-quality section of the hydrologic conditions summary should contain information about important changes in surface- or ground-water quality detected during the year. The effects of excessive or deficient streamflow on surface-water quality, and the effects of man's activities, including serious chemical spills, on surface- and ground-water quality, may be discussed. Mean constituent concentrations at key stations or wells may be compared with long-term averages. Regression relationships may be determined between selected constituents, and the use of graphics is encouraged. In short, the Districts should use their own initative in determining which water-quality information is of sufficient importance to be presented in this section.

A review of the hydrologic-conditions summaries in a number of recently published State data reports reveals progress in the effort by Districts to improve that section of the introductory text by expanded coverage, the use of more graphics, and the inclusion of limited interpretive material. However, the review also revealed the need for further emphasis on some of the guidelines for preparing the water-quality part of the hydrologic conditions summary, as indicated in the following comments:

1. Authors should avoid use of extremely broad statements or conclusions regarding the water quality of an entire State because they are almost impossible to substantiate. For example, "Water quality in the State exhibited little change in the 19xx water year" is a statement that rarely should be used because Districts seldom have sufficient data to be able to conclude this.

2. Authors should provide clear, concise, interesting information to the reader, and then back up important conclusions on water quality with the necessary supporting information. Generally, they should specify the water-quality sampling stations on which a water-quality statement is based and provide the geographic distribution of the stations. A State map showing the location of the stations involved in a study is usually useful.

   A statement such as "Concentrations of trace metals were much less than the critical concentrations for various beneficial uses" is too vague to be used in summary statements unless the following questions are also answered:

   - How many stations is this statement based on?
   - What is the geographic distribution of the stations?
   - Does the statement refer to ground water, surface water, or both?
   - What trace metals?
   - What is meant by critical concentrations?

Additional sets of questions to be answered could be listed for many other sample water-quality statements that might be used in State data reports, such as "No residues of pesticide or polychorinated biphenyls (PCB's) were found in State streams during the year." Care must be taken by the authors to supply the necessary qualifications and supporting information for statements such as this. Because most interpretive material that is used in State data reports will come from previously published, Director-approved reports, the necessary supporting information should be readily available. Districts should cite such reports as a reference, when appropriate. (See Appendix B, example 2.)

3. The water-quality observations discussed in State data report summary statements are not always significant (although it is recognized that this is subjective).

4. Discussions of water quality based on results of interpretive projects are clearly more interesting and informative and are recommended for all reports.

The ground-water-level section of the hydrologic conditions summary might compare the year's fluctuations in ground-water levels in different parts of the State with the past water levels, and should interpret this comparison. A great deal of latitude is allowed in presenting this information, but some options are: use of record high or low water levels related to precipitation; use of hydrographs related to precipitation; comparison of seasonal fluctuations in key wells with "normal" seasonal levels; and use of hydrographs from areas of continued water-level decline. Computer-generated hydrographs may be used to show ground-water-level trends for an extended period of time. (See Appendix B, example 7.)

Examples of how two Districts prepared the "Summary of Hydrologic Conditions" section are given in Appendix B, examples 1 and 2. Remember that all bar graphs, diagrams, or maps used in the report should be referenced if they appeared in previously published reports.

Special Networks and Programs

The text may describe to the user the special networks and programs that are operated by the Water Resources Division. (See Appendix A, example 8.) The "Pesticide Program" has been discontinued and all references to the program should be deleted. A new entry for this section is the National Trends Network (NTN), a 150-station network for sampling atmospheric deposition in the United States. Each District has the responsibility to edit the descriptions and include only those networks or programs for which there are data in the data report. A District may, at its option, include the entries of this section in the "Definition of Terms" section.

Explanation of Records

A short paragraph describing the period covered by the data report, the records being published, the locations of the stations and wells, and how the report is organized should be included here. Following this paragraph, records should be explained under the following subheadings:

- Station Identification Numbers
- Records of Stage and Water Discharge
- Records of Surface-Water Quality
- Records of Ground-Water Levels
- Records of Ground-Water Quality
- Records of Precipitation Quality

The introductory text now presents separate sections for the explanation of surface-water-quality and ground-water-quality records, as indicated by the above list. Although the sample introductory text in Appendix A, example 8 does not include a "Records of Precipitation Quality" section, it should be included if significant precipitation-quality data are collected within the District. The "Records of Precipitation Quality" section presented later in this report contains information that could be useful in its preparation.

Station Identification Numbers

The sample introductory pages should describe to the reader the systems used to assign station identification numbers for all streamsite stations and ground-water wells. The "downstream order" numbering system is used for surface-water stations and the "latitude-longitude" system is used for ground-water wells and other offstream sites. Surface-water sites where only miscellaneous measurements are made may be placed in either system, depending upon District policy. An example of this section is given in Appendix A, example 8.

Downstream order and station numbers

Generally, each gaging station and partial-record station has been assigned a unique 8-digit station number that automatically places the station in the downstream order.

New number assignments are made by the District, and each District maintains its own master list that includes all assigned numbers. Assignment of numbers to miscellaneous-data sites is suggested, if feasible, especially now that the on-stream site-identification numbering system has been modified so that additional digits may be added.[1]

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[1]See Water Resources Division Memorandum No. 82.84, "Change of On-Stream Site-Identification Numbering System," dated May 13, 1982.

The downstream station identification numbers have been converted to a variable-length format (from 8 to 14 digits) for on-stream sites. The conversion left-justified the present 8-digit number in position 2-9 of the station identification number field so that additional digits may be added as required. Additional digits should be added with prudence because the more digits that are added, the more restrictive the number becomes. Adding one digit at a time to the station number will retain more flexibility for future stations. The preferred way is to add digits to the immediate right of the number, for example: 14023412 could become 140234121 rather than 14023412000001.

For the most part, the order of publication of gaging stations is the downstream order and station-number sequence. Exceptions are for reservoirs, diversions, or return flows that are listed in groups, after listings of other records for the basin.

The first two digits of the station number indicate the Part or major drainage system formerly used for Water-Supply Papers and the last 6 digits indicate the downstream order within the Part.

In determining the correct downstream order for a reservoir gaging station, the station is considered to be at the dam, even though the gage itself may be some distance upstream from the dam. Therefore, a hydrologic-data station on a tributary that enters a reservoir between the reservoir gage and the dam would nonetheless be listed ahead of the reservoir gage. Where tributaries enter a reservoir from opposite sides, or at various points around the perimeter, the downstream order generally will be determined by the order in which the tributaries entered the river before the dam was constructed. For a few special situations, such as tributaries to a lake with no outlet, the "downstream" order had to be arbitrary.

A distributary--whether a natural channel or a manmade diversion from a stream--is inserted in downstream order as if it were a tributary to the stream at the same point. In other words, the same order of listing applies whether the gaging station is on an inflow or outflow channel. In a few rare cases, perhaps on transbasin diversions, the record may be more important as inflow to the receiving stream than as outflow from the exporting stream. If this is the case the diversion may be listed as a tributary to the receiving stream. Return flows are considered tributaries. For a canal diverting at the end of a dam, the canal gaging station is listed ahead of the reservoir station. If a canal diverts from each end of a dam, the downstream order of the two canals is arbitrary. Canals having reversible flow or those which involve more than one diversion or more than one delivery point present many problems for which assignment of downstream order and number must be arbitrary; however, a single station number should be assigned to each station.

The downstream-order and numbering system is illustrated by the sketch (fig. 1) on the following page of a hypothetical river basin showing gaging stations assigned station numbers in the proper downstream order.

Figure 1.--Caption on next page--belongs near here.

Following is a listing of stations for the hypothetical river basin shown in the sketch:

RED RIVER BASIN

Station number	Station name
	East Fork Green River (head of Red River):
04710000	East Fork Green River tributary No. 2 near A
04711000	East Fork Green River tributary near A
04711150	East Fork Green River at A
04711300	North Fork Green River at A
04711550	Green River near C
	Rainbow Reservoir:
04716005	Rainbow Wash above Rainbow Reservoir, at C
	White River (head of Gray River):
04717505	White River tributary near B
04718500	White River at B
04719500	Clear Creek near B
04720005	Crystal Creek near B
04722500	Black River near B
	Gray River (continuation of White River):
04724205	Silver Creek near C
04724505	Gray River near C
04724800	Rainbow Reservoir tributary near C
04725000	Gray River at C (discontinued)
04725200	Blue River diversion from Rainbow Reservoir, at C
04725500	Rainbow Reservoir at C
04725600	Green River below Rainbow Reservoir, at C
	Blue River:
04727000	Yellow Creek near C
04727500	Blue River near C
	Red River (continuation of Green River):
04730000	Brown Wash near C
04733000	Muddy Creek at D
	Little Muddy Creek:
04733200	Little Muddy Creek tributary near D
04734000	Red River near D

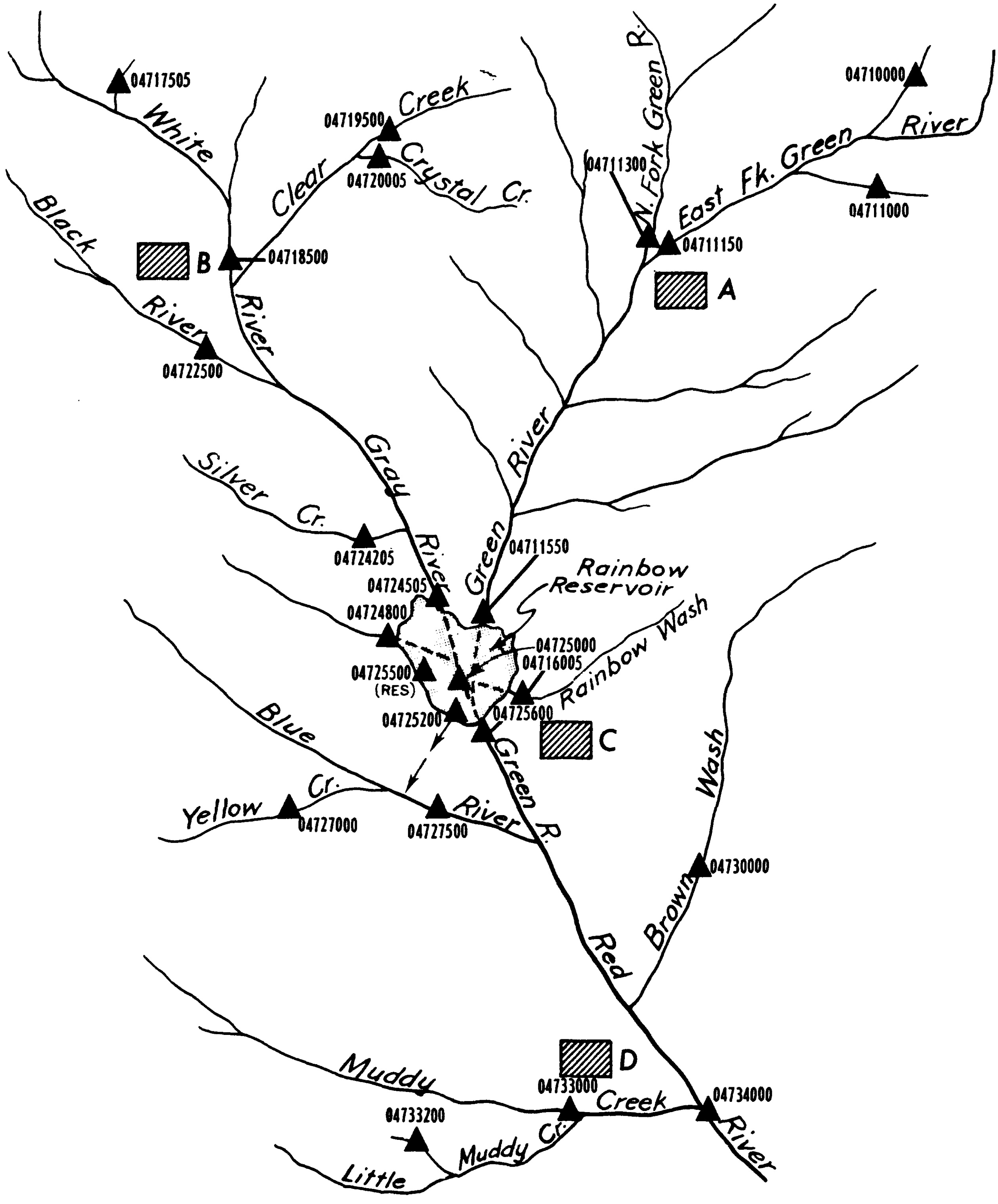

Figure 1.--Downstream order and station numbers of gaging stations in hypothetical river basin

The sample list includes a reservoir gage, tributaries to the reservoir, diversions, and unnamed streams. It should be noted that, when two streams join to form a stream of a different name, the stream having the larger drainage area at the confluence is considered the headwater or main stream. Station 04725000 was discontinued during the report period due to the filling of Rainbow Reservoir.

Numbering system for wells and miscellaneous sites

The latitude-longitude identification numbering system is described and illustrated in the sample introductory text (Appendix A, example 8). Besides being used for all ground-water wells, this numbering system may be used for off-stream sites and also may be used for certain on-stream sites where there is difficulty in assigning a meaningful downstream order number. The numbering system provides a retrieval number for data of the following types.

1. Wells. (See p. 29.)
2. Large open-water areas (lakes, reservoirs, bays, and so forth).
3. Water-quality miscellaneous sampling sites.
4. Surface-water sites at which miscellaneous measurements are made and for which the "downstream order" station-identification number is not (or cannot be) assigned.

If appropriate, Districts are encouraged to provide a brief explanation of the local well-numbering system. (See Appendix B, example 21.)

Records of Stage and Water Discharge

Examples of this and each of the following subsections are given in the sample introductory text (Appendix A, example 8). One of the principal changes in format for this section of the introductory text is the inclusion of a new section, "Data Presentation," which utilizes the paragraph headings as they normally appear in the station manuscript of gaging-station records to present an explanation of the records to users of the report. This modified text is recommended because the material has been reorganized under simplified section headings that focus the reader's attention on concise explanations of the purpose of each paragraph.

Two other major revisions in the explanation of the records of stage and water discharge are the result of a policy change concerning reporting estimated daily discharges. Beginning with the 1985 water year, all estimated daily values either will be flagged in the daily-discharge table or identified by date in the REMARKS paragraph of the station description. The previous guidelines only required identification of estimated daily values in the REMARKS paragraph if the effective period of estimation exceeded 30 days or included the maximum discharge for the year. Now, for some Districts, the use of the REMARKS paragraph will be expanded to include the listing of dates for all estimated days, regardless of the length of the estimated period. The other option, available to all Districts that retrieve the daily-discharge tables using the Prime computer system, is flagging estimated daily values directly in the data tables. The two principal revisions to the introductory text that have been made to inform users of this important policy change are the redefinition of the purpose or potential use of the REMARKS paragraph in the "Data Presentation" section and the addition of a new section, "Identifying Estimated Daily Discharge."

Data collection and computation

This section describes the methods and frequency of collecting streamflow data and computing water-discharge records. Certain parts of this section may be modified or omitted if not applicable to the District. The paragraph describing the items in the monthly summary may be modified according to the units used within the District. A discussion of the methods used for estimating daily-discharge records should be included; and the user should be referred to the next two sections, "Data Presentation" (REMARKS paragraph) and "Identifying Estimated Daily Discharge," for information on how estimated daily-discharge values are identified in station records.

Data presentation

A brief explanation of each paragraph heading appearing in the station description will be given. The structured format in Appendix A, example 8 is recommended. In the example each paragraph heading is listed separately, followed by an appropriate explanation, in the order in which it appears in the station description. A brief explanation of the daily tables and their summaries also should be included.

The REMARKS entry for this section is now especially important because it explains to the user the procedures for reporting estimated daily discharges. The following REMARKS statement is recommended for all State data reports:

> **REMARKS.--All periods of estimated daily-discharge record will either be identified by date in this paragraph of the station description for water-discharge stations or flagged in the daily-discharge table. (See next section, "Indentifying Estimated Daily Discharge.") If a remarks statement is used to identify estimated record, the paragraph will begin with this information presented as the first entry. The paragraph is also used to present information relative to the accuracy of the records, to special methods of computation, to conditions that affect natural flow at the station and, possibly, to other pertinent items. For reservoir stations, information is given on the dam forming the reservoir, the capacity, outlet works and spillway, and purpose and use of the reservoir.**

Those Districts that publish medians of the yearly mean discharges should insert a sentence following the discussion of "average discharge" as follows:

> **In addition, the median of yearly mean discharge is given for stations that have 10 or more complete years of record, if the median differs from the average by more than 10 percent.**

Publication of skeleton rating tables is not recommended; however, they may be published if the District thinks they serve a useful purpose. If such tables are published, the following paragraph should be inserted after the entry "Extremes for Current Year."

> **Skeleton rating tables immediately follow the "Extremes for Current Year" paragraph for stream-gaging stations where they serve a useful purpose and the dates of applicability can be identified easily.**

A skeleton capacity table for all reservoirs for which daily records are published should be published each year, and a reference to skeleton capacity tables included in each report. If evaporation or precipitation data are published for one or more reservoirs, a statement to that effect should be added to the paragraph describing the skeleton capacity tables.

The use of footnotes to the daily table should be avoided, if possible, because of difficulties in printing symbols on some computer printers. Follow the criteria given in the section "Footnotes and Reference Marks" wherever possible. Data tables with flagged estimated discharges will have "e Estimated" automatically printed as a footnote.

Identifying Estimated Daily Discharge[1]

This new section under "Records of Stage and Water Discharge" will, in combination with the modified REMARKS statement to be placed in the "Data Presentation" section, provide users with an explanation of the procedures used for identifying estimated daily discharge in State data reports. The wording should be as follows:

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[1]Because the total number of ranks in the sample introductory text (Appendix A, example 8) is only three, the heading for this section will appear in the data report as a third-order heading (Caps and Lowercase, Centered). See, also, the sample CONTENTS (Appendix A, example 5) for proper placement and rank of this new section.

Estimated daily-discharge values published in the water-discharge tables of annual State data reports are identified either by flagging individual daily values with the letter symbol "e" and printing a table footnote, "e Estimated," or by listing the dates of the estimated record in the REMARKS paragraph of the station description.

If the data tables are obtained by the user by computer retrieval rather than from published data reports, the estimated daily values will be identified by flags if the retrieval was from the District's Prime computer system. Users obtaining the tables by computer retrieval from the national WATSTORE computer system will receive a warning message that the discharge tables may contain estimated values and instructions to contact the District office for further information, if desired.

The guidelines to Districts for identifying estimated daily discharges are summarized as follows:

1. Districts must identify estimated daily discharges in State data reports beginning with the 1985 water-year reports.

2. Districts should modify the introductory text of the State data report to inform users that all water-discharge station records will now identify estimated daily discharge. This involves revising the explanation of the purpose or potential use of the REMARKS paragraph in the "Data Presentation" segment of the explanation of the records of stage and water discharge and the addition of a new subsection titled "Identifying Estimated Daily Discharge" under the "Records of Stage and Water Discharge" section.

3. Districts must identify all daily discharges that were estimated using any method other than the normal application of a stage, velocity, or stage-fall rating at the gaging station, such as comparison of hydrographs with nearby stations, interpolation between discharges on a recession, and use of weather records. Both periods of lost record and periods for which the stage-discharge relation was invalid because of backwater or other reasons will be identified.

4. Districts using the WATSTORE computer system for retrieving water-discharge data tables for use in preparing the State data report will identify estimated daily discharge in the REMARKS paragraph of the station description. This method of identification is required because estimated daily values cannot, at this time, be flagged in the WATSTORE computer files. Users obtaining data tables by computer retrieval from the WATSTORE computer system rather than from published data reports will receive a warning message that the discharge tables may contain estimated values and instructions to contact the District office for further information, if desired.

5. Districts using the Prime computer system will, without exception, be required to flag estimated daily-discharge values in the computer files. This procedure will permit users obtaining data tables by computer retrieval from the Prime computer system (rather than from published data reports) to receive the estimated-discharge information without referring to the station description.

6. Districts using the Prime system for retrieving water-discharge data tables for use in preparing the State data report will have two options for identifying estimated discharge in gaging-station records. They may either identify the estimated values by flagging them in the data table or by listing the dates of the estimated record in the REMARKS paragraph of the station description. A Prime computer software program will provide a special retrieval option for those Districts preferring to use the REMARKS paragraph, permitting the data tables to be retrieved without flags or the accompanying footnote. Flagging the estimated values in the data tables is recommended but is not mandatory.

7. Districts that use the REMARKS paragraph for identifying estimated discharge in State data reports should always present the estimated record as the first entry of the paragraph, as in the following examples:

   REMARKS.--No estimated daily discharges during water year. Records good.

   REMARKS.--Estimated daily discharges during water year: Nov. 26-29, Mar. 21-28, May 29 to June 1, and Aug. 6-21. Records good except for periods of estimated record, which are poor.

   See the "Remarks" section under "Manuscript Station Description" for detailed instructions on using the REMARKS paragraph to identify estimated daily discharges and to assign accuracy to the daily-discharge record.

Districts preparing the State data report using the Prime computer system will have two retrieval options available to make the preparation easier. District personnel will be able to manually input daily discharges with the option to flag or <u>not</u> flag these values as estimated days (digital record might be lost but backup graphic record is available). There will be a "summary option" available that will provide a computer printout of all dates in the water year for which estimated days were entered into the Prime computer files. This printout will allow Districts to check the estimated days reported in the REMARKS paragraph if that reporting option was selected.

<u>Accuracy of data</u>

This section describes the basis for accuracy rating of the data, the rounding procedure used in reporting discharge figures, and the effects on runoff due to various factors.

Other data available

This section describes data collected by the District but not mentioned in the preceding sections, and data collected by State agencies or other Federal agencies. Reference may be made to miscellaneous sites, results of seepage investigations or other special studies, and precipitation records, to name a few. Records for partial-record stations for the current water year should be included in the data report; reference to a special report containing partial-record data is not an acceptable substitute. Mention also should be made of detailed information on file in the District (or Subdistrict) office.

Organization of this section is left to the discretion of the individual Districts. The sample text in Appendix A, example 8, demonstrates how one District handled this section. Statements in the example may be modified (or omitted) as desired.

Of increasing concern, in light of the revolution in computer and communication technology, is the need to make users more aware of the sources of information available to them within the Geological Survey. In order to meet this need and to elevate user awareness of our products and services, Districts may want to include in their introductory texts information on the following three important activities within the Water Resources Division that help to identify and improve access to the vast quantity of existing water data:

1. The National Water Data Exchange (NAWDEX), which indexes the water data available from more than 400 organizations and serves as a focal point to help those in need of water data to determine what information already is available.

2. The National Water Data Storage and Retrieval System (WATSTORE), which serves as the central repository of water data collected by the U.S. Geological Survey and which contains large volumes of data on the quantity and quality of both surface and ground waters.

3. The Office of Water Data Coordination (OWDC), which coordinates Federal water-data acquisition activities and maintains a "Catalog of Information on Water Data."

Records of Surface-Water Quality[1]

A short introductory paragraph explaining why surface-water-quality data ordinarily are obtained at or near stream-gaging stations and informing the user of the variety of the types of data and measurement frequencies contained in the report should be included here. Following this paragraph, records should be explained under the following subheadings:

Classification of Records
Arrangement of Records
On-site Measurements and Sample Collection
Water Temperature
Sediment
Laboratory Measurements
Data Presentation
Remark Codes

Examples of this and each of the above subsections are given in Appendix A, example 8.

Classification of records

This section describes the three classifications for surface-water-quality sites, explains the distinction between "continuing records" as used in the report and "continuous recordings," and refers the user to a map showing the locations of the surface-water-quality stations.

Arrangement of records

This section describes the arrangement of the surface-water-quality records in the data report. The discussion should describe not only the placement of the records for the continuing water-quality stations but also that for partial-record stations and miscellaneous sampling sites.

[1]At the District's option, the information presented in this section and the section, "Records of Ground-Water Quality," may be combined in a single section, "Records of Water Quality," to follow the explanation of the records of stage and water discharge.

On-Site measurements and sample collection

This section describes the methods used in collecting surface-water-quality data to assure that the data obtained represent the in situ quality of the water. Publications on "Techniques of Water-Resources Investigations" that describe procedures for on-site measurements and for collecting, treating, and shipping samples are cited. A brief reference should be made to the records published for water-quality stations equipped with digital monitors.

Water temperature

A discussion of water-temperature measurements should be presented with a brief reference to temperature-recording instruments included.

Sediment

This section describes the collection and analysis of sediment samples. The discussion should include a brief reference to the types of sediment records published in the data report.

Laboratory measurements

This section describes how and where each sample collected by the District is analyzed. Districts should revise the example paragraph in Appendix A, example 8, to make it appropriate to their individual situations. If samples are analyzed in cooperator-managed laboratories, the name and location of the laboratory should be given.

Data presentation

This section describes the format of surface-water-quality records in the report. For those stations that are interleaved with water-discharge records, the individual manuscript headings are described to the user in a paragraph format similar to that shown in the "Data Presentation" section under the heading RECORDS OF STAGE AND WATER DISCHARGE. The discussion should include a brief description of the format for the surface-water-quality partial-record stations and miscellaneous sampling sites. Districts will need to revise the last paragraph to make it appropriate to their individual situations. For example, some Districts do not assign "downstream order" identification numbers to miscellaneous sampling sites. Also, many Districts publish the water-quality records for partial-record stations and miscellaneous sampling sites in a single table. (See Appendix A, example 27.) For District personnel involved in preparation of the station records, a detailed discussion of each paragraph of the station description is given in the section "Description Headings" beginning on p. 149.

Remark codes

This section presents a list of the remark codes that may appear with the water-quality data in the report and lists the corresponding remark next to each symbol.

Records of Ground-Water Levels

This section describes to readers the water-level records contained in the report. The introductory paragraph should state that the published records represent only a basic network of wells selected to provide a sampling and historical record of water-level changes in the Nation's most important aquifers, and reference should be made to the appropriate map showing the locations of the observation wells in the network. Records are not included for wells measured only once, and are not necessarily included for all of the wells measured regularly over a number of years as part of a larger network. The number of wells for which records are included should be given, and the user should be informed of other records available that have not been published in the data report. If data from project wells are included, this should be explained. Examples of this section of the introductory text, as published by two States, are shown in Appendix B, example 22. Appendix A, example 8, shows the introductory text discussion of ground-water-level records in the new format.

Data collection and computation

This section describes how the records are obtained; how they are arranged for publication; and how the water-level measurements are reported with reference to land surface. A brief discussion of the accuracy of water-level measurements also should be included.

The unique well identification number and the local well name or number that serves to more readily locate the well, previously explained in the section "Station Identification Numbers," should be mentioned within the context of explaining the arrangement of the tables for publication.

The section may include basic text on State aquifers (such as a brief description of the State's major aquifers), normal patterns of seasonal water-level fluctuations, (such as normally high levels in spring and low levels in winter), and areas of water-level declines due to pumping, but significant information relating to the water-year record should be included only under "Summary of Hydrologic Conditions".

Data presentation

This section provides users of the report with a brief explanation of each paragraph heading appearing in the station description of the well records and of the data tables that follow. Further, more detailed information on the format to be used for preparing well and water-level records, intended primarily for District personnel concerned with preparation of ground-water data for publication, begins on page 170. The section is titled "Ground-Water-Level Data" and it contains specific information and examples for each of the paragraph entries and describes the various formats available for the water-level tables that follow. (See Appendix A, example 8.)

Records of Ground-Water Quality

This section describes to users the records of ground-water quality published in the data report. The introductory paragraph should present a brief general discussion of how and why ground-water-quality records may differ from other records contained in the report.

Data collection and computation

This section describes the methods and frequency of collecting and analyzing ground-water-quality data by the District. Some discussion of sampling techniques may be included. If the collected samples were obtained from a Statewide ground-water-quality monitoring network, or if the samples were collected at specific locations for areal studies or for other uses, this information should be stated. Districts should revise the example paragraphs contained in Appendix A, example 8, to make the description appropriate to their individual situations.

Data presentation

Use this section to describe the location of the ground-water-quality data in the report and explain how the well records are arranged and identified in the table. For ground-water-quality records, a single table is used to report data for multiple wells and no descriptive statements or paragraphs precede the data. However, the well number, depth of well, date of sampling, and other pertinent data are given in the table. An example of the format for reporting the data is given in Appendix A, example 34. Further guidelines pertaining to preparation of the table containing ground-water-quality data are in the section "Ground-Water-Quality Data" beginning on page 175.

Records of Precipitation Quality

Data collection and computation

Some Districts presently collect precipitation-quality data and many others will do so in the future. Precipitation-quality records differ from other water-quality records in that they generally represent composite samples collected over a period of time. A section discussing precipitation-sampling instrumentation and methods should be included in the "Explanation of Records" section of the introductory text, if appropriate.

Districts that publish precipitation-quality data may structure this section to meet their individual needs. If no precipitation-quality data are collected within a District, this section should not be included in the report.

Data presentation

Precipitation-data tables should be in the last section of the data report, immediately following the section on "Quality of Ground Water." The order of presentation of the records should be alphabetical by county (or other geographic division). Within each county, the stations should be arranged in order of increasing site-identification numbers. The format arrangement for publishing quality-of-precipitation data is a descriptive heading for the station followed by the table values. The section "Precipitation-Quality Data" discusses description headings and the composition of the tables and provides an example of a precipitation-quality data table.

Access to WATSTORE Data

Beginning with the 1983 water-year, all State data reports have included in their introductory text a new section "Access to WATSTORE Data." This became necessary because revisions of water-quality hydrologic data will no longer be published in State data reports, and appropriate changes made by updating the WATSTORE computer files has become the only requirement. This policy change concerning publication of revisions places increased responsibility on the Districts to enhance user awareness of all aspects of the WATSTORE Program. The new section provides information on the purpose of WATSTORE and on how the system may be used, and should be inserted in the introductory text immediately after the explanation of the records, as follows:

> The National WATer Data STOrage and REtrieval System (WATSTORE) was established for handling water data collected through the activities of the U.S. Geological Survey and to provide for more effective and efficient means of releasing the data to the public. The system is operated and maintained on the central computer facilities of the Survey at its National Center in Reston, Virginia.
>
> WATSTORE can provide a variety of useful products ranging from simple data tables to complex statistical analyses. A minimal fee, plus the actual computer cost incurred in producing a desired product, is charged to the requestor. Information about the availability of specific types of data, the acquisition of data or products, and user charges can be obtained locally from each of the Water Resources Division's District offices (see address given on the back of the title page).

General inquiries about WATSTORE may be directed to:

Chief Hydrologist
U.S. Geological Survey
MS 437 National Center
Reston, Virginia 22092

Definition of Terms

This section, a sample of which is given in Appendix A, has been standardized over the years. Definitions for the most part are based on those given in Water-Supply Paper 1541-A. Terms listed in the sample that are not used in the report may be omitted. However, if a District wishes to list definitions for all terms in order to be consistent with other Districts, it should do so.

Any proposed changes in definitions must be submitted to Chief, Publications Planning Unit, for approval.

Publications on Techniques of Water-Resources Investigations

This section is a brief catalog listing of publications describing the techniques of collecting, computing and analyzing hydrologic data. The list is arranged by major subject headings called books and is further divided into sections and chapters. (See Appendix A, example 8.) It will be updated periodically and will provide users references to all techniques publications cited in the introductory text. This list will be provided by the Publications Planning Unit for all State data reports. (See the section "Preparation of Camera-Ready Copy for Direct-Image Offset Printing.")

Illustrations

Illustrations can be useful tools in summarizing data, showing trends, making comparisons, and so on. If properly used, they can make the data report a more useful and informative product. They should be helpful to the users of the report, simple to prepare and to print, easily understood, and should not add appreciably to the cost or delay the publication of the report. Photographs are not permitted.

The only illustrations required in a State data report are maps showing the location of hydrologic-data sites for which records are being published. However, illustrations are very useful in data reports, especially in the introductory text, and each District is encouraged to use its own initiative in determining which illustrations would be appropriate for its particular needs. Examples of maps showing the location of hydrologic data sites are given in Appendix A, example 8; examples of illustrations for the "Summary of Hydrologic Conditions" are given in Appendix B, examples 1 and 2 beginning on p. B-1. The illustrations for the section "Summary of Hydrologic Conditions" should be placed within the section itself and not separated by other sections of the introductory text. Maps and several other illustrations useful in data reports are discussed below:

Maps of Hydrologic Data Sites

Maps showing the location of hydrologic data sites for which records are being published are required. The following guidelines for maps should be observed: a simple base should be selected; reduction must be to page size (no fold-out is permitted) or to two facing pages. Symbols and station numbers must be clearly shown. Printing should be in black only, but the base may be "screened" to make it appear gray instead of black. The surface-water base map should show stream drainage and lakes, with names for the major streams and as many gaged streams as possible without cluttering the map. For the well-location map, counties (or other geographic designations) should be shown and named. Latitude and longitude lines (degrees only) should be shown along the margins of the map. The State name is not needed on the map, because it will appear in the title, unless the report covers more than one State, in which case the names should be shown within the State boundaries. If gaging stations are shown in adjacent States, the names of those States should be shown. The names and locations of a few cities and towns may be shown, but these should be no greater than the density shown on the U.S. base map, scale 1:2,500,000.

If possible, the scale of the base map should be such that a reduction of about 50 percent will result in a page-size map--maps are limited to 9 by 7 in. so the original map should be no more than 18 by 14 in. The shape or length-width ratio of the area to be covered by the map will of course govern the placement on the page. If the map cannot be reduced to fit on a single page or on facings pages and remain legible, it may be cut into three or more segments and placed on the following page or pages. A small index map should identify each map segment, its relation to other segments, and to the page on which they appear. Fold-out and two-color (or more) maps are not permitted.

Location sites should be plotted using the approved symbols used in the station-location maps in the sample introductory text given in Appendix A, example 8. The down-stream station number should be lettered large enough so that after reduction each number is legible. In many areas, the size of the numbers will be governed by the density of the sites; and expanded inset maps may be necesary for some areas where stations are dense. Separate maps may be required for each type of hydrologic data or for partial-record stations. The maps should have a scale, a title, and an explanation of symbols and numbers as shown in the sample maps in Appendix A, examples 8 and 14.

Schematic Diagrams

Reports may include schematic diagrams to illustrate a complex pattern of streamflow at hydrologic data sites, such as diversions and return flows. An example of a schematic diagram is included in Appendix B, example 8.

Hydrologic-Conditions Bar Graph

Reports may include bar graphs that show monthly and yearly runoff compared with medians for two or more gaging stations. An example of a bar graph is included in Appendix B, example 1. The diagram may be placed on a separate page in the SUMMARY OF HYDROLOGIC CONDITIONS. The size of camera-copy (including title and running head) should be no larger than 9.8 by 7 in. The discharge for each month is plotted as a bar adjacent to the bar showing median discharge for that month for the desired period. The bars may be plotted as monthly mean discharge in cubic feet per second, or monthly discharge in acre-feet. The title should read: "Figure___. Discharge during __ water year compared with median discharge for______ at three representative gaging stations". Be sure to include a reference to the figure under SUMMARY OF HYDROLOGIC CONDITIONS.

Bar graphs that compare the range in concentration of water-quality constituents during the water year with the average for the period of record also may be used.

Other illustrations, such as runoff maps, hydrographs of major floods, comparison of average reservoir storage for the year with average of record, graphs of tidal cycles or other events also may be included.

Ground-Water-Level Hydrographs

Hydrographs that illustrate changes in ground-water levels are recommended, for they portray seasonal or long-term trends in an easily understandable form.

The number of hydrographs and periods of record depicted in the station records are optional. If the intent is to represent the annual tabular measurements graphically, a short-term (2 or 3 years) hydrograph may be included with each record. (See Appendix A, example 30.) If the intent is to show how the annual measurements relate to the long-term record, a long-term hydrograph may be included with an explanation text or a long-term dual hydrograph showing annual highs and lows can be used (Appendix A, example 33).

Hydrographs should be labeled as to whether they are plots of monthly lows, annual highs and lows, daily highs, and so on; dashed segments or other symbols used on the graphs should be explained.

Hydrograph plotting programs are used by several Districts. Assistance in determining the feasibility of using one of these programs can be obtained from the Office of Computer Technology, U.S. Geological Survey, 440 National Center, Reston, Virginia 22092.

SURFACE-WATER-QUANTITY DATA

Publication of surface-water hydrologic data has been an established practice for many years, and the same methods and format will continue to be used for presenting the data. Water-discharge and water-quality records for a given station are grouped together (interleaved), so far as practical, with water-discharge records presented first. Manuscript headings providing information on station locations, drainage areas, and other pertinent items are included for all records except those regarded as miscellaneous or partial. Methods and formats for data presentation and criteria for publication of records are discussed in the following paragraphs.

Records Provided by Other Agencies

Some records collected and prepared by other agencies are provided for publication in Geological Survey reports. The records must be accurate and serve a useful purpose. A discussion of COOPERATION statements to be used for acknowledging and qualifying the records provided is presented in the section "Cooperation" under "Manuscript station description."

Inclusion of Records for Stations in Adjoining States

Records for selected gaging stations in adjoining States may be included, especially along boundary streams and on interstate streams. Adjoining Districts should work out a mutually agreeable system for exchange of station records that will facilitate publication. No mention will be made that a record is provided by another District.

Manuscript Station Description

The manuscript station description is the part of the station record that contains essential information on the following items:

- Basin name
- Station number
- Station name
- Location
- Drainage area
- Period of record
- Revised records
- Gage
- Remarks
- Cooperation
- Average discharge
- Extremes
- Revisions

Typical descriptions as headings for tables of daily discharge are presented in several examples in Appendix A.

All quantitative and qualitative water-resources data for a station will be grouped together. The station will be described first (basin name, station number, location, and drainage area). Information will follow about water discharge (period of record, revised records, gage, remarks, contents, cooperation, average discharge, extremes, and tables of discharge, gage heights, or contents). Water-quality information collected at the station will be given in similar order, with descriptive headings preceding tabular data. If the site of the water-quality station is the same as that of the discharge gaging station, neither the LOCATION nor the DRAINAGE AREA statements are repeated. Tables of chemical, physical, biological, and radiochemical data and so on that are obtained less often than once daily are presented first. Tables of "daily values" of specific conductance, pH, water temperature, dissolved oxygen, and suspended sediment then follow in sequence. (See Appendix A, examples 18A and 18B.)

Specific information on each item mentioned above is discussed in the following sections. The format for presentation of data is outlined, and examples of the proper wording for statements most commonly used are given. For the examples shown in the main text, dual units have been omitted because their use is no longer required. However, for the full-page examples in Appendix A that illustrate the complete station description format, deleting the dual units was not always practical and some examples were reproduced exactly as originally published.

Basin Name (Running Head)

The name of the river basin is placed at the top of the page of camera-ready copy in capital letters, and is used as the running head for each station in that basin. The name is the same as the basin name given in the list of stations. For a gaging station (or reservoir station) on the main stem, such as the Ohio, Mississippi, or Columbia River, the running head will be "OHIO RIVER MAIN STEM", for example. The main-stem name will be used even though a different stream name applies in the headwaters. Thus, the running head "MISSOURI RIVER MAIN STEM" is used for stations on the Red Rock, Beaverhead, and Jefferson Rivers in Montana.

To signify the beginning of the station records, the page (odd-numbered) just preceding the section on surface-water stations, both quantity and quality, should have the name "SURFACE-WATER RECORDS" centered on the page. (See Appendix A, example 9.) An explanation of the remark codes used for water-quality data should be included as shown in the example.

For reports that include records for more than one Part, the first station for each Part should have a heading two lines above the basin name to identify the Part. For example, in a report for which the sample list of stations previously given would apply, the page where the first Part 8 station record is given would contain the heading:

WESTERN GULF OF MEXICO BASINS

RIO GRANDE BASIN

Occasionally, short records from two gaging stations are combined on one page. If the second of these two stations begins a new basin, the basin name is used above that station record, just as if the records for the basin began on a new page.

Certain stations have running heads that differ from the usual basin name. These special running heads are used for diversions, groups of very minor tributaries, islands, the St. Lawrence River basin, the Mississippi River Delta, and Alaska and Hawaii among others.

Station Number and Name

The 8-digit (or more) station number and full station name in capital letters is centered below the basin name. The State name will be in the two-letter form used by the U.S. Postal Service. There will be two spaces but no punctuation between the number and name. The Postal Service abbreviation is permitted in the station name in the station description, the list of stations, and the index. It should not be used in the introductory text of the report except when given as part of an address that includes the zip code. (See p. 240 of WRD Publications Guide.)

When the station number is changed, only the new number will be shown, followed by the word "(revised)" in parentheses for the first year following the change. There will be no reference to the revision or the former number in subsequent years. It is the responsibility of the District to correct the station number in computer files for all affected data.

The station name should be chosen with care, and should be distinctive but short, and insofar as possible, the same name should be used for all equivalent records and different names used for nonequivalent records. The full station name consists of five parts: (1) the feature name (stream, canal, or reservoir); (2) the generic name ("River," "Creek," "Lake," "tunnel" and so on, (3) the term to indicate location ("at," "above," "below," "near," and so on)[1]; (4) the place name (city, town, or major feature); and (5) the State or States where the reference place name is located. Each of these items is discussed below.

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[1]Although the terms "above" and "below" are permitted in station names, the phrases "upstream from" and "downstream from," respectively, are to be used in their place elsewhere in the station description.

The most recent U.S. Geological Survey topographic maps should be used as the principal references for selecting station names. The name selected should be distinctive but as short as possible. The use of distinctive names for branches of a stream is preferred to terms "North Branch ________ River" or "West Fork _______ Creek," for unnamed streams. Where the terms "Branch" or "Fork" are used, the preposition "of" is omitted as "Salt Fork Brazos River." However, in the name of a second fork or branch use the form "South Fork of South Branch Potomac River."

Many small streams are not named on any map. However, if a stream is important enough to be gaged, it should have a name. In this situation, select a reasonable name and propose it to the United States Board on Geographic Names (BGN), 523 National Center, Reston, Virginia 22092 (928-6261). Forms are available from the BGN for this purpose. The name submitted may be used in the meantime, provided it does not conflict with other names in the vicinity. Any conflicts in name usage should be submitted to BGN.

The generic name is used to designate the physical or physiographic feature being gaged. For a stream channel this might be "River," "Creek," "Wash," "Brook," "Run" (common in parts of the East), "Stream" (used in Hawaii and New England), "Bayou," "Bogue," "Spring," "Draw," "Rio," "Rito" (the last two Spanish). Other names that are more properly applied to topographic features rather than stream channels are "Gulch," "Arroyo," "Canyon," and "Coulee." However these names have become established through use for many gaging stations in the West. When naming a new station try to use the accepted hydrographic terms. There are examples of the name "Canyon" being applied to a gaging station in a broad valley because the confined reach far upstream was designated "Canyon." It is preferable to use a name such as "______ Canyon Creek" for the gaging station in such cases. For an artificial channel the generic term is generally that used by the agency that constructed or controls the channel. These names might be "canal," "ditch," "tunnel," "wasteway," "drain," "diversion," or the like. For a storage basin the name generally would be based on usage of the controlling agency, and might be "Reservoir," "Lake," "Pond," or the like. Only one generic term should be used, as "Smith Lake" or "Smith Reservoir" but not "Smith Lake Reservoir." Some names have been designated by acts of Congress; those statutory names must be used.

The criterion for use of "at" or "near" is based on the distance of the hydrologic-data station from the reference place name. When a new hydrologic-data station is established, use "at" if the station is within a mile of the nearest point of the reference place, provided this does not conflict with the name of another nonequivalent station; use "near" if the station is more than a mile away, provided this does not conflict with the name of a nonequivalent station. Occasionally a problem is created when a station that was within a mile of a town is moved to a location more than a mile away from town. If the records are equivalent at both sites, the name need not be changed from "at" to "near." Likewise, if a station that is more than a mile from a town is relocated to less than a mile away, the name need not be changed from "near" to "at." Neither is it necessary to change from "near" to "at" when the town limits are extended so that a station is actually located within these limits. In certain areas where several stations are located on the same stream and towns are sparse it may be necessary to use terms such as "upstream" or "downstream" in reference to tributaries, reservoirs, dams, or other features, in order to provide a distinctive name for each gaging station. The term "at mouth" or "near mouth" will be helpful in a few special cases.

The reference location in the station name should be that of the largest city or town within a rather small radius of the station, and should be a town in the State in which the station is located, except as noted in the next paragraph. The place name should serve to locate the station within a reasonably small region of the State; it should appear on a recent topographic map and preferably on the State base map. In rare instances, a dam or other structure is more important than a nearby town; if the dam or structure is shown on maps, it may be a more suitable reference for use in the station name.

The final item in the station name, the State name, is that of the State where the reference location is situated. When two State names are used as part of the station name for a stream crossing a State boundary, give the full name of States in downstream order (for example, "North Platte River at Wyoming-Nebraska State line"). When two State names are used as part of the station name for a stream that forms a State boundary, give the States (abbreviated) in alphabetical order (for example, "Colorado River below Davis Dam, AZ-NV").

Changes in station names should be avoided. If a station name must be changed, give the new name first and the old name below in parentheses, as follows:

06442000 MEDICINE KNOLL CREEK NEAR BLUNT, SD
(Formerly published as Medicine Creek near Blunt)

The parenthetical phrase will be shown only in the report for the year in which the change is effective. In subsequent years, the statement will be included in the PERIOD OF RECORD section of the report (see "Name Changes," p. 51).

A parenthetical phrase under the station name (and above a former name, if any) will be used to identify an "International gaging station", a "Hydrologic bench-mark station," or a station in any other special network or program.

In summary, each station name should be brief yet distinctive, and in accordance with local usage and criteria for assigning geographic names.

Location

The first paragraph of the station description has the heading LOCATION. (Note that paragraph headings are in capital letters). The location of the principal gage with respect to the cultural and physical features in the vicinity and with respect to the reference place mentioned in the station name are given under LOCATION. Information on former locations of the gage, and on locations of auxilary gages used to determine fall, are given under the GAGE paragraph. In addition, when the location of the gage is changed during the year, a statement will be given under LOCATION, as shown in the following example: "Prior to Apr. 27, 1975, at site 1,200 ft downstream." This type of statement will be given in the report of the water year in which the change occurred, but not in later reports.

The information given under LOCATION should be obtained either from the most accurate maps available, or by actual measurements at the station. The information should be in sufficient detail to enable the user of the records to locate the station readily on available maps and perhaps in the field. The description should be complete enough to prevent confusing the station in current operation with one that may formerly have been operated in the vicinity. In general, unless there are special reasons for doing otherwise, location refers to the structure (gage house), not the intake or bubble orifice. The information that should be included under LOCATION is discussed in the following paragraphs.

Latitude and longitude

The latitude and longitude of the gaging station should be determined and reported to the nearest second, to enable users of the report to locate precisely the gaging stations in the field on large-scale maps, and minimize the likelihood of similar latitude-longitude identification numbers.

Landlines

In States covered by public-land surveys, the location of the gage with respect to landlines may be given if desired. Give the quarter (or quarter-quarter) section rather than "near the South quarter corner" or "near the center".

County name

The name of the county (or corresponding political unit) in which the gage is located will be given after the landline location (or latitude and longitude), for all stations. This identification has been prompted by the interest in county and local planning. Do not give the name of the county in which the reference place is located if different from the county in which the gage is located.

Hydrologic-Unit number

The Hydrologic-Unit number for the site, identified from hydrologic unit maps, will follow the county name. The number designation will be in the form "Hydrologic Unit 11040007," for example.

If the gage is located on Federal land, include an identifying statement immediately following the Hydrologic Unit number, such as "National park," "monument," "forest," "Indian reservation," or "military reservation." If the gage is located on a Spanish land grant, this information also may be given.

Next state which bank the gage is on, as "on right (left) bank", then give the approximate distance from the gage to the various cultural and physical features, proceeding from the nearest to the farthest features. If the distance is measured in an air line, give its compass direction, using the eight points of the compass. If the distance is measured along the stream, refer to the distance as "upstream" or "downstream". If the gage is located downstream from a nearby reservoir, give the distance from the dam. Give distances in feet or miles; do not use yards or other English units. Express parts of a mile as a decimal to the nearest tenth. Common fractions of a mile will not be used.

Dams

The LOCATION paragraph for each reservoir should give the name of the dam, if named, and the stream on which it is located. For example, ". . . at right intake tower of Coolidge Dam on Gila River". For an offstream reservoir: ". . . on right bank near abutment of Horsetooth Dam on tributaries of Cache la Poudre River . . .".

Bridges and stream banks

If the gage is at a bridge or culvert, state whether the gage is located on the upstream or downstream side and whether it is located on a bank, near a bank, or near the center of a bridge span. The exact location along the span need not be given for gages that are attached to a pier or pile bent--for example, "on right bank at upstream side of bridge on U.S. Highway 66"; "near left bank on downstream end of pier of Congress Street Bridge"; near center of span on upstream side of bridge on State Highway 32"; "on left bank 50 ft upstream from culvert on northbound lane of Interstate Highway 270".

Towns and other culture

The town or other feature used in the station name should be referred to under LOCATION, giving distance and direction. If this town or feature is not shown on the base map of the State, include also the distance and direction from a town that is shown on the base map. Use distance from center for any town shown only as a spot on the base map. For larger cities where city limits are shown on the base map, refer to some specific point in the city.

Tributaries

Include reference to the nearest tributary shown on the State base map, and to important tributaries that are reasonably close to the gage, giving the upstream or downstream distance of the station from the tributary. Also give the distance of the gage upstream or downstream from a minor tributary not shown on the State base map, if necessary, to definitely locate the station and to identify the drainage basin. Only rarely should it be necessary to refer to an unnamed tributary, but if it is, use the form: "0.8 mi upstream from small left-bank tributary". If the tributary is a fork of the stream on which the gage is located, a short form of the name of the tributary (such as East Fork) can be given, unless there is a complication of forks or branches; for example: "3.4 mi downstream from confluence of North and South Forks". Note that the word "confluence" is only used to indicate that two streams of different names join to form a stream bearing a third name. Do not use the word "junction", because it is generally considered to refer to the joining of the works of man, as two railroads or highways. Reference to a tributary may be omitted if it is so far from the gage that reference to it serves no useful purpose. If the station is relatively close to the mouth of the stream being gaged, give the distance upstream from the mouth. Note that the wording is "10 mi upstream from mouth" not "upstream from Mississippi River".

When published discharge is computed from a point substantially different from that of the gage location because the flow of a downstream tributary is included or flow of an upstream tributary is excluded, that fact should be brought out under LOCATION, in the form: "Records include flow of Willow Creek."

River mileage

If river mileage has been established, for a stream, this information should be included as the last item under LOCATION, as ". . . and at mile 50.5." Bulletin 14 (October 1968) of the Water Resources Council, titled "River Mileage Measurement", will be helpful in making these determinations. The source of the mileage figure will not be given. River mileage will be omitted for those stations located so close to the mouth of the river that the statement ". . . miles upstream from mouth" is more appropriate.

If only one item under LOCATION is revised, insert the correct figure or statement, followed by the word "(revised)" in parentheses. If more than one item under LOCATION is revised, head the paragraph "LOCATION (REVISED)." The word "(REVISED)" is used only in the first report containing the revised figure or statement.

Several examples of LOCATION paragraphs are given below.

- LOCATION.--Lat 28°05'03", long 80°45'11", in NE 1/4 sec.6, T.28 S., R.36 E., Brevard County, Hydrologic Unit 03080101, on left bank 10 ft upstream from bridge on U.S. Highway 192, 1.0 mi downstream from Sawgrass Lake, 1.8 mi upstream from Lake Washington, and 9.2 mi west of Melbourne.

- LOCATION.--Lat 33°31'17", long 90°11'03", in SW 1/4 sec.10, T.19 N., R.1 E., Choctaw Meridian, Leflore County, Hydrologic Unit XXXXXXXX, on left bank 110 ft downstream from bridge on U.S. Highways 49E and 82 (old) in Greenwood, 0.4 mi downstream from Palusha Bayou, 3 mi downstream from confluence of Tallahatchie and Yalobusha Rivers, and at mile 169.4.

- LOCATION.--Lat 36°56'22", long 80°53'13", Wythe County, Hydrologic Unit 05050001, on left bank 20 ft downstream from bridge on State Highway 619 (revised) at Grahams Forge, 2.2 mi downstream from Glade Creek, and at mile 7.3.

- LOCATION (REVISED).--Lat 36°59'53", long 78°21'03", Lunenburg County, Hydrologic Unit 03010204, on right bank at upstream side of bridge on State Highway 40, 0.5 mi downstream from Tusekiah Creek, 4.6 mi upstream from Juniper Creek, and 5.2 mi northwest of Lunenburg.

- LOCATION.--Lat 34°18'58", long 114°09'23", in NW 1/4 SW 1/4 sec.28, T.3 N., R.27 E., San Bernardino Meridian, San Bernardino County, Hydrologic Unit 15030101, at intake pumping plant for Colorado River aqueduct of Metropolitan Water District of Southern California, 1.8 mi upstream from Parker Dam on Colorado River.

- LOCATION.--Lat 61°12'00", long 149°50'10", in SW 1/4 sec.21, T.13 N., R.3 W., on right bank 10 ft upstream from culverts on Lake Otis Road, 2.3 mi southeast of Anchorage Post Office, and 3.2 mi upstream from mouth.

[In Hawaii the county and Hydrologic Unit may be omitted because the boundaries of these are the same as the island, which is identified in the running head.]

- LOCATION.--Lat 27°27'00", long 157°57'30", on left bank of adit 8, 2,700 ft downstream from eastern boundary of Ewa Forest Reserve and 5.2 mi northeast of Waipahu Post Office.

Drainage Area

Drainage areas are measured using the most accurate maps available. The drainage area is given in units of square miles and, for those Districts that use dual units, the metric equivalent in square kilometers.

Drainage-area figures may need to be coordinated with other Federal or State agencies that operate gaging stations near the Geological Survey sites. The standard methods of determining drainage areas and the standards for accuracy of figures are contained in the report "Inter-Agency Coordination of Drainage Area Data," published as Bulletin 4 (November 1951) of the Federal Inter-Agency River Basin Committee.

When coordinating drainage-area figures, use the same accuracy limits and degree of rounding used by the agencies involved. When coordination between agencies is not required, drainage areas should be determined to the nearest square mile for areas greater than 100 mi^2, if available maps permit this precision, to the nearest tenth of a square mile between 10 and 100 mi^2, and to the nearest hundredth of a square mile for areas less than 10 mi^2. Drainage-area figures may be rounded if the available maps are not sufficiently detailed or are of too large scale; the rounded figures will be qualified as "approximately" in the published reports.

If the drainage area at a gaging station has been determined by another agency, show the source of the figure or give a credit line unless it is known that approved and accepted methods were used.

For some gaging stations, the drainage boundary may be so indefinite or the maps so imprecise that the computed area must be rounded even more than is warranted for the qualification "approximately". The area then may be given as "About 1,800 mi^2." The use of "Indeterminate" may be justified for a few stations where the drainage boundary cannot be defined.

The drainage area for a reservoir station is determined at the dam location or outlet of the reservoir, regardless of the location of the gage. Thus, the drainage area will include drainage areas of any tributaries that enter the reservoir below the gage but above the outlet. No qualification is needed after the drainage-area figure to explain the inclusion of the drainage areas of such tributaries. However, drainage area for a reservoir system that combines the contents of several reservoirs should be computed at the most downstream dam and qualified as follows:

- **DRAINAGE AREA.—6,211 mi^2, at Stewart Mountain Dam.**

The records of a gaging station located upstream from a tributary may include the flow of that tributary. Similarly, the records of a gaging station located downstream from a tributary may exclude the flow of that tributary. For such stations, the drainage area should be followed by a statement explaining the situation, as follows:

- **DRAINAGE AREA.—258 mi^2, includes those of Gold and Buck Creeks.**

- **DRAINAGE AREA.—1,130 mi^2, approximately, excludes approximately 80 mi^2, of Medicine Lodge Creek.**

Occasionally, the point at which discharge measurements are made is at some distance from the gage. If records of daily discharge are computed for the measurement site, and the drainage area is determined for the measurement site, these facts should be explained, as follows:

- **DRAINAGE AREA.—348 mi^2 at cableway, 1.2 mi upstream, where all discharge measurements are made.**

If records of flow in several channels are gaged separately and combined to give total flow at a specified location, the DRAINAGE AREA paragraph should be qualified accordingly, as follows:

- **DRAINAGE AREA.—640 mi^2, approximately (total area above river and slough stations).**

- **DRAINAGE AREA.—305 mi^2, combined drainage area of all channels of St. Marks and East Rivers.**

At many gaging stations, flow is affected by water diverted from the stream or into the stream upstream from the station. Generally, no adjustment is made to the drainage areas unless all or nearly all of the flow from one basin is diverted continuously into another basin. In this case, the drainage areas of the respective basins should be adjusted accordingly and noted in the report. Show the date of diversion if it occurred during the period of record.

- **DRAINAGE AREA.—1,295 mi^2, including that of Sand Creek, which is diverted into Blackfoot River through Idaho Canal.**

- **DRAINAGE AREA.—8.2 mi^2, since June 1956. Prior to August 1945, 27.0 mi^2. See WSP 1713 for history of progressive reduction by flood-control diversion structures.**

If the information in WSP 1713, mentioned in the example above, is not too long, it could be included in the statement. When the flow is only partially or intermittently diverted, the drainage areas need not be adjusted, but adequate explanation of the diversions should be made in the REMARKS paragraph.

Figures of drainage area should not be adjusted because of interconnected flow from one river basin to another during high stages in either river. Instead, the records of discharge during such periods should either be adjusted or qualified by an explanatory statement.

If a part of the drainage area above a gaging station is known to be noncontributing, give the total drainage area, with a qualification giving the estimated size of the noncontributing (or contributing) areas.

- **DRAINAGE AREA.—34,356 mi^2, of which 6,002 mi^2 probably is noncontributing.**

- **DRAINAGE AREA.—2,500 mi^2, approximately, of which about 1,200 mi^2 is partly or entirely noncontributing.**

- **DRAINAGE AREA.—5,740 mi^2, approximately; includes a 2,940 mi^2 closed basin in northern part of San Luis Valley in Colorado.**

- **DRAINAGE AREA.--242,900 mi^2, approximately, including all closed basins entirely within the drainage area.**

Considerable doubt may exist as to the major basin of which the noncontributing area is to be considered a part. The lowest point in the boundary of the noncontributing area is the governing factor.

In certain basins, such as those that drain extensive lava beds or sandhills, the drainage area determined from topographic maps may not represent the effective contributing area because of significant ground water movement into or from adjacent basins. In this situation the DRAINAGE AREA paragraph should be qualified, as follows:

- **DRAINAGE AREA.--1,260 mi^2, approximately, of which about 110 mi^2 contributes directly to surface runoff.**

When the headwaters of two or more streams lie in the same swamp or other depression, each stream should be assumed to drain that part of the depression lying closer to it than to any other stream, unless more definite information can be obtained by ground reconnaissance. For example:

- **DRAINAGE AREA.--About 1,990 mi^2, which includes area from estimated part of watershed in Okefenokee Swamp.**

If the drainage area is revised, show the new figure, followed by the word "revised", when published for the first time. In subsequent publications the word revised will not be used. Instead the fact that drainage area has been revised in the past will be indicated in the REVISED RECORDS paragraph by giving the report number in which the revised drainage area was first published (see example in section "REVISED RECORDS"). If the drainage area is revised for a gaging station which was once at a slightly different location, it is sometimes useful to also give the revised figure for the former site so that the correct information will be available on the size of the intervening area. If both revised areas are included, show the revised area for the old site only for the first year published, as follows:

- **DRAINAGE AREA.--1,538 mi^2, revised. (Area at site used prior to Oct. 1, 1949, 1,502 mi^2, revised.)**

In general, do not make minor revisions of drainage area before coordinating the figures with those of other Districts or agencies, if applicable. However, if a published figure is found to be grossly in error (more than 10 percent), the figure should be revised as soon as possible, and the new figure reported to other interested parties, if applicable.

Whenever a drainage-area figure is revised, the figures for the next upstream and downstream gaging stations may need to be revised, including discontinued stations, to maintain compatibility among the total areas and intervening areas.

See section "REVISED RECORDS" for procedures for listing drainage-area revisions.

Water-Discharge Records

The following station description guidelines are limited to water-discharge records; the guidelines for preparing water-quality records for surface-water stations are in the section, "Surface-Water-Quality Records."

Period of Record

Periods for which there are published records for the present station or for stations generally equivalent to the present one are given under "PERIOD OF RECORD." An equivalent station is one that was in operation at a time that the present station was not, and whose location was such that records from it can reasonably be merged with records from the present station.

Under "PERIOD OF RECORD" give the periods for which daily records of gage height, discharge, or contents are published. When listing dates, give the month and year but not the day. Except for seasonal records (those for which only records for irrigation seasons are published or those for which no winter records were published some years), omit months for which no records are available. The words "current year" are used instead of an ending month and year if the station is in operation beyond the end of the period covered by the report. For example:

- **PERIOD OF RECORD--October to December 1933, March to August 1934, November 1934, May 1935, April 1938, June 1940, October 1940 to current year.**

The first year a record is published, however, it will be necessary to use the form "May to September 1983" or October 1982 to September 1983." If the station is established after July 1, say Aug. 10, 1982, usually the record should be published the following year and then the form will be "August 1982 to current year."

If a gaging station is discontinued add the notation "(discontinued)" after the date of the end of the record; use the ending month and year instead of the words "current year." If a station is discontinued between Oct. 1 and Dec. 31, it is preferable to publish records collected during those 3 months with records for the preceding year. If a station is destroyed by flood, or other act of God, that fact may be noted by adding, after the date of end of record, a statement such as "(destroyed by flood of July 1982)" instead of "(discontinued)."

Include in the list of dates all those for which records generally are equivalent to those at the present site, regardless of changes in site or changes in name. Do not include periods for which records are not equivalent, even if published under the same name. Records that are not equivalent but published under the same name will be listed separately later in the paragraph. (Criteria for determining equivalence of records are given later in this section.)

Also include in the list of dates those periods for which records originally were published only in reports of some other agency, but have subsequently been published in the 1950 or 1960 series of compilation reports of the WSP 1301 to 1319 or 1721 to 1740 series. The source of such records will not be identified under PERIOD OF RECORD, because the compilation report indicates the source of these records.

Records other than daily discharge or contents

Indicate periods for which records other than daily discharge or contents have been published by a notation such as "(gage heights and discharge measurements only)," or "(elevations only)," after the period to which the note applies. A note may apply to the entire period of record. (See also later section, "Records of gage height.")

Indicate periods for which only records of monthly or yearly discharge (or monthend contents) were published for a station such as "(monthly discharge only)," "(yearly discharge only)" or "(monthend contents only)" after the period to which the note applies. Records for early years when rating tables were published with daily gage heights and monthly discharge, will be considered equivalent to records of daily discharge and may be included in the periods of record just as if actual figures of daily discharge were cited.

Examples of statements that include periods of gage-height records only, monthly or yearly discharge only, or monthend storage only are given below:

- **PERIOD OF RECORD.--November and December 1910 (gage heights and discharge measurements only), October 1937 to current year.**
- **PERIOD OF RECORD.--September to December 1909 and January 1912 to July 1913 (gage heights only), January 1940 to September 1984 (discontinued).**
- **PERIOD OF RECORD.--May 1929 to October 1933, March 1940 to current year (monthly discharge only, July 1954 to March 1955).**
- **PERIOD OF RECORD.--November 1910 to September 1914 (gage heights only), October 1914 to September 1919, October 1919 to September 1924 (gage heights only), October 1933 to current year (monthly discharge only).**
- **PERIOD OF RECORD.--January 1917 to current year. Daily mean elevations published since October 1938.**

In the above examples, the parenthetical statement applies only to the period that precedes the parentheses and does not carry back beyond the comma. The second example above shows the use of "and" rather than a comma to indicate that the qualification applies to two successive periods.

Fragmentary records

If records for some periods are fragmentary and they have not been filled in to obtain monthly records for a compilation report, add the notation "(fragmentary)" after the dates of such record.

Certain stations are operated to obtain only a limited range of flow. The notations "(since October 1952, no low-flow records)"; "(high-water discharges only)"; "(operated as a low-flow station only)" after the dates explain the situation.

Seasonal records

If all or some of the yearly records only include the irrigation season and records for the incomplete parts of these years were not published, qualify the years with seasonal records by a statement such as "(irrigation seasons only)" or "(prior to October 1932 irrigation seasons only)." The notation "(seasonal records only)" may be used for other than irrigation.

If winter records were not computed for some years, and were not subsequently filled in for a compilation report, follow the dates with a statement such as "(no winter records)" or "(no winter records in water years 1908-09, 1916-30)".

Direct reference to compilation reports

The 1950 and 1960 series of compilation reports contained estimated figures of monthly and yearly discharge for breaks in the records, monthly and yearly discharge or contents for periods that originally were published only in reports of some other agency, and some records that were never published previously. The PERIOD OF RECORD paragraph should contain a standard statement referring to the compilation report that contains estimated records, as follows:

- **PERIOD OF RECORD.--October 1915 to current year. Prior to June 1916 monthly discharge only, published in WSP 1301.**
- **PERIOD OF RECORD.--June 1929 to September 1934 (monthly discharge only, published in WSP 1313), October 1938 to current year.**
- **PERIOD OF RECORD.--May 1908 to current year. Prior to February 1925, monthend contents only, published in WSP 1307.**
- **PERIOD OF RECORD.--October 1927 to December 1945, March 1946 to current year. Monthly discharge only, December 1927 to March 1928, published in WSP 1318.**

- **PERIOD OF RECORD.--April 1905 to March 1908, October 1937 to current year. Monthly discharge only for some periods, published in WSP 1311.**

- **PERIOD OF RECORD.--March to November 1907 and April 1909 to December 1912 (discharge measurements and fragmentary gage-height record), January 1913 to June 1922 (October 1915 to September 1916, monthly discharge only), May 1930 to December 1933, July 1935 to current year. Water-year estimates for 1913, 1915-16, 1920-22, 1930, 1934-35, published in WSP 1733.**

Criteria for equivalence of records

Two or more discharge records at different sites on the same stream are considered equivalent if, for the same period, the monthly discharge at the two sites can generally be expected to be within about 5 percent of each other, or if there is less than 5 percent difference in drainage area between the two sites. On some sand-channel streams having small base flows, low flows at two sites a short distance apart may vary greatly as water is lost or gained along the channel, although the high flows may be equivalent. The entire period of record at both sites can be shown, with a qualifying statement, as follows:

- **PERIOD OF RECORD.--July 1961 to current year. Low-flow records not equivalent prior to Nov. 10, 1964, because of undetermined channel-flow loss between sites.**

If a diversion that amounts to 5 percent or more of the streamflow on a monthly basis takes place between two sites, records at the two sites cannot be considered equivalent even if there is little or no difference in drainage area. Equivalent records for the two sites can be obtained by adjusting the measured discharge for the diversions. Diversions upstream from a station may cause records before a certain date to be nonequivalent to present records at that station. The basis for computing equivalent records may be indicated as follows:

- **PERIOD OF RECORD.--September 1934 to current year. Records since May 1949 equivalent to earlier records if diversion to Moffat water tunnel is added to flow past station.**

Regulation or storage of flow between two sites generally has no effect on the equivalence of records if virtually the same runoff (within 5 percent) passes the two sites.

The periods of record for equivalent records at two or more sites are not given separately in the manuscript nor are they identified by site, but instead are included chronologically in the list of dates under the PERIOD OF RECORD for the current station. Information regarding changes in site location is given in the station description under the GAGE paragraph.

Name changes

If the name of the stream or location of the station has been changed, repeat the whole of the previous name or location (except the State name, which should be repeated only if different) in parentheses after the PERIOD OF RECORD description or at the end of the list of dates. Alternatively, give only the part of the name, in quotation marks, that is different.

- **PERIOD OF RECORD.--October 1946 to current year. Prior to October 1957, published as Reedy Lake Outlet near Frostproof.**
- **PERIOD OF RECORD.--July 1949 to current year. Published as Eel River near Reelsville, October 1952 to September 1956.**
- **PERIOD OF RECORD.--March 1924 to December 1925 (published as "near Broken Bow"), October 1929 to current year.**
- **PERIOD OF RECORD.--April 1929 to September 1931 and February 1936 to July 1937 (published as "near Beulah, Wyo."), June 1954 to current year. NOTE: For the above example, the station is now in South Dakota.**
- **PERIOD OF RECORD.--January 1916 to current year. Published as "near Bernardo" prior to October 1920 and as "near Escondido" October 1920 to September 1925.**
- **PERIOD OF RECORD.--August 1888 to current year. Prior to October 1941, published under different names as follows: "near Fort McDowell," "at mouth," "above Salt River," "at McDowell," "at McDowell, near Lehi," "near McDowell," and "above Camp Creek, near McDowell."**

If the only name change that has been made is the separation, combination, or sequence of words, no mention should be made under PERIOD OF RECORD. For example, changes such as from "Sixmile Creek" to "Six Mile Creek," from "Red Rock" to "Redrock," or from "Havasu Lake" to "Lake Havasu" need not be mentioned.

Occasionally, records for the same period, at different sites, published in earlier reports under different names as nonequivalent records are now considered to be equivalent. Reference to the overlapping records should be given by modifying the usual form, as shown in the following example.

- **PERIOD OF RECORD.--October 1938 to current year. Prior to January 1939 monthly discharge only, published in WSP 1306. Published as "near Donelson" 1939-40. Records published for both sites April to September 1940.**

Nonequivalent records

Generally, no mention will be made of records that are not equivalent to the present records. However, if nonequivalent records have been published under exactly the same name as the present records, mention of the records must be made to avoid confusion. Under PERIOD OF RECORD, the periods and location (with respect to the present site), and reasons for nonequivalence will be given in a single sentence. No mention of the periods of nonequivalent records will be made under GAGE or elsewhere in the station description.

- **PERIOD OF RECORD.--December 1938 to current year. January 1929 to November 1938, at site 0.8 mi downstream, not equivalent because diversion was not included.**

- **PERIOD OF RECORD.--May 1910 to December 1915, July 1919 to December 1920, October 1951 to current year. Monthly discharge only for some periods, published in WSP 1313. Prior to October 1951 published as North Fork White River near Buford. Records for July 1903 to December 1906, published as North Fork White River near Buford (station 03302800) at site 6.5 mi upstream, are not equivalent because of inflow between sites.**

- **PERIOD OF RECORD.--October 1931 to current year. Records for July to September 1931 at site 4 miles upstream published as "near Mill City," (station 14182000) are not equivalent because of difference in drainage areas.**

Nonequivalent records published under different names will not be mentioned except where failure to do so would cause confusion or where two records published separately could be combined to obtain a record equivalent to a third published record, thereby producing a continuous period of equivalent record for one site.

- PERIOD OF RECORD.--October 1963 to current year. If records for Yuma Basin Canal wasteway (station 09525000) and Reservation Main Drain No. 4 (station 09530000) are substracted from records at this station, records equivalent to those published 1902-64 as Colorado River at Yuma (station 09521000) can be obtained.

Qualifications for tributaries or diversions

Where a gaging station is located upstream (or downstream) from the mouth of a tributary, but the published records include (or exclude), respectively, the flow of that tributary, that fact should be explained in the manuscript under the LOCATION and DRAINAGE AREA paragraphs. No mention should be made under PERIOD OF RECORD if the entire period of record has been computed on the same basis. However, if part of the record was computed on a different basis, a qualification should be included, as follows:

- **PERIOD OF RECORD.--July 1906 to current year. Flow of Musconetcong River included since October 1931.**

Note that in the above example, the station "Delaware River at Riegelsville, NJ" has always been above the Musconetcong River; however, prior to the 1932 water year, published records for the station did not include flow of the tributary.

Discredited records

Omit from the list of dates any periods of published record that have been shown to be erroneous. Add a statement giving the periods and numbers of the water-supply papers that contain such discredited records (see more detailed explanation of discredited records on page 110). Do not make a specific discrediting statement about records provided by some other agency. If certain records provided by another agency were found unsatisfactory for inclusion in the 1950 or 1960 compilation reports, merely omit all reference to the periods involved without any explanation. At certain stations only part of the records within a given period may be discredited, such as values of daily discharge; however, monthly discharges may be revised or may be satisfactory as published. Examples of suitable statements pertaining to discredited records are given on p. 110.

Discharge measurements only

Generally, periods for which only discharge measurements are available should not be mentioned under PERIOD OF RECORD. Reference should not be made to measurements made prior to the beginning of daily records or during breaks in periods of discharge records. Exceptions to this general rule are conversions from low-flow partial-record stations to continuous-record stations and stations for which a list of periodic discharge measurements provides nearly as much useful information as a complete record of daily discharge. An example of the second type is a record of spring flow that varies little with time. For gaging stations on springs, list the dates for which periodic discharge measurements have been published, either on a page among the continuous-record discharge stations or in lists of miscellaneous discharge measurements.

- **PERIOD OF RECORD.--1898, 1904, 1907, 1917, 1929-30 (one discharge measurement each year), February 1931 to current year (discharge measurements only). Prior to October 1940, published as Blue Springs near Dunnellon.**

<u>Gage heights published by other agencies</u>

The National Weather Service, the U.S. Army Corps of Engineers, the Mississippi River Commission, and other agencies have published records of gage heights for sites at which the Geological Survey now collects discharge data. For many of these stations, gage heights were used to compute discharges that subsequently were published in a water-supply paper compilation report. Make reference to sources of the gage-height records in a separate sentence, as follows:

- **PERIOD OF RECORD.--October 1928 to current year. Monthly discharge only for October, November 1928 published in WSP 1304. Prior to October 1939 published as "near River Junction." Gage-height records collected at site 0.9 mi downstream October 1919 to September 1925 and at site about 100 ft downstream October 1925 to December 1958 are in reports of the National Weather Service.**

- **PERIOD OF RECORD.--March 1901 to September 1906 (published as "at North Lansing"), October 1934 to current year. Monthly discharge only for some periods, published in WSP 1307. Gage-height records collected in this vicinity 1907-10 (flood seasons only), 1911-19, 1920-28 (flood seasons only), and since 1931 are in reports of the National Weather Service.**

Mention gage heights published by other agencies only if they include periods other than those for which records are published by the Geological Survey.

Unpublished records

Generally, no mention will be made of records not published by the Geological Survey. Discharge records of acceptable accuracy should have been published by the Geological Survey in the 1950 or 1960 compilation reports. If records are not considered reliable enough to be published by the Geological Survey, they should not be mentioned under PERIOD OF RECORD. Because the compilation report series has been discontinued, an exception to the above rules should be made for stations for which the Geological Survey begins to publish records after 1960, and for which another agency has published earlier records that are reliable. Other exceptions may be daily records in files when only monthly records are published, or fragmentary records that may not warrant publication as daily records. Examples illustrating how unpublished records may be mentioned follow:

- **PERIOD OF RECORD.--January 1961 to current year. March 1938 to June 1952, in reports of State engineer.**
- **PERIOD OF RECORD.--October 1953 to current year (records of monthly diversion only). Records of daily diversion, available in files of the Geological Survey.**
- **PERIOD OF RECORD.--October 1941, April 1942 to current year. Fragmentary records 1926-41, in files of the State Engineer.**
- **PERIOD OF RECORD.--October 1944 to September 1945, October 1949 to current year. Records for February 1943 to September 1944 at site 1.2 mi downstream not equivalent, but would be equivalent by adding flow of Wright No. 2 and Cook Canals, (records in report on Bear River Hydrometric Data, 1944, Geological Survey open-file report).**

Reference to operation as a partial-record station

A more detailed discussion of appropriate statements to be used in the station description when referring to former operation of a station as a partial-record station is given in a later section "Conversion from Partial-Record to Continuous-Record Station." An example is given below of a statement to be used under PERIOD OF RECORD for gaging stations that have been converted from partial-record to continuous-record operation:

- **PERIOD OF RECORD.--Occasional low-flow measurements, water years 1955, 1967-1969, and annual maximum, water years 1959-69. October 1969 to current year.**

Preferred order

In the PERIOD OF RECORD paragraph the preferred order of listing applicable items is as follows: (1) dates of period of record; (2) reference to filled-in periods in a compilation report; (3) discrediting statement; (4) reference to former names; (5) reference to nonequivalent records; (6) reference to gage heights and unpublished records. The example below shows most of the above items:

- **PERIOD OF RECORD.--April 1928 to September 1955, July 1958 to current year. No winter months records 1928-31, 1933-55. Prior to October 1930 monthly discharge only, published in WSP 1311. Records for December 1930 to March 1931, published in WSP 732, are unreliable and should not be used. Published as "near Therma" 1928-34. March 1923 to September 1926, in reports of State engineer.**

Revised Records

A paragraph headed REVISED RECORDS should be added to the station descriptions of all stations for which revisions have been published to make it easier for users to find revised discharge records. The paragraph lists the reports in which revised discharge data have been published, each followed by the water years for which figures were revised. Data that were incorrect in a State data report, but were subsequently published correctly in WSP 1901 to 1937 (1961-65 records) or WSP 2101 to 2137 (1966-70 records) need not be considered revisions for this paragraph.

Revisions involving maximum, minimum, or supplementary peak discharges (not daily discharges) should be indicated by the following letter symbols: "(M)" is used to indicate that only the instantaneous maximum discharge was revised; "(m)" indicates that only the momentary or daily minimum was revised; "(P)" indicates that some peaks above the base were revised (maximum for year may or may not be included, but at least one lesser peak was revised).

First list the water-supply paper number (abbreviate as WSP xxxx) or State data report (abbreviate as WDR XX-YY-1), followed by a colon, then the water years for which revisions were made in those reports. List the reports in numerical order and, after each report, list the years in chronological order.

- **REVISED RECORDS.--WSP 892: 1933, 1935(M), 1939. WSP 972: 1931-32 (M) 1934 (M), 1935-38, 1940. WSP 1723: 1923 (monthly runoff). WDR NC-75-1: 1973-74 (M).**

- **REVISED RECORDS.--WSP 1715: 1948, 1955. WDR CA-75-1: 1974.**

If the revisions cover several consecutive years and some of the years had revisions of daily discharge, use the following:

- o **REVISED RECORDS.--WSP 1002: 1930-40 (maximum only, 1933-36, 1938).**

Clear, concise statements are desirable and the above example shows that sometimes a minor qualification statement following a consecutive-years listing can be used to avoid a long cumbersome string of dates.

Indicate previous revisions in drainage area by citing the report in which the revised drainage area was first published, as follows:

- o **REVISED RECORDS.--WSP 1032: 1933(M), 1935-36, 1937(M), 1938-39(m). WSP 1112: Drainage area.**

If drainage area is revised a second time, make no reference to the first revision. A change in drainage area resulting from a relocation of a gage does not constitute a revision and requires no mention under REVISED RECORDS.

Revisions (designated "corrections" in some compilation reports) of a minor nature need not be mentioned.

Discussion of the format and the criteria for making revisions is given later in this report in the sections "Publication of Revisions" and "Criteria for Revisions," respectively.

Gage

The GAGE section identifies the type of gage currently in use; gives the datum of the present gage referred to the National Geodetic Vertical Datum of 1929, if appropriate; and provides a condensed history of the types, locations, and datums of previous gages used during the period of record, including information about auxiliary or supplementary gages, if any. National Geodetic Vertical Datum of 1929 must be defined in the list of definitions in each annual State data report.

Type of gage

Begin the GAGE paragraph with "Water-stage recorder" or "Nonrecording gage" to identify the principal gage type. If a crest-stage gage is used as an auxiliary gage to record peak stages, write "Water-stage recorder and crest-stage gage." If a station has an artificial control that significantly improves the accuracy of the discharge record, mention the control immediately after the type of gage, as follows:

- **Water-stage recorder, crest-state gage, and concrete control.**
- **Water-stage recorder and sharp-crested weir.**
  (For rectangular or trapezoidal--Cipolletti-weir.)
- **Water-stage recorder and V-notch sharp-crested weir.**
  (For triangular weir of any angle.)
- **Water-stage recorder and Parshall flume.**
  (Material--concrete, metal, wood--need not be stated.)
- **Nonrecording gage, crest-stage gage, and wooden control.**

If the control was built several years after gage installation, give effective date as follows:

- **Water-stage recorder. Concrete control since Aug. 5, 1964.**

The above statements should be adequate for the purpose of the GAGE paragraph. There is no need to include a detailed description of the instrumentation at the gaging station. Reference to a bubble gage, telemark, surface follower, or other means of obtaining a graphic record or a digital punched-tape record should not be given in the GAGE section. However, description of special methods of obtaining discharge records other than through use of the stage-discharge relation should be given. The statement should be brief and general, as follows:

- **Totalizing flowmeters on each turbine in Hoover Dam powerhouse.**
- **Differential recorder to record head on turbines of powerplant.**
- **Recording flowmeters on rated pumps.**
- **Deflection-meter recorder.**

Datum of gage

The introductory text of each report will explain that gage datums are referred to National Geodetic Vertical Datum of 1929 unless otherwise noted. Give the elevation of the gage datum to the nearest hundredths of a foot, if it can be determined from a standard bench mark of the Geological Survey or of the Coast and Geodetic Survey, or any other bench mark or reference mark that has been tied to National Geodetic Vertical of Datum 1929 by a network of levels, provided the bench mark is within a reasonable distance of the gaging station. The statements "Datum of gage is____ft above mean sea level" and "above mean sea level" are now "Datum of gage is____ft above National Vertical Datum of 1929" and "above National Vertical Datum of 1929," respectively[1]. The phrase "below mean sea level" is now "below National Geodetic Vertical Datum of 1929." Table headings should conform to the following styles:

ELEVATION, IN FEET ABOVE NGVD of 1929,[2] WATER YEAR ____

WATER LEVEL, IN FEET ABOVE NGVD OF 1929, WATER YEAR ____

If the datum has not been tied to the National Geodetic Vertical Datum of 1929 by leveling from a bench mark, give the elevation of the gage as determined from a topographic map or from barometric leveling[3].

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[1]The use of the word "above" is now recommended, when appropriate, before the phrase "National Geodetic Vertical Datum of 1929," as illustrated in these examples. This represents a change from the previous instructions to omit the word "above," given in Water Resources Division Memorandum No. 79.01, dated October 5, 1978.

[2]The phrase "ABOVE NGVD of 1929" is abbreviated as "NGVD" in some computer-generated table headings in annual State data reports.

[3]The term "altitude" is to be replaced by "elevation" in the introductory text and station descriptions of all State data reports.

Examples of the proper procedures and formats for listing the elevation of gage datums are given below.

1. If the elevation of a gage datum was determined by the Geological Survey by leveling from a bench mark of the Geological Survey or Coast and Geodetic Survey, adjusted to the National Geodectic Vertical Datum of 1929, write:

    - **Datum of gage is National Geodetic Vertical Datum of 1929.**

    - **Datum of gage is 543.67 ft above National Geodetic Vertical Datum of 1929.**

2. Occasionally the National Mapping Division (NMD) of the Geological Survey ties in gages at the time of their mapping. The preliminary elevation furnished by the NMD is based on the unadjusted elevation of a bench mark (usually to the nearest foot) and should be qualified as "unadjusted" until final adjustment is made.

3. If the elevation was determined by the Geological Survey from bench marks other than those of the Geological Survey or Coast and Geodetic Survey, state the source of the bench mark, as:

    - **Datum of gage is 893.61 ft above National Geodetic Vertical Datum of 1929 (Iowa State Highway Commission bench mark).**

NOTE: Errors as great as several hundred feet have been found in the stamped elevations on bench marks; precise figures should be obtained from the agency which set the bench mark.

4. If the elevation of gage datum was determined by an agency other than the Geological Survey, use:

    - **Datum of gage is 543.67 ft above National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers).**

5. Occasionally, the NMD ties in gages in connection with river-surveys.

    - **Datum of gage is 543.67 ft (river-profile survey).**

6. Some stations have been tied in to other datums, such as "Sandy Hook datum", "mean Gulf level", "New York State Oswego (Barge) Canal datum", or "project datum". Such datums must be qualified, as follows:

    - **Datum of gage is 543.67 ft, Sandy Hook datum.**

7. If elevation of the gage datum cannot be determined accurately by leveling from a bench mark, the approximate elevation of the gage may be determined from barometric observations or from topographic or river-profile maps. Rounding in these circumstances should not be finer than to the nearest foot and should usually be to 10 feet. The following statements are recommended:

    - **Elevation of gage is 2,690 ft, by barometer.**

    - **Elevation of gage is 7,340 ft above National Geodetic Vertical Datum of 1929, from topographic map**[1]

    - **Elevation of gage is 7,340 ft, from river-profile map.**

8. For some stations, rather than publish gage heights referenced to an arbitrary datum, gage readings are converted to elevations above the National Geodetic Vertical Datum of 1929, even though the datum of the gage is not at the National Geodetic Vertical Datum of 1929. For such stations write:

    - **Datum of gage is 543.67 ft above National Geodetic Vertical Datum of 1929; gage readings have been reduced to elevations above National Geodetic Vertical Datum of 1929.**

If it is necessary to inquire about the adjusted elevation of a bench mark established by another agency, write a letter to the agency giving complete details concerning the bench mark, such as the description, the information stamped on the face of the mark, and the elevation previously used. For information concerning bench marks of the Geological Survey or any other Federal agency, write to:

National Cartographic Information Center
U.S. Geological Survey
Mail Stop 507
Reston, VA 22092.

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[1] U.S. Geological Survey topographic maps are referenced to the National Geodetic Vertical Datum of 1929.

History of changes

Following the datum statement, a brief summary of changes to gages is given, starting with the earliest change. If the type of gage was changed during the period of record (whether in the current year or in previous years), and no change in site or datum occurred, write:

- **Prior to May 10, 1948, nonrecording gage at same site and datum.**
- **June 1, 1930, to Nov. 14, 1934, nonrecording gage at same site and datum.**

If there has only been a change in location write:

- **Prior to Aug. 14, 1972, at site 500 ft upstream at same datum.**

If there has only been a change in datum write:

- **Prior to Jan. 12, 1969, at datum 0.79 ft lower.**

Various combinations of changes may have been made. If the type, location, and datum have been changed, write:

- **Prior to Jan. 12, 1939, nonrecording gage at site 500 ft upstream at datum 2.00 ft higher,**

or

- **June 1, 1930, to Nov. 14, 1934, nonrecording gage at bridge 0.5 mi downstream at datum 5.34 ft lower,**

or, if the datum was not known, write:

- **June 1, 1930, to Nov. 14, 1934, nonrecording gage at bridge 0.5 mi. downstream at different datum.**

When two or three changes have been made, mention former gages in chronological order, as follows:

- **GAGE.--Water-stage recorder and concrete dam and orifice control. Datum of gage is 295.11 ft above National Geodetic Vertical Datum of 1929 (Highway Department bench mark). Aug. 22 to Nov. 2, 1910, and Dec. 30, 1912, to May 3, 1934, water-stage recorder, and Dec. 15, 1910, to Dec. 29, 1912, nonrecording gage at site 0.1 mi upstream at different datum.**

A listing of more than three changes in site or datum made before 1971, is at the discretion of the District. A brief statement in current reports regarding historical changes can be given as follows:

- **GAGE.--Water-stage recorder. Concrete control since Nov. 5, 1954. Elevation of gage is 5,770 ft above National Geodetic Vertical Datum of 1929. See WSP 1711 or 1731 for history of changes prior to July 17, 1942.**

Periods may be grouped to cover changes in type, location, or datum, as follows:

- **GAGE.--Water-stage recorder. Datum of gage is 2,513.64 ft above National Geodetic Vertical Datum of 1929. Prior to Oct. 1, 1954, and from Aug. 25, 1958 to Dec. 31, 1962, at site 530 ft upstream at datum 1.13 ft higher. Oct. 1, 1954, to Aug. 24, 1958, at site 530 ft upstream at datum 1.87 ft lower.**

- **GAGE.--Water-stage recorder. Elevation of gage is 7,600 ft above National Geodetic Vertical Datum of 1929, from topographic map. Prior to Sept. 16, 1938, nonrecording gage at same site, but at datum 0.21 ft lower, May 14, 1911, to Apr. 17, 1914.**

Auxiliary gage

A gage used with a base gage to determine fall is called an "auxiliary" gage. If an auxiliary gage is used, describe it at the end of the GAGE paragraph, as follows:

- **Auxiliary water-stage recorder 12.5 mi downstream from base gage at datum 3.08 ft lower.**

- **Since Oct. 1, 1958, auxiliary water-stage recorder 6.2 mi upstream from base gage at datum 286.35 ft above National Geodetic Vertical Datum of 1929. June 22, 1954, to Sept. 30, 1958, auxiliary nonrecording gage at site 11.7 mi downstream from base gage at different datum.**

Occasionally, the gage for another gaging station is used as an auxiliary gage. Then the following form is preferred:

- **Water-stage recorder or nonrecording gage for Red River at Shreveport (station 07348500) used as auxiliary gage for this station.**

If there have been more than two changes in auxiliary gages, describe the present one and then use a phrase similar to:

- **Prior to Oct. 1, 1953, auxiliary gages at different sites and datums.**

Supplementary gage

A gage used to obtain additional data is described as a "supplementary" gage. A supplementary gage may be used in place of the principal gage if the latter is isolated or cut off from the channel, or registers only above (or below) a certain gage height. One or more supplementary gages may be used on bypass channels or overflow channels, or on streams that flow in several channels, each of which is rated independently. The following are several examples of statements in the GAGE paragraph that refer to supplementary gages:

- **Since Oct. 1, 1936, supplementary water-stage recorder on secondary channel 600 ft to the left at datum 1.69 ft lower.**

- **Prior to Sept. 18, 1956, nonrecording gage at bridge 5.6 mi downstream at datum 0.34 ft lower, now used as supplementary gage for high-water periods when flow exceeds 1,100 ft^3/s.**

- **GAGE.--Two water-stage recorders. Datum of gage on main (north) channel is 7,495.02 ft and on secondary (south) channel is 7,496.89 ft above NGVD of 1929 (levels by Bureau of Reclamation). See WSP 1712 or 1732 for history of changes prior to Oct. 1, 1937. North channel: At present site and datum since Oct. 14, 1965. May 4, 1936, to Oct. 13, 1965, at site 280 ft downstream, at datum 1.00 ft lower.**

NOTE: It is permissible to use the more concise term "NGVD of 1929" in place of National Geodetic Datum of 1929 when the GAGE paragraph is lengthy as in the above example.

- **GAGE.--Water-stage recorder and, since April 1949, Parshall flume on creek; water-stage recorder and Parshall flume on each diversion.**

For an example of the GAGE paragraph for a station that has been operated as a partial-record station see section "Conversion from partial-record to continuous-record station."

Remarks

The REMARKS paragraph contains information pertaining to the accuracy of the records, to special methods of computation of contents or discharge, to conditions that affect the natural flow at the station such as regulation and diversion, and to other miscellaneous data. An accuracy statement for station daily records is required in the REMARKS entry of the station description for all water-discharge stations reporting daily discharge. Other pertinent information also should be included, if appropriate. This section should be updated each year.

Beginning with the 1985 water-year report, all Districts must identify estimated daily discharges in State data reports either by flagging individual estimated values directly in the data table or by listing the dates of the estimated record in the REMARKS paragraph of the station description. Although Districts using the Prime computer system will be required to flag estimated daily-discharge values in the computer files, a computer software program will provide a special table-retrieval option for Districts that prefer to use the REMARKS paragraph for identifying estimated daily record. The option will permit data tables to be retrieved without flags or the accompanying footnote. Districts using the WATSTORE computer files to retrieve water-discharge data tables for preparation of annual State data reports will be required to use the REMARKS paragraph to identify the estimated daily record. In the previous guidelines, estimated daily values were identified only if they were in a period of estimated record that exceeded 30 days or included the maximum discharge for the year. Comprehensive discussions on all aspects of identifying estimated daily discharges in State data reports are presented in the sections "Data Presentation" and "Identifying Estimated Daily Discharge," that begin on pages 22 and 23, respectively. Discussion on the use of the REMARKS paragraph to identify estimated daily discharge is given in a following subsection, "Identifying Estimated Daily Record and Assigning Accuracy."

Accuracy

Four accuracy classifications are used to rate station records. A rating of "excellent" means that about 95 percent of the daily discharges are within 5 percent of the true discharge; "good" within 10 percent; "fair" within 15 percent; and "poor" means that daily discharges have less than "fair" accuracy. An accuracy rating should be assigned only after the computations are complete. All records should be computed with equal care and to the greatest degree of accuracy possible under existing conditions.

Accuracy depends primarily on the stability of the stage-discharge relation, and the frequency and reliability of stage and discharge measurements. Accuracy of discharge figures computed for special conditions (backwater, ice effect, unstable control, no gage-height record, and so on), although usually less than that for stable stage-discharge conditions, is still dependent on reliability and completeness of information. Accuracy and consistency are not synonymous. Comparative studies of two or more nearby stations' records are very desirable. However, the fact that records are consistent is no assurance that the records are accurate.

Identifying estimated daily record and assigning accuracy

The REMARKS paragraph of the station description for water-discharge stations publishing daily-discharge tables has two principal functions, to identify estimated daily discharges published in the data table, if these values are not flagged in the table itself, and to present an accuracy statement pertaining to the station record. Districts that use the REMARKS paragraph for identifying estimated daily discharge in State data reports should always present the estimated record as the first entry of the paragraph. This entry is then followed by the the accuracy statement for the station daily record. Other pertinent information pertaining to conditions that affect the natural flow at the station such as regulation and diversion and so forth should be included, if appropriate.

Discussion of the proper procedures and formats to use in reporting the estimated daily discharges and in assigning accuracy statements for station records in the REMARKS paragraph are given below.:

1. If there are no estimated daily-discharge values to identify (or flag) for the water year, then a statement in the REMARKS paragraph of the station record should report this to the user, as follows:

   - **REMARKS.--No estimated daily discharges. Records fair.**

   For Districts flagging estimated daily values in the data table, this will be the only situation where they are required to enter an estimated-record statement in the REMARKS paragraph preceding the accuracy statement.

2. An estimated-record statement is required for Districts not flagging the estimated daily values in the data table even though the estimated record is not downgraded in accuracy. For example:

   - **REMARKS.--Estimated daily discharges: Jan. 27 to Feb. 10 and Apr. 2-9. Records good.**

3. Districts that flag estimated daily values directly in the daily discharge table are not required to repeat the identification by including an estimated-record statement in the REMARKS paragraph (except in the special case where there is no estimated record as in paragraph 1 above). For Districts flagging estimated daily record, the example in paragraph 2 above would read:

   - **REMARKS.--Records good.**

4. All estimated daily discharge that is downgraded in accuracy will be identifed in the accuracy statement of the REMARKS paragraph, regardless of the method chosen for identifying estimated record. For example, if two periods of estimated record, Jan. 24-31 and Feb. 10-14, were reported for the water year (either in the manuscript, by dates, or in the data table by flags) but only one period was downgraded, the REMARKS accuracy statement would read:

   - **Records good except for estimated daily discharges, Jan. 24-31, which are poor**

   If all the periods of estimated record are downgraded to the same level of accuracy, only a general reference to the estimated record would be needed. For example:

   - **Records good except for estimated daily discharges, which are poor.**

5. The estimated record should be listed in chronological order as shown below:

   o **REMARKS.--Estimated daily discharges: Oct. 29 to Nov. 5, Dec. 27 to Jan. 28, Feb. 6-12, Apr. 21-24, and Sept. 4.***

6. Accuracy statements for the REMARKS paragraph generally are listed in descending accuracy order, as follows:

   o **REMARKS.--Estimated daily discharges: Sept. 3-10. Records excellent above 500 ft^3/s and good below, except for estimated daily discharges, which are good above 500 ft^3/s and fair below.**

   o **REMARKS.--Estimated daily discharges: April 5-10, May 16 to June 2, June 7-23, and Sept. 1-5. Records good except for period of estimated daily record, May 16 to June 2, which is fair and period of estimated daily record, June 7-23, which is poor.**

7. When estimated daily record is downgraded in accuracy, the District has the option on whether or not to mention the adverse conditions associated with the downgraded record. For example, either of the following formats is acceptable:

   o **REMARKS.--Estimated daily discharges: Oct. 29 to Nov. 5, Dec. 27 to Jan. 28, Feb. 6-20, Apr. 21-24, and Sept. 4-7. Records good except for periods of no gage-height record, Oct. 29 to Nov. 5 and Sept. 4-7, and periods with ice effect, Dec. 27 to Jan. 28 and Feb. 6-20, which are poor.**

   o **REMARKS.--Estimated daily discharges: Oct. 29 to Nov. 5, Dec. 27 to Jan. 28, Feb. 6-20, Apr. 21-24, and Sept. 4-7. Records good except for periods of estimated record, Oct. 29 to Nov. 5, Dec. 27 to Jan. 28, Feb. 6-20, and Sept. 4-7, which are poor.**

   If all five estimated periods in the examples above had been downgraded to the same level, the accuracy statement could be simplified to "Records good except for periods of estimated daily record, which are poor."

8. Generally no statement of accuracy is given for records that are completely provided by another agency; nor are statements of accuracy given for lake or reservoir records that report contents or elevations. However, the periods of estimated record should be identified for water-discharge records provided by another agency.

<u>**Special methods of computation**</u>

Methods for computing daily discharge using rate of change in stage or fall as a factor are mentioned in the introductory text. These methods need not be mentioned under REMARKS for individual stations, except as a basis for assigning a different accuracy to periods computed by these methods.

Methods for computing daily discharges by other than the Geological Survey's standard methods, when used for the major portion of the year, should be explained under REMARKS, as follows:

- ***** Daily discharge determined from flow through turbines, computed from relation between discharge, head, and gate openings.**

Descriptive Data for Reservoirs

Selected data pertaining to dams and reservoirs and their effects on streamflow should be given in the REMARKS paragraph. Types of information that can be included are the type of dam, dates that operations began, capacity at certain control levels, data on capacity tables, purpose of storage, and uses of water, gates, outlet structures, and diversions, if any. Sources providing water for storage for an offstream reservoir should be explained. These items will be discussed below and examples given.

The type of dam should be stated briefly, as "concrete dam with riprapped earth embankments," "earthfill dam," "rockfill dam," "concrete arch dam," "concrete arch-gravity dam," "earth dikes and dam, with concrete navigation lock," "concrete dam with spillway cut in natural rock," or whatever combination is appropriate. An example of an offstream reservoir is:

- **Reservoir is formed on natural lake into which a great part of the low flow of White River is diverted.**

Give the date storage began and the date the dam was completed, and any other pertinent information such as "storage began Feb. 1, 1935; dam completed Mar. 1, 1936"; "some storage began in June 1935; dam was completely closed and placed in operation Mar. 4, 1936; water in reservoir first reached minimum pool elevation Mar. 24, 1936"; "closure of dam was made June 9, 1957," "construction of dam began in 1934; completed in 1941; storage began early in construction period."

Give all pertinent information on reservoir capacity, being sure to show the amount of dead storage, controlled storage below spillway crest, and controlled storage (or uncontrolled storage) above spillway crest. The user should be able to determine from contents data the quantity of storage available for release and the available capacity for storing additional inflow, above or below the spillway. Various terms have been used in reports of the Geological Survey and other agencies to identify storage at different reservoir water levels. The preferred terms as given in WSP 1838 (p. 12-13) are "total storage," and "usable storage"; these terms should be used as defined. In WSP 1541-A, the terms "conservation storage" and "flood-control storage" also are defined. Although other operating agencies may use terms such as "active," "inactive," "available," or "live," Geological Survey terminology is preferred. Some examples of capacity data are given below:

- *** * * Usable capacity, 185,200 acre-ft, 1949 survey, between elevations 2,927.0 ft, lowest outlet, and 2,975.0 ft, crest of spillway. Dead storage below elevation 2,927.0 ft, 6,800 acre-ft. Figures given herein represent usable contents.**

- o * * * Usable capacity, 1,730,000,000 ft^3 between gage heights 121 ft, maximum drawdown, and 141 ft, full pond. Dead storage unknown. Figures given herein represent usable contents.

- o * * * Usable capacity, 107,200 acre-ft between gage heights 36.00 ft, sill of powerhouse penstock, and 46.00 ft, top of flashboards. Dead storage below gage height 36.00 ft, about 115,000 acre-ft. Figures given herein represent usable contents.

If more than one capacity table has been used, include the date of the reservoir survey and the date the present table came into use. For example:

- o * * * Total capacity (based on 1963-64 resurvey, new capacity table put into use Apr. 1, 1967), 29,755,000 acre-ft consisting of the following * * *.

Use of water in the reservoir should be briefly stated as:

- o * * * Reservoir is used for irrigation and power generation.

- o * * * Reservoir impounds water for diversion through East Delaware tunnel to Reservoir, in Hudson River basin, for water supply of New York City.

- o * * * Reservoir provides power; released water flows down Bucks Creek to Lower Bucks Lake, where it enters tunnel that discharges into Grizzly Creek, thence to Bucks Creek powerhouse.

- o * * * Reservoir is used for flood control and municipal water supply. Flood storage is regulated by power-operated slide gage; water-supply storage is regulated by stop logs.

- o * * * Reservoir is used for flood control and conservation. There are no gates on spillway and all regulation is done by gates in conduits through dam or through bypass gate around conservation weir.

- o * * * Outflow from lake controlled by stop logs and sluice gates at outlet. Gates fully open during flood season each year. No spilling this year. Prior to December 1954, stored water released during winter period for power.

Regulation

For streamflow records, indicate in a brief statement the effect of regulation upstream from the station[1]. The distance to the source of the principal regulation or nearest upstream reservoir should be given. Where there has been appreciable change in the streamflow regulation upstream from a station during the period of record, the date of the beginning or change in regulation should be indicated; give only the calendar year, unless a more precise date is warranted. If the regulation has been effective throughout the period of record, no date for the beginning of the regulation need be given.

An indication of the degree of regulation should be given, if possible. Wnen the regulation is by reservoirs, the usable capacity of the reservoirs will be a good indication of the degree of regulation. If the reservoir records are published separately, give the station number in parentheses following the reservoir name, but do not give the capacity; the capacity and other information will be given under REMARKS in the reservoir record. Use of station numbers is preferable to page references, especially for records that are provided to another District. If the reservoir records are not published, give the usable capacity of the reservoir in parentheses after the reservoir name. If there are several reservoirs, give only the combined usable capacity of all, unless the capacity of each reservoir is important enough to show separately. When there are more than three or four reservoirs upstream from a station, the number of reservoirs and the combined capacity (or a page reference if they are all published in a group) is preferable to a statement for each reservoir. Some examples are given below:

- o * * * **Flow completely regulated by Fort Peck Reservoir (station 06131500) 8 mi upstream.**
- o * * * **Flow regulated by Pardee Reservoir (station 11313500) beginning March 1931, Cammanche Reservoir (station 11322300) 1 mi upstream beginning December 1963, several small reservoirs, and four powerplants.**
- o * * * **Flow regulated by 14 flood-control reservoirs (reservoirs in Muskingum River basin).**
- o * * * **Flow regulated by Conemaugh River Reservoir (station 03043500) 20 mi upstream since 1952; by Loyalhanna Creek Reservoir (station 03045600) 17 mi upstream since 1942; and by other reservoirs, the 11 most effective of which have a combined capacity of 3,536,000,000 ft^3.**

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[1]Except for the station name, the phrases "upstream from" and "downstream from" are to be used, when appropriate, in place of "above" and "below", respectively, in the station description.

- o * * * **Flow regulated by upstream reservoirs on Etowah, Coosa, and Tallapoosa Rivers (Reservoirs in Mobile River basin).**

Adverbs may be used to qualify the degree of regulation. However, the adverb "partly" gives no clue as to the magnitude of regulation and is not recommended. If the station is immediately downstream from a large reservoir, the capacity of which is so large that the outflow always is controlled, one can state "Flow completely regulated by * * * Reservoir, 0.2 mi upstream." If the regulation is only at low flow or at high flow that could be mentioned; for example:

- o * * * **Some regulation at low flow by mills upstream from station.**

- o * * * **Flow slightly regulated by locks, dams, and reservoir upstream.**

- o * * * **Considerable regulation by many reservoirs (combined capacity, about 50,000 acre-ft).**

- o * * * **Considerable regulation by Lake Junaluska on Richland Creek and Lake Logan on West Fork Pigeon River for the periods of low flow, combined capacity of reservoirs, about 4,364 acre-ft.**

- o * * * **Flow regulated to some extent since July 1928 by Rushford Lake, capacity, 1,106,000,000 ft^3 and, at high flows, by Mount Morris Reservoir (station 04224000) since November 1951.**

At some stations downstream from powerplants or mills, considerable diurnal fluctuation is caused by the plants, yet the capacity of their ponds is not enough to affect the daily mean flows by any appreciable extent. If such is the case, the term "diurnal fluctuation caused by" is used instead of the term "flow regulated by." Similarly, the adverbs "large" or "small" or "some" and the periods, if only at low flow, should be indicated. For example:

- o * * * **Diurnal fluctuation caused by hydroelectric plant 0.5 mi upstream; because storage capacity is small, daily flows are not affected appreciably.**

In some coastal areas stations are affected by tide at times; refer to the effect of tide by an appropriate statement, such as:

- o * * * **Flow generally affected by tide when discharge is less than 15,000 ft^3/s.**

- o * * * **Flow occasionally reversed as a result of tide and wind effect.**

The statements about regulation should be reviewed each year to modify remarks, as appropriate.

Diversions

Indicate in a separate brief statement the effects of diversion to or from the stream or reservoir upstream from the station. The distance to the nearest diversion also should be given.

Many gaging stations in the West are on streams having diversions for irrigation upstream from the station. Diversions of two general types may be described in the REMARKS paragraph.

1. Diversions upstream from the station used for irrigation of land in the drainage basin upstream from the station.

2. All other diversions (including irrigation diversions where the diversion is upstream from the station, but the point of application is downstream from the station or in another basin).

For diversions of the first type, the size of the diversion can be indicated by giving the approximate number of acres irrigated upstream from the station, as follows:

o * * * **Diversions for irrigation of about 8,000 acres upstream from station.**

If there are only a few diversions, all of which are known, the total number of diversions can be specified, as follows:

o * * * **Two small diversions for irrigation of hay meadows upstream from station.**

o * * * **Adjudicated diversions upstream from station for irrigation of about 8,800 acres lying both upstream and downstream from station. One diversion upstream from station for irrigation of 1,200 acres downstream from station.**

o * * * **Diversions upstream from station for irrigation of about 90,000 acres of which about 36,000 acres are downstream from station. Bell Ranch Canal (station 07223000) diverts directly from Conchas Dam 2.8 mi upstream and crosses from right to left bank just upstream from Canadian River gage for irrigation of about 700 acres on Bell Ranch. Conchas Canal (station 07223300) diverts directly from Conchas Dam and bypasses gage for irrigation of about 35,000 acres around Tucumcari.**

o * * * **At a point 8.8 mi upstream from station, water is diverted to Bell Fourche Reservoir (station 06435000) through Inlet Canal (station 06434500). Other smaller diversions from main stem and tributaries for irrigation. Total diversions for irrigation of about 60,000 acres upstream from station.**

For diversions of the second general type, the actual quantity of water bypassing the gage or diverted out of the basin, if known and published, may be added to the flow measured at the gage to obtain the natural runoff from the area upstream from the gage. Generally, many records of the quantity of diversion can be obtained and included in the report. The various ways in which records of diversion can be shown in a report are discussed in the section "Adjustments for effect of regulation or diversion."

The location of the point of diversion, the use, and the point of return of the water should be indicated if the water returns to the stream downstream from the gage.

Diversions upstream from the station for a municipal supply generally need to be mentioned only if the sewage effluent does not return upstream from station.

For most towns and small cities, the point of sewage return does not need to be mentioned because the sewage effluent generally is discharged into the same drainage basin in which the town is located. For example, where sewage effluent enters downstream from a station:

- *** * * Diversion upstream from station from Carr Pond for municipal supply of Coventry, Warwick, and West Warwick.**

- *** * * Records include diversion of an average of 14.4 ft^3/s for municipal supply of city of Anniston.**

Diversion from one basin into another should be explained in sufficient detail to indicate that the diversion is either "out of" the drainage area being gaged or "into" the drainage area being gaged:

- *** * * Transmountain diversions upstream from station through Berthoud Pass ditch and to Moffat water tunnel (see Transmountain Diversions).**

- *** * * High-water diversion upstream from station into Hillsborough River basin through Withlacoochee-Hillsborough overflow near Richland (station 02311000).**

Where the record of diversions is not published separately, the quantity of the diversion can be given under REMARKS. For example:

- *** * * About 12,300,000 gal diverted just upstream from station each month for industrial use.**

- *** * * About 0.6 ft^3/s is diverted just upstream from station for industrial use.**

On some larger streams, the upstream development of the basin may be so complex that it is impossible to go into detail regarding the quantity of diversion, storage, or related factors. For example, a statement such as the following has been used for the downstream Platte River or Colorado River stations:

- o * * * **Natural flow of stream affected by transmountain (or transbasin) diversions, storage reservoirs, power developments, ground-water withdrawals and diversions for irrigation, and return flow from irrigated areas.**

Diversions downstream from a station have no effect on the flow being gaged and generally are not mentioned. However, for those stations where such information has particular significance, variations of the following statements can be used:

- o * * * **No diversion upstream from station.**
- o * * * **Station is upstream from all diversion to Duncan Valley.**
- o * * * **No diversion between station and mouth of river.**
- o * * * **Greater part of flow diverted by Rock Creek Canal, 500 ft downstream.**

If a diversion is discontinued during the operation of a gaging station, that fact should be mentioned under REMARKS; the year in which the change takes place should be noted.

For a gaging station on a canal or other diversion, give the location of the diversion or intake, the name of stream from which diversion is made, and a brief reference to use of the water, such as for power generation, irrigation, or municipal supply. For an irrigation canal, give the irrigated acreage, if known, and the point of discharge of return flow. For a transbasin or transmountain diversion, make it clear whether the water being measured is imported or exported. Some examples are given below:

- o * * * **Canal diverts from right bank of Gila River in SE1/4SW 1/4 sec. 28, T.1 N., R.1 W., for irrigation in the Buckeye area. Total acreage irrigated this year in the Buckeye Irrigation District is 18,000 acres. Records include wastewater and flow from canals of Salt River Project, delivered through Buckeye feeder ditch to the Gila River channel in SW1/4NW1/4 sec. 34, T.1 N, R.1 W., near mouth of Aqua Fria River. In February 1960, pumpage of water into Buckeye Canal began between canal intake and measuring flume and is included in the canal record. See table below for monthly discharge of Buckeye feeder ditch and pumpage into Buckeye Canal.**

- o * * * **Flow during navigation season is net diversion through Glen Falls feeder from the Hudson River basin to the summit level of the Champlain (Barge) Canal, and is regulated in accordance with requirements of the canal.**

- o * * * This is a transmountain diversion from Grand Lake and Shadow Mountain Lake for power and irrigation in the South Platte River basin as part of the Colorado-Big Thompson project. Diversion point is at west portal near town of Grand Lake, 13.35 mi west of east portal.

- o * * * Discharge is the sum of HGS-3 flow and S-3 pumpage. Flow regulated by hurricane gages and pump station at Lake Okeechobee. Flow frequently reversed during and after periods of heavy rainfall by pumpage into the canal from agricultural lands in the Everglades, or by the operation of pump structure 3.

- o * * * Canal diverts water from Weber River in SW1/4SW1/4 sec. 21, T.1 S., R.6 E., for irrigation and water supply in Jordan River basin. Figures given herein represent water diverted from main stem of Weber River, some of which may return to Weber River through seepage. For records at outlet of canal, see station 10154500.

<u>Miscellaneous data</u>

At many discharge stations, the only water-quality characteristic that is measured at the time discharge measurements are made is water temperature. Publication of the water-temperature data is optional. However, measurement of water temperature can be useful in developing, over a period of time, a general knowledge of the annual range in water temperature at stations for which such information is not available. For these stations, the existence of miscellaneous measurements of water temperature should be noted in REMARKS by the statement, "Several measurements of water temperature were made during the year." The statement is unnecessary and should not be used if water temperature was one of several other water-quality characteristics measured at the station.

Other pertinent information such as use of recording rain gages and telemeter equipment should be reported as follows:

- o **National Weather Service rain gage and gage height telemeters at station.**

- o **U.S. Army Corps of Engineers satellite telemeter at station.**

- o **Recording rain gage at station.**

Cooperation

Statements acknowledging the role of another agency in supplying records will be given in a separate paragraph titled COOPERATION following REMARKS. Acknowledgment of record cooperation must be made if all or any part of a record is provided by a cooperating agency that has collected the information by its own methods and for its own use, and if the record is accepted by the Geological Survey for publication. The distinction between this type of cooperation and financial cooperation is described in the "Cooperation" section of the introductory text.

In acknowledging gage-height records, indicate the exact degree of responsibility of the cooperator with respect to the record.

1. If the cooperating agency is entirely responsible for the gage-height record, use one of the following statements:

    (a) **COOPERATION.--Gage-height record was provided by * * *.**

    (b) **COOPERATION.--Gage readings were provided by * * *.**

Statement (a) may apply to a record from either a recording or a nonrecording gage; (b) applies only to a nonrecording gage.

2. If the responsibility is divided between the cooperator and the Survey, use one of the following statements:

    (a) **COOPERATION.--Water-stage-recorder graph was provided by * * *.**

    (b) **COOPERATION.--Water-stage recorder was inspected by employee of * * *.**

    (c) **COOPERATION.--Gage-height record was collected in cooperation with * * *.**

Relative to statement 2 (b), if the employee of the cooperator performs the duties under instructions and supervision of the Geological Survey, the cooperation is equivalent to financial cooperation and is to be acknowledged in the introductory text rather than in the station description.

Statement 2 (c) applies to stations at which the collection of the gage-height record is under joint supervision of employees of the Geological Survey and of the cooperator. This group includes principally stations at which the gage-height record is collected jointly with the National Weather Service, the U.S. Army Corps of Engineers, or some other Federal agency.

If gage heights are collected by the National Weather Service independently of any supervision on the part of the Geological Survey, use statement 1 (a).

If the Geological Survey and the National Weather Service cooperate in obtaining the gage-height record, even though the salary of the observer is paid entirely by the National Weather Service, use statement 2 (c). For stations of this class it is also advisable to mention the National Weather Service under "Cooperation" in the introduction to the report.

If the records are completely provided, write:

- **COOPERATION.--Records were provided by * * *.**

A statement for reservoirs may take the form:

- **COOPERATION.--Capacity tables were provided by Salt River Valley Water Users' Association.**

If the records of discharge are provided by an organization as one of the requirements under license by the Federal Power Commission, a statement similar to the following is used:

- **COOPERATION.--Records were collected by the Kings River Power Co., under general supervision of the Geological Survey, in connection with a Federal Power Commission Project.**

U.S. Army Corps of Engineers

Gaging stations that are operated in cooperation with the U.S. Army Corps of Engineers may be divided into the following groups:

1. Stations at which all records are collected and computed by the Geological Survey, with only financial assistance from the U.S. Army Corps of Engineers. This cooperation is acknowledged in the introductory text in the section headed "Cooperation."

2. Stations for which most of the record is collected and computed by the Geological Survey with assistance by the U.S. Army Corps of Engineers in the form of gage-height records or discharge measurements. This cooperation is acknowledged in the station description as follows:

   - **COOPERATION.--Ten discharge measurements were provided by the U.S. Army Corps of Engineers.**

   - **COOPERATION.--Gage-height record and 10 discharge measurements were provided by the U.S. Army Corps of Engineers.**

3. Stations that are operated by the U.S. Army Corps of Engineers with some assistance by the Geological Survey. The records for these stations are collected and computed by the U.S. Army Corps of Engineers. Participation by the Geological Survey consists of making a limited number of discharge measurements and reviewing of the records. This cooperation is acknowledged in the station description as follows:

   o **COOPERATION.--Gage-height record, 30 discharge measurements, and computations of daily discharge were provided by the U.S. Army Corps of Engineers; 3 discharge measurements were made, and records were reviewed by the Geological Survey.**

If the status of a station during the report year was the same as that described for group 3, above, but the records of discharge for a number of earlier years were collected and computed by the U.S. Army Corps of Engineers and submitted for publication with the records for the current year, the following statement is used in the station description:

o **COOPERATION.--Gage-height record, 30 discharge measurements, and computations of daily discharge for water year 1975 were provided by the U.S. Army Corps of Engineers; 3 discharge measurements were made and records were reviewed by Geological Survey. Records for May 1939 to September 1974 were collected and computed by U.S. Army Corps of Engineers and were reviewed by Geological Survey.**

Similar statements should be used for stations operated in cooperation with the U.S. Bureau of Reclamation.

If another agency provides records of change in contents of reservoirs or records of diversion into or out of the basin only for purposes of adjusting the monthly yield or for publication as a part of the monthly table for the station, there usually will be no need for a COOPERATION paragraph in the station description. However, acknowledgment of the agency for providing figures should be made in a footnote describing the adjustment.

Average Discharge

Give the average discharge for stream-gaging stations for which 5 or more complete water years of record are available, provided the flow during the period of record is comparable as explained below. The years for which the average discharge is computed need not be consecutive. The paragraph is omitted if the criteria for computing the average are not met.

The average discharge is computed as the arithmetic mean of the water-year mean discharges. It is computed only for stations having at least 5 water years of complete record; and only water years of complete record, either in annual or compilation reports, are included in the computation. Water-year mean discharges that were omitted from the 1950 or 1960 compilation reports because part or all of the records were discredited should not be included in the computations.

Average discharge is not computed for stations where diversions, storage, or other water-use practices cause the value to have little significance. If water developments that significantly alter flow at a station are put into use after the station has been in operation for a period of years, a new average is computed as soon as 5 water years of record have accumulated after the development has been completed and the use of water stabilized. See the following section, "Effect of Diversion or Regulation," for additional information on the subject.

Because discharge is computed using only water years of complete record, for new stations established between Oct. 1 and Dec. 31 daily estimates should be made, if possible, to complete the water year. These estimates should be published with the first year of record--that is, do not wait until 5 years of record are available to make daily estimates to complete the first year of record. Daily estimates are required and "flat" estimates should not be entered into computer storage. For example, a monthly mean estimate of 10 ft^3/s would require an entry into computer storage of 10 ft^3/s for each day of the month, which, most likely, is not representative of the true daily flows.

Average discharge is expressed in cubic feet per second. Equivalent runoff, in inches per year, is given if annual runoff is computed for the station and equivalent discharge, in acre-feet per year, is given if discharge, in acre-feet, is computed annually. Runoff, in inches, is computed by multiplying the average discharge by the factor 13.58 and then dividing the result by the contributing drainage area; acre-feet is computed from average discharge by multiplying by the factor 724.5. Rounding rules are the same as those for mean discharge, inches, and acre-feet in the annual summaries. (See the section "Significant Figures and Rounding Limits.")

- **AVERAGE DISCHARGE.--8 years, 80.4 ft^3/s, 19.91 in/yr.**

In the above example if the period of record is considered to be August 1974 to September 1982, the number of water years of complete record would equal the difference between the dates, and the dates, therefore, need not be given under AVERAGE DISCHARGE. However, if the record began in November or December and the first water year was not completed, or if the record ended during the period January to August, the dates will be given, as follows:

- **AVERAGE DISCHARGE.--17 years (water years 1968-84), 35.9 ft^3/s, 26,010 acre-ft/yr.**

The period of record for the above example was December 1966 to June 1985. The dates as given are for the period covering the water years of complete record which began October 1967 and ended September 1984.

Dates should also be given if several series of years are used to compute average discharge and if repetition of dates will aid in clarifying the statement. For example:

- **AVERAGE DISCHARGE.--56 years (water years 1891-93, 1900-02, 1909-10, 1926-28, 1936-37, 1942-84), 384 ft^3/s, 278,200 acre-ft/yr.**

Effect of diversion or regulation

Average discharge will not be published for periods during which extensive irrigation development or new diversions have taken place. However, if 5 or more years of record are available before development, the average for those years may be published. Also, after a development has been completed and use of water stabilized, an average based on 5 or more years of this later period may be given, if a figure of average discharge is considered to be of some significance. For such stations the average discharge should include a qualifying remark, such as "(prior to diversion to Moffat water tunnel)" or "(since diversion to Moffat water tunnel)". The old average should be deleted when the new average is given, unless the old figure has substantial value for purposes of comparison.

Changes in regulation by upstream reservoirs need not nullify the value of an average discharge. For example, if a large flood-control or power dam is constructed upstream from a station during the period of record, the average discharge may be computed on the basis of yearly mean discharge adjusted for change in storage. However, if a series of reservoirs are constructed in a basin, so that storage and release of water involves substantial unmeasured gains or losses, adjustments should not be attempted and the average discharge should be omitted.

Similarly, if a reservoir is used primarily for irrigation, diversions upstream from the station may be increased so much compared to earlier years that the average discharge would be meaningless.

If average discharge is based on adjusted yearly means, use qualifying terms, such as "(adjusted for storage)", "(adjusted for diversion)", or "(adjusted for storage and diversion)". If monthly or yearly figures of discharge are adjusted, but the average discharge is not adjusted, use "(unadjusted)." If a date needs to be included in the qualification statement, use "(adjusted for storage since March 1937)."

See also section "Combined records of streamflow and diversion," p. 118, for additional information on average discharge.

Corrections

If a previously published average discharge needs to be corrected, use the following form:

- **AVERAGE DISCHARGE.—22 years, 7,458 ft^3/s, 17.64 in/yr. The figure published in the 1975 report was in error; the correct figure is 21 years, 7,494 ft^3/s, 17.73 in/yr.**

Minor errors, such as a change in the least significant of four figures generally need not be mentioned. A correction of figures of average discharge, regardless of magnitude, will not be noted in the REVISED RECORDS paragraph.

Medians

On streams where average annual runoff is low and the annual variability of runoff is high, the median of the yearly mean discharges will be appreciably smaller than the average discharge. The median of the yearly means may be given, in addition to the average, for such stations if there are 10 or more complete years of record, and if the median is consistently (about two-thirds of the time) less than 90 percent of the average. If medians are published, they should be published every year rather than omitting them for the occasional years when the criterion is not met. Use the middle value (or average of two nearest the middle) as the median. If the average discharge is given in acre-feet per year, give the median in acre-feet per year, as well as in cubic feet per second. Multiply by the factor--724.5--to convert the median in cubic feet per second to acre-feet per year. Generally give the median to one less significant figure than the average, as shown below:

- **AVERAGE DISCHARGE.--32 years (water years 1951-82), 42.5 ft^3/s, 30,790 acre-ft per year; median of yearly mean discharges, 38 ft^3/s, 27,500 acre-ft per year.**

If the average discharge is adjusted for storage or diversion, the median also should be computed from the adjusted yearly mean discharges and reported as shown in the following example:

- **AVERAGE DISCHARGE.--70 years (water years, 1901, 1904, 1915-82), 346 ft^3/s, 250,700 acre-ft per year; median of yearly mean discharges, 230 ft^3/s, 167,000 acre-ft per year. All figures adjusted for storage in Charles Reservoir.**

Extremes for Period of Record

This paragraph reports the instantaneous maximum and minimum discharge (or contents) and gage heights (or elevations) for the period of record. In some instances maximum and minimum figures may need to be qualified. (See section "Qualification of maximums and minimums" given under the paragraph EXTREMES FOR CURRENT YEAR.) In most cases, maximum discharge (or contents) is the instantaneous maximum corresponding to the crest stage obtained with a water-stage recorder (graphic or digital), or a nonrecording gage read at the time of the crest. However, although the minimum discharge reported is usually the instantaneous minimum, there are several exceptions which are discussed later in this section. The maximum and minimum figures will be reported to the same number of significant figures as used in the daily tables. Maximum and minimum gage heights or elevations will be given to hundredths of a foot, if accuracy of the data warrants, otherwise to the nearest tenth of a foot.

The format for water-discharge gaging stations should be as follows:

- **EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, * * *; minimum, * * *.**

The dates covered are restricted to those shown under PERIOD OF RECORD. There will be no need to show separate dates for maximum and minimum to cover periods of crest-stage gage operation because those periods will be identified in PERIOD OF RECORD.

When the maximum discharge and maximum gage height for the period of record occur on the same day, report the maximum discharge and the date (or dates) of its occurrence, followed by the gage height, as shown below:

- **EXTREMES FOR PERIOD OR RECORD.--Maximum discharge, 5,400 ft^3/s, Jan. 26, 1978, gage height, 6.80 ft; minimum,***

When the maximum discharge and maximum gage height occur on different days, report the maximum gage height and the date of its occurrence in separate statements. For example, if maximum discharge and maximum gage height occurred at different times because of backwater or a rating shift, first report the gage height that corresponds to the maximum discharge. Then give the maximum gage height in a separate statement. If backwater is the cause for the difference, use a qualifying statement as in the following example:

- **EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 8,060 ft^3/s, Sept. 24, 1968, gage height, 12.65 ft; maximum gage height, 17.65 ft, Feb. 10, 1967, (backwater from Ohio River); minimum discharge, * * *.**

No qualifying statement is needed when the difference in time between maximum gage height and maximum discharge is caused by a shift in rating.

For example:

- **EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 8,060 ft^3/s, Sept. 24, 1968, gage height, 12.52 ft; maximum gage height, 12.70 ft, Sept. 25, 1968; minimum discharge, * * *.**

When maximum discharge occurs during a period of no gage-height record and the peak gage height is determined from the recorded range in stage, peak-stage indicator, high-water mark in well, or outside floodmark, the date of maximum discharge generally can be closely determined from records from nearby stations or from climatological data. However, if there is serious doubt about the date, the statement should be qualified as follows:

- **EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 684 ft^3/s, occurred sometime during period Dec. 27, 1973, to Jan. 3, 1974, gage height, 7.44 ft, from recorded range in stage; minimum, * * *.**

Other possible statements might read "probably occurred Dec. 30, 1973, or Jan.2, 1974", "about Dec. 30, 1973", or the like.

If the maximum discharge was not determined, give the maximum gage height, if known, followed by a statement such as "discharge not determined" or "ice jam, discharge not determined."

The minimum discharge and gage height will be reported next, in accordance with the following guidelines:

1. For stations on streams that are subject to little or no regulation, little or no diurnal fluctuation, and little or no shifting of the low-water control, report the minimum discharge and the corresponding gage height (if it is the actual minimum gage height). If the minimum gage height frequently occurs at a different time from the minimum discharge, the low-water control probably is unstable and the minimum gage height probably has little significance (See paragraph 5 below).

2. For stations on streams that are subject to extensive regulation or diurnal fluctuation or diversion, report the minimum daily discharge. The momentary minimum discharge and gage height also may be reported, if desired. An abnormally low daily or momentary minimum caused by unusual regulation or by storage behind an ice jam upstream or similar condition should be explained. Momentary minimum discharge of regulated streams should be computed (and published) very carefully because such minimums may indicate violations of regulations governing minimum releases.

3. For stations at which the stage-discharge relation is affected by ice, report the minimum daily discharge if the period of least flow occurred during the period of ice effect, unless the momentary minimum can be determined satisfactorily. If the apparent minimum occurred outside the period of ice effect, but there is some possibility of lesser but undetermined flow having occurred during the period of ice effect, report the open-water figure and add a statement that a lesser discharge may have occurred during the period of ice effect, as follows:

   o *** * *; minimum, 43 ft^3/s, Aug. 22, 1974, but may have been less during period of ice effect, gage height 1.72 ft.**

4. If the minimum discharge (instantaneous) cannot be determined, give the minimum daily discharge if daily records are complete or if the minimum daily is known to have occurred during the period of daily records. Otherwise, state "minimum not determined" and add a statement such as "occurred during period of ice effect," if appropriate.

5. For stations on streams that have shifting low-water controls, the minimum gage height should be omitted, unless it has some significance.

Maximum and minimum contents of reservoirs, when measured by a continuous recording gage, should be listed in the EXTREMES paragraph, even though the daily and monthend figures may apply to the contents at a stated time. If records are based on a nonrecording gage, read once daily, the EXTREMES paragraph should state:

o **EXTREMES (AT 0800) FOR PERIOD OF RECORD.--Maximum contents, * * *.**

When identical maximum or minimum discharges (or contents) for the period of record occur on more than one day, each day should be listed. This situation may occur with identical gage heights; it also may occur with different gage heights when the shifting-control method or changes in rating tables are applied. If gage heights are different for two or more identical maximum discharges, the maximum gage height and date should be given in a separate statement. To minimize the chance that identical maximum discharges will occur because of the accuracy (or lack thereof) of gage-height readings, gage heights should be read to the nearest hundredths or a foot, if possible.

At times the momentary minimum discharge may occur on a number of consecutive days during a diurnal pattern of flow. To avoid listing a number of consecutive dates, the phrase "part of each day" or "part or all of each day" might be used. An example to illustrate the occurrence of identical maximum and minimum discharges is given below:

- **EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 10,100 ft^3/s, Oct. 15, 1973, Apr. 27, 1974; maximum gage height, 10.03 ft, Apr. 27, 1974; minimum discharge, 2.0 ft^3/s, Oct. 7, 11-14, Oct. 29 to Nov. 3, 1968, part of each day Jan. 12-23, 1971, and part or all of each day Jan. 26 to Mar. 2, Mar. 7-28, 1973.**

If no flow occurs at a station, write "no flow" for the minimum, followed by the dates or extent of the no-flow period(s). The words "minimum" or "minimum discharge" are not necessary. For example:

- **Maximum discharge, * * *; no flow * * *.**

If dates of no flow are reported, list only those days when the mean discharge is zero for the day; do not list the adjacent days, even though there was no flow for parts of those days. In other words, the periods of no flow shown will actually represent minimum daily. However, when the duration of no flow shown is less than a day, write:

- *** * *; no flow for part of July 10, 1973.**

or

- *** * *; no flow part of each day Sept. 2-12, 1974.**

Additional formats for reporting the EXTREMES paragraph follow:

- **Maximum discharge, * * *; minimum, * * *; minimum daily, * * *.**
- **Maximum discharge, * * *; maximum gage height, * * *; minimum discharge, * * *.**
- **Maximum discharge, * * *; minimum daily, * * *.**
- **Maximum daily discharge, * * *; minimum daily, * * *.**
- **Maximum discharge, * * *; no flow part of * * *; minimum daily discharge, * * *.**

- **Maximum gage height, * * *, discharge not determined; minimum discharge, * * *.**

If during the period of record, the location or datum of a gage is changed, this information should be reported, as follows:

1. If the extreme occurred during a period when the gage was at a different datum but near the present site, it may be feasible to reference the gage height to the present datum. If this is done, write:

   - *** * *, gage height, 16.83 ft, present datum, * * *.**

2. If a gage height for the present site but different datum has not been referred to the present datum, write:

   - *** * *, gage height, 21.09 ft, datum then in use, * * *.**

   However, all former gage heights at the present site should be referred to the present datum, if the former datum is recoverable.

3. If the gage height was obtained from a gage at a different site and datum than that of the present gage, and it is not practical to reduce the gage height to the present datum because of slope of the water surface, write:

   - *** * *, gage height, 8.30 ft, site and datum then in use, * * *.**

For stations on canals or other diversions, only the maximum and minimum daily discharges should be reported. Because maximum and minimum daily discharges for each year are included in yearly summary data below the daily table, they need not be repeated in the EXTREMES paragraph. Only one statement need be reported for the entire period of record, as follows:

- **EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 2,040 ft^3/s, Nov. 11, 1943; no flow for several days in 1937-39, 1945.**

If a new maximum gage height occurred as a result of the control having been filled, but the corresponding discharge was less than the maximum of record, use the following statement:

- **EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 8,480 ft^3/s, July 29, 1963, gage height, 10.04 ft; maximum gage height, 10.50 ft, Aug. 31, 1976; minimum discharge, 3.6 ft^3/s, Dec. 14-17, 1968.**

If the location or datum of a gage was changed during the period of record, make certain that the maximum gage height reported was determined after consideration of changes in location or datum, especially if that gage height is numerically larger than the gage height corresponding to the maximum discharge.

If the maximum gage height for the period of record is affected by backwater, and if a shift in rating has occurred so the gage height corresponding to the maximum discharge is not the maximum gage height for open-water conditions, the latter should also be given. For example, assume that the maximum discharge for May 1, 1963, was 9,000 ft^3/s (8.50 ft). This was exceeded July 20, 1965, with a discharge of 9,200 ft^3/s (8.45 ft). The maximum gage height of record, 9.00 ft, occurred Mar. 10, 1967; peak discharge was less than 9,000 ft^3/s due to backwater from ice. The paragraph should read:

- **EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 9,200 ft^3/s, July 20, 1965, gage height, 8.45 ft; ; maximum gage height, 9.00 ft, Mar. 10, 1967 (backwater from ice); maximum gage height unaffected by backwater, 8.50 ft, May 1, 1963; minimum * * *.**

Two maximums may be shown if flood peaks are presently controlled by a storage reservoir constructed during the period of record, but were uncontrolled prior to the construction. For example:

- **EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 100,000 ft^3/s, July 1, 1912, gage height, 23.55 ft; minimum * * *. Maximum discharge since construction of * * * Dam in 1952, 15,000 ft^3/s, Apr. 15, 1963, gage height, 8.21 ft.**

A separate set of extremes may be shown for combined streamflow and diversion, as follows:

- **EXTREMES FOR PERIOD OF RECORD.--River only, maximum discharge, 384 ft^3/s, June 3, 1944, gage height, 5.21 ft; no flow May 19, 1952, Sept. 6, 7, 1965 (entire flow diverted to canal). Combined flow maximum discharge, 1,820 ft^3/s, June 7, 1952; minimum daily, 89 ft^3/s, June 23, 1961.**

Over an extended period of no flow the dates of minimum discharge should be omitted and a general statement made to indicate the approximate frequency and duration of no flow. Statements such as "at times," "at times each year," "at times most years," "most of time," "many days," or "for long periods" may be included.

The maximum and minimum discharges for the period of record may have been reported to a different number of significant figures than those specified in these guidelines. This is particularly true for long-term stations where rules for reporting significant figures have been changed. Continue to show maximum and minimum discharges with the same number of significant figures published previously. When these extremes are superseded, the new figures should be reported to the recommended number of significant figures.

In a few instances, maximum and minimum discharges reported do not cover the entire period of record, either because early records are fragmentary or because some partial months do not include a maximum of record. When reporting such extremes, the paragraph should begin with "EXTREMES FOR PERIOD OF RECORD (SINCE 1927)," or "EXTREMES FOR PERIOD OF RECORD (1910-15 AND SINCE 1927)."

If the maximum discharge reported in the EXTREMES FOR PERIOD OF RECORD is determined to be the maximum as of some date prior to the beginning of record collection, that fact should be reported in a second statement, as follows:

- **Maximum stage of Aug. 19, 1955, is greatest since at least 1845.**
- **Stage and discharge of the flood of June 12, 1944, are the greatest since at least 1880.**
- **A longtime local resident says flood of May 16, 1950, was the highest since 1882, although stages in 1942 or 1943 were nearly as high due to large ice jam.**
- **Floods in 1943, 1950, and 1952 are the only major floods since 1884.**

  (All three floods are within period of record 1928-33, 1937-60; 1943 flood is maximum for period of record.)

- **Maximum stage of Sept. 27, 1936, is greatest since at least 1847. Maximum stage 1847-97, 34.6 ft, May 28, 1885, from floodmarks.**

Extremes Outside the Period of Record

Include information on extremes, such as major floods or unusually low flows that have occurred outside the stated period of record, in a paragraph titled EXTREMES OUTSIDE PERIOD OF RECORD, immediately after the EXTREMES FOR PERIOD OF RECORD, as follows:

1. If a flood produces a maximum stage or discharge for a definite long period of time, the following statements may be applicable:

   - **EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum stage since 1889, 34.0 ft, former site and datum, Apr. 17, 1950, from floodmark, discharge 51,800 ft^3/s.**
   - **EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum discharge since at least 1886, about 5,800 ft^3/s, Mar. 19, 1936.**

2. If a particular flood was outstanding, but information is not adequate to establish it as the maximum for a definite time period, the following statements may be applicable:

   - **EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of June 5, 1940, reached a stage of 20.6 ft, present datum, from floodmarks, discharge, 22,200 ft^3/s.**
   - **EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in September 1926 reached a stage of 18.0 ft, discharge not determined; flood in 1934 reached a stage of 15.8 ft, discharge not determined; information supplied by State Highway Commission.**

- **EXTREMES OUTSIDE PERIOD OF RECORD.--Outstanding floods occurred in June 1864 and May 1876. Flood in May or June 1894 reached a stage of 9.13 ft; information supplied by local resident, discharge, about 9,800 ft^3/s. For discussion of these floods, see WSP 997.**

- **EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of May 8, 1950, reached a stage of 26.0 ft, from floodmark established by U.S. Army Corps of Engineers; discharge, 67,000 ft^3/s, but may have been exceeded by flood of July 5, 1908.**

3. If a particular flood is known to have been higher than the maximum for the period of record, but the stage and discharge are uncertain, write:

- **EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in July 1916 reached a stage of about 2 ft higher than that of Aug. 13, 1940 (from flood profile of Tennessee Valley Authority).**

- **EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in 1854 is believed to have been approximately equal to that of Mar. 23, 1929, from information by local residents.**

- **EXTREMES OUTSIDE PERIOD OF RECORD.--A flood in May 1901 has not yet been exceeded.**

4. If a particular flood was outstanding but lower than the maximum for the period of record, write:

- **EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum discharge, 3,510 ft^3/s, Mar. 16, 1953, gage height, 8.83 ft; maximum gage height, 12.16 ft, Aug. 31, 1954 (backwater from tide).**

- **EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in March 1936 reached a discharge of 3,150 ft^3/s, by computation of flow over dam 1.5 mi upstream from station. Maximum discharge since 1886 occurred in November 1927 and was possibly twice that of March 1936. Maximum stage since at least 1835, 15.0 ft, Sept. 21, 1938 (due to hurricane tidal wave).**

- **EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum discharge, 102,000 ft^3/s, Oct. 29, 1950, gage height, 32.4 ft.**

- **EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Feb. 21, 1927, reached a stage of about 31.2 ft at present site and datum; discharge, 101,000 ft^3/s. Flood in February 1890 reached a stage about 1.9 ft higher, according to knowledgeable local resident; discharge about 130,000 ft^3/s.**

The expression "maximum discharge known * * *" should not be used because it leads to ambiguities. For example, the phrase does not indicate the length of period for which discharge is the maximum. In addition "known" has been used ambiguously in previous reports to express two directly opposite meanings, "There may have been higher floods but they were not reported." and "This is definitely the highest flood since first settlers entered the area."

Floods outside the period of record should be limited to two or three major floods; if several greater floods occur during the period of record, only the largest outside the period of record need be reported. Even the second and third highest floods during the period of record are not reported except in the year each occurs. When flood frequency studies are made, care must be taken to be sure no significant flood is overlooked, especially one which is useful in extending a frequency curve. Examples of suitable statements describing outstanding floods outside the period or record are given below.

- **EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum stage since at least 1852, 48.2 ft, Dec. 10, 1913, present datum, from floodmarks on right bank 1,000 ft upstream from gage. Stages for other floods at railroad bridge, at present datum, from information by Southern Pacific Railroad, are as follows: 43.7 ft, May 1884; 44.7 ft, June 13, 1885; 45.6 ft, July 1899; 43.3 ft, May 2, 1915; 40.9 ft, May 9, 1922.**

An example of reservoir storage data outside the period of record is:

- **Maximum contents prior to 1903, 753,300 acre-ft, May 31, 1894, elevation, 2,137.6 ft, from high-water marks.**

If an unregulated discharge, occurring before the period of record, has been measured (or a significant no flow observed), and it is less than the minimum unregulated discharge during the period of continuous record, then that information should be reported as follows:

- **EXTREMES OUTSIDE PERIOD OF RECORD.--A discharge of 0.13 ft^3/s was measured, Sept. 13, 1953.**

- **EXTREMES OUTSIDE PERIOD OF RECORD.--Stream is reported to have receded to no flow in 1882 and in 1897.**

This type of statement should be included whether or not low-flow measurements are reported in PERIOD OF RECORD.

Extremes for Current Year

The guidelines for this entry generally parallel those previously given for the EXTREMES FOR PERIOD OF RECORD, except that instantaneous maximum and minimum discharges and corresponding gage heights should be limited to the current year only. In addition, information relative to secondary peak discharges greater than a selected base discharge should also be reported for selected stations meeting certain criteria. Discharge peaks greater than the base discharge but less than the maximum discharge are known as secondary peaks. Secondary peaks are useful in many types of hydrologic studies, and should be reported, when appropriate.

Format

Both sentence and tabular formats are used in reporting extremes for the current year. The sentence format resembles that used for the EXTREMES FOR PERIOD OF RECORD entries except for dates, which will report only month and day. Sentence format should be used only for stations for which secondary peak discharges are not published. Reporting the time for the instantaneous maximum for the year is not required but may be done at the District's option. The tabular format should be used for stations for which secondary peaks are published, and reporting the time (if known) of the peaks is required for these stations. An example of the sentence format would be:

- **EXTREMES FOR CURRENT YEAR.--Maximum discharge 10,100 ft^3/s, Oct. 15, gage height, 10.03 ft; minimum 2.0 ft^3/s, Sept. 10, gage height, 0.50 ft.**

Examples of the tabular format are shown in the appendix in order to illustrate the full 11.5-in. length of typed line, and are also included in the the discussion of peak discharge on p. 94.

<u>Special conditions</u>.--A fairly common occurrence on coastal streams in the southeast--and occasionally in other parts of the country--is for the maximum discharge during the year to occur on a rising stage Sept. 30 or on a falling stage Oct. 1. For these situations the peak discharge for the storm event occurs in the following or preceding water year. The entry in the extremes paragraph should clarify this point to the reader by stating the date the peak occurred even though that date is in the next (or previous) water year. (See example below.) In addition to giving the maximum discharge in the EXTREMES entry, the maximum peak discharge that occurred during the water year should be given. If the maximum peak discharge is not independent of the flood of Sept. 30 (or Oct. 1), the maximum independent peak discharge should also be given. A few examples should suffice to illustrate the format to be used:

- **EXTREMES FOR CURRENT YEAR.--Maximum discharge, 12,700 ft^3/s, Sept. 30, stage rising, peak occurred Oct. 1, 1976; maximum peak discharge, 4,300 ft^3/s, Apr. 18, gage height, 14.3 ft; minimum discharge, * * *.**

- **EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,080 ft^3/s, Oct. 1, stage falling, peak occurred Sept. 28, 1975; maximum peak discharge, 1,890 ft^3/s, July 27, gage height, 9.08 ft; minimum discharge, * * *.**

- **EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,170 ft^3/s, Oct. 2, gage height, 11.81 ft, occurred on recession following peak of Sept. 28, 1975; maximum independent peak discharge, 2,020 ft^3/s, Jan. 1, gage height, 9.72 ft; minimum discharge, * * *.**

- **EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,740 ft^3/s, Oct. 1, gage height, 15.39 ft, was not independent of the same peak discharge that occurred Sept. 30, 1975; maximum independent peak discharge, 2,610 ft^3/s, July 12, gage height, 14.43 ft; minimum, * * *.**

If records for less than a complete water year are being published for the first time for a new station, or for the last time for a discontinued station the EXTREMES entry will be modified slightly. For a new station with no other period of record, write:

- **EXTREMES FOR CURRENT YEAR.--Maximum discharge during period May to September, * * *.**

The statement for a re-established station should be similar but should include, of course, extremes for the period of record as well as for the current year.

For a discontinued station, write:

- **EXTREMES FOR CURRENT YEAR.--Maximum discharge during period October 1975 to February 1976, * * *.**

Peaks greater than a base discharge

Peak discharges greater than a given base discharge and the associated gage heights, are used in many studies. The data are necessary for the detailed hydrologic studies of runoff, flood routing, unit hydrographs, and flood frequency that are required for design of highways and bridges, flood-control structures, and other water-development projects. A canvass of cooperating agencies in 1975 and 1981 indicated a continuing demand for peak discharges greater than a base. Those peak discharges that exceed a selected base discharge will be published for selected stations only. Criteria for selecting stations, base discharge, and peaks to be reported are described below.

Criteria for selecting stations.--

1. Publish secondary peaks for streams not subject to substantial control by man. For stations that are affected by occasional or minor manmade regulation, either publish all of the secondary peaks (regardless of whether some may be affected by regulation), or none of the secondary peaks.

2. Do not publish secondary peaks for streams where the crests are so flat that the peaks generally are either the same as, or not more than 5 percent greater than, the daily mean discharge. Use this rule even though an occasional secondary peak does exceed the daily mean discharge by more than 5 percent.

3. Publish secondary peaks only for stations that have a recording gage. However, if the frequency of gage readings for stations without recording instruments is such that reasonably accurate graphs can be drawn, then peaks may be reported. As a precaution, crest-stage gages should be installed at all nonrecording stations on flashy streams.

4. Publish secondary peaks only for stations where the record is complete. Do not publish peaks where the record is fragmentary or seasonal and where peaks greater than the base discharge may have occurred during a period of nonoperation. This restriction does not apply, however, if the period of nonoperation is known to be one of low flow during which flooding did not occur, nor does it apply to the partial-year period at the beginning or end of a record.

Criteria for selecting base discharge.--The base discharge is selected so that an average of three peaks a year will be reported. The base discharge will be shown with the list of peaks and should be reported to not more than two significant figures. The following are criteria for selecting base discharge:

1. For stations for which peaks greater than a base have been compiled, continue to use the same base if the peaks published meet the three-times-per-year guideline. Guidelines for deciding when the base should be changed are given in paragraph 4 below.

2. For stations with records of more than 5 years, but for which no flood-frequency curves have been computed, list the annual flood peaks and compute their recurrence interval by the formula $T = (n+1)/m$.

   where T = recurrence interval, in years;
   n = number of years of record; and
   m = order number of peaks, beginning with the largest peak as number 1.

   Then choose as the base a discharge (rounded upward) whose recurrence interval is approximately 1.1 years.

3. For stations with records of 5 years or less, select a base discharge by judgment and comparison with other stations. The selected base discharge should preferably be a little low rather than high; then, as more data become available, a higher base discharge can be selected, if necessary.

4. Changes in the base are not desirable; a selected base discharge should be retained until it proves entirely unsatisfactory. Base discharge should be reviewed every 5 or 10 years, or when a flood-frequency study is undertaken. If there are more than about 40 peaks greater than base discharge in a 10-year period, the base discharge should be raised; likewise, if there are fewer than 20 peaks during a 10-year period, base discharge should be lowered. When base discharge is lowered, however, previously published lists of peaks are rendered incomplete, and additional peaks may have to be entered in the peak-flow file. The additional peaks should be published in future flood-frequency reports, but not in the State annual hydrologic-data reports.

   Whenever the base is revised, insert the word "revised" after the base discharge in the first report containing the revised figure; no reference to the revision needs to be made in subsequent reports.

Criteria for selecting independent peaks greater than a base discharge.--Report peaks greater than base discharge according to the criteria listed below. Publish all independent peak discharges, with corresponding gage heights and time of occurrence, for which discharge exceeds the base discharge, regardless of the number of peaks in a year.

1. Two peaks are considered independent if the hydrograph recedes to a well-defined trough between the peaks. Publish both peaks if the instantaneous discharge of the trough is equal to or less than 75 percent of the instantaneous discharge of the lower peak; otherwise publish only the higher peak.

2. For small, highly responsive watersheds, only the highest peak discharge resulting from an obvious single storm event should be reported regardless of the trough configuration or magnitude between peaks.

3. For periods of diurnal peaks caused by snowmelt, report only the highest peak during each distinct period of melting, if such periods can be identified, even though other peaks may meet the preceding criteria. Identification of each distinct period of melting is largely a matter of individual judgment, but the principle as explained in paragraph 1 above for instantaneous discharges can be applied to daily discharges as an identification guide.

Tabular format for peaks greater than a base discharge.--Peaks greater than base discharge are reported in the EXTREMES FOR CURRENT YEAR paragraph. They are published in tabular format with the extremes for the current year indicated by asterisks to the left of both the maximum discharge and maximum gage height. Placing an asterisk on both values is preferable to the past practice of not placing an asterisk on the gage height unless it occurred on a different day from that of the discharge. Minimize use of footnotes, qualifications, and explanations in the table. The table should have an 11.5 in. typed width (115 characters on a 10-pitch machine) in order to line up with the daily-discharge table. Minimum discharges are published in a separate paragraph following the tables of peaks. Examples of these entries are included in the appendix; examples of parts of these entries are given below.

List the peak discharges in chronological order, and report the time (in 24-hour time) to the nearest 30 minutes from graphical records, and to the nearest punch interval (as printed on the primary computation sheet) for digital records. If a peak lasts several hours, list the time the peak gage height was first reached. Examples of the tabular format for reporting peak discharges greater than a base discharge follow:

1. For stations for which secondary peak discharges are reported but at which no peak greater than the base discharge occurs in the current year; use the following tabular form:

- **EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge base of 100 ft^3/s and maximum (*):**

Date	Time	Discharge (ft^3/s)	Gage Height (ft)	Date	Time	Discharge (ft^3/s)	Gage Height (ft)
Jan. 4	1615	*95	*3.68				

Minimum discharge, 0.19 ft^3/s, Oct. 1.

2. For stations for which secondary peak discharges are published but only one peak greater than base discharge occurs in the current year, use the following form:

- **EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 2,200 ft^3/s and maximum (*):**

Date	Time	Discharge (ft^3/s)	Gage Height (ft)	Date	Time	Discharge (ft^3/s)	Gage Height (ft)
Feb. 21	1400	*2,860	*8.30	No other peak greater than base discharge.			

Minimum discharge, 83 ft^3/s, Oct. 2.

3. For stations for which secondary peak discharges are published and two or more peaks occur in the current year:

- **EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 80 ft^3/s and maximum (*):**

Date	**Time**	**Discharge (ft^3/s)**	**Gage Height (ft)**	**Date**	**Time**	**Discharge (ft^3/s)**	**Gage Height (ft)**
Dec. 25	0700	84	3.06	**Aug. 20**	0800	*169	*4.23

Minimum discharge, 0.02 ft^3/s Oct. 1, 2; minimum gage height, 0.48 ft, Oct. 1.

Special conditions.--At recording-gage stations peaks may occur when the recorder is out of operation, or during ice-affected periods. Peaks occurring during such periods, that otherwise fit criteria for reporting, should be reported as follows.

1. When the peak stage is known (from recorded range in stage or high-water mark) and the calendar date is also known, but the time of day is not known, insert the word "Unknown" in the TIME column.

2. When the peak stage is unknown, insert the word "Unknown" in the GAGE HEIGHT and DISCHARGE columns.

3. When the peak dicharge cannot be determined, insert "Unknown" in the DISCHARGE column.

4. If a reasonable estimate of peak discharge can be made on the basis of other records, although the date of occurrence may be uncertain, footnote the DATE column with "[a]Sometime during period July 7-13," or the like; insert dashes in the "TIME" column; and round the discharge (but do not qualify it with "about"). A date need not be footnoted if it can be determined reasonably well within a day.

5. If a peak discharge is affected by ice, insert a dash in the time column and enter "ice jam" in the gage height column, unless the gage height is the maximum for the year.

6. If the maximum gage height for the year is affected by ice, and the corresponding maximum discharge is neither a peak greater than base discharge nor the maximum for the year, use the words "ice jam" in the discharge column. Use of a footnote such as "backwater from ice" may be more appropriate in some instances.

7. If the maximum gage height for the year is affected by ice, and peak discharge greater than base discharge or maximum discharge for the year occurred on the same day, place an asterisk and a letter symbol to the left of the reported gage height; the footnote should read "(a) Ice jam".

8. For stations where peak gage height and peak discharge occur on different days because of changing stage or variable slope, give the peak gage height (and the corresponding time), in addition to the time of peak discharge. If peak gage height occurs on the same day as the peak discharge, report the peak gage height and the time of the peak discharge. Because all peaks greater than a base discharge are now being entered into the WATSTORE Peak-Flow File, it is recommended that the gage height associated with the peak discharge now be reported, even though it may not be the maximum stage of the rise. For example:

- **EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge--and so on.**

Date	Time	Discharge (ft^3/s)	Gage Height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Nov. 28	2300	*18,900	29.73	**July 11**	0130	18,100	29.31
Nov. 29	0200	(a)	*30.53				

(a) Backwater from Missouri River

In the preceding examples, the November 29 peak gage height occurred 3 hours after the peak discharge on November 28 which requires that both dates be listed. The July 11 peak gage height may have occurred many hours (as many as to 22 1/2) after the peak discharge, but there is a single listing because both were on the same day. The discharge for November 29 was not listed for it was less than the base discharge. Whenever possible, type in the cause of the maximum stage occurring at a time different than that of the peak discharge. If room does not permit it, use a symbol and corresponding footnote.

Qualifying maximums and minimums

Maximum and minimum discharges, reservoir contents, and gage heights reported under EXTREMES may need to be qualified to indicate that the reported values are not necessarily the actual extremes. If a maximum or minimum discharge was computed from the highest or lowest reading of a nonrecording gage, the qualification "observed" may be necessary to explain that the actual maximum (or minimum) may have been higher (or lower) than that given. The word "observed" is not needed if the stage was known to be changing so slowly that the gage readings may, for all practical purposes, be considered the actual maximum (or minimum). For this reason it is likely that very few maximums or minimums will need the qualification. If the word "observed" is needed, use the following format:

- **Maximum discharge observed, * * *; minimum observed, * * *.**
- **Maximum discharge observed, * * *; minimum discharge, * * *.**
- **Maximum discharge, * * *; minimum observed, * * *.**

Where a maximum (or minimum) reading was obtained from a water-stage recorder, but the gage was out of operation during another period when the discharge (or contents) may have been higher (or lower) than reported, qualify the observed maximum or minimum reading with the word "recorded" and add a statement to specify the other period when a higher (or lower) event may have occurred, as follows:

- **Maximum discharge, * * *; minimum recorded, 4.4 ft^3/s, Aug. 27, but may have been less during period of ice effect Dec. 10 to Jan. 2, or period of no gage-height record Nov. 7-13.**

For most nonrecording stations where the stage was changing rapidly and gage readings were made infrequently, it is likely that the absolute maximum (or minimum) was not observed. The usual practice is to construct graphs based on the gage readings and other known factors so that missing gage records can be extrapolated. If this is done, the gage height should be qualified as follows:

- **Maximum discharge, 1,230 ft^3/s, Aug. 15, gage height, 12.25 ft, from graph based on gage readings; * * *.**

If maximum stage was determined by leveling to floodmarks, write:

- **Maximum discharge, 1,230 ft^3/s, Aug. 15, gage height, 12.25 ft, from floodmarks; * * *.**

No qualifying statement is needed if maximum stage was determined from a crest-stage gage. However, the GAGE paragraph should contain reference to the crest-stage gage as part of the gaging-station equipment.

The gage height shown for a recording station should be that which represents the stage in the stream as shown by the outside gage. When the stages in the stilling well and in the stream differ considerably, every effort should be made to eliminate the cause of the difference so that the well gage height does represent the stage in the stream. Exact agreement is not necessary, but any appreciable difference should be adjusted in favor of the outside gage.

Reported gage heights need not be qualified where the recorded gage height and the outside gage height are virtually the same (within a few hundredths of a foot) or where the recorded gage height has been adjusted to the outside gage height.

If the recorded inside gage height is considerably less than the outside gage height because of drawdown, and there is no basis for adjusting to the outside gage, both gage heights should be shown and qualified, as follows:

*** * * gage height, 14.40 ft in gage well, 14.77 ft, from outside gage; * * *.**

*** * * gage height, 14.5 ft in gage well, 16.9 ft, from floodmarks; * * *.**

*** * * gage height, 35.5 ft in gage well; 36.29 ft, top of surge in gage house; 37.97 ft, from floodmark at waterplant and in wire-weight gage box at upstream side of bridge * * *.**

Qualifications may be needed for figures of maximum or minimum contents at a reservoir station. Generally, the published contents data, including maximums and minimums, represent usable contents below the maximum controllable level, which may be the top of the spillway crest, top of gates, top of conservation pool, or at some other established level. If the maximum contents includes some surcharge or uncontrolled storage, write:

- **EXTREMES FOR PERIOD OF RECORD.--Maximum contents observed, 299,200 acre-ft, temporary use of flashboards, June 16, 1942, elevation, 4,164.43 ft; minimum observed, * * *.**

- **EXTREMES FOR PERIOD OF RECORD.--Maximum contents, 178,500 acre-ft, Apr. 19, 1941, gage height, 170.13 ft, of which 500 acre-ft, was uncontrolled storage; * * *.**

Because of changes in relation of reservoir capacity to stage caused by sedimentation, maximum contents of record and maximum elevation of record may occur at different times. If this happens, report the maximum elevation and date of its occurrence in a separate phrase, as follows:

- **EXTREMES FOR PERIOD OF RECORD.--Maximum contents, 693,000 acre-ft, Apr. 18., 1943, June 4, 1953; maximum elevation 450.77 ft, June 26, 1958, minimum contents, * * *.**

The date of the last reservoir survey (and the date that the new reservoir capacity table was established, if different from the survey date), should be given in the REMARKS paragraph if the capacity table has been substantially revised. There will be no need to qualify maximum or minimum contents for changes in the capacity table.

Minimum reservoir contents for the period of record may require a variety of qualifications, such as: "minimum since reservoir first filled in May 1927, * * *"; "minimum since power pool was reached, * * *" (may be "conservation pool" or "normal low operating level") or "minimum since appreciable storage was attained, * * *." During the initial filling period, which may last several years, minimum contents are meaningless, in which case, the qualifying statement might read: "no storage prior to Mar. 13, 1963." Some reservoirs that are fed by ephemeral streams are empty for various periods of time. The qualifying statement then might read: "no storage Sept. 5, 1933, July 19 to Aug. 13, 1940," "no storage at times during 1928-29, 1933, 1940," "no storage at times," or "no storage at times when natural flow was passing through reservoir."

A gage height may be qualified as "affected by wind," "affected by seiche," or some other appropriate phrase.

For gaging stations on streams that are affected by regulation, neither the maximum nor minimum discharge need be qualified by the word "(regulated)," provided the regulation is mentioned in the REMARKS paragraph. However, any unusual regulation should be described, such as regulation caused by construction work upstream from the station, a dam failure, sluicing at a dam upstream from the station, storage behind ice jams, or other unusual conditions of a temporary nature. For example:

- **EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of May 18, 1927, was considerably higher than flood of June 16, 1918; landslide about 2 mi upstream washed out and released about 10,000 acre-ft of impounded water; discharge not determined.**

- **EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 10,200 ft^3/s, Aug. 17, 1959, caused by wave over Hebgen Dam following earthquake; gage height, 5.3 ft, from floodmark, * * *.**

- **EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, * * *; minimum daily, 0.1 ft^3/s, May 13, 1941, Sept. 20-22, 1950, when gates in dam at New Fork Lake were closed.**

- **EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 16,800 ft^3/s, Sept. 7, 1965, gage height, 8.53 ft, caused by emergency release from Fontenelle Dam; minimum daily, * * *.**

If minimum discharge occurs during a short drop in discharge caused by temporary storage in the form of ice and channel storage, and is appreciably less than the base (ground-water) flow, the minimum discharge should be qualified if the momentary minimum is less than 75 percent of the adjacent base flow. The qualification is as follows:

- *** * *; minimum, 2.6 ft^3/s, Mar. 2, 1956, result of freezeup.**

The qualification should not be used for the minimum daily discharge.

Maximum discharge determined by indirect methods, such as extension of the rating curve and indirect measurements, should be reported in one of the following ways:

1. If maximum discharge was determined by extending the rating curve, use the following statement, regardless of whether linear or logarithmic plotting paper was used:

   - *** * * from rating curve extended above 7,500 ft^3/s.**

   The qualification applies to the momentary maximum; do not qualify the maximum daily discharge. The figure reported in the above example should be the discharge of the highest current-meter measurement, rounded upward to two places--for example 7,430 ft^3/s would be given as 7,500 ft^3/s.

2. Extension made on the basis of a velocity-area study, slope-conveyance study, step-backwater method, theoretical-weir formula, laboratory rating, or comparison with record for other station, should be qualified as follows:

- *** * * from rating curve extended above 7,500 ft^3/s on basis of velocity-area study.**

- *** * * from rating curve extended above 30,000 ft^3/s on basis of runoff comparisons with nearby stations.**

- *** * * from rating curve extended above 23,000 ft^3/s on basis of rate of change of storage in San Carlos Reservoir; * * *.**

3. Extension of the rating curve above the highest current-meter measurement based on an indirect measurement of peak flow (slope-area, contracted-opening, or other), should be qualified; as follows:

   - *** * * from rating curve extended above 150 ft^3/s on basis of slope-area measurement of peak flow; * * *.**

   - *** * * on basis of contracted-opening and flow-over-road measurement of peak flow.**

4. Extension above the highest current-meter measurement made by averaging several indirect measurements or special computations, of which the flood being reported may or may not be one, should be qualified as follows:

   - **EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 21,400 ft^3/s, June 15, 1942, gage height, 15.50 ft, from rating curve extended above 3,800 ft^3/s on basis of slope-area measurements at gage heights 13.03 ft, 14.49 ft, and 15.50 ft; * * *.**

   The indirect measurements listed in a situation like that of the above example may be lower than the maximum discharge for the flood being reported, or even higher if there was a determination of a flood outside the period of record.

5. If the qualification for maximum discharge is overly long or complex, only include the complete qualifying statement in the EXTREMES FOR PERIOD OF RECORD paragraph, even though it also applies to the current-year maximum discharge as well as for the maximum for the period of record (and possibly for a flood outside the period of record). Refer to the qualification in the EXTREMES FOR CURRENT YEAR paragraph by the phrase: "from rating curve extended as explained above." Use the same phrase in the EXTREMES OUTSIDE PERIOD OF RECORD paragraph, if applicable. For example:

   - **EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 22,700 ft^3/s, Sept. 21, 1938, from rating curve extended above 4,600 ft^3/s on basis of contracted-opening measurement at gage height 12.83 ft and slope-area measurement at gage height 18.2 ft, maximum gage height, 18.2 ft from floodmarks; minimum, * * *.**

- **EXTREMES FOR CURRENT YEAR.--Maximum discharge, 12,200 ft^3/s, Aug. 19, gage height, 12.83 ft, from rating curve extended as explained above; minimum, * * *.**

If the qualifying statement is brief, it should be repeated wherever necessary. For example, the phrase "from rating curve extended above 460 ft^3/s by velocity-area study" in one paragraph should not be changed to "* * * as explained above" in the other paragraph. The phrase in one paragraph may read "by computation of peak flow over dam," and in the other paragraph may read "by computation of flow over dam at gage height 13.63 ft."

6. Peak discharge of a flood determined solely by results of the indirect measurement (other than extending a rating curve), should be qualified as follows:

- **EXTREMES FOR PERIOD OR RECORD.--Maximum discharge, 3,000 ft^3/s, Mar. 3, 1965, by computation of peak flow through culvert and over road; maximum gage height, 27.50 ft, from floodmark; minimum, * * *.**

- **EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 267,000 ft^3/s, July 15, 1951, computed by flood-routing method from hydrograph defined at Miami, river mi 144.2, by several discharge measurements, gage-height record, and comparison with computed inflow to Lake O' the Cherokees; maximum gage height, 34.03 ft, July 16, 1951, from floodmark; minimum, * * *.**

Indirect measurements made at a considerable distance from a gaging station may require adjustments for channel gains or losses, and should be qualified as follows:

- **EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 52,200 ft^3/s, Sept. 21, 1938, from rating curve extended above 11,000 ft^3/s on basis of computation of peak flow over Scotland and Baltic Dams, 5 mi and 9 mi downstream, respectively, adjusted for flow from intervening area, gage height, 27.6 ft, from floodmarks; * * *.**

7. At times a flood early in the next water year (for example, occurring Nov. 23, 1983) may be the maximum for the period of record. Thus, it is possible that the maximum discharge for the current year (for example, occurring Jan. 6, 1982) could be computed from a rating curve extended to an indirect measurement of the later flood. Consequently, a 1982 water-year maximum discharge could be qualified as:

- **EXTREMES FOR CURRENT YEAR.--Maximum discharge, 7,970 ft^3/s, Jan. 6, gage height, 9.07 ft, from rating curve extended above 3,100 ft^3/s and computation of peak flow over weir at gage heights 9.07 ft and 9.69 ft, for flood of Nov. 23, 1983; * * *.**

The qualification "for flood of Nov. 23, 1983," should, of course, be deleted in 1983 and later years.

When an indirect measurement requires a long extension of a rating curve, the curve should be drawn through the plotted measured discharge (0 percent) unless some other reliable evidence (control shape or channel conditions, for example) definitely shows that the measured discharge is unreliable. Likewise, the rating curve should be drawn through a current-meter measurement that is the sole definition of the extreme high end of the rating.

Occasionally a discharge measurement (or an indirect measurement) made on the peak for the year plots slightly to the right or left of the rating curve. This could occur where the rating is the average of several measurements (lower or higher, or both), and the rating curve is considered to apply directly without shifts. In such a situation publish the rating-curve discharge, not the measured discharge. No qualification is necessary.

Recheck each year to be sure the qualification used for the maximum discharge for the period of record is still appropriate. The discharge figure shown for the highest current-meter measurement may be raised from time to time as higher measurements are made. As soon as the rating curve is adequately defined by measurements the qualification should be deleted.

If the rating curve extension is based on the shape of a previous rating curve that was defined to a higher discharge than the rating on which the current year maximum discharge is based, the higher discharge is used for qualification. The qualifying statement "* * * from rating curve extended above 27,000 ft^3/s" should be used instead of "* * * from rating curve extended above 2,000 ft^3/s on basis of shape of previous rating defined to 27,000 ft^3/s."

Revisions

If a critical error in published records is discovered, a revision is included in the next annual report following discovery of the error. A separate paragraph headed REVISIONS, when required, will follow the EXTREMES FOR CURRENT YEAR paragraph in the station manuscript. This section includes the criteria for making revisions to records which were previously published in either water-supply papers or annual State data reports. The figures of discharge subject to revisions are extremes, peak discharges, daily discharge, and monthly or yearly discharge.

Revise only those published records of discharge that are substantially in error--and only when the revisions are reliable. The publication of indiscriminate revisions tends to cast doubt on the reliability of all records; therefore, questionable records should be withheld from publication until additional data have been collected.

The scope of revisions of water-discharge data may range from the changing of a single figure to the revision of an entire year or several years of record. Revisions may result from additional data, re-examination and reinterpretation of data, or from the discovery of errors in computation. Records prior to 1961 were reviewed thoroughly for the nationwide compilation reports and the 1961-70 records were reviewed in the 5-year water-supply-paper series, so there should be very little need in the future to revise records for any period prior to 1971. All revised figures should be entered in the WATSTORE files (and the affected period of record checked for correctness) in accordance with standard procedures.

If revisions are published, an analysis should be prepared explaining the basis for making the revisions and the reasons why other periods perhaps do not need revision. This analysis should be completed and filed for reference.

Criteria for revisions

The criteria for revising published data are based largely on the difference between the old and new data, measured in percent. Extremes and peaks greater than base discharge should be revised if the difference in discharge between old and new data is more than about 10 percent. Revisions may be made for errors less than 10 percent if they are needed to maintain the correct relationship between the annual maximum discharge and a supplemental peak discharge or to keep annual maximums in the proper order of magnitude.

Because minimum discharge for many streams may not be as important as maximum discharge, a greater percentage error may be tolerated before any revision of the minimum is warranted.[1] Minimum discharges that are of little practical value need not be revised. Justification is needed before revising any

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[1]Minimum discharge for some streams, however, is taking on increasing importance because of the need to maintain a minimum streamflow to meet particular water-quality standards. For these streams, standards for revision should not be relaxed.

regulated momentary minimums, minimums at canals or ditches, or very low values of minimum discharge at stations with considerable periods of zero flow.

Daily and monthly discharges should be revised only if a monthly mean discharge is in error by 10 percent or more, or if a daily discharge is in error by 50 percent or more; however, figures for an unusually high or low period may be revised regardless of the percentage effect on the monthly mean. Revisions are not warranted within the medium range of flow, even if days are in error by more than 50 percent, when the error in the monthly mean is less than 10 percent. Also, revisions are not made for low discharges (less than about 10 ft^3/s), even if the error in the monthly mean is more than 10 percent.

An exception to the percentage limitations must be made if the revised instantaneous maximum for a water year is less than a daily discharge in that year. Daily discharges then must be revised so that the relationship between instantaneous discharges and daily discharges will be correct. Similarly, daily discharge must not be less than the momentary minimum discharge for that water year.

If selected daily discharges in a given water year need to be revised, revise as many days as necessary to avoid sharp breaks in the hydrograph at the beginning and end of the revised period. However, do not make the revised period unduly long to accomplish this purpose.

At very low discharges, the allowable percentage error between old and new data may be more than 50 percent. For example, a 100 percent increase in a daily value from 0.01 to 0.02 ft^3/s or even from 0.10 to 0.20 ft^3/s probably would not be significant.

Revisions of estimated data, such as daily discharge during periods of ice effect, should be made only when new information is available to substantiate the change and the revised values are reliable. (Do not revise merely because of a slightly different interpretation of the same base data). The percentage change in the monthly mean should be much greater than 10 percent, depending to some extent on the basis for the revisions, before revisions of estimated figures are considered warranted.

If any daily discharges are revised, the corresponding monthly and yearly discharges based on the new daily figures also must be revised. However, do not report monthly summaries for months that are incomplete, or yearly summaries for years that are incomplete.

Publication of revisions

Revisions are published in a separate paragraph headed REVISIONS which will follow the EXTREMES FOR CURRENT YEAR paragraph. Formats for publication of various revisions are as follows:

Extremes.--If the extremes for only 1 or 2 water years are revised, give the revised figures in sentence form. Even if the only revision is that for the maximum discharge for the period of record, a separate REVISIONS paragraph must be given to call attention properly to the revision and to indicate which water-supply paper or State annual report contains the figure that is superseded as a yearly maximum. In listing the report superseded, list only the annual report or water-supply paper in which the superseded extreme appeared as a yearly maximum. However, do not use a REVISIONS paragraph to call attention to revisions of historical flood data (outside the period of record) because in that case there is no water-supply paper (or State annual report) in which this figure appears as a yearly maximum; instead, insert "(revised)" after the revised figure for the first year only. If extremes in 3 or more water years are revised, use a table preceded by an introductory sentence. Samples follow:

One Year:

- **EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 126,000 ft^3/s, revised, Apr. 14, 1971, gage height, 13.62 ft; minimum, 2,600 ft^3/s, Sept. 1, 1941, gage height, 2.44 ft .**

* * * * * * *

- **REVISIONS.--The maximum discharge for the water year 1971 has been revised to 126,000 ft^3/s, Apr. 14, 1971, gage height, 13.62 ft.**

In the above example, the maximum discharge for the period of record was revised; therefore, the maximum is flagged as "revised" in that paragraph for the first year only.

Two Years:

- **REVISIONS.--The maximum discharges for the water years 1971 and 1972 have been revised to 106,000 ft^3/s, May 13, 1971, gage height, 25.7 ft, from graph based on gage readings, and 103,000 ft^3/s, Oct. 1, 1971, gage height, 24.4 ft, from floodmark, superseding figures published in reports for 1971 and 1972.**

Three Years or More:

- **REVISIONS.--The maximum discharges for some water years have been revised, as shown in the following table. They supersede figures published in WSP 2106 and the reports for 1971 and 1975.**

Water year	Date	Discharge (ft^3/s)	Gage height (ft)
1970	Aug. 13, 1970	74,500	32.46
1971	Apr. 17, 1971	24,800	22.08
1975	Oct. 4, 1974	49,500	28.04

The above sample table of revisions shows a single set of columns, but camera copy should be typed as a double set of columns to fill an 11.5-in. line. The reference to Water Supply Papers will be omitted if there is none. The format for publication of revised minimum discharge is the same as that for revised maximum discharge.

Rarely are both the maximum and minimum discharges for the same year revised. If this does occur, use a paragraph format similar to the following:

- **REVISIONS.--The maximum and minimum discharges for water year 1971 have been revised to 66,900 ft^3/s, Dec. 9, 1970, gage height, 19.42 ft and 1,050 ft^3/s, Sept. 30, 1971, gage height, 0.62 ft, respectively. They supersede figures published in the report for 1971.**

If there are revisions of both maximum and minimum discharges involved for 2 or more years, a tabular setup is recommended.

If a figure previously published as a maximum or minimum is not actually the extreme (but was the true discharge at the time), the publishing of the correct extreme is considered a correction rather than a revision. Where the correction figure is the extreme for the period of record, merely publish the correct figure noted as "(corrected)" for the first year only. Where the correct figure is not the extreme for the period of record, treat it as a revision, but use "CORRECTIONS" as the paragraph heading instead of "REVISIONS", as follows:

- **CORRECTIONS.--The maximum discharge for water year 1975 is 12,500 ft^3/s, June 5, 1975, gage height, 7.87 ft; the previously published figure was not the maximum.**

<u>Peaks greater than base discharge</u>.--Revised supplemental peaks greater than base discharge should be reported in the same manner as revised extremes. The format will be determined by the combined number of supplemental peaks and annual maximums being published. Three or fewer items can be given in sentence form; otherwise use a tabular format. Example of sentence form:

- **REVISIONS.--The maximum discharges reported for water years 1971 and 1972 have been revised to 106,000 ft^3/s, May 13, 1971, gage height, 25.70 ft, and 103,000 ft^3/s, Oct. 1, 1971, gage height, 24.40 ft, superseding figures published in the reports for 1971 and 1972. Peak discharge for Apr. 7, 1972 (1030 hours) has been revised to 100,000 ft^3/s, gage height, 23.00 ft.**

An example of a revisions heading and appropriate introductory statement for the tabular format for four or more peaks follows:

- **REVISIONS.--The peak discharges and annual maximum (*) reported for water years 1968, 1971, and 1975 have been revised as shown in the following table. They supersede figures published in WSP 2101, and the reports for 1971 and 1975.**

The table is similar to the table shown above for revisions of extremes for three years or more (p. 105), but with a "Time" column added between "Date" and "Discharge".

Daily and monthy discharge.--Revised daily and monthly discharge, if any, should follow any revisions of extremes. Attention should be called to revisions of daily or monthly discharge in the REVISIONS paragraph by an appropriate introductory statement. The reports containing superseded figures are identified once in REVISIONS, either with extremes or with daily figures, but not with both unless needed for clarity. Only one annual report need be listed for each water year in which there are revisions (omit the reports containing wrong calendar-year summaries only).

The format for reporting the revisions in daily and monthly discharge depends, to some extent, on the number of days needing revision in a given year. There are three possible formats: (1) Partial daily table with partial monthly table, (2) partial daily table with complete monthly table, and (3) complete daily and monthly tables.

1. A partial daily table with a partial monthly table consists of a list of only the daily discharges actually changed and monthly and yearly summaries of discharge for only the months and years involved. (The summary for each month or year listed should be complete and include all the items originally published even though some of the items are unchanged.) This form should be used when relatively few days are revised in a given year and not too many months are involved. Generally not more than about 3 full months (or the equivalent number of days spread over 6 months or less) should be presented in this form. (See Appendix B, examples 16 and 17.) Be sure to report correct calendar year figures if incorrect figures were ever published.

2. A partial daily table with a complete monthly table for the water year generally should be used if the number of revised daily discharge is relatively small but the days involved are spread over more than 6 months in a given year. The complete monthly table is published so that a user who is interested only in monthly records will not have to consult another report for part of the record. However, if several years are revised, it is desirable to be consistent in the use of partial or complete monthly tables for all years for the same station.

3. A complete daily and monthly table should be republished if daily discharges for more than 3 full months (or the equivalent number of days spread over the year) are revised. Whenever it is necessary to publish a complete daily and monthly table for a given year, also republish complete data on extremes for that year, whether or not the extremes are revised. If either or both extremes were revised, identify them as being revised.

The partial daily table lists only the revised days. The revised figures may be on a single line if there are only a few days involved. However, if there are more than 4 days being revised, the 4 sets of columns extending the full 11.5-in. width of the page may be used as shown below:

o **REVISIONS.--The maximum discharge for calendar and water year 1979 has been revised to 1,200 ft^3/s, Sept. 5, 1979, gage height, 6.74 ft, from floodmarks; revised daily discharges, in cubic feet per second, for periods in September 1979 are given below. These figures supersede those published in the reports for 1979 and 1980.**

Sept. 5....170	**Sept. 7....180**	**Sept. 22....200**	**Sept. 24....90**
6....350	**21.... 32**	**23....120**	

	TOTAL	MEAN	MAX	MIN	(ft^3/s)/mi^2	IN
September 1979	**1872**	**62.4**	**350**	**10**	**3.63**	**4.05**
Wtr Yr 1979	**11463.99**	**31.4**	**350**	**.43**	**1.83**	**24.79**
Cal Yr 1979	**16263.00**	**44.6**	**350**	**1.7**	**2.59**	**35.17**

The revisions in the above example were published in a 1981 water-year report. The 1979 calender-year summary figures (revised) were included because the previously published figures (in the 1980 report) are now incorrect.

The revisions example below shows only the revision statement and only the first two of the four columns of the revised daily discharges. Monthly and yearly summaries should be included for each of the months and years involved.

o **REVISIONS.--Revised maximum discharges for water years 1971-73, and revised daily discharges, in cubic feet per second, for high-water periods in these years, are given below. These figures supersede those published in the reports for 1971-73.**

Sept. 17, 1971....5300	**Apr. 4, 1972....5300**
18..........5070	**Sept. 7..........7880**
19..........5420	**8..........7050**
Apr. 2, 1972....4340	**Mar. 7, 1973....4960**
3..........5180	**16..........4340**

If the revisions are for low-water periods with revised minimum discharges, use a format similar to those above. If there is no extreme to be revised, the wording in the REVISIONS paragraph should be modified appropriately.

When revisions are so extensive that complete daily, monthly, and yearly tables need to be published, the following statement is given, followed by the extremes and then the daily, monthly, and yearly tables.

o **REVISIONS.--Revised figures of discharge for the water year 1972, superseding those published in the report for 1972 are given below.**

Extremes should be reported in a paragraph headed "EXTREMES FOR 19XX WATER YEAR.--," which is, indented 3 spaces. Paragraph or tabular format may be used, depending on the number of peaks above base being revised. Daily tables and summaries that contain revised figures should follow the entry for extremes. (See Appendix B, example 20.)

Corrections.--The distinction between a revision and a correction is one of importance. A change in a figure which cannot be reproduced (or inferred) from other published information is considered a revision. A change in a figure which can be derived from other ("basic") figures on the same page is considered a correction. Errors in published gage height, daily discharge, and instantaneous extreme discharge are rectified by revisions. "Corrections" are made only to errors in totals, means, runoff in inches, and similar summary items for which the published basic data are correct.

Erroneous values, judged to be significantly in error by revisions standards will be corrected in a paragraph called "CORRECTIONS." Minor errors in monthly or yearly figures need not be corrected.

Figures of discharge per square mile or runoff in inches will not be corrected or revised if only the drainage area is revised.

Only one type of correction should be referenced in subsequent water years in the REVISED RECORDS summary paragraph; all others will be omitted. That one is the true maximum (or minimum) which replaces an otherwise correct figure which was not an extreme for the year but which was erroneously published as such. The reference will be reported just like a revised extreme. (No identification as "correction" is required.)

General notes

Some general notes on revisions are as follows:

1. It may be useful at times to republish some previously published, revised daily figures so that users of the record will not have to consult another report to obtain all the data for a given year. This also allows simplification in the summary items in the REVISED RECORDS paragraph in future years by eliminating the need for listing some other reports in which revisions were published. For instance, if the daily discharges for Mar. 11, 12, 1981, were revised in the 1982 report, and then in the current 1983 report the daily discharges for Mar. 9, 10, 13-15, 1981, are to be revised, the current report should include revised figures for the entire period Mar. 9-15, 1981, so that the user of the records will find all the revisions for 1981 in one report.

   Thus, future REVISED RECORDS paragraphs would have to list only one report for the 1981 revised figures. As another example, if a few days in April 1981 were revised in the 1982 report and some days in September 1981 were to be revised in the current 1983 report, both the few days in April 1981 and September 1981 plus the resulting changes in monthly discharge for April 1981 and September 1981 should be published in the current 1983 report. It is not practical to republish long lists of previously revised daily discharge, but whenever revisions are being made for years for which revisions were previously published, this procedure should be considered.

2. For stations for which the drainage area has been revised, any revised monthly summaries, partial or complete, should use the revised drainage area in the computations of discharge per square mile or runoff in inches.

3. In partial monthly and yearly summaries resulting from revised daily discharge, list both calendar-year and water-year figures for each complete year involved. Thus the partial example on p. 108 would list both calendar-year and water-year figures for at least the three years shown (in the two columns of daily discharge on the "left side") in which daily discharges were revised.

Discredited records

If published records are found to be seriously in error, but sufficient data are not available to revise them, identify such records as follows:

1. If all the records for a given period are seriously in error, omit that period from the main list of dates under PERIOD OF RECORD and follow the dates with a statement giving the periods discredited. Use the following form:

   - **PERIOD OF RECORD.--October 1931 to current year. Records for July 1927 to September 1929, published in WSP 642, 662, and 682, are unreliable and should not be used.**

   In the REVISED RECORDS paragraph, add "See also PERIOD OF RECORD". Omit the word "also" if there are no other items in this paragraph. These references to the discredited records should be continued in succeeding reports. The GAGE paragraph should not describe the gages used during the periods discredited. The AVERAGE DISCHARGE and the EXTREMES FOR PERIOD OF RECORD paragraphs should not include these periods.

2. If only a part of the records for a given period, such as those for high or low discharges, have been discredited, leave the main list of dates complete under PERIOD OF RECORD but add a general statement explaining which records have been discredited, as follows:

   - **PERIOD OF RECORD.--May 1928 to September 1931, December 1936 to current year. All figures of discharge greater than 2,000 ft^3/s prior to March 1937 are unreliable and should not be used.**

   - **REVISED RECORDS.--WSP 953: Drainage area. See also PERIOD OF RECORD.**

These statements should be used in each succeeding report. Continue to describe the gages used during this period in the GAGE paragraph, but omit the period, which is now incomplete, from the AVERAGE DISCHARGE paragraph. Include the period under EXTREMES FOR PERIOD OF RECORD but make changes as necessary. That is, if the maximum discharge for the period of record is thought to have occurred in the period when high discharges have been discredited, change the statement on maximum to read "Maximum discharge occurred Jan. 25, 1937 (discharge uncertain)". If the maximum is thought to have occurred outside of the discredited period, use the statement: "Maximum discharge determined, 22,200 ft^3/s, Feb. 3, 1939 * * *." On the other hand, if there is reasonable assurance that the maximum for the entire period did not occur during the discredited period, show this known maximum as the maximum for the period of record.

The REVISIONS paragraph in the first report discrediting the records should include a statement explaining discredited figures of maximum discharge, daily discharge, supplemental peak discharge, and, if applicable, discharge at indicated times as published in a flood report; an example follows:

- **REVISIONS.--Figures of maximum discharge and daily discharge greater than 2,000 ft^3/s for the periods May 1928 to September 1931 and December 1936 to February 1937, published in WSP 663, 683, 698, 713, 823, and 838 are in error and should not be used because information is insufficient to make corrections for backwater from Triplett Creek.**

3. If monthly discharges for some months have been revised in a compilation report, but revised daily figures for those months will not be published (for instance, where daily winter records are of poor accuracy but satisfactory monthly figures have been computed), the daily records have, in effect, been discredited. However, because the monthly records are still available, no mention of these periods need be made unless the periods involved are more than a few months in length. For instance, if only the winter months of several years fall in this category, no mention need be made of the periods under PERIOD OF RECORD. For longer periods, use a qualification, as follows:

   - **PERIOD OF RECORD.--October 1919 to current year (October 1923 to September 1924, monthly discharge only, published in WSP 1301; figures of daily discharge for these months published in WSP 581 are unreliable and should not be used).**

   Then, in the REVISED RECORDS paragraph add the remark: "See PERIOD OF RECORD." AVERAGE DISCHARGE should include these periods. EXTREMES FOR PERIOD OF RECORD should be qualified, when necessary, to indicate that the published values may not be the absolute extremes for the entire period.

4. For a short period of discredited record, use the following form:

   o **PERIOD OF RECORD.--* * *. Records for Nov. 1-7, 1947, and Nov.1-16, 1948, published in WSP 1118 and 1148, are unreliable and should not be used.**

Discontinued stations

Records from discontinued gaging stations should rarely need to be revised. Revisions should be considered only for changes to important statistical data. Each proposed revision should receive special consideration by District personnel and should not be accepted without the specific approval of the District Chief.

If records for a discontinued station are revised, it is the District's responsibility to correct the WATSTORE computer file and to publish the revision in the current annual data report. The District should then prepare an appropriate statement to be included in the introductory text of the current and future annual data reports explaining revision procedures. The statement should instruct users to contact the District office to determine if the published records were ever revised after the station was discontinued. The statement may be included immediately after the explanation of the headings used in the station description, as shown in the sample introductory text in Appendix A, example 8. District files should contain a current list of discontinued streamflow stations. (See sample "List of Discontinued Stations" in Appendix B, example 4.) Stations that have had revisions published after they became inactive should be flagged.

Generally, the preferred format for publishing revisions of records for discontinued gaging stations is similar to that for active stations. The following comments and suggestions should be helpful:

1. Place the heading "REVISION OF RECORDS FOR A DISCONTINUED STATION" at the top of the page two lines below the basin name.

2. The list of gaging stations in the front of the data report should include the name of the discontinued station with "(discontinued station, revision of records)" appearing to the right of the station name.

3. A discontinued station for which revised data are to be published in a current data report should contain a station description as described in paragraphs 4-13 below.

4. The LOCATION and DRAINAGE AREA paragraphs normally should be identical to those published the year the station was discontinued.

5. The PERIOD OF RECORD paragraph should <u>not</u> contain the statement "...to current year (discontinued)," but rather should state the year the station was discontinued, as follows:

   PERIOD OF RECORD.--October 1973 to September 1978 (discontinued).

6. The REVISED RECORDS paragraph should duplicate the description published the year the station was discontinued. The statement "(Also, see revisions below.)" should be added, however, for special emphasis.

7. The GAGE paragraph should remain the same.

8. Under the AVERAGE DISCHARGE paragraph, enter "(Revised)," if appropriate.

9. Under the REMARKS paragraph, do not include a statement of accuracy.

10. The EXTREMES FOR PERIOD OF RECORD paragraph should not differ from that given in the last published report unless the revisions affect the extremes.

11. The EXTREMES OUTSIDE THE PERIOD OF RECORD paragraph, if previously published, generally will not be affected.

12. The EXTREMES FOR CURRENT YEAR paragraph should be omitted.

13. The REVISIONS paragraph generally should be formatted according to the guidelines given for active stations.

Skeleton Rating Table

Skeleton rating tables were omitted from the 1961-70 water-supply papers and 1966-68 State reports, but are published in some subsequent State reports. Skeleton rating tables can be used to make an approximation of daily gage heights from daily discharges and to indicate the range in stage resulting from any given range in discharge. They may be published for gaging stations (except canals) that fit two criteria (given below), and should immediately precede the daily table.

Skeleton rating tables may be published only if:

1. No more than three short rating tables or two long rating tables were used during the year; and

2. shifting control or other special conditions did not have an appreciable effect on the stage-discharge relation.

Shifts or backwater corrections of less than 0.1 ft are not considered to be appreciable shifts for the purpose of deciding whether skeleton ratings are appropriate. If periods of shifting control or backwater that require adjustments greater than 0.1 ft are less than half the total open-water periods (that is, do not include periods of ice effect in the computation), a skeleton rating may be published. For example, a skeleton rating table could be published, if a rating was affected by ice for 4 months, shifts were less than 0.1 ft for 2 months, no shifts occurred for 2 1/2 months, and shifts of more than 0.1 ft occurred for the remaining 3 1/2 months.

The tables should be short and simple. Space the figures so that the average of consecutive readings will not, in general, be more than 5 percent greater (or less, for a reversal) than the reading that would be obtained at the midpoint. When the interval reaches 0.5 ft, use points at the 0.5-ft gage heights until a 1.0 ft interval is reached; then use only each foot or multiples thereof. An example follows:

- **RATING TABLE (gage height, in feet, and discharge, in cubic feet per second). (Stage-discharge relation affected by ice Dec. 11 to Apr. 25.)**

Gage Height (feet)	Discharge (ft3/s)	Gage Height (feet)	Discharge (ft3/s)
8.8	1,510	11.0	4,600
9.0	1,740	12.0	6,400
9.5	2,360	13.0	8,300
10.0	3,040	14.0	10,500
		15.0	13,000

If the rating permits, the range in gage heights reported by skeleton tables should be only the maximum necessary for the corresponding range in discharges to include the minimum and maximum daily discharges for the year.

Use two or more sets of columns of gage height and discharge for the skeleton rating table to fill the space across the page as nearly as possible. If two rating tables were used, indicate the dates to the nearest day for which each was used. If the change in ratings was made effective other than at midnight, repeat the day when both tables were used, in dates for each table. If one table is identical with the other above or below a certain gage height, duplication of figures may be avoided by showing each to a common gage height and discharge with the following footnote under one of the tables:

- **NOTE.--Same as preceding (or following) table above (or below) 4.5 ft.**

The table that applies to the period having the greater range in stage should be complete whereas the other should include the footnote.

Headings for skeleton rating tables should be qualified to identify special conditions that affected the stage-discharge relation for significant periods of time during the water year. The following examples are typical of some of the parenthetical statements (placed immediately under the headnote) that may be used.

- **(Stage-discharge relation affected by ice Nov. 23 to Apr. 1, and by backwater from Beaver Dam, Aug. 11 to Sept. 30.)**

- **(Shifting-control method used Oct. 1-30, July 21 to Sept. 9.)**

- **(Shifting-control method used May 20 to July 14; stage-discharge relation affected by ice Dec. 17 to Mar. 7.)**

Skeleton rating tables generally are assumed to apply to periods of doubtful or no gage-height record, unless there is evidence to the contrary (such as shifts greater than 0.1 ft before and after the reported period). If the stage-discharge relation has not been affected, the skeleton rating can be assumed to have been in effect.

Values of discharge in skeleton rating tables should be reported only to the same number of significant figures as the daily figures. Gage heights should be reported only to nearest tenths; zeros should be omitted from the hundredths column.

Tables of Daily and Monthly Discharge

Tables of daily and monthly discharges that are generated and printed out by computer for use as camera-ready copy should be carefully inspected to see that the tables are correct and that the printout is of sufficient quality to be used as camera-ready copy. The ink densities of typed manuscript description and the computer printout should be as nearly alike as possible. There should be no light and dark contrast to the printed figures on the computer printouts and all figures should be sharp and complete. If the daily-values table can be stored on a disk, transferred to a word processor, and mated with the station manuscript, the complete station record can be printed out on properly sized paper after editing. This method produces camera-ready copy of the same print quality and requires no splicings.

If a table of daily and monthly discharges is to be typed, the format should be the same as that of the computer printout with matching type. Daily figures must be shown for all periods, whether discharge is computed from complete field information or estimated.

For a few large streams the values of daily discharge for some water years may need to be listed in units of thousands of cubic feet per second. When this is done, the table title should read: DISCHARGE, IN THOUSANDS OF CUBIC FEET PER SECOND, WATER YEAR OCTOBER 19XX TO SEPTEMBER 19XX. For other stations only the monthly total may require more space than is available in the column; in such cases the total will be printed out with the letter M which indicates the figure is expressed in thousands. For these stations add a footnote to read: "M Expressed in thousands." Such occurrences should be rare. Truncation of figures to the right of the decimal point in totals may be more common, but the practical effect is so significant that the event can be ignored.

Adjustments for Effect of Regulation or Diversion

Figures of monthly and yearly unit discharge, in cubic feet per second per square mile, and runoff, in inches, are published only if these figures repesent natural yield without gross error--whether adjusted or unadjusted. The term "gross error" may be considered 10 percent or more. If the flow past a stream-gaging station is subject to considerable day-to-day variation because of regulation, but the effect on monthly and yearly unit discharge and runoff is minor, these figures may be published without adjustment.

If the flow is subject to regulation and storage in a single reservoir a short distance upstream from the station, and if the effect on monthly and yearly unit discharge and runoff is considerable (more than 10 percent), monthly and yearly mean discharge may be adjusted for change in reservoir contents. Monthly and yearly unit discharge and runoff, computed from the adjusted mean discharge, may be published. For stations farther downstream, it is probable that unit discharge and runoff should not be published. Similarly, adjusted unit discharge and runoff may be published for a stream-gaging station, if a single measured diversion bypasses it.

If flow is subject to regulation and storage in several reservoirs, so that adjustments for change in reservoir contents--without additional adjustments for evaporation, time of travel, bank and channel storage, and seepage gains or losses--would result in natural yield with gross error of more than 10 percent, unit discharge and runoff should not be published. Where flow is affected by several diversions upstream from a station, and the quantities of the diversions and return flows cannot be determined precisely, no adjustments should be made, and figures of unit discharge and runoff should not be published.

Where streamflow is adjusted for storage in a single reservoir for which the contents figures are published elsewhere, no reservoir data should be reported with the discharge record. The monthly and yearly summary should indicate adjusted mean, unit discharge, and runoff following the observed data. If the reservoir-contents figures are not important enough to be published elsewhere, the monthend contents figures should be reported as supplemental data between the observed and the adjusted discharge figures.

Where streamflow is adjusted for a single diversion, no diversion figures need be published with the adjusted figures, because the quantity of the diversion may be determined as the difference between the observed and adjusted mean discharges. If the diversion data is considered important, the figures may be published elsewhere in the report.

Where discharge is adjusted for both storage and diversion, sufficient information should be given to separate the effect of one from the other; figures of monthend contents and diversions may be given on separate lines, but data available elsewhere in the report should not be repeated.

Even if streamflow is not adjusted, the monthend contents of a reservoir or figures of a diversion or return flow, if not published elsewhere, may be shown on the last lines of the monthly summary.

Examples of footnotes used to show the basis for adjustment or the supplemental data where adjustments are not made, follow:

† **Monthend contents, in cubic feet per second-days, in Lake Logan.**

† **Diversions, in acre-feet, through August P. Gumlick tunnel.**

† **Inflow from pumpage, in cubic feet per second, from Patuxent River basin. Records provided by Washington Suburban Sanitary Commission.**

‡ Adjusted for change in contents in Lake Winnipesaukee.

‡ Adjusted for diversion to Pit No. 4 powerplant.

Usually (but not always), the single dagger (†) denotes an adjusting figure and the double dagger (‡) denotes an adjusted figure.

An example of dual footnotes, where reservoir data are published elsewhere and diversion records published with the streamflow station, is given below:

† Diversions, in cubic feet per second, from Wild Creek Reservoir for municipal supply; provided by city of Bethlehem.

‡ Adjusted for diversion and change in contents in Wild Creek and Penn Forest Reservoirs.

An example of a dual footnote, where diversion and reservoir data are published with the streamflow station, without adjustment, is given below:

† Diversion, in cubic feet per second, by city of Durham.

‡ Monthend contents, in millions of cubic feet, in Lake Michie.

Data on diversions or reservoir contents should be listed in the Index, so that a user can find them. Also, the REMARKS paragraph should contain a statement such as "See table below for figures of diversion and monthend contents."

If supplemental records of storage or diversion are furnished by another agency, this should be acknowledged in these footnotes, if the records are not published elsewhere.

For stations where the monthly figures of discharge are not adjusted, but the yearly figures are adjusted, report the monthly totals and observed means, as usual, but not unit discharges or runoff. Report the yearly total and observed mean and the yearly adjusted mean, unit discharge, and runoff. The three adjusted yearly figures should have a footnote similar to those shown above.

Statements used in footnotes to qualify runoff figures (adjusted or unadjusted) for certain stations, such as "may not represent natural flow because of regulation," should not be used. Figures of unit discharge and runoff for such stations should not be published.

If a negative value is obtained after adjustment, this usually indicates that an adjustment should not be made--that is, the adjustment may be too large compared with the figure being adjusted. The true physical significance of negative figures should be investigated rather than lightly ascribing them to "evaporation and seepage," or the like.

Combined Records of Streamflow and Diversion

Some gaging stations are operated just downstream from a diversion to determine the quantity of water passing down the stream from the point of diversion. It may be desirable to combine discharge records of the diversion with those of the streamflow station to determine the flow in the stream just upstream from the point of diversion.

If daily records of the combined flow at the stream station and the diversion are required, a table of combined daily discharge, with the corresponding monthly and yearly summary, may be published. The combined records will be placed immediately after the records for the stream station. The heading of the combined table should be similar to the following example:

COMBINED DISCHARGE, IN CUBIC FEET PER SECOND, OF DAY CREEK AND ETIWANDA WATER CO.'S DIVERSION NEAR ETIWANDA, WATER YEAR OCTOBER 1975 TO SEPTEMBER 1976

A statement under REMARKS should refer to the records of combined discharge. Under AVERAGE DISCHARGE, give first, in the usual way, the average discharge for the stream station (if the station meets the criteria for publishing average discharge). Then, in a separate statement give the average combined discharge for the stream and diversion (if these records meet the criteria for publishing average discharge). An example is given below:

- **AVERAGE DISCHARGE.--Creek only: 39 years, 3.32 ft^3/s, 2,410 acre-ft/yr; median * * *.**

  Combined creek and diversion: 16 years, 3.44 ft^3/s, 2,500 acre-ft/yr; median * * *.

If a daily table of combined streamflow and diversion is published, there is no need to publish a separate daily table for the diversion. If, on the other hand, a daily table of the diversion is considered necessary, as well as a daily table of streamflow, then do not publish a daily combined table. In other words, there is no need to publish three daily tables when any combination of two tables will provide enough data for the user to compute the third table by simple addition or subtraction.

If there is no need to publish daily records of combined discharge, the monthly and yearly diversion and combined discharge may be incorporated in the monthly and yearly summaries. An appropriate statement under REMARKS might read: ***Figures of daily discharge do not include diversions upstream from station and downstream from Union Gap. See monthly table of diversions to each canal and of combined flow of Yakima River and canals.

Records of Discharge for Periods Greater Than 1 Year

Sometimes records for more than a year are published in a single report. For instance, records for stations established between July 1 and September 30, should not be published alone but should be held over to be published with the following full year of record. Also, records for stations established somewhat earlier in the water year might better be withheld until the next year if the stage-discharge relation is not reasonably well defined in time to include the records in the report for the water year in which the station was established. Similarly, if a station is discontinued between October 1 and December 31, the records for the available part of these 3 months should be published with the preceding full year of record. Records should preferably be complete for a full water year or calendar year.

The necessary changes in arrangement of the station description for presenting records of more than 1 year in a single report are given in the following paragraphs.

Extremes

Under EXTREMES FOR CURRENT YEAR report each water year or part thereof as a separate paragraph if the period being reported is 3 years (or parts of 3 years) or less, unless there are peaks greater than a base discharge. Report months for periods other than full water years; the months should correspond to those given under PERIOD OF RECORD. Do not cite days of the month except in the rare case of an outstanding extreme within that month, but outside the period of record. Because the designation "current year" is not applicable for multiple year records, the paragraph for each period or water year should be identified as, for example, "May to September 1975:", "Water year 1976". No summary period (EXTREMES FOR PERIOD OF RECORD) is needed unless there were some other years published in previous reports. If the period being reported exceeds 3 years, then an EXTREMES FOR PERIOD OF RECORD paragraph should be included. Samples of the desired form are as follows:

- **EXTREMES FOR CURRENT PERIOD.--May to September 1975: Maximum discharge during period, 1,500 ft^3/s, Aug. 17, gage height, 14.73 ft; minimum, 10 ft^3/s, Sept. 20, gage height, 0.45 ft.**

  Water year 1976: Maximum discharge, 1,820 ft^3/s, Oct. 2, gage height, 15.92 ft; minimum, 15 ft^3/s, Aug. 10, gage height, 0.64 ft.

  October to November 1976: Maximum discharge during period, 2,420 ft^3/s, Nov. 11, gage height, 17.65 ft; minimum, 30 ft^3/s, Oct. 6, gage height, 1.22 ft.

If a station has been re-established, then a statement for the EXTREMES FOR PERIOD OF RECORD should be included, as in the following example:

o **EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 20,400 ft^3/s, Mar. 21, 1936, from rating curve extended above 9,000 ft^3/s on basis of slope-area measurement of peak flow, gage height, 9.83 ft, from floodmark; minimum, 12 ft^3/s, Aug. 20, 1934, gage height, 0.26 ft.**

EXTREMES FOR CURRENT PERIOD.--Water year 1976: Maximum discharge, 3,480 ft^3/s, Mar. 30, gage height, 4.59 ft; minimum, 34 ft^3/s, Sept. 2, gage height, 0.68 ft.

October to December 1976: Maximum discharge during period, 596 ft^3/s, Nov. 14, gage height, 2.19 ft; minimum, 55 ft^3/s, Dec. 10, gage height, 0.82 ft.

If peaks above a base or extremes for 4 years (or parts of 4 years) or more are reported, use a tabular format similar to the format used to report peaks greater than a base discharge for 1 year, but give the year following the month and day after each date in the data columns. Use symbols and footnotes, if necessary, for qualifications of gage height, discharge, or other data, to avoid cluttering tables. An EXTREMES FOR PERIOD OR RECORD paragraph should be included if there are records other than those in the current report. This summary paragraph is also recommended if the period being reported exceeds 3 years. (See Appendix B, example 19.)

Tables of daily and monthly discharge

Use a separate daily discharge table for each water year and for each part of a water year of 3 months or more. The table for a partial water year should extend the same width as the table for the full water year which follows.

Significant Figures and Rounding Limits

Inch-Pounds Units

The following set of rounding rules should be used for all discharge reported in inch-pound units, whether computed manually or by computer. The number of significant figures is not based on the accuracy of the data but solely on the magnitude of the figure. For consistency, the published results of discharge measurements at gaging stations, partial-record stations, and miscellaneous sites should also follow the rounding rules for daily discharge as given in table 1.

Table 1.--Significant figures and rounding limits for daily discharge

Range of discharge (cubic feet per second)	Significant figures	Rounding limits
<0.10	1	hundredths
0.10 - 0.99	2	hundredths
1.0 - 9.9	2	tenths
10 - 99	2	units
≥ 100	3	variable
See Note		

NOTE: Only a few gaging stations will require use of rounding limits for daily discharge that differ from those given above. For example, a small-area research gaging station monitored by special instrumentation, may record daily discharge to 0.001 ft^3/s. International gaging-station records should conform to the above rules and will include (if appropriate) the statement in REMARKS: "Differences between figures published herein and corresponding figures in reports of the Water Survey of Canada are due to variations in automated-program techniques."

Computer-generated daily tables will show the sums of the daily figures for complete months and years unrounded, unless the number of characters exceeds the column width, in which case there may be truncation.

Significant figures and rounding limits for monthly and yearly means and average discharges are given in table 2,

Table 2.--Significant figures and rounding limits for monthly and yearly means and average discharge

Range of discharge (cubic feet per second)	Significant figures	Rounding limits
<0.010	1	thousandths
0.010 - 0.099	2	thousandths
0.10 - 0.99	2	hundredths
1.00 - 9.99	3	hundredths
10.0 - 99.9	3	tenths
100 - 999	3	units
≥1,000	4	variable

Significant figures and rounding limits for discharge per square mile are given in table 3.

Table 3.--Significant figures and rounding limits for discharge per square mile

Range of discharge (cubic feet per second per square mile)	Significant figures	Rounding limits
<0.10	1	variable
0.10 - 0.99	2	hundredths
1.0 - 9.99	3	hundredths
≥10.0	3	variable

To compute runoff, in inches (monthly and yearly), multiply the total cubic foot per second-days by 0.0372 and then divide the product by the drainage area. The figures should be listed to hundredths. Note that the yearly total is not computed by adding the 12 monthly figures.

Runoff, in acre-feet (monthly and yearly), should be computed as the sum of daily discharge figures (total cubic foot per second-days) times 1.9835. The significant figures are reported as given in table 4.

Table 4.--Significant figures and rounding limits for monthly and yearly runoff (acre-feet)

Range of Runoff (acre-feet)	Significant figures	Rounding limits
<0.10	1	hundredths
0.1 - 0.9	1	tenths
1.0 - 9.9	2	tenths
10 - 99	2	units
100 - 999	3	units
1000 - 9999	3	tens
≥10,000	4	variable

International System (SI) Units

The use of SI units as dual units (whereby the inch-pound unit is given first, followed by the SI unit in parentheses) in annual data reports is optional. The decision as to whether to include dual units in station manuscripts should be based largely upon the desires and policies of cooperators. In any case a metric conversion table will still be required for the inside cover (cover 3) of each report.

If SI units are used in the station descriptions, values should be rounded, as follows: The minimum published discharge figure, other than zero, will be 0.001 m^3/s. For those stations where the minimum flow is currently published as 0.01 ft^3/s, under the dual system the SI unit under EXTREMES will be shown as <0.001 m^3/s. However, if the change is ever made to publish only SI units, 0.01 ft^3/s would become "no flow." Also, all daily flows of 0.01 ft^3/s (0.0003 m^3/s) stored in the Daily Values File would then be converted to SI units and be printed out as "0"). Daily flows of 0.02 ft^3/s (0.006 m^3/s) would be rounded to 0.001 m^3/s and larger flows will be similarly rounded.

Large numbers in both English and metric units should be shown with commas separating groups of 3 digits to the left of the decimal point in text, station descriptions, or typed tables as, for example, 18,000,000 ft^3/s; in computer-generated tables, however, all numbers will be closed up without commas as 18000000. Commas should be used in the numbers listed for peaks greater than base discharge.

The following conversion rules and examples should be useful guides for Districts choosing to use dual units in station descriptions.

LOCATION:

Feet (ft) - to convert to meters (m), multiply by 0.3048 and round to approximate equivalent.

- **Examples: 10 ft (3 m); 100 ft (30 m); 1,200 ft (370 m).**

Miles (mi) - to convert to kilometers (km), multiply by 1.609 and round to same number of decimal places as miles.

- **Examples: 0.1 mi (0.2 km); 0.3 mi (0.5 km); 1.0 mi (1.6 km); - - - at mile 1,536.8 (2,472.7 km).**

DRAINAGE AREA:

Square miles (mi^2) - to convert to square kilometers (km^2), multiply by 2.590 and round to the same number of decimal places as for square miles, except for "approximately" figures, which are rounded to approximately equivalent values.

o **Examples:** **0.51 mi^2 (1.32 km^2); 5.11 mi^2 (13.23 km^2); 51.1 mi^2 (132.3 km^2); 151 mi^2 (391 km^2); 483,312 mi^2 (1,251,778 km^2); 701,000 mi^2 (1,816,000 km^2), approximately.**

The last example is rounded to thousands--thus, the qualification "approximately".

GAGE:

Datum of gage in feet (ft) - to convert to meters (m), multiply by 0.3048 and round to thousandths if datum was determined by precise levels from a standard bench mark for which an elevation referenced to the NGVD of 1929 in hundredths of a foot has been published by National Mapping Division or by some other recognized leveling agency. However, if the elevation of the gage was determined approximately by barometer, from topographic map, and so forth, it should be converted to the approximate equivalent value in meters as that given in feet.

Examples:

- **Datum of gage is 543.67 ft (165.711 m) above National Geodetic Vertical Datum of 1929.**
- **Elevation of gage 7,340 ft (2,237 m) above National Geodetic Vertical Datum of 1929, from topographic map (nearest 10 ft).**
- **Elevation of gage is 93 ft (28.3 m), from river profile map (nearest foot).**

AVERAGE DISCHARGE:

Cubic feet per second (ft^3/s) - to convert to cubic meters per second (m^3/s), multiply by 0.02832 and round to 4 significant figures for values greater than 1.000 m^3/s and to thousandths for values less than that figure.

Inches per year (in/yr) - to convert to millimeters per year (mm/yr), multiply by 25.4 and round to nearest millimeter.

Acre-feet per year (acre-ft/yr) - to convert to cubic meters per year (m^3/yr), multiply by 1,233 and round to 3 significant figures. If converted figure exceeds 1,000,000 m^3/yr, use SI prefixes "hecto (h)" or "kilo (k)" to reduce the number of digits. Cubic hectometer (hm^3) is equivalent to 1,000,000 m^3 and cubic kilometer (km^3) to 1,000,000,000 m^3.

- **Example: 13 years, 0.65 ft^3/s (0.018 m^3/s), 472 acre-ft/yr (582,000 m^3/yr); median of yearly mean discharge, 0.30 ft^3/s (0.008 m^3/s), 217 acre-ft/yr (268,000 m^3/yr).**

- **Another example: 30 years, 71.1 ft^3/s (2.014 m^3/s), 13.82 in/yr (351 mm/yr), 51,510 acre-ft (63.5 hm^3/yr).**

- **Another example: 51 years, 1,429 ft^3/s (40.47 m^3/s), 56.41 in/yr (1,433 mm/yr), 1,035,000 acre-ft/yr (1,280 hm^3/yr).**

EXTREMES:

To convert discharge in cubic feet per second (ft^3/s) to cubic meters per second (m^3/s), multiply by 0.02832 and round discharge in cubic meters per second, as follows:

- **Less than 0.10 m^3/s, to nearest thousandth.**

- **Equal to or more than 0.10 m^3/s but less than 1.00 m^3/s, to nearest hundredth.**

- **Equal to or more than 1.00 m^3/s, to 3 significant figures.**

If inch-pound units have been rounded to show approximate values, SI units should be similarly rounded.

- **Examples: 0.01 ft^3/s (0.001 m^3/s); 0.05 ft^3/s (0.001 m^3/s); 1.0 ft^3/s (0.028 m^3/s); 35 ft^3/s (0.99 m^3/s); 40 ft^3/s (1.13 m^3/s); 1,000 ft^3/s (28.3 m^3/s); 100,000 ft^3/s (2,830 m^3/s); about 1,000 ft^3/s (28 m^3/s); about 100,000 ft^3/s (2,800 m^3/s).**

Gage heights or elevations- to convert feet (ft) to meters (m), multiply by 0.3048 and round to nearest thousandth of a meter except where the accurancy of the gage height does not warrant this refinement.

Examples:

- **EXTREMES FOR PERIOD OF RECORD: Maximum discharge, 18,600 ft^3/s (527 m^3/s) Sept. 5, 1970, gage height, 13.6 ft (4.15 m), from floodmark, from rating curve extended above 3,800 ft^3/s (110 m^3/s) on basis of slope-area measurements at gage heights 4.73 ft (1.442 m) and 10.7 ft (3.26 m); no flow at times.**

- **EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Feb. 20, 1937, reached a stage of about 17 ft (5.2 m), present site and datum, discharge about 31,000 ft^3/s (880 m^3/s).**

- **EXTREMES FOR CURRENT YEAR: Maximum discharge, 1,780 ft^3/s (50.4 m^3/s) Aug. 15, gage height, 7.12 ft (2.170 m); minimum, 0.20 ft^3/s (0.006 m^3/s) Jan. 5, gage height, 1.01 ft (0.308 m).**

REMARKS:

Distances in feet or mile - see LOCATION above.

Cubic feet per second - see EXTREMES above.

Acres - To convert to square meters (m^2), multiply by 4,047 and round to 2 significant figures for values less than 100,000 m^2 and to 3 significant figures for values equal to or greater than 100,000 m^2. If the converted figure is equal to or greater than 1,000,000 m^2, use SI prefixes such as km^2 (1,000,000 m^2) to express figures. Figures qualified as "about" may have a lesser degree of refinement.

- **Example: Records good except those less than 50 ft^3/s (1.4 m^3/s), which are poor. Low flow regulated by power plant 1.5 mi (2.4 km) upstream. Diversions for irrigation of about 51,500 acres (210 km^2) of which about 12,000 acres (49 km^2) are downstream from station.**

Because the 50 ft^3/s in the above example is a rounded figure, the SI figure 1.4 m^3/s also is rounded. The SI equivalent of "about 51,500 acres" is rounded from 208 to 210 km2 and the "about 12,000 acres" from 48.6 to 49 km^2.

LAKES AND RESERVOIRS:

Acre-feet (acre-ft) - To convert capacity figures to cubic meters (m^3), multiply by 1,233 and round to 3 significant figures unless greater refinement is needed to show changes in contents. If the converted figure is equal to or greater than 1,000,000 m^3, use SI prefixes such as hm^3 (1,000,000 m^3) or km^3 (1,000,000,000 m^3).

- **Examples: 10 acre-ft (12,300 m^3); 10,000 acre-ft (12.3 hm^3) 10,000,000 acre-ft (12.3 km^3).**

Millions of gallons - To convert to cubic meters (m^3), multiply by 3,785 and round to 3 significant figures unless greater refinement is needed to show changes in contents. Use SI prefixes for values equal to or greater than 1,000,000 m^3.

- **Examples: 500,000 gal (1,890 m^3); 10,500,000 gal (39,700 m^3); 2,094,000,000 gal (7.926 hm^3); 15,786,000,000 gal (59.75 hm^3); 151,374,000,000 gal (572.95 hm^3), greater refinement necessary; 162,000,000,000 gal (613 hm^3), rounded to nearest million gallons.**

Cubic feet (ft^3) - To convert to cubic meters (m^3), multiply by 0.02832 and round to 3 significant figures unless greater refinement is needed to show changes in contents. Use SI prefixes for values equal to or greater than 1,000,000 m^3.

- **Examples: 192,000,000 ft^3 (5.44 hm^3), rounded to nearest 1,000,000 ft^3; 1,339,200,000 ft^3 (37.926 hm^3), rounded to nearest 100,000 ft^3; 3,080,260,000 ft^3 (87.233 hm^3), rounded to nearest 10,000 ft^3.**

Cubic feet per second-day (cfs-day) - To convert to cubic meters (m^3), multiply by 2,447 and round to 3 significant figures unless greater refinement is needed to show changes in contents. Use SI prefixes above 1,000,000 m^3.

- **Examples: 390 cfs-day (954,000 m^3); 61,200 cfs-days (150 hm^3); 703,100 cfs-days (1,720 hm^3); 1,236,700 cfs-days (3,026 hm^3).**

Gage heights or elevations in feet - see EXTREMES.

Tons (short) - to convert to metric tons (Mg), multiply by 0.9072 and round to the same number of significant figures as used for short tons.

- **Example: 6,310 tons (5,720 metric tons); 3.7 tons (3.4 metric tons); 98 tons (89 metric tons).**

Footnotes and Reference Marks

Footnotes and footnote reference marks in hydrologic-data reports may appear in the introductory text, in station descriptions or daily discharge tables, and in the tables for partial-record stations or miscellaneous sites. Rules for their use are set forth in the United States Government Printing Office "Style Manual," 1984 edition; "Suggestions to Authors of the Reports of the United States Geological Survey," fifth edition, 1958, and sixth edition, 1978; and the "Water Resources Division Publications Guide," 1982 edition. Selected rules on footnoting applicable to annual State data reports are discussed in the following paragraphs.

The use of footnotes in station descriptions generally is limited to the EXTREMES FOR CURRENT YEAR paragraph. The following example illustates use of a footnote in a station description:

o EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,100 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage Height (ft)	Date	Time	Discharge (ft^3/s)	Gage Height (ft)
Oct. 5	2000	2,020	7.78	Mar. 21	[a]1800	*15,900	[b] *13.00
Nov. 26	2045	2,580	8.15	Apr. 10	0300	1,630	7.58
Mar. 18	0700	1,580	7.31				

[a]Estimated
[b]From floodmarks

Minimum daily discharge, 4.7 ft^3/s; minimum gage height, 4.42 ft, Sept. 21-23.

In the above example, raised lowercase letters were used as footnote references, and they were placed at the left of the figures to avoid appearing as exponents.[1] The use of an asterisk in the "and maximum (*)" remark is standard. Two or more footnote references occurring together are separated by spaces, not commas.[2] The footnote is placed on the second line below the table and indented three spaces from the left margin.

In general, in recent years footnotes have been used in daily discharge tables principally for those stations where they are needed in the monthly and yearly summaries to designate adjustments for diversion or regulation or to report supplemental data. The examples on p. 116 illustrate this application. Occasionally, the footnote "M Expressed in thousands" may be used for figures that would otherwise exceed the column width (eight digits). Or, a footnote to a reservoir table might read:

o NOTE.--All figures of contents expressed in thousands.

As discussed previously in the section "Identifying Estimated Daily Discharge," Districts will begin flagging in the PRIME computer system all daily-discharge values that are estimated, beginning with the 1985 water-year data reports. The tables may then be retrieved with both the flagged days and a printed footnote, "e Estimated."

Footnotes to a daily-discharge table are placed on the second line below the table and indented three spaces from the left margin. As previously mentioned (p. 116-117), the symbols * (asterisk), † (dagger), and ‡ (double dagger) have been assigned fairly standarized meanings. If additional footnotes are required, lettered footnote references may be used in alphabetical order. The use of "NOTE.--" is useful in emphasizing a particular point to the reader, such as:

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[1]See WRD Publications Guide, p. 301.
[2]See GPO Style Manual, Rule 13.84.

o **NOTE.--Negative figures indicate *****

or

o **NOTE.--Figures of gross evaporation are based on data obtained on Lake Mead by *** and are computed by *****

For surface-water partial-record stations and miscellaneous sites, the use of raised lowercase numbers or letters for footnote references in the data tables is especially helpful to users. If the reference marks are not raised, the user may have trouble locating a reference mark to a particular footnote. The footnote references are placed at the right in reading columns, symbol columns, and date columns, and at the left in figure columns.[1] Footnotes should appear on the page (or pages) to which they apply, if possible. However, if a table occupies several pages, the footnotes may be placed on the last page of that table to avoid repeating the footnotes. Then, the statement "See footnotes at end of table" should be placed at the bottom of each page preceding the last page containing the footnotes. The last page of the table would then list the appropriate footnotes below the table, indented three spaces from the left margin, as follows:

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‡ Operated as a continuous-record gaging station.
*** Also a crest-stage partial-record station.**

Records of Gage Height

This section describes procedures for reporting gage heights or elevations of lakes and rivers. Procedures for reporting records of gage heights (or elevations) of reservoirs, or lakes used as reservoirs, are discussed in the section "Reservoir Records."

Records of gage height for river stations generally are not published, except where such data are requested by cooperators. If records of gage height for rivers or lakes are published, the same general format for reporting should be used as that for records of daily discharge. (See Appendix A, example 22.) Station descriptions should be similar to those for discharge stations and should include all appropriate information under the standard paragraph headings. Certain items, however, may differ somewhat from those for discharge stations. In particular, for periods of no gage-height record, dashes should be shown in the gage-height table with no explanation required. Whenever feasible, skeleton-table formats similar to those used for publishing ground-water levels (every 5th day) should be used for reporting gage-height records.

Selected stations may require a table of daily gage heights in addition to a table of daily discharge (or contents), in which case the station description and the discharge (or contents) table should be on the first page and the gage-height table on the second page. Both tables may be preceded by a single unified station description.

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[1]See GPO Style Manual, Rule 13.83.

Remarks

Do not discuss the accuracy of gage-height record under REMARKS for a station for which only gage heights are published unless there is doubt with regard to reliability of the record, in which case an appropriate statement should be made. For example, "Gage heights during winter months are to top of ice," and "Gage heights July to September doubtful." Other statements may be given as necessary to explain the record being published.

Extremes

Under the EXTREMES paragraphs, report the maximum and minimum gage heights or elevations. Use the term "gage height" if they are measured above an arbitrary datum (not NGVD of 1929). If they are measured from National Geodetic Vertical Datum of 1929, use the term "elevation." Do not use the term "stage" nor the modifier "water-surface" before "elevation" or "gage height." Qualifications to the maximum or minimum gage height should be included where appropriate, using the same criteria used for qualifying extremes of gage height for streamflow stations.

Daily Table

If a record consists of two or more daily readings of a gage (either recording or nonrecording), the reported value should be the average value and should be identified on the computer printout under the heading "MEAN VALUES." However, for once-daily readings made at very nearly the same time each day, the computer printout should indicate the time of the readings in the table heading.

Complete elevation figures, such as 4198.75, should be reported in daily elevation tables. The maximum and minimum daily figures of gage height or elevation should be printed out in the summary only for each complete month. The computer should print a dash for each day of missing record and for incomplete months in the summary.

Reservoir Records

The format for reporting daily reservoir records is essentially the same as that for reporting streamflow records. The format, as it applies to both types of records, has been discussed in preceding sections; so the discussion in this section will be limited to those items relating only to reservoir records.

Reservoir records may be published either as monthly summaries only, or as records of daily contents (or daily gage heights or elevations), with a monthly summary. Generally daily figures of reservoir contents are more useful than those of stage, although daily figures of stage may be published for special reasons. However, publication of reservoir records on a daily basis should be restricted. (See next section.) If the need does not clearly justify the publication of daily figures, monthly summaries only should be published. An alternative to publishing daily records is to publish elevations in skeleton-table format similar to that used to report ground-water levels.

Criteria for Publishing Daily Reservoir Records

The criteria for publishing daily records for a reservoir are that the reservoir records are needed (requested by a cooperator) and are of adequate accuracy for adjusting daily streamflow records or that daily records are required to show compliance with legal limits on storage or elevations. The most common use requiring daily records is flood control.

For other uses, such as irrigation, municipal supply, power, or conservation, publication of daily reservoir records usually is not essential; monthly summaries only should be published. Also, where reservoir records are used to adjust streamflow records on a monthly basis only or to indicate the extent to which published streamflow records do not represent natural yield, monthly summaries of reservoir data should be adequate.

In general, omit records of reservoirs that are too small to have a material effect on the regimen of the stream at any stream-gaging station. Where reservoir records are published by groups for a basin, and it is both desirable and feasible to account for all reservoirs in the basin, the very small reservoirs may be mentioned along with the description of the other reservoirs, even though no records of contents for those small ones may be published.

Criteria for Publishing Records Separately or in Groups

The following considerations can be used to determine whether a reservoir record should be published separately or as a part of a group of reservoir records.

1. If daily records for a reservoir are reported, the records should appear on a separate page in the same downstream order as a streamflow record at that location. (See Appendix A, example 19.)

2. If only monthly records for a reservoir are reported, the records should be published separately in proper downstream order if this is the only reservoir record to be published in this particular basin. The "basin" for this purpose would generally be the basin name that is used as a "running head" at the top of the page for the streamflow records. (See Appendix A, example 20.) Two or more monthly reservoir records in the same basin should be published as a group using the short form of description. (See Appendix A, examples 21A and 21B.) The group generally should be placed at the end of the basin records.

Format for Daily Reservoir Records

Daily records of reservoir contents (or elevation) should be reported as a separate station, on a page by itself. A complete station name and number will be used, along with separate paragraph headings for LOCATION, DRAINAGE AREA, PERIOD OF RECORD, REVISED RECORDS, GAGE, REMARKS, COOPERATION, and EXTREMES. The reported drainage area is that computed at the dam or outlet location, even though the gage may be some distance upstream from the dam. If daily records are now published, but monthly records formerly were published, add a statement to PERIOD OF RECORD, such as: "Prior to October 1962 monthend contents only." If data were collected by a recording gage, momentary extremes should be reported, even though the daily and monthend figures may be for 2400 hours, or some other time. If a nonrecording gage was used, the extremes should be based on the contents listed in the daily table. If, sedimentation has reduced the reservoir capacity so that the maximum contents of record corresponds to an elevation less than the maximum elevation of record, report both maximum contents and maximum elevation separately in the following manner:

- **EXTREMES FOR PERIOD OF RECORD.--Maximum contents, 95,600 acre-ft May 13, 16, 1925, elevation, 1,980.8 ft; maximum elevation, 1,911.84 ft, Dec. 22, 1964 (from high water mark); minimum, * * ***

The headings of computer printouts for daily values should identify the type of measurement (contents, elevation, gage height, and so on), units of measurement (cubic feet, acre-feet, millions of gallons, feet, and so on), and time (2400 hours, 0800 hours, and so on or "mean values"). The information must be entered correctly into the data file, and printouts must be checked (and corrected, if necessary) to see that accurate figures are retrieved. Maximum and minimum daily figures should be printed out in the summary for each complete month. The mean may be deleted if desired. For incomplete daily records, a dash should be printed out for each missing day and entered, when appropriate in the summary. If the daily figures listed are for contents, type in the monthend gage heights or elevations in the line following the summary of monthly minimums. Enter the symbol "(†)," and in a footnote, enter "Elevation, in feet, at end of month." (See Appendix A, example 19.) If the monthend gage height or elevation is reported for a time other than the time of day indicated for the listed daily values of contents, report the time of the reading in the footnote, as follows: "Gage height, in feet, at 1600 hours on last day of month," or "Gage height, in feet, at 0800 hours on first day of following month." If the reported daily figures are gage heights or elevations, state the monthend contents and footnote the data in that line with "† Contents, in <u>unit</u>), at end of month." If the monthend contents are for a different time of day from that indicated for the daily figures of stage, or if the daily figures of stage are daily means, state the time of the monthend contents as in the following footnote " Contents, in (<u>unit</u>), at 2400 hours on last day of month." On the next line give the change in the contents during the month, and use a footnote that reads, ".‡ Change in contents in (<u>unit</u>)." In the spaces for yearly summaries use the symbol "(‡)" to indicate changes in contents for the calendar year and for the water year.

Format for Monthly Reservoir Records

Monthly records of contents for a single station in a basin include a station description with separate paragraph headings, the same as for daily records. The table consists of monthend elevation (or gage height), monthend contents, and monthly and yearly change in contents. A sample of this arrangement is given in Appendix A, example 20.

The column arrangement as shown in the sample should be used for records of a single reservoir or a group of major reservoirs. If monthly records for two or more reservoirs are to be published in a group, add the name of the reservoir over each set of the three columns of elevations, contents, and change in contents. The station title will be "RESERVOIRS IN _____ RIVER BASIN." This title, as well as the names of the individual reservoirs, should be in the index. The station description will be in an abbreviated form; it will contain the usual data, but will not be separated into paragraphs with side headings except for EXTREMES. The first paragraph will include the data that would be listed under the items LOCATION, DRAINAGE AREA, PERIOD OF RECORD, and GAGE; the second paragraph will include items concerning REMARKS and COOPERATION, the third paragraph will include EXTREMES FOR PERIOD OF RECORD, and the fourth paragraph will include EXTREMES FOR CURRENT YEAR. Capitalize key words. An example of the format is given in Appendix A, example 21A.

If monthly records for a large number of small reservoirs are to be given in a single group an even more abbreviated form should be used. The descriptive material should be very brief and only a single paragraph used for each reservoir. This format will present the basic data in the least space and will be consistent with reservoir data given in the compilation reports; however, the abbreviated format will require users of the record to calculate changes in contents for any desired period. In order that data for change in contents for the month of October may be computed without reference to the previous annual report, include the monthend contents for September of the previous year. Although the format is seldom used, it is quite useful for providing comprehensive coverage for a large number of small reservoirs in a limited amount of space. An example is shown in Appendix A, example 21B.

Skeleton Capacity Table

Publication of skeleton capacity tables for reservoirs for which daily records of either contents or elevation are published is optional. Generally, publication of such tables is not recommended. The decision as to whether to include such a table should be based largely upon the desires and policies of cooperators. However, a skeleton capacity table should not be published if daily records of both contents and elevation are published. Also, skeleton capacity table, if published, should not be published for reservoir records for which only monthly data are given. The skeleton capacity table, if published, should cover the range in elevation and contents that occurred during the year, and should report values (in whole feet) at 5-, 10-foot, or larger intervals for ease in plotting. Tables should not be unduly long, and should be expressed in terms of usable or total contents to correspond to the values published in the daily table. If there have been reservoir surveys after the reservoir has been in operation for a period of years, report details of the more recent survey (by whom and when) in the REMARKS paragraph.

Revisions of Capacity Tables

When the effective date of a revised capacity table occurs during the water year, both the old and the new skeleton capacity tables, with effective dates, should be published if daily records are published. Whenever a new capacity table is put into use, the figures of change in contents for the preceding month and for the calendar year and water year must be computed on the basis of the new table. Footnotes should be used to explain the computation of figures of change in contents. This, of course, will involve two separate annual reports if the new table is put into use between January 1 and September 30. For example, if the effective date of a revised capacity table is January 1, the change in contents for January and for the water year will be footnoted; then in the following year's report the calendar-year change in contents should be footnoted.

When reporting monthend contents, if a new capacity table is put into use on October 1, recompute the preceding September 30 contents from the new table and footnote the value as "Computed on basis of revised capacity table put into use Oct. 1, 1981." The change in contents for October and for the water year would then be computed directly from the listed data.

The effective date of a revised capacity table should be, whenever possible, the first day of the month, and preferably October 1, if the table revision was required because of gradual sedimentation in a reservoir. However, if the capacity of the reservoir is known to have changed abruptly due to silting from one specific flood event or because of dredging, the revised capacity table should be put into effect on the applicable date. A footnote similar to the following should then be used:

NOTE.--Effective date of new capacity table was June 5, 1981.

There would be no justification to recompute the preceding May 31 contents from the new tables and the change in contents for June and water year 1981 would be computed directly from published monthend and yearend contents.

Publication as Supplement to Streamflow Record

For a single reservoir in a basin, the monthend contents may be shown as a supplement to records for a stream-gaging station a short distance downstream from the reservoir, even though this procedure is discouraged for major reservoirs. The monthend contents should then be footnoted and the reservoir listed in the index to the report. The above arrangement may be used whether or not the streamflow records are adjusted for storage. See also section "Adjustments for effect of regulation and diversion."

Details of Publication

Use the term "contents" rather than "storage," whenever practical, and the term "change in contents" rather than "gain or loss in storage" in the station description. Generally, figures of usable contents are preferred, although for certain reservoirs it may be more important to show total contents. Negative values for contents should not be reported.

"Acre-feet" is preferred as a unit of measurement for reservoir contents. "Millions (or billions) of cubic feet" commonly is used in the Eastern part of the United States, and "millions of gallons" commonly is used for municipal water-supply reservoirs. The unit "cubic feet per second-days" has been used in the Tennessee and Cumberland River basins to serve a special use by the Tennessee Valley Authority (TVA), but should not be used elsewhere. Units of measurement within a river basin should be consistent within that basin. Changes in contents generally are given in the same units as the contents; however, "equivalent in cubic feet per second" may be used if it is important to provide figures with which the user can adjust records for a streamflow station.

Generally, a maximum of seven digits may be listed in each column of the daily table. For any contents values that equal or exceed 10,000,000, the daily table should give figures in thousands, millions, or billions. The table heading should state the thousands (millions, billions), or a footnote to the table should read:

NOTE.--All figures of contents expressed in thousands (millions, billions).

Contents should not be reported to more significant figures than is justified by the accuracy of the stage record and the magnitude of the reported value. For example, if the probable error in daily gage height is 0.01 ft and the area of the reservoir is about 10,000 acres, contents should not be given to closer refinement than 100 acre-ft or 5,000,000 ft^3 unless there is special justification for greater precision. Two or more Districts publishing records for the same reservoir should be consistent in the number of significant figures (use identical figures) reported.

When publishing daily elevations, table headings should conform to the following style:

ELEVATION, IN FEET, WATER YEAR_____

The reference to National Vertical Datum of 1929 should be confined to the station description and should not appear in the table heading. The GAGE paragraph of the manuscript should include the statement "Datum of gage is National Geodetic Vertical Datum of 1929." Whenever feasible, publish elevation tables rather than tables of gage heights.

Partial-Record Stations and Miscellaneous Sites

A surface-water partial-record station is a site where limited streamflow data are collected systematically over a period of years for use in hydrologic analyses. Data from these partial-record stations serve to extend the areal coverage to include more streams than would be feasible to operate as continuous-record stations.

Two types of surface-water partial-record stations are operated: (1) low-flow partial-record stations, for which periodic discharge measurements are made during periods of base flow derived primarily from ground-water storage; and (2) crest-stage partial-record stations, for which maximum discharge is recorded. At many stations both types of partial records are collected; such stations should be cross-referenced in the tables.

"Miscellaneous surface-water sites" are locations other than surface-water continuous- or partial-record stations at which random discharge measurements, generally of base flow or of peak-flow, are made in times of drought or flood to give better areal coverage to these events. A "miscellaneous site" may become a partial-record station if the measurements of base or peak flow are changed from a random basis to a systematic basis of operation.

Data from these partial-record stations and miscellaneous sites are published in three tables at the back of the annual hydrologic-data reports.

See the section on PERIOD OF RECORD on page 55 for reference to periods of operation for partial-record stations that have been converted to continuous-record stations.

The following sections include information on publishing data from each type of surface-water partial-record station and from miscellaneous sites. Sample tables are shown in Appendix A, examples 23-25.

Station Name and Number

The principles used to select names and numbers for continuous-record stations also apply to surface-water partial-record stations. Care must be taken to see that the names of these partial-record stations do not conflict with the names of continuous-record stations. Similarly, each partial-record station should be assigned a distinctive station number, so that a combined list of continuous-record and partial-record stations may be prepared in downstream order (as, for example, in the "Index of Surface-Water Records"). Note that a single station number is used for a dual-purpose station (low-flow and crest-stage). Assignment of station numbers to miscellaneous data sites is recommended, if feasible.

If no suitable name can be found for a gaged stream, use a name such as "Red River (Creek, and so forth) tributary" for the first partial-record station installed on a tributary to Red River ("No. 1" will be understood, but not used). For a station on another tributary, the name would be "Red River tributary No. 2," and so on. If more than one station is operated on tributary No. 2, for example, the same stream name but a different number and place name would be used and a different place name used for reference. Tributary numbers (No. 1, No. 2, and so on) are assigned without reference to any particular downstream order. Normally the same number would not be used to designate two different tributaries to the same named stream. However, an exception to the above rule can be made for unnamed tributaries to a large interstate river. For example, there could be "Mississippi River tributary No. 2 near Brainerd, MN," and "Mississippi River tributary No. 2 near Baton Rouge, LA." However, avoid the use of "tributary" by finding a locally used name if at all possible.

See sketch and downstream-order list in section "Downstream order and station numbers."

Crest-Stage Partial-Record Stations

Only the annual maximum discharge and gage height should be published for crest-stage partial-record stations even though, for some stations, information was obtained on some lower floods, and other discharge measurements were made to define stage-discharge relations.

In certain arid regions, crest-stage gages may be operated on small water-courses that flow only rarely; and, in some years, there may be no flow. When this occurs, the water year should be shown in the date column, a dash entered in the gage height column, and a symbol placed in the discharge column with the following corresponding footnote:

> "No evidence of any flow during the water year."

If the annual maximum was too low to register on the crest-stage gage, the minimum gage height that can be recorded should be entered in the gage height column preceded by a "less than" symbol (<). The corresponding discharge also preceded by a "less than" symbol should be entered in the discharge column if the rating is defined; otherwise a dash should be entered. The footnote "Peak stage did not reach bottom of gage," does not indicate the limit of unknown, and, therefore, should be avoided.

There may be times when the gage height for the annual maximum was not registered. If possible, the approximate date should be given, along with an estimate of the discharge.

Low-Flow Partial-Record Stations

The discharge measurements at low-flow partial-record stations are made during periods of base flow. These measurements may be correlated with concurrent flow at continuous-record stations in low-flow analyses. A measurement (not of peak flow) made during a period of direct runoff should not be published; it may be used in establishing a stage-discharge relation, but it is probably of very little correlative value. At the District's option, however, it may be published as a miscellaneous-site measurement with an appropriate footnote for cross reference. A current meter or an indirect measurement of peak flow for the year or of a particular flood should be listed in the miscellaneous site table with appropriate footnotes for cross reference.

Low-flow measurements made over a period of 3 to 5 years should be sufficient to establish a satisfactory correlation. However, if a lower minimum flow occurs in a subsequent year, then that flow should be measured and published. Thus, a low-flow station is never discontinued but remains operational in order to include future lower flow measurements that may improve the correlation with nearby stations.

Discharge Measurements at Miscellaneous Sites

The discharge measurements under this category will be those at sites where data are collected for a special reason and not on a regular systematic basis over a period of years. Unless there is an intention to collect data at a site as part of a regular program of areal stream gaging, the site should be considered as miscellaneous and not as a partial-record station. For example, in times of severe drought, extreme low flows should be measured on many streams at sites other than continuous-record or partial-record stations. Similarly, during outstanding floods, peak-flow measurements are obtained at sites other than those equipped with recorders or with crest-stage gages. Such measurements will be listed in the miscellaneous-site table. Footnotes should identify measurements of base flow and measurements of peak flow.

At some regular gaging stations, discharge measurements are made on a supplementary channel diversion or other nearby site on the same stream. Where such measurements are useful in connection with the gaging-station record, they should be published as a supplementary table with the gaging station, and not in the list of measurements at miscellaneous sites.

At times, discharge measurements may be made at the site of a discontinued gaging station. If these are measurements of base flow, they should be published in the table for low-flow partial-record stations. If these are not measurements of base flow, or if they are made for water-management purposes, or otherwise are not a part of the areal stream-gaging program, they should be included in the table of measurements at miscellaneous sites. A measurement of peak flow at a former gaging station also will be considered a miscellaneous-site measurement unless that station has been converted to a crest-stage partial-record station.

A measurement of base flow made at a crest-stage partial-record station is not published unless the site also is (or has been) a low-flow partial-record station; however, at the District's option, the measurement may be included in the table of measurements at miscellaneous sites. A measurement of peak flow made at a low-flow partial-record station that is not also a crest-stage partial-record station should be published in the miscellaneous-site table and footnoted as "at low-flow partial-record station."

Format for Publication

The format and the general introductory text explaining the nature and purpose of the data are given in the appendix. If only one or two of the three tables are in a report, the text may be modified to indicate what information is available. If, due to lack of rating definition, records for a group of crest-stage partial-record stations are withheld (but are to be published in a subsequent report), a statement to that effect would be helpful to the user of the report.

A brief explanation will precede each table. (See Appendix A, examples 23-25.) Several items have been standardized for all three tables. For example, the centerheads, which include the basin names, are the same as the running heads used for the continuous-record stations and the capitalized basin headings in the list of stations. Also, downstream order numbers must be shown for partial-record stations. The location statement should be brief; give latitude and longitude (also landline location, if desired), county in which the station is located, Hydrologic-Unit number, air line distance from town mentioned in station name, and distance upstream or downstream from a significant hydrologic feature (tributary, mouth, and so on). The State name is part of the partial-record station name, so should not be repeated under "Location" unless the actual site is in a different State.

Under "Period of record," the years shown are water years. The dates of measurement and of annual maximum are given in chronological order. If the date of the annual maximum is not known, show it only to the extent that it is known, leaving spaces where a digit is not needed or not known. If more than one measurement is made on the same date at a miscellaneous site, include the time of measurement after the date.

Report discharge measurements and peak discharges with the same number of significant figures as used for daily discharges. Show gage heights to hundredths of a foot, if possible, otherwise to tenths of a foot.

Standard footnotes and references should be used, if applicable, for several items, as follows:

*** Also a crest-stage partial-record station.** (Footnote to the low-flow table; symbol is placed before station number.)

*** Also a low-flow partial-record station.** (Footnote to crest-stage table; symbol is placed before station number.)

(Cross reference and include a station description in both tables for combined low-flow and crest-stage stations, even though no record is published in one of the tables for that year.)

*** Base flow**
† Peak flow

(Footnotes to miscellaneous measurement table; asterisk and dagger symbols shown above are placed before appropriate discharge figure.)

‡ Operated as a continuous-record gaging station. (Footnote to all tables are to use double dagger "‡" after dates in period of record column.)

For other footnote references, use letter symbols a, b, c, and so on, starting with "a" in each table and following in sequence. Figures of drainage area are footnoted the same as for continuous-record gaging stations. If no discharge figure is available, insert a dash in the discharge column. Published figures may be revised on the basis of more accurate basic data. There is no need to mention a preliminary discharge unchanged by review; however, if there is a change, the correct figure should be published in the next report, footnoted "Revised." It is not necessary to identify previously unpublished information. When a partial-record station is converted to a continuous-record station, a footnote in the "Period of Record" column should explain this in the following manner: "Discontinued as a low-flow partial-record station; established as a continuous-record station 10-1-81."

Note that footnote references precede a figure (except date) and follow the words in a reading (or date) column; a reference mark in a column location without a figure (or words) is placed in parentheses. If the tables are long and require many footnote references, the footnotes themselves may all be placed on the last page of the table; there will then be a general footnote, "See footnotes at end of table," on each page except the last.

Conversion From Partial-Record to Continuous-Record Station

Occasionally, the need arises for continuous records at a partial-record station. The change in type of record should be documented to show what information is available at the station.

As explained in the preceding section, a footnote to the final listing in the partial-record table calls attention to the discontinuance as a partial-record station and the establishment as a continuous-record station.

In the station manuscript for a continuous-record station, the previous operation of a partial-record station will be indicated in the PERIOD OF RECORD and GAGE paragraphs. Examples of appropriate statements are given in the section "Period of record."

If the drainage area at the continuous-record station is different from that at the low-flow or crest-stage station, the former drainage area will be shown for the first year only, as follows:

- **DRAINAGE AREA.--17.5 mi^2. Area at crest-stage gage station, 17.7 mi^2.**

Reference to the crest-stage station (and to the low-flow station, if one was used) will be made in the GAGE paragraph, as follows:

- **GAGE.--Water-stage recorder. Datum of gage is 1,360.15 ft above National Geodetic Vertical Datum of 1929. May 18, 1969, to June 12, 1975, crest-stage gage at site 50 ft downstream at same datum.**

Note that inclusive dates are given, rather than the wording "Prior to June 13, 1975, * * *." Without these dates, the period of operation cannot be determined, because the PERIOD OF RECORD paragraph and the published records show water-year dates only.

If the conversion from crest-stage to continuous-record station is within a water year (as in the example given just above), the EXTREMES FOR PERIOD OF RECORD should give the maximum discharge for the entire period--for example, 1969-75--and the second paragraph (current year) the maximum discharge for the water year; however, the minimum must be qualified to limit it to the actual period applicable. For example:

- **EXTREMES FOR CURRENT YEAR.--Maximum discharge, 5,050 ft^3/s, Nov.18, gage height, 16.98 ft; minimum (June to September), 14 ft^3/s, Aug. 28, gage height, 1.28 ft.**

Ordinarily, annual maximums previously published in tables of crest-stage partial-record stations should not be relisted under EXTREMES when records are published for the first time as a continuous-record station. However, a maximum published in the crest-stage table should be republished when it is the maximum for a water year that includes any continuous records being published for the first time. Such would have been the case, if in the above example, daily records for June to September 1975 were withheld in 1975 and were published in the cable of a 1976 report. The maximum of Nov. 18, 1974, might have been published in the table of crest-stage stations as an annual maximum in the 1975 report, but it would need to be relisted in the 1976 report.

Also, if the discharge is determined for any maximums previously footnoted as "Discharge not determined," or if there are revisions to previously published maximums, the new or revised figure should be listed under REVISIONS. If there are many of these, it may be well to republish the entire list of annual maximums.

If a continuous-record station was formerly operated as both a low-flow and crest-stage partial-record station, it is possible that both the maximum and minimum for the period of record occurred during partial-record operation. Examples for the PERIOD OF RECORD and EXTREMES paragraphs are as follows:

- PERIOD OF RECORD.--Occasional low-flow measurements, water years 1968-72, and annual maximums, water years 1968-74. July 1974 to current year.
- EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 468 ft^3/s, Apr. 10, 1970, gage height, 6.93 ft; minimum observed, 0.07 ft^3/s, Sept. 15, 1972.

Conversion From Continuous-Record to Partial-Record Station

When a continuous-record station is discontinued, a decision should be made as to whether or not the station is to be converted to a low-flow partial-record station, a crest-stage partial-record station, or both. If it is to be converted, a statement similar to the following should be used at the end of the PERIOD OF RECORD entry:

*** * *(discontinued as a continuous-record station; converted to a crest-stage partial-record station).**

Then, in later reports, the partial-record table would be footnoted to show the period of continuous-record operation.

Seepage and Low-Flow Investigations

If a series of discharge measurements is made along a reach of channel to determine seepage gains or losses, the results of these measurements generally are published as "Smith River seepage investigation," following the list of discharge measurements at miscellaneous sites. If a series of base-flow measurements is made in a particular river basin to determine the yield in various parts of the basin, the results of these measurements are published at the end of the report as "James River basin low-flow investigations." To have any hydrologic significance, the series of measurements should be made at times when surface runoff from storms has ceased and flow is virtually ground-water seepage.

Each investigation should have a brief text to explain the nature and purpose of the study. A statement should be made that the measurements do (or do not) represent base flow, based on time since last precipitation. Reference should be made to the dates of previous investigations, if any. If water samples were collected for chemical analyses and water temperatures measured, all reported data should be published in the same table or group of tables.

The listing in the tables for these special investigations will be in downstream order. River miles (referenced to mouth or some specified point) should be given. The location statement should be brief and limited to essential items. If a gaging station is included, identify the station; detailed description under "Location" is then not needed. Tributary inflow should be listed in a separate column, and diversions, if any, in another column. The gains or losses are residuals after adding tributary inflow to mainstream flow and subtracting outflow diverted from the stream. The overall gain or loss should be shown for each series. Drainage area and unit runoff may be shown, if useful. In seepage investigations a qualifying statement should point out the large percentage errors possible when reporting small differences (whether net gain or net loss).

Examples are given in the appendix as a guide for preparing the results of these special investigations for publication. (See Appendix A, example 26.)

Rounding rules for discharge figures must be determined for each special investigation, based on the magnitude of the differences to be reported; standard rounding rules used for daily discharge tables generally do not provide enough refinement to evaluate measurement differences found in such studies. Unlike rounding in other parts of the report, all discharge figures should show the same number of decimal places, because both large and small numbers are subtracted as well as added. Do not use more decimal places than needed. Figures of unit discharge (cubic feet per second per square mile) and runoff (in inches), however, should conform with rounding rules used for gaging stations.

SURFACE-WATER-QUALITY DATA

Records to be Published

All water-quality data collected at surface-water stations and miscellaneous or project sites should be published. Data provided by cooperating agencies that participate in the WRD Quality Assurance Program and that are stored in WATSTORE also may be published. Frequencies of the published data may vary from daily values for a surface-water continuous-record station to single measurements at miscellaneous surface-water sites.

Data inadvertently omitted from the previous water-year reports should be combined with current data for the station sites in question. If no current data are being reported, then the data may be published alone.

Policy on Publishing Constituents with Both Field and Laboratory Values

In recent years several questions have been raised as to the policy on publication and storage of water-quality constituents with both field and laboratory values. Quality of Water Branch Technical Memorandum No. 82.06 provides the policy guidance needed to answer those questions and the background information to help explain the need for the guidelines set forth in the memorandum. The guidelines on publication given here were taken from that memorandum and are based on the belief that field measurements of pH, specific conductance, alkalinity, hydroxide, carbonate, bicarbonate, and carbonate alkalinity, when done correctly, are the best measurements available and should be given priority in publication and transferral to the STORET data base. The guidelines for publication and storage are as follows:

1. Under no circumstances will laboratory values be substituted for field values or vice versa in either the data files or data publications.

2. When both field and laboratory values are available, the field value will be published in preference to the laboratory value unless there is reason to suspect the quality of the field measurement.

3. When the field value is unavailable or questionable, the laboratory value may be published.

4. Only values of hydroxide, carbonate, bicarbonate, and carbonate alkalinity obtained in the field by the incremental titration method will be published. Rare exceptions have been allowed by written permission of the Assistant Chief Hydrologist for Research and Technical Coordination for projects locked into the field fixed-pH endpoint method. These values may be published in a column suitably labeled "field, fixed-pH endpoint." Transferral of these data to STORET must await appropriate STORET codes from EPA. Note that publication and storage of alkalinity measurements in the field (00410) and laboratory (90410) are governed by guidelines 1, 2, and 3.

Procedures for Retrieval of Data for Publication

Instructions for retrieving daily values for publication are given in "WATSTORE-National Water Data Storage and Retrieval System," Volume 1, chapter IV, section B and section C (U.S. Geological Survey, 1977). Use program G490 for retrieval of data and H474 for table printouts. Designate type 1 for once-daily tables, type 2 for maximum and minimum tables, type 3 for maximum, minimum, and mean tables, and type 4 for daily suspended-sediment tables.

Instructions for retrieving water-quality data (other than daily values) for publication are in "WATSTORE - National Water Data Storage and Retrieval System," Volume 3, chapter III, section A, and chapter IV, section B (U.S. Geological Survey, Water Resources Division, written communication, 1983.) Use programs E771 for retrieval of nondaily values and A534 for table printouts. For tables of data for partial-record stations and miscellaneous sampling sites, designate type 2 table format. Carefully review all data printouts to see that the data are correct and that the printing is clear and sharp enough for direct-image offset printing. If there are errors, or the print is not suitable for printing, the file must be corrected and a new retrieval made. It may be necessary to make many retrievals in order to obtain a good reproducible copy of correct data.

Instructions for preparing pages of tabular data for publication are in the section, "Typing offset copy."

Surface-Water-Quality Records

Data-Collection-Site Classification

Surface water-quality data-collection sites are classified as follows:

1. Continuing-record station.--A specific location where water-quality data are collected on a regularly scheduled basis. Sample-collection frequency may be once or more times daily, weekly, monthly, or quarterly, or at some intermediate frequency.

2. Partial-record station.--A specific location where water-quality data are collected systematically but on a limited frequency, usually less than quarterly, over a period of years.

3. Miscellaneous sampling site.--A location where random water-quality data are collected, often on a one-time basis, to provide better areal coverage to define water-quality conditions in a river basin; or where samples are collected once or more frequently, but not on a regular basis, as part of a project.

Arrangement of Records

Water-quality data from continuing-record stations, partial-record stations, or miscellaneous sampling sites collected at a continuous water-discharge station are published immediately after the water-discharge data. Station number and name are identical.

Where water-discharge data are not available, the continuing water-quality record should be published with its own station number and name in the regular downstream order sequence, as follows:

02213000 Ocmulgee River at Macon, GA (discharge records only)
02213700 Ocmulgee River near Warner Robins, GA (chemical and temperature records only)
02215500 Ocmulgee River at Lumber City, GA (discharge, chemical and temperature records)

Prepare the list of surface-water data stations with the type of data collected at each site indicated by symbols placed within parentheses immediately after the station name, as illustrated previously in the guidelines on preparing the introductory pages of the data report. (See the Section "List of Surface-Water-Data Stations.")

Water-quality data collected at a partial-record station or miscellaneous sampling site not located at a continuous water-discharge station are published in a separate section of the report immediately after the section on water-discharge partial-record sites.

The sequence and format for publishing water-quality records are as follows:

1. Water-quality description heading.

2. Water-quality tables containing less than daily values. In order to eliminate blanks, the data may be grouped in tables based on frequency of sampling. For example, constituents sampled monthly may be grouped in one table whereas constituents sampled quarterly may be grouped in a following table. An updated constituent reporting-order table will soon be available on the Prime computer system. This table will be retrievable by executing the "RPT.ORDER" procedure within the water-quality data-processing system on the Prime. In retrieving water-quality data for publication, request the constituents in the order designated by the new table.[1] The order for reporting less-than-daily-values follows:

    Descriptive or station-site information

    Field measurements

    Physical properties

    Biological constituents[2]

    Inorganic constituents
        Common cations
        Common anions
        Dissolved, suspended, volatile, and total solids
        Nutrients
        Trace constituents
        Radiochemical constituents

    Organic constituents
        Gross measurements
        Industrial-related compounds
        Pesticides

    Suspended sediment and bed material

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[1]Continue to use the constituent reporting-order list provided in the 1976 guidelines for preparation of State data reports until the new reporting-order table becomes available on the Prime computer system.

[2]The biological-constituents data may, at the District's option, be placed as last item in the data table.

3. Biological taxonomic data tables.[1] Taxonomic data tables will be published in the following order:

    Phytoplankton

    Zooplankton

    Periphyton

    Benthic invertebrates

    Primary productivity

4. Properties or constituents measured on a daily or more frequent basis. These may include but are not limited to the following:

    Specific conductance

    pH

    Water temperature

    Dissolved oxygen

    Turbidity

    Chloride

    Suspended sediment

These data tables should follow the same order given for reporting less-than-daily-values.[2]

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[1]The biological taxonomic data tables may, at the District's option, be placed as the last item in the data tables.

[2]Continue to use the constituent reporting-order list provided in the 1976 guidelines for preparation of State data reports until the new reporting-order table becomes available on the Prime computer system.

Description Headings

Water-quality data collected at gaged sites should be placed at the top of the page following the water discharge records for the same location. The river basin in which the station is located is centered in capital letters at the top of the page. The station number and name are centered in capital letters in the second space below the basin name. If the records follow water-discharge records for the same station, add "Continued" after the station name. The heading "WATER-QUALITY RECORDS" should be centered in the second space below station number and name. The station description should contain the following paragraph headings in the order given below:

Location

Omit this paragraph if all information is given for corresponding water-discharge records. Include a LOCATION paragraph only for water-quality stations that do not have water discharge or other hydrologic data, such as gage heights or lake elevations preceding the water-quality data. Instructions for the LOCATION entry are the same as those for water-discharge stations given on pages 39 to 43. The conversion of miles to kilometers no longer is necessary but may be done at the District's option.

Examples:

- LOCATION.--Lat 29°42'35", long 95°21'23", Harris County, Hydrologic Unit 12040104, at bridge on Scott Street in Houston.

- LOCATION.--Lat 40°54'18", long 96°35'09", in NW 1/4 SW 1/4 sec 24, T.11N., R.7E., Lancaster County, Hydrologic Unit 10200203, at bridge 0.5 mi north of Interstate Highway 80 and 3 mi southwest of Waverly.

Drainage area

Omit this paragraph if all pertinent information was given in the corresponding water-discharge records. Include a DRAINAGE AREA paragraph only for water-quality stations that do not have water discharge or other hydrologic data preceding the water-quality data. Instructions for the DRAINAGE AREA entry are the same as there for water-discharge stations given on pages 43 to 46. The conversion of square miles to square kilometers no longer is necessary, but may be done at the District's option.

Period of Record

Information concerning the water years for which any water-quality data previously have been published in WSP's through 1970 and in the State annual report series since 1970 should be included under "Period of Record." The data on which this information is based may have been collected at any frequency (daily, monthly, or less). For example, if a station was operated as a partial-record station in water years 1966-68 and as a daily temperature station only during water year 1969, no data of any type were collected during water year 1970, and the station was operated as a daily records station for several constituents beginning in October 1970 and continuing to the present, the PERIOD OF RECORD heading would read:

- **PERIOD OF RECORD.--Water years 1966-69, 1971 to current year.**

In the case of newly established stations for which records are being published for the first time, publish the month and year of the first and last samples. Do not use "current year" if sampling was started in that year. For example:

- **PERIOD OF RECORD.--April to September 1982**
- **PERIOD OF RECORD.--November 1981 to September 1982**
- **PERIOD OF RECORD.--October 1981 to September 1982**

If water-quality data collection is continued entirely through the year after the year of establishment of the station, the PERIOD OF RECORD format will use the terms "water year" and "current year." Stations shown in the three examples above would all contain the following PERIOD OF RECORD entry for their second water year of operation:

- **PERIOD OF RECORD.--Water years 1982 to current year.**

If a station is discontinued during or at the end of the water year of the current report, publish the month and year of the last sample, followed by the word "discontinued," as follows:

- PERIOD OF RECORD.--Water years 1966-69, 1971 to July 1982 (discontinued).
- PERIOD OF RECORD.--Water years 1977 to September 1982 (discontinued).

Districts may, at their option, publish a more detailed breakdown of categories of available water-quality information, and the periods of record and sampling frequency for each, as subheadings under "PERIOD OF RECORD". This option will provide greater user information, which some Districts indicate that cooperators have requested, but at the cost of considerable time in manuscript preparation and updating. Examples of possible categories follow:

Biological data

Inorganic chemical data

Nutrient data

Trace-constituent data

Radiochemical data

Organic chemical data

Example:

- **PERIOD OF RECORD.--Water years 1973 to current year.**
  INORGANIC CHEMICAL DATA: Water year 1973 to current year, monthly.
  NUTRIENT DATA: Water years 1973 to current year, monthly.
  TRACE CONSTITUENT DATA: Water year 1978 to July 1981, semi-annually.
  RADIOCHEMICAL DATA: Water years 1978 to June 1980, quarterly.

Districts are not limited to these exact categories but may use similar ones at their discretion. A District may choose to include a detailed description of these categories in the report introduction.

The period of record for discontinued water-quality stations, which remain active water-discharge stations, may be shown under "PERIOD OF RECORD" in the water-discharge headings for these stations.

Period of Daily Record

Each property or constituent for which records are collected on a daily or more frequent basis should be included under this heading. List all periods of publication for each property or constituent by month and year, as follows:

- **PERIOD OF DAILY RECORD.--**
  SPECIFIC CONDUCTANCE: October 1970 to current year.
  pH: October 1970 to current year
  WATER TEMPERATURE: October 1968 to September 1969, October 1970 to current year.
  DISSOLVED OXYGEN: October 1970 to current year.
  SUSPENDED-SEDIMENT DISCHARGE: July 1971 to July 1972, October 1973 to current year.

If only one property or constituent is published for a station and it was collected on a daily or more frequent basis omit the PERIOD OF RECORD entry and include the single property or constituent under the heading "PERIOD OF DAILY RECORD." For example, for a station with only daily water temperature, enter only:

- **PERIOD OF DAILY RECORD.--**
  WATER TEMPERATURE: October 1966 to current year.

The months and years must be stated for stations that are established or discontinued within the current year.

- **PERIOD OF DAILY RECORD.--**
  SPECIFIC CONDUCTANCE: November 1981 to September 1983.
  WATER TEMPERATURE: January 1976 to April 1983.

Instrumentation

This paragraph is similar to the "GAGE" paragraph in the "WATER-DISCHARGE RECORDS" description heading, and is used only if a water-quality monitor (multiparameter recorder), temperature recorder, automatic sediment sampler, or other sampling device is installed at the collection site. A District may be general or specific in use of this entry. For example, a detailed description of the sampling equipment may be included as well as a description of where the equipment is located. Districts are encouraged to provide information on the frequency of measurement to allow users to better evaluate the reported extremes. Be as specific as necessary but remember that use of brand names is discouraged and that a disclaimer is necessary if such names are used.

- INSTRUMENTATION.--Water-quality monitor since Oct. 1970. Digital recorder set for four-hour-interval punches.
- INSTRUMENTATION.--Water-temperature recorder since Oct. 10, 1968, provides continuous recordings.
- INSTRUMENTATION.--Sediment pumping sampler since Mar. 15, 1974.
- INSTRUMENTATION.--Water-quality monitor from Oct. 22, 1978 to Sept. 30, 1984, and sediment pumping sampler since Oct. 1979.
- INSTRUMENTATION.--Water-temperature recorder since July 23, 1959 provides continuous recordings. Sensor located in upper intake of stilling well.

Remarks

The REMARKS paragraph is used to add any pertinent information that qualifies or describes the data in the tables. Districts are encouraged to provide information on the frequency of observer measurements to allow users to better evaluate the reported extremes. The remarks should be written in the following order:

1. Remarks pertaining to water-quality analyses--sampling methods of analyses, or availability of records.

- o **REMARKS.--In addition to water-quality monitor, samples were collected by a local observer on an approximate twice-weekly basis. Partial chemical analyses were made each month on those samples having the maximum and minimum specific conductance for the month.**

- o **REMARKS.--Unpublished records of daily specific conductance and pH are available in files of District office.**

2. Remarks pertaining to water temperature.

- o **REMARKS.--Water-temperature recorder clock stopped Oct. 8-22 (range in temperature 9.0, to 13.0,C), Apr. 30 to May 5 (range in temperature 7.0, to 8.0,C); no record Nov. 21 to Dec. 3.**

- o **REMARKS.--Records represent water temperature at sensor within 0.5,C. Temperature at the sensor was compared with the average for the river by temperature cross section on (give date or dates). A maximum variation of 2.5,C was found within the cross section.**

3. Remarks pertaining to sediment data--sampling methods, computations, or records.

- o **REMARKS.--Sediment samples were collected in open-water channel during period of ice effect.**

- o **REMARKS.--Total sediment discharges were determined biweekly.**

4. Remarks pertaining to the source of water-discharge records when the sampling station or site and the water-discharge station are of different name and location.

- o **REMARKS.--Water-discharge records for Eagle Creek below Gypsum (station 09070000) are used for computation of weighted averages (or suspended-sediment loads).**

5. General remarks.

The following examples, some of which were chosen from published data reports, demonstrate the potential of the "REMARKS" paragraph in providing maximum information to the user of the data report.

- o **REMARKS.--Daily samples and most monthly samples were collected at the raw-water tap in Sault Ste. Marie municipal water plant at Big Point. Intake is 1,500 ft out at a depth of 30 ft, 10 ft above bottom of the channel. The October sample is a cross-section sample collected by boat at Brush Point, 2.2 mi upstream.**

- **REMARKS.--Monthly and annual loads and mean concentrations for selected chemical constituents computed using the daily (or continuous) records of specific conductance and regression relationships between each chemical constituent and specific conductance. Regression equations developed for this station may be obtained from the Geological Survey District office on request.**

- **REMARKS.--Daily observer measurements of water temperature for October 1 to November 30 were not published because of apparent inaccuracy in thermometer readings by observer. Prior to July 1, 1971, sediment records were provided by U.S. Army Corps of Engineers.**

Cooperation

The cooperation paragraph acknowledges data provided by a cooperating agency and accepted by the Geological Survey for publication, or any data that are collected and analyzed for the Geological Survey. For example:

- **COOPERATION.--Records were provided by California Department of Water Resources and were reviewed by U.S. Geological Survey.**

- **COOPERATION.--Chemical data were provided by U.S. Environmental Protection Agency and were reviewed by U.S. Geological Survey.**

- **COOPERATION.--Biological samples were collected by the U.S. Geological Survey and analyzed by New Mexico Environmental Improvement Agency.**

- **COOPERATION.--Temperature records were provided by Niagara-Mohawk Power Corp.**

Extremes

Annual maximum and minimum values will be published only for water-quality data collected at least once daily by observers or by monitoring instruments. Separate "Extreme" paragraphs should be shown for extremes for period of daily record, extremes outside the period of daily record, and extremes for the current year. Extremes will not be reported for any data collected on a less than daily basis. The order of reporting extremes for daily values is the same as that for reporting the constituents in the water-quality tables.

Guidelines for reporting all water-quality extremes, including period of daily record, outside period of daily record, and current year extremes, are as follows:

1. Generally, daily or instrument-recorded records should include data for at least 80 percent of the days during the water year during which runoff occurred. Thus, a discharge station where flow occurred throughout the water year and where water-quality properties or constituents are measured daily, would require the reporting of 292 days of data, whereas a station with only 50 days of flow during the water year would require only 40 days of water-quality data. However, at the discretion of the District, maximum or minimum values may be shown for lesser periods, but only if the reported values can reasonably be expected to be the true extremes. An example for this would be:

   SPECIFIC CONDUCTANCE: Maximum recorded (more than 20 percent missing record), 1,900 microsiemens, July 6, 1977; minimum recorded, 250 microsiemens, Aug. 1,3, 1982.

2. New or discontinued stations may report extremes for less than a 12-month period provided the period of operation is continuous and 80 percent of the days during which runoff occurred for the period of question are reported.

3. Maximum or minimum values based on once-daily measurements may not represent true extremes because they may not have been measured at or near the exact time of day that the actual extreme occurred. Conversely, instruments, such as disc temperature recorders, measure and record the actual daily extremes. However, data measured by equipment that records hourly or more frequently may approximate actual daily extremes. Therefore, a distinction should be made between values based on once-daily observer measurements and those based on more frequent instrumentation measurements. This is done by inserting the word "daily" after "Maximum" or "Minimum" in the EXTREME entries if the values to be published represent once-daily observer measurements.

4. When maximum or minimum values occur on more than one date during the period of record, use the following general procedure for indicating frequency and duration:

1 - 5 days	-	publish individual dates
6 - 19 days	-	use the term "several"
20 or more days	-	use the term "many"

The following are additional guidelines to cover "special cases" when reporting water-quality extremes:

1. Minimum water temperatures only may be reported if the station is operated continuously only during the winter months.

2. Maximum water temperatures only may be reported if the station is operated continuously only during the summer months or the warmer periods of the year when the maximum water temperature can be expected to occur.

3. Extremes may be reported when a stream is ice covered for a considerable period during winter months and an observer can not make regular measurements. Proper notations of the period of interrupted record should be made in REMARKS, such as "Stream frozen Dec. 24 to Feb. 28."

4. When a few days are missing during a probable maximum or minimum period, even though the record is complete for at least 80 percent of the days for the period, the maximum or minimum values should be reported as "recorded." For example, "Maximum recorded, 15°C June 28, but may have been higher during instrument malfunction July 4-10." NOTE: Proper notation also should be made in REMARKS, such as, "Interruptions in the record were due to malfunctions of the instrument."

5. In cases of no flow, proper notation should be made in the REMARKS paragraph such as, "No flow July 5-31, Aug. 10-14."

6. Reporting of 0°C water temperature: Conditions may be found in which water temperatures less than 0°C are measured. Negative values of water temperature in the ranges of 0.0°C to -1.0°C may be published after thorough review and accuracy verification (QW Tech. Memorandum 75.15, Mar. 13, 1975). If a thorough review is impractical and the minimum value is 0°C or less, the value "0.0,C" is used instead of the phrase, "freezing point."

7. The extremes for sediment concentration will be reported as maximum daily mean and minimum daily mean.

Extremes for period of daily record

The data in this paragraph should cover all dates reported in the PERIOD OF DAILY RECORD entry unless extremes for some years were not reported because the data were considered incomplete. Extreme values for the period of daily record should be checked with the extreme values for the current year and updated as necessary. Examples of the format for this paragraph follow.

1. Report dates of extreme values in months, days, and years.

   a. Once-daily station:

      EXTREMES FOR PERIOD OF DAILY RECORD.--
      SPECIFIC CONDUCTANCE: Maximum daily, 1,230 microsiemens, Feb. 5, 1979; minimum daily, 120 microsiemens, July 20, 1975.
      WATER TEMPERATURE: Maximum daily, 20.5°C, July 23, 1974; minimum daily, 0.0°C on many days during winter.
      SEDIMENT CONCENTRATION: Maximum daily mean, 444 mg/L, June 29, 1972; minimum daily mean, 11 mg/L, Jan. 23, 1978.
      SEDIMENT LOAD: Maximum daily, 2,860 tons, Mar. 14, 1975; minimum daily, 3 tons, Jan. 24, 1978.

b. Instrumented monitoring station:

> **EXTREMES FOR PERIOD OF DAILY RECORD.--**
> **SPECIFIC CONDUCTANCE: Maximum, 1,230 microsiemens, Feb. 7, 1978; minimum, 120 microsiemens, July 20, 1975.**
> **pH: Maximum, 8.7, July 24, 1977; minimum, 4.4, Jan. 27, 1982.**
> **WATER TEMPERATURE: Maximum, 25.0°C, Aug. 30, 1973; minimum, 4.0°C, Jan. 21, 1981.**
> **DISSOLVED OXYGEN: Maximum, 15.0 mg/L, Jan. 6-10, 1975; minimum, 0.2 mg/L, Aug. 19, 1982.**

2. If the period of operation given in PERIOD OF DAILY RECORD is not applicable to the respective extremes statement because data are incomplete, the periods covered by the extremes are given in parentheses, as follows:

> **EXTREMES FOR PERIOD OF DAILY RECORD.--**
> **SPECIFIC CONDUCTANCE (water years 1965-70, 1972 to current year): Maximum....**

3. If either maximum or minimum values are available for some years of the overall period of record, the missing period may be indicated, as follows, by the material in parentheses:

> **EXTREMES FOR PERIOD OF DAILY RECORD.--**
> **SPECIFIC CONDUCTANCE: Maximum, 1,230 microsiemens, June 20, 1975; minimum (water years 1972-74, 1976 to current year), 210 microsiemens, Dec. 20, 1978.**

4. When the sampling frequency of a water-quality parameter is changed from daily to a lesser frequency, or is discontinued, the District may omit the extremes for the period of daily record for the parameter. If a District chooses to continue publishing the PERIOD OF DAILY RECORD for the parameter under these circumstances, the periods covered by the extremes statement must be qualified in parentheses as follows:

> **EXTREMES FOR PERIOD OF DAILY RECORD.--**
> **SPECIFIC CONDUCTANCE (water years 1965-80): Maximum...**

5. Specific examples follow for situations where maximum or minimum values occur for more than one date:

   a. Same values occur from 1 to 5 times during period of daily record:

> **EXTREMES FOR PERIOD OF DAILY RECORD.--**
> **SPECIFIC CONDUCTANCE: Maximum daily 750 microsiemens, Jan. 10, 1979; minimum daily, 235 microsiemens, Mar. 15, 16, 1979, Sept. 23, 1981.**

WATER TEMPERATURE: Maximum daily, 34.5°C, July 11, 1980, July 31, to Aug. 1, 1981; minimum daily, 1.0°C, Jan. 23, 1980.

b. Same values occur from 6 to 19 times during period of daily record:

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: Maximum, 30.5°C on several days in water years 1980 and 1981; minimum, 3.5°C on several days during winters.

c. Same values occur more than 20 times during the period of daily record:

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: Maximum, 24.5°C on many days during summers; minimum, 0.0°C on many days during winters.
SEDIMENT CONCENTRATION: Maximum daily mean, 450 mg/L June 29, 1980; minimun daily mean, 3 mg/L on many days in 1976-82.

6. Specific examples follow for the situations where only minimum water temperatures are reported because a station is operated only during winter months, or only maximum temperatures are reported because a station is operated only during summer months.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: Minimum, 3.5°C, Feb. 2, 1979.
EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: Maximum, 37.5°C, July 26, 1980.

<u>Extremes outside period of daily record</u>

This paragraph reports the extreme value of any parameter that occurs during the period of operation of a station--for example, sediment concentrations measured on samples collected by U.S. Geological Survey personnel during floods prior to or after the period that daily samples are actually collected and that are not part of the daily record. Report month, day, and year of extremes for such records, as follows:

EXTREMES OUTSIDE PERIOD OF DAILY RECORD.--A suspended-sediment concentration of 50,000 mg/L was measured May 19, 1959.

EXTREMES OUTSIDE PERIOD OF DAILY RECORD.--Dissolved-solids concentration of 1,380 mg/L was measured Jan. 19, 1967.

EXTREMES OUTSIDE PERIOD OF DAILY RECORD.--A pH of 9.0 was measured Aug. 10, 1967.

Extremes for current year

In this paragraph publish extreme values and their dates of occurrence for the current year. Always check the extreme values with those reported in the tables for the current year to make sure that the dates are correct. Report extremes for the current year in months and days but not in years, as follows:

1. Once-daily measured station

   EXTREMES FOR CURRENT YEAR.--
   SPECIFIC CONDUCTANCE: Maximum daily, 1,230 microsiemens, Feb. 5; minimum daily, 120 microsiemens, July 20.
   WATER TEMPERATURE: Maximum daily, 20.5°C, July 23; minimum daily, 0.0°C on many days during winter period.
   SEDIMENT CONCENTRATION: Maximum daily mean, 444 mg/L, June 29; minimum daily mean, 0 mg/L on many days during July to September.
   SEDIMENT LOAD: Maximum daily, 1,860 tons, Mar. 14; minimum daily, 0 ton on many days during July to September.

2. Instrumented station:

   EXTREMES FOR CURRENT YEAR.--
   SPECIFIC CONDUCTANCE: Maximum, 3,120 microsiemens, Apr. 15; minimum, 62 microsiemens, July 23.
   pH: Maximum, 8.7, July 5, 6; minimum, 4.4, Jan. 27, 30.
   WATER TEMPERATURE: Maximum, 20.0°C, Aug. 30, 31; minimum, 0.0°C on many days during February.
   DISSOLVED OXYGEN: Maximum, 15.0 mg/L, Jan. 6, Feb. 11; minimum, 5.8 mg/L, Oct. 5.

Revisions

Revisions of water-quality data will no longer be published in State data reports; therefore, the REVISIONS paragraph will no longer be used in the station description for water-quality sites. If errors in published water-quality records are discovered after publication, appropriate updates will be made to the Water-Quality File in the U.S. Geological Survey's computerized data system, WATSTORE, and subsequently by monthly transfer of update transactions to the U.S. Environmental Protection Agency's STORET system. The usual volume of updates makes it impractical to document individual changes in the State data-report series or elsewhere. Potential users of U.S. Geological Survey water-quality data should be encouraged to obtain all required data from the appropriate computer file to ensure the most recent updates.

No criteria for revisions have been established. It is the responsibility of each District office to review its own reports to determine if the magnitude of any erroneous data is such that updates are required for data stored in the WATSTORE Water-Quality File.

Biological Data

Types of biological data from strictly quantitative samples for which parameter codes established by the U.S. Environmental Protection Agency are available should be included in standard water-quality tables when reporting less-than-daily values, as described in the "Arrangement of Records" section for surface-water-quality data.

Phytoplankton and benthic-invertebrate taxonomic data may be retrieved for publication using the Biotab procedures described in the WATSTORE Users Guide, Volume 3, Chapter V, Section B (U.S. Geological Survey, Water Resources Division, written communication, 1982). Such data may be published without alteration. These tables should follow water-quality tables of less-than-daily values.

Some types of biological data are not retrievable with Biotab procedures. Examples of formats for publishing such data are shown in the following tables. Tables of various combinations of data are provided for zooplankton, periphyton, primary productivity, phytoplankton, and benthic invertebrates. A District may choose to type phytoplankton and benthic invertebrate data in these formats rather than use the computer-generated Biotab format if zooplankton, periphyton, and/or primary productivity data are being published. Typing in this format will provide biological data sets of consistent format for stations for which more than phytoplankton and benthic invertebrate taxonomic data are being published. Preceding the sample tables for each type of biological data and for primary productivity are lists of related characteristics commonly measured for each type of data. These lists indicate the order of reporting and permit the selection of those characteristics to be reported. The names in each hierarchical level are listed in alphabetical order.

Zooplankton

1. Date of collection

2. Time of collection

3. Taxonomic format for scientific name of organism:

   PHYLUM
   Class
   Order
   Family
   Genus
   Species

4. Count--number of organisms or cells per volume (milliliters or liters) of water.

5. Percent composition (or percent of total)--the percentage of the individual organism count to the total organism count of the sample.

6. Biomass--expressed in grams per cubic meter (g/m^3).

   a) Dry weight
   b) Ash weight
   c) Organic weight

7. Sampling method--type of device used for zooplankton collection--for example, net.

Table 5.--Data-table format (typed) for publishing zooplankton data

QUALITATIVE AND ASSOCIATED QUANTITATIVE ANALYSES OF BIOLOGICAL DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

ZOOPLANKTON

Date	Time	Organism	Count (organisms/mL)	Percent of total	Sampling method
Feb 2	1900	ROTIFERA			Net
		Monogononta			(210 micrometers)
		Ploima			
		Brachioninae		100	
		Kellicotia Longispina	2		
		TOTAL	2	100	

Periphyton

1. Date--the date of collection or date artificial substrate was retrieved.

2. Length of exposure--the length of time, in days, the artificial substrate was in the body of water.

3. Time (of collection, if deemed necessary).

4. Taxonomic format for scientific name of organism (see Zooplankton).

5. Count per area--number of organisms or cells per unit area (square centimeters or meters) of substrate.

6. Percent composition (or percent of total)--the percentage of the individual organism count to the total organism count of the sample.

7. Biomass--expressed in grams per square meter (g/m^2).

   a) Dry weight
   b) Ash weight
   c) Organic weight

8. Periphyton chlorophyll--expressed in milligrams per square meter (mg/m^2).

   a) Chlorophyll *a*
   b) Chlorophyll *b*

9. Biomass-pigment ratio--$\frac{\text{dry weight - ash weight}}{\text{chlorophyll } a}$

10. Sampling method--type of method or device used for sample collection--for example, type of artificial substrate or natural substrate.

Table 6A.--Data-table format (typed) for publishing periphyton data

QUALITATIVE AND ASSOCIATED QUANTITATIVE ANALYSES OF BIOLOGICAL DATA, WATER YEAR OCTOBER 1981 to SEPTEMBER 1982

PERIPHYTON

Date	Length of exposure (days)	Organism	Count (organisms/m^2)	Percent of total	Sampling method
Mar 13	29	CHRYSOPHYTA			Polyethylene strip
		Bacillariophyceae			
		Navicula	24	47	
		Synedra	22	53	
Apr 15	33	CHRYSOPHYTA			Polyethylene strip
		Bacillariophyceae			
		Navicula	19	42	
		Synedra	22	49	
		Tabellaria	4	9	
May 2	37	CHRYSOPHYTA			Polyethylene strip
		Bacillariophyceae			
		Synedra	21	33	
		Tabellaria	42	67	

Table 6B.--Data-table format (typed) for publishing periphyton data

QUALITATIVE AND ASSOCIATED QUANTITATIVE ANALYSES OF BIOLOGICAL DATA,

WATER YEAR OCTOBER 1981 to SEPTEMBER 1982

PERIPHYTON

Date	Length of exposure (days)	Biomass weight (g/m2)		Chlorophyll a (mg/m2)	Chlorophyll b (mg/m^2)	Biomass pigment ratio	Sampling method
		Dry	Ash				
Mar 13	21	12	0.8	0.04	0.02	280	Polyethylene Strip
June 20	21	40	2.6	.41	.36	91	
Sept 17	22	31	2.2	.37	.24	78	
Dec 10	21	17	.9	.09	.03	179	

Primary productivity

1. Date of measurement

2. Depth in meters, corresponding to transparency depths.

3. Transparency in percent of surface light.

4. Primary productivity--measured and calculated values in milligrams of carbon per cubic meter per day (mg C/m^3)/d or milligrams of oxygen per cubic meter per day (mg O2/m^3)/d.

5. Primary-productivity rate (summation)--calculated as production in the euphotic zone. Depending on method of collection and analysis, reported as:

   a. Carbon assimilation rate

      1. Milligrams of carbon per square meter per hour (mg C/m^2)/h.

      2. Milligrams of carbon per square meter per day (mg C/m^2)/d.

   b. Oxygen-evolution rate

      1. Milligrams of oxygen per square meter per hour (mg O_2/m^2)/h.

      2. Milligrams of oxygen per square meter per day (mg O_2/m^2)/d.

6. Sampling method--either carbon-14 method, or oxygen light-and-dark-bottle method. For an example of publication format, see below:

Table 7.--Data-table format (typed) for publishing primary-productivity data

QUALITATIVE AND ASSOCIATED QUANTITATIVE ANALYSES OF BIOLOGICAL DATA, WATER YEAR OCTOBER 1975 TO 1976

PRIMARY PRODUCTIVITY

		Trans-parancy (percent of surface light)	Primary productivity		Carbon assimilation rate (carbon-14)		Oxygen-evolution rate (oxygen light-and-dark bottle)	
Date	Depth (meters)		(mg C/m³)/d	(mg O_2/m³)/d	(mg C/m²)/h	(mg C/m²)/d	(mg O_2/m²)/h	(mg O_2/m²)/d
Feb 02	4.5	60	12	4				
	9.0	30	14	5				
	12.0	20	10	3				
	18.0	10	8	2				
	24.0	5	3	1.5				
	36.0	1	1	1				
Summation of primary productivity in euphotic zone					9.5	93.0	5.2	64

Phytoplankton

Phytoplankton tables presented in this fashion are similar to zooplankton tables. Biomass in grams per cubic meter, should be included in phytoplankton tables with columns for dry weight, ash weight, and organic weight.

Table 8.--Data-table format (typed) for publishing phytoplankton data

QUALITATIVE AND ASSOCIATED QUANTITATIVE ANALYSES OF BIOLOGICAL DATA, WATER YEAR 1975 TO SEPTEMBER 1976

PHYTOPLANKTON

					Biomass (grams per cubic meter)			
Date	Time	Organism	Count (cells/mL)	Percent of total	Dry weight	Ash weight	Organic weight (grams)	Sampling method
Feb 02	1900	CHLOROPHYTA						Water pump
		Chlorophyceae						
		Ulothrix	1200	25				
		CYANOPHYTA						
		Myxophyeae						
		Anabaena	3600	75	0.5	0.2	0.3	
		TOTAL	4800					

Benthic invertebrates

Benthic-invertebrate tables presented in this fashion should include metamorphic stage, percent composition, and diversity index. Other information should be the same as that given in the zooplankton table.

Table 9.--Data-table format (typed) for publishing benthic-invertebrate data

QUALITATIVE AND ASSOCIATED QUANTITATIVE ANALYSES OF BIOLOGICAL DATA, WATER YEAR OCTOBER 1975 TO SEPTEMBER 1976

BENTHIC INVERTEBRATES

Date	Time	Length of exposure (days)	Organism	Meta-morphic stage	Organism count Total	Organism count (no./m^2)	Percent compo-sition	Di-versity index	Biomass wet weight (g/m^2)	Sampling method
Mar 20		21	ARTHROPODA							Multiplate
			Crustacea							artificial
			Amphipoda			35				substrate
			Isopoda			2				
			Insecta							
			Diptera							
			Chironomidae			14				
			Trichoptera			1				
			TOTAL			52		2.84	3.1	
May 01	1900		ARTHROPODA							Peterson grab
			Insecta							(composite of
			Diptera							4 samples)
			Chironomidae	larva	25	75	52			
			Ephemeroptera							
			Ephemeridae	nymph	6	16	11			
			Plecoptera							
			Periodidae	nymph	4	11	7			
			Trichoptera							
			Hydropsychidae	larva	8	22	15			
			Limnephilidae	larva	8	22	15			
			TOTAL		54	146				

Analyses of Samples, Partial-Record Stations and Miscellaneous Sites

Water-quality and sediment data for partial-record stations and miscellaneous sites at ungaged locations are normally published in a separate section (or sections) after the section on water-discharge partial-record stations and miscellaneous sites. However, if a water-quality partial-record station or miscellaneous site is at a continuous water-discharge station, water-quality data are placed immediately following the water-discharge complete-record station with the heading:

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water year 1983.

or

PERIOD OF RECORD.--Water years 1970-83.

or

PERIOD OF RECORD.--Water year 1976 to current year.

Water-quality partial-record stations and miscellaneous sites not located at continuous water-discharge stations are arranged by river basin in downstream order with station or site number, station or site name, and, in parentheses, the latitude and longitude. Water-quality analyses and sediment data are listed in downstream order usually in separate tables. The title will appear as a running head in capital letters. (See Appendix A, example 27.)

A statement explaining the purpose of water-quality partial-record stations or miscellaneous sites should appear at the beginning of the section. The statement should be the same as or similar to the following:

Water-quality partial-record stations and miscellaneous sites are locations where chemical-quality, biological and/or sediment data are collected once only, intermittently, or systematically but on limited frequency over a period of years for use in hydrologic analyses.

The station name for water-quality analyses (chemical data) may not be printed in full on the computer printout; the name is printed as it appears in the header file. The District need not type and splice in the full station name to replace the abbreviated name, but will need to add the basin name in upper case above the first station title in each basin. Space is provided on the printout.

A station name will need to be retyped and spliced in only where it is so long that it would not be understandable to the user. The basin name and station title, if necessary, will be typed with a font that matches the computer-printout type.

EXAMPLE:

Station title as it may appear on the computer printout:

08048000 WF TRINITY R AT FT WORTH TEX (LAT 32° 45' 40" LONG 097° 29' 55")

If this is not considered understandable to the user, it may be retyped as:

TRINITY RIVER BASIN

08048000 WEST FORK TRINITY RIVER AT FORT WORTH, TX

(LAT 32° 45' 40" LONG 097° 29' 55")

Remark Codes

Footnotes for surface-water-quality records differ from those for water-discharge records in that the symbols appearing in the tables are, with minor exceptions, computer generated. Because of the technical aspects of remark codes that may be printed in data tables, personnel responsible for formatting water-quality data tables should read Quality of Water Branch Technical Memorandum No. 81.22, which defines the "less than" and "ND" remarks, reviews the implications of remark codes, and outlines the options available to the user relative to WATSTORE, SAS, and statistical procedures in general. The remark codes presently available for use in WATSTORE are described in Volume 3, Chapter II, Section A, Page 15 of the WATSTORE manual.

Except for the standard mathematics symbols "<" and ">", explanations of the remark symbols appearing in water-quality data tables preferably should appear on the page (or pages) to which they apply. However, if this is not feasible or would result in use of excessive space, then it may be more practical to place an appropriate summary explanation in the introductory text (Appendix A, example 8), at the beginning of the surface-water records (Appendix A, example 9), and at the beginning of the ground-water-quality records. (Appendix A, example 10.) An explanation similar to the following should be used:

The value for each parameter of water quality may be qualified by a printed remark code. The remark and the corresponding printed symbol that may appear in the data tables are listed below.

REMARK CODES for Water-Quality Data

Symbol	Remark
E	Estimated value
<	Actual value is known to be less than the value shown
>	Actual value is known to be greater than the value shown
K	Results based on colony count outside the acceptance range (non-ideal colony count)
L	Biological organism count less than 0.5 percent (organism may be observed rather than counted)
D	Biological organism count equal to or greater than 15 percent (dominant)
&	Biological organism estimated as dominant

Table Titles

All surface-water-quality tables should have a title that is centered immediately above each table. This title states the type of data in the table and the inclusive dates of measurement for the water year.

All water-quality analyses except those for daily values should have the following title printed by the computer:

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

or

WATER QUALITY DATA, DECEMBER 1981 to SEPTEMBER 1982

If the records ceased before the end of the water year, the title should be changed to agree with the inclusive date for the period of record.

WATER QUALITY DATA, OCTOBER 1981 to MARCH 1982

The table titles for daily values are printed by the computer and only need to be changed if the inclusive dates are not for an entire water year, as shown above.

GROUND-WATER-LEVEL DATA

Records to be Published

Water-level and water-quality data from basic networks of observation wells should be published. In most States, wells included in the water-level network are not the same wells as those in the water-quality network and the two types of data are published in separate sections of the data report. (See section "Ground-water-quality data.) Also, many States do not include records of all water-level observation wells that are measured regularly. The published data in this series of reports are intended to provide a sampling of water-level changes in the Nation's important aquifers. This network of "Federal" wells has been maintained with few changes from the well network reported in the series of Water-Supply Papers titled "Ground-water levels in the United States," last published for the 1974 calendar year.

Criteria for reporting revisions of published records have not been established. Where published records are found to be in error, each District is responsible for revising the data base in the WATSTORE computer files but republishing the revised data in this report series is not recommended.

A section for quality-of-ground-water data will follow the section on ground water-level data in the annual data report. Interleaving of water-level and quality-of-ground-water data usually is not appropriate because the two types of data generally are not obtained from the same well, and each individual printout of an analysis would require a separate set of space-consuming headings. Instructions for reporting quality-of-ground-water data are given following instructions for reporting ground-water-level data.

Arrangement of Water-Level Data

Water-level observation wells should be listed by county (or other geographic unit) in alphabetical order and then either by an optional local well number or name (or both) within each county (or other geographic unit) or by ascending order of latitude within the county. Each record should include the description of the well and a tabulation of water levels measured during the water year.

Description Headings

The use of International System (SI) units in the station manuscript is no longer required. The recommended order and format for the description of a well and the record follows:

Well Number

This entry will report the 15-digit well-identification number and the local well number or name (or both). The identification number is a mandatory unique data-site number, based on latitude and longitude, that identifies the well. The local well number or name is formatted to best suit the District's needs. It commonly contains information on the well's location. (See Appendix B, example 21.)

Location

The next entry is headed "LOCATION" and contains the latitude and longitude, derived from the best available maps (given in degrees, minutes, and seconds); a landline location designation, if desired; the hydrologic unit number (from hydrologic unit maps); other pertinent identification; the distance and direction from a geographic point of reference, if desired; and, lastly, the owner's name.

Aquifer

This entry should designate by name (if name exists) and geologic age the aquifer(s) open to the well. The aquifer code, as used in the Ground-Water Site-Inventory (GWSI) files of WATSTORE, also may be shown. Where the aquifer penetrated by the observation well is clearly under either water-table or artesian conditions, these terms may be included in the aquifer description where the information is deemed useful. In cases in which the condition is unknown or of an intermediate nature, it is recommended that reference to water-table or artesian conditions be omitted.

Well Characteristics

This entry describes the well in terms of depth, diameter, casing depth and/or screened interval, method of construction, use, and additional information such as casing breaks, collapsed screen, and other changes since construction. Linear dimensions are expressed in inch-pound units (feet, inches).

Instrumentation

This paragraph provides information on both the frequency of measurement and the recording or measuring method used. This information allows the user to better evaluate the reported water-level extremes, by knowing whether they are based on weekly, monthly, or some other frequency of measurement.
Examples of possible entries under "INSTRUMENTATION" are:

- o Monthly measurement with chalked tape by USGS personnel.
- o Quarterly air line measurements by observer.
- o Continuous strip-chart recorder.
- o Digital recorder--15-minute punch.

Datum

This entry describes both the current measuring point and the land-surface elevation at the well.

The measuring point (MP) should be described physically (such as top of collar, notch in top of casing, plug in pump base, and so on), and in relation to land surface (such as 1.3 ft above land surface). Because the land surface normally is disturbed during well installation, and/or the well may be located in a building or may penetrate a concrete slab, the distance between the MP and land surface may be difficult to measure. For this reason, this distance normally should be reported to the nearest foot or tenth of a foot. The elevation of the measuring point also may be described in feet above (or below) NGVD of 1929; it should be reported with a precision depending on the method of determination. Surveyed points may have a precision of 0.1 or 0.01 ft, whereas elevation extrapolated from topographic maps normally should be reported to the nearest foot. The land-surface elevation at the well should be given in feet above (or below) NGVD of 1929; it is normally reported to the nearest foot or tenths of a foot.

Remarks

This entry describes factors that may affect the water level in a well, or the measurement of the water level. It should identify wells that also are water-quality observation wells. Examples of remark statements that may be appropriate are:

- o Water level affected by pumping of nearby well.
- o Water level affected by regional drawdown cone.
- o Water level affected by tidal fluctuations.
- o Water level fluctuates with river stage.
- o Record lost between March 3 and April 16 because clock stopped; 8.5 ft of oil in casing; upper surface of oil measured; no correction applied.
- o Well also sampled for water quality.

Period of Record

This entry indicates the month and year of the start of publication of water level records by the U.S. Geological Survey, and the words "to current year" if records are to be continued into the following year. (See Appendix A, examples 28-29.) If measurements are not being continued through the end of the current water year, the ending date will be shown, followed by the word "discontinued." A break in record of longer than 1 year should be indicated by an ending date followed by a new beginning date (month and year).

Periods for which water-level records are available, but are not published by the U.S. Geological Survey, may be noted, provided the note includes a description of where the records are available (such as State or county reports, or files in the District office) as shown in the following example:

- PERIOD OF RECORD.--May 1949 to November 1961, August 1964 to current year. Records from December 1961, to July 1964 are unpublished and available in files of the Geological Survey.

Extremes for Period of Record

This entry contains the highest and lowest water levels of the period of published record, with respect to land-surface datum (lsd), and the dates of their occurrence. For example:

- Highest water level, 17.55 ft below land-surface datum, June 5, 1980. Lowest water level 23.74 ft below land-surface datum, April 15, 1981.

Data Tables

The EXTREMES FOR PERIOD OF RECORD entry normally completes the descriptive material and is followed by a table of water levels. Only recorded or measured values should be included in the table. Estimated values should generally not be published. If estimated values are published, they should always be identified either by a footnote to the table or by an appropriate statement in the REMARKS paragraph. Water levels normally will be reported in feet below land surface datum.

If daily values are available from, for example, a continuous strip-chart recorder, an abbreviated (72 water levels) table should normally be published, containing 12 monthly columns that report water levels for the 5th, 10th, 15th, 20th, and 25th day and for the end of each month. (See Appendix A, example 28.) Reporting the complete record (365 water levels) is not recommended, but may be done at the District's option. (Although not commonly required to define ground-water-level trends, some Districts publish daily values.) Missing records should be indicated by dashes in place of the water level. An explanation of the dash should be given, either in an appropriate footnote or in the explanation of the ground-water records in the introductory text. The daily value reported normally should be the daily low-water level. However, regardless of whether the daily low, daily high, or daily mean level is published, the type of water-level measurement reported should be specified in the introductory text section "Records of Ground-Water Levels," if not in the table headings.

If multiple values (at least six) are available for the water year, but not daily values, the table should contain six columns in which the water levels are listed sequentially according to the date of measurement.

If fewer than six values are available for the water year, they should be listed, by date, on a single line.

The highest and lowest water levels of the water year and their dates of occurrence should be shown on a line below the table. These water levels should be based on all measurements made during the year. Because all daily values are not published (for example, only 72 values are listed in the abbreviated table and those listed, normally, are only the daily lows), the extremes may be values that are not be listed in the table.

Computer programs are available to generate the descriptive material and tables of water levels in the formats described above. (See WATSTORE Volume 2, Chapter 4, Section L.) These programs can merge data from the Daily Values File and the Ground-Water Site-Inventory File to produce the desired format. Sample output for the 12-column and the 6-column format are shown in Appendix A, examples 28-29.

For water-level observation-well networks involving a large number of wells that are measured only once or twice a year, the above formats are not space efficient. Some States have combined the descriptive information and water-level measurements for multiple wells in one table, although this method of reporting the data is less desirable because it limits the descriptive information available to users.

If a single table is used to report data for multiple wells, care must be taken to include the most useful information normally included in the well and record description. A sample format has been programmed and is contained in WATSTORE Volume 2, Chapter 4, Section L, and a sample of the output is shown in Appendix A, example 31.

GROUND-WATER-QUALITY DATA

Arrangement of Records

Chemical analyses of ground water should be published under a section headed QUALITY OF GROUND WATER. All ground-water-quality data collected from network or project wells should be published. Water-quality observation wells should be listed by county (or other geographic unit) in alphabetical order, and then either by optional well number or name (or both) within each county (or other geographic unit) or by ascending order of latitude within the county. Instructions for retrieving ground-water-quality data are similar to those given under "Procedures for Retrieval of Data for Publication" in the section titled "Surface-Water-Quality Data." Use programs E771 for retrieval of data and A534 for table printouts, and designate "type 3" for ground-water-quality analyses. An example of the format for reporting the data is given in Appendix A, example 34.

Data Tables

The ground-water-quality section follows the section entitled GROUND-WATER-LEVEL DATA. The water-year heading should be centered under the table heading, as follows:

QUALITY OF GROUND WATER

WATER-QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983.

Districts should define identification terminology and those geologic units used in the report. These explanations may come between the table heading and the water-year heading or at the bottom of the first page of ground-water-quality data. Examples of these definitions follow:

(Local Identifier: indicates location by township, range, and section. Geologic Unit: 112SDGV, Pleistocene sand and gravel; 211FXHL, Fox Hills Sandstone, 310KIBB, Kaibab Limestone.)

Chemical constituents in the tables will be listed in the same order as designated for those published in surface-water-quality tables. Examples of the format for reporting the data are given in Appendix A, example 34.

PRECIPITATION-QUALITY DATA

Early in the 1983 water year, a network of precipitation-quality monitoring stations became operational. In conjunction with the establishment of the network, decisions on storage and retrieval of precipitation data (precipitation quantity and quality data) will be made by the Quality of Water Branch. Pending these decisions, interim guidelines for publishing precipitation data are presented here. These guidelines are similar to the publication format devised by the New York District.

Precipitation-quality-data tables should be in the last section of the report. They should immediately follow the section on "Quality of Ground Water."

Arrangement of Records

A method for numbering precipitation stations presently is not available. Accordingly, the recommended order of presentation is alphabetical by county, although presentation by drainage basin is an alternative if deemed more useful. If more than one precipitation station is located within a county (or drainage basin), the stations may be arranged either in order of increasing site-identification numbers or alphabetically by station name.

The format arrangement for publishing quality-of-precipitation data is a descriptive heading for the station, followed by the table values. The following sections discuss the description headings and the composition of the tables.

Description Headings

Quality-of-precipitation data should begin on a new page. A heading titled "CHEMICAL QUALITY OF PRECIPITATION should be centered at the top of each page. The station name is centered below, as follows:

o **STILLWATER RESERVOIR NATIONAL WEATHER SERVICE STATION AT**

STILLWATER RESERVOIR, NY

The station description should contain the following paragraph headings in the order given below:

Location

This entry should contain information similar to that included in the location paragraph for a surface-water discharge station; for example:

- LOCATION.--Lat 43°53'28", long 75°02'10", Herkimer County, at National Weather service station "Stillwater Reservoir," 0.3 mi northwest of New York State Department of Environmental Conservation forest ranger's cabin, 0.8 mi southeast of Stillwater Reservoir dam, and 6.8 mi west of Beaver River.

Period of Record

This entry is identical to period-of-record paragraphs for surface-water-quality data. The word "composite" and a description of the composite period may appear in parentheses following the date(s) at the District's option; for example:

- PERIOD OF RECORD.--October 1977 to current year (monthly composite).

Instrumentation

A complete description of the sampling equipment or instrumentation should be included in this entry; for example:

- INSTRUMENTATION.--The sample collector is a straight-sided polyethylene funnel approximately 6.5 in. in diameter that drains into a glass receiving bottle. Looped plastic tubing connects the funnel with the receiving bottle to retard evaporation. The polyethylene funnel is heated during the cold-weather season for snow collection. The receiving bottle is enclosed in an insulated box. The opening to the collector is approximately 5 ft above ground level and is protected by a windshield.

Remarks

Pertinent information not covered in the other entries should be included here. This may include but is not limited to, information about sample storage and analytical techniques; for example:

REMARKS.--Inches of precipitation was measured by the National Weather Service station for the reported period of sampling. Analyses of samples for the 1979 water year were delayed beyond the usual time. Specific conductance and pH were measured within approximately 2 months after the end of the composite period. However, chemical analyses were not performed until the end of the water year. All samples were stored at 4°C from the time of receipt until analysis.

Data Tables

Precipitation-quality data tables should be arranged in a similar fashion to surface-water-quality data tables. The composite period of collection should be reported first, followed by the inches of precipitation for the period of collection. Measured constituents should follow, arranged in an order similar to that recommended for constituents surface-water-quality tables. An example of a precipitation data table follows:

Table 10.--Data-table format (typed) for publishing precipitation-quality data

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1980 TO SEPTEMBER 1981

MONTHLY COMPOSITE

PERIOD OF COLLECTION	INCHES OF PRECIPI-TATION	CAL-CIUM (CA) (mg/L)	MAGNE-SIUM (MG) (mg/L)	SODIUM (NA) (mg/L)	POTAS-SIUM (K) (mg/L)	SULFATE (SO4) (mg/L)	CHLO-RIDE (CL) (mg/L)
80/10/01 TO 80/10/31	6.69	.14	.08	.11	.03	1.70	.12
80/10/31 TO 80/12/01	3.59	.59	.12	.00	.11	4.70	.19
80/12/01 TO 81/01/01	2.65	.22	.02	.07	.16	3.30	.46
81/01/01 TO 81/02/01	2.01	---	---	---	---	5.70	.68
81/02/01 TO 81/03/02	3.44	.18	.02	---	.13	7.20	.54
81/03/02 TO 81/04/01	2.08	2.00	.44	---	.11	5.50	.48
81/04/01 TO 81/05/01	4.70	1.20	.23	.46	.09	4.50	.61
81/05/01 TO 81/05/31	3.49	.88	.19	.15	.31	5.00	.31
81/05/31 TO 81/07/02	6.19	.05	.01	.18	.26	2.60	.09
81/08/01 TO 81/09/02	4.75	.63	.07	.14	.06	5.20	.33
81/09/02 TO 81/10/01	4.19	.39	.03	.16	.05	3.40	.11

(Note: Example from NY-81-3, p. 195 - partial table)

INDEXING THE REPORT

Each State annual hydrologic-data report should contain an index. (See Appendix A, example 36.) The index should begin on an odd (right-hand) page; if the last page of records is an odd page, a blank even (left-hand) page will face the first page of the index. The page number should be located in the same position (upper right and left corners of each page) as in the other parts of the text.

Entries in the index are made for each continuous-record station, partial-record station, and miscellaneous site; entries are also made for each section of the introductory text, for each of the terms listed under "Definitions of Terms," for each illustration, and for each station plotted on graphs in the "Summary of Hydrologic Conditions" section. For some Districts, listing each miscellaneous site, especially those associated with projects, may not be practical. In these instances, only an appropriate general entry, as illustrated in the following paragraphs, is required. However, whenever feasible, the individual miscellaneous-site listings should be made.

A general entry is made for each river basin, and for groups of records in a basin, such as gaging-station records, reservoirs, low-flow or crest-stage partial-record stations, measurements at miscellaneous sites, or seepage investigations. Examples of these listings are given below:

For a single group of records in a basin:

Page

Saco River basin, gaging-station records in.........

For several groups of records in a basin:

Deschutes River basin, crest-stage partial-
record stations in.............................
discharge measurements at miscellaneous sites
in...
diversions from, above Bend, OR..................
gaging-station records in........................
low-flow partial-record stations in..............
reservoirs in, above Bend, OR....................
water-quality miscellaneous sites in.............
water-quality partial-record stations in.........

For various other headings (other than "* * * River basin"):

Dolores River, near Cisco...........................
tributaries between, and Green River, gaging-
station records for..........................

Imperial Dam, diversions and return flows at and
below......................................

Page

Lake Superior, streams tributary to, crest-stage partial-record stations for....................
discharge measurements at miscellaneous sites for...
gaging-station records for.........................
low-flow partial-record stations for..............

Long Island, streams on, discharge measurements at miscellaneous sites for........................
gaging-station records for.........................
low-flow partial-record stations for..............
water-quality partial-record stations for.........

Molokai, island of, gaging-station records on........

Palo Verde Dam, tributaries between, and Parker Dam, gaging-station records for................

Transmountain diversions, from Colorado River basin, above Compact Point, near Lees Ferry, AZ...

On rare occasions when dual headings are used (closed-basin situation) both the major basin and the subbasin are indexed to identify the gaging-station records published. An example is the subheading "Closed basin in San Luis Valley, CO," which is indexed as "San Luis Valley, CO., closed basin in, gaging-station records for streams in"; the same page numbers are also included in the listing "Rio Grande basin, gaging-station records in," as the closed basin lies within the Rio Grande basin.

If only a single gaging-station record is published for a particular river basin (and no partial-record stations or other data are published), the index listing for the basin is omitted.

Each gaging station is listed as a direct alphabetical entry under stream name (giving the complete station name), and as an indirect entry, by locality. Each partial-record station is listed with a direct entry. Also, each miscellaneous site normally is listed with a direct entry; however, in some Districts this may not be practical. Districts also are encouraged to list an indirect entry for each partial-record and miscellaneous site, if feasible. The indirect entry is very helpful to users of the reports who may wish to find all records near a particular town. For example, at least 20 stations are referenced to Miami, Florida.

The direct listing by stream name is a separate entry for each station; for a single station on a stream, a single-entry listing is used; for more than one station on a stream, or a stream system (including branches or forks), a multiple-entry listing is used.

Some examples of direct single-entry listings are:

Page

Fish River near Fort Ken..........................
Little Bear Creek near Halltown...................
Oahe Reservoir near Pierre........................
Templeton Gap floodway at Colorado Springs........
Ward tunnel outlet at Huntington Lake.............

Some examples of direct multiple-entry listings are:

Page

Willamette River, at Albany.......................
at Harrisburg.............................
at Salem..................................
at Wilsonville............................
Coast Fork, at London.....................
below Cottage Grove Dam...................
near Goshen...............................
Middle Fork, above Salt Creek, near Oakridge...
at Jasper.................................
below North Fork, near Oakridge...........
near Dexter...............................
near Oakridge.............................
North Fork of, near Oakridge..............
near Salem................................

(Note that the next-to-last station in the above list is on the North Fork of the Middle Fork Willamette River, so it is indented under Middle Fork.) The proper alphabetical order of stream names (or of place names for the indirect entries) seems to cause a great deal of confusion. The above examples show that entries are in alphabetical order after the first comma in the stream name. Words before the first comma are omitted in the indented subheadings. For the Middle Fork Willamette River in the above example, the order is based on the designation "above," "at," "below," and "near." For the two Middle Fork stations with the "near" reference, the order is based on the place names "Dexter" and "Oakridge".

State names should not be listed in the index, except for reports that cover more than one State or for stations in States adjacent to the State for which the report is published.

Different streams with the same name are listed separately and identified appropriately. Placing basin name in parentheses after the stream name will usually distinguish different streams with the same name. If two or more streams with the same name are located in the same basin, indicate in parentheses the name of the stream to which each is tributary to distinguish them. Some examples of direct single-entry listings for different streams with the same name are:

Page

Fish Creek (streams on Douglas Island) near Auke Bay.....................................
Fish Creek (streams on Revillagigedo Island) near Ketchikan...........................
Goose Creek (Platte River basin) above Cheesman Lake.....................................
Goose Creek (Rio Grande basin) at Wagonwheel.....
Pigeon River (tributary to Indian River) at Afton
Pigeon River (tributary to Lake Huron) near Owendale................................
Pigeon River (tributary to Lake Superior) at Middle Falls, below International Bridge...

Alphabetize items in order by the first word of the name. For example, Big Sioux River precedes Bighorn River; Bad River precedes Badger Creek; Au Sable precedes Ausable; and New York precedes Newark. If the first word for two or more listings is the same, use the second word to determine order, then the third, and so on--thus, "Mosquito Creek below Mosquito Creek Dam, near Cortland," precedes "Mosquito Creek Reservoir."

Whenever a designation such as "East," "North," "Middle," "Big," "Little," is a part of the stream name (without the term "Fork," "Branch," or the like), the complete name is used for indexing. Thus "Big Sioux River" is listed under "B," and "Little Sioux River," under "L." In the following example, the station on Middle Tuolumne River is listed under "M," whereas other stations in the basin are listed under "T," as:

Page

Middle Tuolumne River * * *...............
Tuolumne River, above * * *...............
at * * *................................
near * * *..............................
North Fork, * * *......................
South Fork, * * *......................

Stations on East Goose Creek, Goose Creek, Little Goose Creek, and West Goose Creek, are indexed under "E," "G," "L," and "W," respectively, as each name is complete without modifers.

Where the generic term precedes the rest of the stream name, the direct-entry listing is based on the same rule; that is, index by the complete stream name. Thus, a station on Rio Fernando de Taos is indexed under "R," not "F" or "T." Likewise, the station on Bayou Funny Louis is indexed under "B," not "F" or "L." Stations on River Raisin are indexed under the word "River."

Although the term "Fork" is properly used only with the name of the main stream to designate a branch, the names of some streams have been published as "* * * Fork near * * *" without any other stream name. This is common in Kentucky, Ohio, and Utah, but uncommon elsewhere. A large stream in Montana is named "Clark Fork" (the complete stream name), whereas another stream, also in Montana, is named "Clarks Fork Yellowstone River." The first stream is indexed under "Clark," the second under "Yellowstone River, Clarks Fork." The Red River (a tributary of the lower Mississippi River) has a variety of named forks. A partial listing from WSP 1711, p. 591 (Part 7. Lower Mississippi River Basin, 1960) but modified to show strict application of rules is:

	Page
Red River, at Alexandria, LA......................	
at Fulton, AR.................................	
near Hosston, LA..............................	
near Terral, OK...............................	
North Fork, below Altus Dam, near Lugert, OK..	
Elm Fork of, near Carl, OK.................	
near Carter, OK............................	
Prairie Dog Town Fork, near Brice, TX.........	
Salt Fork, at Magnum, OK......................	
near Wellington, TX........................	

An example of an indirect entry, by place name, is given below:

	Page
Bend, Deschutes River below.....................	**63**
Deschutes River near.........................	**60,61**
diversions from Deschutes River near.........	**62**
reservoirs in Deschutes River basin	
above....................................	**59**
Tumalo Creek near............................	**64,65**

The listing of two page numbers (60, 61) above shows that two gaging stations on successive pages are listed under one entry, in abbreviated form. The full names of the two stations are Deschutes River at Benham Falls, near Bend, and Deschutes River below Lava Island, near Bend. Of course, a direct entry with the complete name for each station also is included in the index. If records for a single station extend to two pages, a hyphen, rather than a comma, will be used--for example, 64-65.

A group of reservoirs is indexed under the basin name and under reservoirs as:

Delaware River basin, reservoirs in........................
Reservoirs in Delaware River basin.........................

Each reservoir, whether published separately or in a group, also is indexed separately, by reservoir name. In addition, all reservoirs should be listed, under the heading "Lakes and reservoirs," as shown below.

Page

Lakes and reservoirs:
Atwood Reservoir......................................
Beach City Reservoir..................................
Cagles Mill Reservoir, change in contents in..........
Charles Mill Reservoir................................
Chatauqua Lake near Mayville..........................
Clarion River, East Branch, Reservoir.................
Claytor Reservoir, change in contents in..............
Deep Creek Reservoir..................................
Delaware Reservoir....................................
Dewey Reservoir near Van Lear.........................
Dover Reservoir.......................................
Geist Reservoir, change in contents in................
Glendale, Lake, change in contents in.................
Hoover Reservoir......................................
Lemon, Lake, change in contents in....................
Pymatuning Reservoir..................................
Rough River Reservoir near Falls of Rough.............
Tom Jenkins Reservoir at Burr Oak.....................
Tygart Reservoir......................................

Note that the list is alphabetical by name, regardless of whether the word "Lake" precedes or follows the given name. Thus, for Lake Lemon, the listing is "Lemon, Lake." The list includes those lakes and reservoirs for which only change-in-contents is reported with a streamflow record.

The entry "Reservoirs. See Lakes and reservoirs," also should be added to the index.

Each diversion, even though published in a group, also should be listed separately in the index.

Partial-record stations and miscellaneous sites should be listed individually by station name or stream name (direct entry), but listing by place name (indirect entry) is optional.

Special investigations should be indexed as follows:

Page

Low-flow investigations, Au Sable River,
East Branch, near Grayling...............
Rifle River near Rose City ....

Index by stream name as follows:

Page

Au Sable River (tributary to Lake Huron),
at Grayling..............................
at Mio..................................
East Branch near Grayling, low-flow
investigation.........................

When a stream name is changed, list the old name as well as the new name in the index, in one report only. This should be helpful to users of the data who are unaware of the name change.

When a station is discontinued during or at the end of the current year, list the station in the index in the usual manner, but delete it the next year. Whenever part of a multiple entry is dropped, the entire entry should be examined to see if any other items in the listing need to be deleted or changed, or if additions are needed to make the entry complete.

Ground-water level and ground-water-quality data should be indexed by county (or other geographic division), but <u>not</u> by individual well. An example of indexing by county follows:

* * * * *

Dodge, Trempealeau River at...................................
Door County, ground-water levels in...........................
Douglas County, ground-water levels in........................
quality of ground water in.................................
Douglas Creek, near Prentice..................................

* * * * *

Ground water, chemical analysis of.............................
levels, by counties..
Gudegast Creek near Starks.....................................

* * * * *

Another arrangement not only lists ground-water data by each county throughout the index as indicated in the example above, but also <u>collectively</u> under the headings "Ground-water-level data, by counties:" and Ground-water-quality data by counties:", as in the following examples:

* * * * *

Green River, near New Hradec...................................
Tributary near New Hradec..................................
Tributary near South Heart.................................
Griggs county, ground-water levels in..........................

Ground-water-level data, by counties:

Aitkin County..
Bowman County..
Burleigh County..
Cass County..

*　　*　　*　　*　　*

Wells County...
Williams County..
Ground-water-quality data, by counties:
Aitkin County..
Burke County...
Burleigh County..
Dickey County..

*　　*　　*　　*　　*

Precipitation-quality stations should be indexed by county (or other geographic division) or by place name, as follows:

*　　*　　*　　*　　*

Athens, Pa., chemical quality
of precipitation near.....................................

*　　*　　*　　*　　*

In addition to individual listings as shown in the above example, these stations should also be listed <u>collectively</u> under the heading "Precipitation-quality stations, Analyses of samples collected," as follows:

*　　*　　*　　*　　*

Precipitation-quality stations, analyses
of samples collected
at Allegany State Park.....................................
at Mays Point..
at Mendon Ponds..
near Athens, PA..

*　　*　　*　　*　　*

PREPARATION OF CAMERA-READY COPY FOR DIRECT-IMAGE OFFSET PRINTING

The term "offset copy" is considered to mean "copy prepared ready for the camera, from which a plate will be made for use in the offset process." The term "typed image" is used to denote a dimension or area within which the typing (or machine listing) is set on the page for offset copy; that is, before reduction. The term "printed image" is used for a dimension or area within which the typing or listing appears on the printed page of the report; that is, after reduction.

References essential for those who prepare the manuscript and those who prepare the offset copy include the United States Government Printing Office "Style Manual," 1984 edition; "Suggestions to Authors of the Reports of the United States Geological Survey," fifth edition, 1958, and sixth edition, 1978; and the Water Resources Division Publicatins Guide," 1982 edition.

Format

For uniformity of appearance, the negatives for covers 1 through 4, including the calendar and metric conversion table, and positives for the title page and list of TWRI reports are prepared by the Publications Planning Unit for all State data reports. The remainder of the camera-ready copy is prepared by each District office.

The size of the printed page of the State hydrologic-data reports is 8.5 by 11 in. This permits a maximum printed-image width of 7.1 in. and a maximum length (including running head) of 9.8 in. These printed-image dimensions permit maximum use of space while still providing the necessary margins. The margins should be approximately as follows: inside (binding), 0.75 in.; outside, 0.7 in.; top, 0.6 in., bottom, 0.6 in. (minimum). The bottom margin, of course, will be much larger on many pages, but the top margin should be uniform, except where the heading is lower (first page of major divisions of book).

Because computer-printout tables have been and will continue to be a major part of the camera-ready copy of annual State data reports, it is necessary to prepare oversize copy for the printer and ask that it be reduced by a given percentage. Reducing the 11.5-in. width of the computer printout and its accompanying typed manuscript to a desired 7.1-in. printed width requires a reduction of 39 percent (61 percent of original size). Thus, 61 percent of 11.5 in. equals 7.02 in., which is acceptably close to 7.1 in. The typed-image length before reduction should not exceed 16 in. because a 39-percent reduction will produce a camera-ready printed-image length of 9.8 in., which leaves acceptable top and bottom margins. For the main body of the report, which consists of station records, an alternative way of expressing reduction is to say that the printed image is 61 percent of the original typed copy. The report index that follows the station records also should be prepared for the same 39-percent reduction.

Some Districts may wish to exceed the standard 39-percent reduction discussed above, especially when there is a frequent need to extend the maximum typed-image length beyond the recommended 16 in. for many of the water-quality-data tables. One State data report (WI-83-1) has been successfully printed using a reduction of 50 percent for both the gaging station and index sections of the report.[1] The printed data for this report were quite legible and the increased margins for a gaging-station record (approximately 0.8 in. at top and 1.0 in. and 1.25 in. for left and right, respectively) were considered more desirable than the often crowded margins previously obtained using the standard 39-percent reduction. For most State data reports the rounded percents of 30 and 40 percent (reductions for the introductory text and the gaging-station records, respectively) are recommended, and any variance in the instructions to the printer should be carefully studied before implementation.

The preliminary pages (back-of-title, preface, contents, and list of stations) the introductory text should be prepared for about 29-percent reduction of 10-pitch lettering.[2] The maximum typed dimensions are 10 by 13.75 in.; therefore, the printed image will be 7.1 by 9.8 in. after reduction. Further discussion of format dimensions and reduction for the introductory part of the report is in the section "Contents, List of Stations, and Introductory Text."

Station Description

The station description (above the daily or monthly table) is typed on 25-percent white bond paper, sub 40, and is then (for many States) spliced to tables obtained from the computer. Each station-description entry will be single spaced, with double space between paragraphs, if space permits. For a few gaging stations with long descriptions, it may be necessary to single space between paragraphs in order to stay within the typed-image length limit. To improve appearance, always leave a blank line below the running head and below the station name. The running head and station name (with number) are centered on the page. Ground-water-level descriptions should be single spaced throughout.

The paragraph headings for surface-water pages should be left-justified and alined with the "D" of the DAY column of the daily table, so that the margin will be the same for the station descriptions and tables. Keep the right margin as even as possible whenever the lines are long enough to reach the margin. Use all caps for the paragraph headings, and if the paragraph entry exceeds one line, the second line is indented three spaces.

---

[1]Maximum reduction permitted is 50 percent (WRD Publications Guide, p. 301).

[2]The NTIS report-documentation page should be reduced 20 percent (80 percent of original size).

Secondary capitalized headings, such as those used in water-quality-station descriptions, should be indented two spaces. (See Appendix A, examples 18A and 18B.) If a skeleton rating table is used, leave three blank spaces above the skeleton rating table and two below. Because the rating table is a part of the daily table rather than the station description, the rating table should be closer to the daily table than to the description.

The page numbers are typed on the same line as the running head; odd numbers are alined with the right margin, even numbers with the left margin.

Daily Tables

Be sure that the dates in the table headings are correct. If the table is for less than a full water year, include the month and year of beginning and end of the record in the heading. If it is necessary to type daily figures of hydrologic data, be very careful that the figures aline horizontally and vertically. Daily figures are alined on the decimal points with the right-hand digit under the last letter of the month heading. Type the side headings ("TOTAL", "MEAN", and so on) for monthly figures, alining them under "D" of the DAY column. Monthly figures are alined on the right with daily figures, without regard to positions of the decimal point. Yearly figures are distributed uniformly across the page under the monthy figures. Computer printouts follow this format. See sample station records in Appendix A, examples 15A and 15B.

Tables of monthly data and special short-form tables are prepared in a variety of formats. Examples in this manual and in water-supply papers should help those preparing tables for atypical data.

If more than one page is needed to report data from one gaging station, the complete name of the station, followed by "--Continued" must be repeated at the top (just under running head) of the second and each additional page. Accordingly, the table headings for partial-record stations, miscellaneous measurements, and similar tables should include "--Continued" on the second and additional pages.

Footnotes

If a footnote is required, it should be placed on the second line below the daily or monthly table and indented three spaces from the left margin. See the section "Footnotes and Reference Marks" for a detailed discussion on the use of footnotes.

Surface-Water Partial-Record Stations and Miscellaneous Sites

See sample stations in Appendix A, examples 23-25, for the standard introductory paragraphs to be used and their proper format.

Contents, List of Stations, and Introductory Text

The contents includes all 1st- through 6th-order headings, that appear in the manuscript. Use a 5-space indention for 2d-order headings, a 10-space idention for 3d-order headings, and so forth. Capitalize only the first letter of the first word. Use leaders out to the page number. Wordings of headings must agree with that used in the text. Aline the page number with the right end of the leaders and the two lines below the last listing on the page. Because the entries for the surface-water list of stations can sometimes be quite long, may contain subordinate ranks requiring several indentions, and is followed by letter placed after station names to indicate the type of data collected, only a 3-space indention for each successive indention is recommended. Continuations of entries on additional lines are indented six spaces. When the list of gaging stations is to be continued on a following page, the basin name, main-stem listing (if different from basin name), and all tributaries of higher rank than the first station on the page are "carried over" from the previous page and precedes the first station listed on the next page. See Appendix A, example 6, and previous water-supply papers and State data reports for typical carryovers in the list of gaging stations.

Each successive indention in the contents is five spaces and for the list of stations it is three spaces. Continuations of entries on additional lines are indented six spaces. When the list of gaging stations is to be continued on a following page, the basin name, main-stem listing (if different from basin name), and all tributaries of higher rank than the first station on the page are "carried over" from the previous page to precede the first station listed on the new page. See Appendix A, example 6, and previous water-supply papers and State data reports for typical carryovers in the list of gaging stations.

The introductory pages will look best if typed with a 10-pitch typewriter. If a 12-pitch typewriter is used, a reduction of about 20 percent (instead of 29 percent) should be specified, and the length and width of the typed image will need to be adjusted so that printed image will be 7.1 by 9.8 in.

The pages for the Contents and List of Stations are numbered with Roman numerals. The page number for the first page of the contents is alined with the right end of leaders and two lines below the last station listing on the page. The first page of the introductory text is page 1. The figure "1" is typed two lines below the last line on the page and alined with the right margin. Make sure that the page number always is typed within the final image area.

Illustrations

Illustrations should be prepared at size (no reduction necessary), if possible. However, illustrations usually are drafted 20 to 30 percent larger than publication scale (Suggestions to Authors, Fifth Edition, p. 126). This provides for a reduction of 17 to 23 percent. In some cases, if the original illustration is suitably large and sharp, a reduction of 39 percent (as for gaging-station records) can be made satisfactorily. The proportion (width-to-length) of the illustrations should be about the same as for other pages (7.1 by 9.8 in.), but the shapes of States differ so much that each State map must be handled on an individual basis. Fold-out maps are not permitted because they require special handling and increase printing costs. Use facing pages for larger-than-page-size maps.

Illustrations may be drafted on plain white paper, tracing paper, or drafting plastic (such as "Cronaflex").[1] All drafting, lettering, and titles must be final and ready for the camera. If information is plotted on stable films, time can be saved in future years by eliminating the need for redrafting because of shrinkage or expansion of the base. The recent change to direct-image printing helps decrease costs by eliminating the need for costly negatives for the main body of the report, while still providing quality printing. However, negatives will still be needed for the cover because of the use of color and for detailed illustrations, especially if halftones or other screenings are used. Many Districts now submit illustrations to the printer as negatives and this practice is recommended because it eliminates a costly procedure and speeds up publication of the report. (See sample printer's instructions in Appendix B, example 12.)

Index

The Index is typed on plain white paper, in two columns, for 39 percent reduction--the same as for gaging-station records. It will begin on an odd page. Allow five spaces between columns. The first page will be 1 in. shorter to allow for "sink" at the top of the page. Leave a blank line between the last entry for one letter of the alphabet and the first entry for the next letter unless the last entry for one letter is at the bottom of a column.

Each column on a page should be the same length. In order to balance the column lengths, some adjustments may be necessary. The column lengths of the last page of the index, usually a short page, also should be balanced.

---

[1]Use of the brand names in this report is for identification purposes only and does not constitute endorsement by the U.S. Geological Survey.

The word "INDEX" is centered over the space between columns. On the first page of the index, a five-space underscore line is typed three spaces below the word "INDEX". The word "Page" that heads each column of page numbers is typed two spaces below this underscore on the first page, and two spaces below the word "INDEX" on successive pages. Entries to the index are started on the first line below the word "Page."

The page number for the first page of the index is placed at the lower right of the page, alined at the right with the last leader of the second column, and on the line below the leader. On succeeding pages the page number is placed on the same line as the word "INDEX"; odd numbers are alined with the right margin, even numbers with the left margin.

Each successive indentation in the index is three spaces; for an overrun for an individual entry, indent six spaces. The listings in a multiple entry are indented three spaces after the first listing.

If multiple entries are carried over to a new column, the entire entry must be carried over (do not start a column with an indention). See Appendix A, example 36.

Manual Procedures for Preparation of Camera-Ready Copy

The increased use of word processors by the Districts has produced many changes and improvements in the preparation of the annual State data report. The majority of Districts currently are using word processors to produce final computer-generated tables without the need to cut and paste. In this highly automated procedure, tabular data from present Geological Survey data bases are merged with descriptive information stored in the word processor for output as camera-ready copy. However, because a significant number of Districts have not yet automated the production process for producing the camera-ready copy for their annual data reports and because some of those who have still find occasional need to produce some of the camera-ready copy manually, the following instructions for manually preparing camera-ready copy are provided.

Typing Camera-Ready Copy

Suitable paper used for typing camera-ready copy is 25-percent rag bond, sub 40, 13 in. wide and 18 in. long. Any paper size large enough to conveniently accommodate the maximum typed image of the introductory text (10.0 by 13.75 in.) or the main text (11.5 by 16.0 in.) is satisfactory. Because the paper used is not a common width or length, it may be necessary to have it cut to special order. The sheet length for completely typed pages (introductory text, index, lists of miscellaneous measurements, crest-stage partial-record stations, and so on) must be greater than the maximum type-image length permitted, but for station descriptions, the sheet length needs only to be long enough for the typed portion that will be spliced to the printout.
The most important requirements for typing camera-ready copy are that the

paper or plastic ribbon should be used, rather than the ordinary inkedcloth ribbon. The impression produced by a carbon-paper or plastic ribbon is clear and uniformly black. The type faces and rollers must be kept clean. For cleaning smudges from the camera-ready copy, a kneaded rubber eraser is very effective; this type of eraser does not smudge the typed copy as artgum or ordinary erasers tend to do.

Notes, such as the marking of errors or omissions discovered in proofreading, may be made directly on the camera-ready copy if a "nonreproducing" blue pencil is used. Marks made with this type of pencil will not appear on direct-image plates made from the camera-ready copy. To correct isolated letters or numbers, white opaquing fluid is preferred. Never erase. The most satisfactory method of making large corrections (such as an entire line, a paragraph, or several items in a row in a table) is by "cutting in" the correct data, which are typed on plain white paper of the same stock as the offset paper. The sheet with the correct data is laid over the erroneous data on a light table; after alining the two sheets, both the correct and incorrect portions are cut through with an "X-ACTO" knife or single-edged razor blade. The patch with the correct data is then substituted into the opening, where it will make an exact fit. The patch is held in place with a strip of tape applied on the back of the sheet. An excellent tape for this is 3M brand No. 750. Under no circumstances should cellophane tape be used for this purpose, because it will react to temperature and humidity changes and cause buckling, puckering, and creases in the camera-ready sheet.

Camera-ready copy is prepared from two sources, computer printout and typed sheets. The computer printout table is delivered in a format that should not exceed 11.5 in. of printed width on paper 14.75 in. wide; the typed station descriptions are 11.5 in. of typed width on paper 13 in. wide. Computer printout and typed sheets must be alined vertically, spliced and trimmed to form the 11.5 by 15.5-in. camera-ready copy on 13 by 18-in. sheets of paper. For attractive copy, care must be taken that there is a 1-in. margin above the running head, at least a 0.5-in. margin on each side, and at least a 0.5-in. margin at the bottom of every page. For ease in handling, all sheets should be the same width and within 0.5-in. of the same length.

Laying Out a Camera-Ready Sheet

Some Districts report having achieved a high degree of efficiency in the process of splicing the station description with the computer printout by utilizing special equipment, such as a light table and a marked, translucent cutting board (commercially available). The procedure explained in the following paragraphs, while not as efficient as some methods of splicing that use special equipment, shows that the splicing process can be made acceptably efficient with only a few simple tools.

Type the station description with a 0.75-in. right and left margin (13-in. wide paper with 11.5 in. of typed image). After completing the last line of typed image in the manuscript station description, depress "carrier return" twice and type an underscore mark flush with the left margin. Tab across and type another underscore mark somewhere close to the end of the right margin. When this manuscript material is ready to be spliced into the computer printout, lay a straightedge to match up these two underscore marks (just to the top of the marks) and cut with an X-ACTO knife. (A piece of glass or other protective material should be placed under the cutting area.) This is a simple method to insure accuracy of alinement with a minimum of time involved when cutting the typed station description.

To connect the station description with the computer printout, one should first use an X-ACTO knife and a straightedge to cut the excess paper off the computer sheet just above the table heading. Using a nonreproducing blue pencil and a straightedge, draw a vertical line starting with the outside of the D on DAY to the top of the page. On the station manuscript, draw a vertical line from the E on EXTREMES FOR CURRENT YEAR down to the bottom of the page. Line up the two blue lines; cut a small nick in the paper on the computer sheet where it extends past the manuscript description.

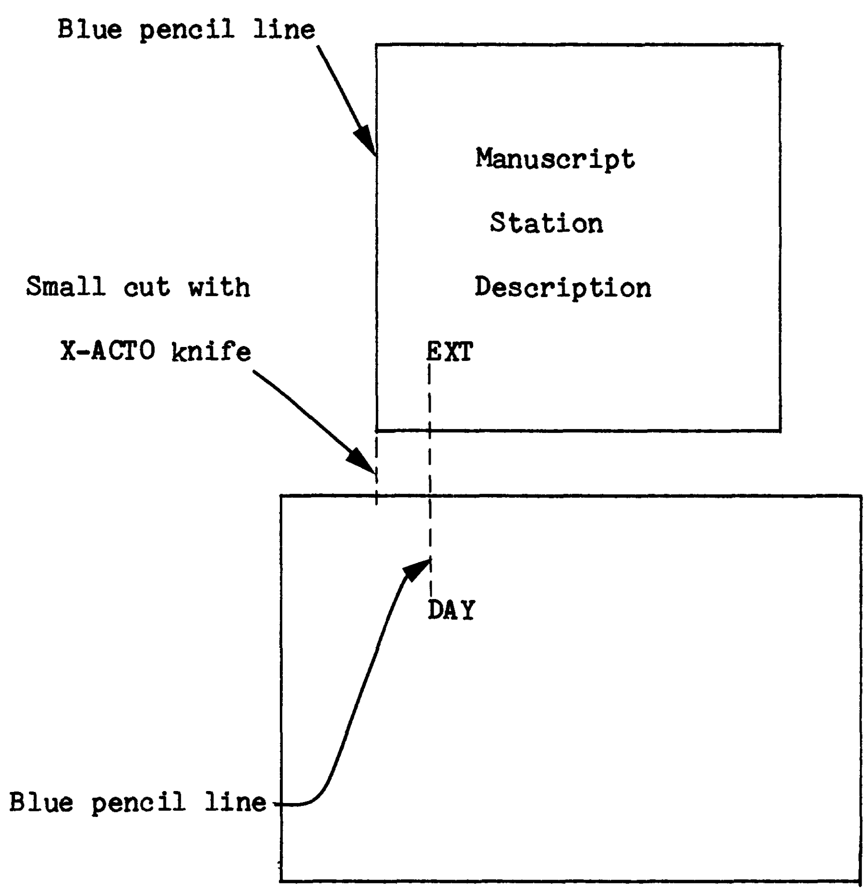


Figure 2.--Alinement of station manuscript sheet with computer printout

Lay the manuscript and computer sheet face down, lining up the "cut mark" on the computer sheet with the edge of the manuscript page. Place a weight on both sheets of paper and tape together. Turn back to where the combined material is facing you and trim with a straightedge and an X-ACTO knife or with a cutting board. The cutting board is faster. For attractive copy, trim the top of the page on the cutting board so it has a 0.5-in. margin at the top of the page. Trim the bottom to fit the 18-in. length. For ease in handling, maintain a uniform 13 by 18-in. size (or whatever size was used) for all the offset sheets.

PRINTING STATE ANNUAL HYDROLOGIC-DATA REPORTS

All printing and binding work for the annual State data reports will be procured through the Government Printing Office (GPO). GPO maintains 14 Regional Printing Procurement Offices in 10 regions throughout the United States. (See Map of Federal Printing Regions in Appendix B, example 13.) Duties and responsibilities of the Regional Offices are related mainly to procuring services from commercial printers on a competitive-bid basis and to make themselves readily available to Federal agencies for consultation and technical advice about requisitioning and printing.

The Standard Form 1, "Printing and Binding Requisition," is the basic form used to request printing, binding and related services from the GPO. A sample printing and binding requisition should show the following items of identification (See Appendix B, example 11, and WRD Publications Guide (1982) Volume 1, p. 353-361):

1. Requisition number--obtain by phone from the WRD Publications Planning Unit.

2. Initials of person authorized to sign requisition.

3. Date of preparation of requisition.

4. Appropriation number assigned by the Publications Planning Unit to which printing costs will be charged.

5. Complete title of report.

6. Number of copies of report to be duplicated. (This number will vary among the various Districts.)

7. Complete shipping address for finished reports.

8. Additional information not covered elsewhere under "Additional Information" section.

9. Signature and title of person authorized to sign the requisition.

In addition to the above, the printing and binding requisitions must contain complete specifications on the trimmed page size of the report, margins, paper, ink, cover stock, number of pages submitted (including blank pages), method of binding, and shipment. The general steps in preparing the annual report for publication and for obtaining printing services are summarized below:

1. The annual questionnaire is sent to Districts by Publications Planning Unit (PPU), usually during the first week of October. (See Appendix B, example 15.) The completed questionnaire will guide PPU in preparing the cover negatives and the title page showing authorship for the data report for the water year just completed. If the District prepares more than one volume, they should duplicate the questionnaire and return a completed copy for each volume. Completed questionnaires should be returned to PPU within 30 days.

2. After receiving the completed questionnaire, PPU will prepare and provide negatives for both sides of the front cover (covers 1 and 2), both sides of the back cover (covers 3 and 4), and the spine strip. A water-year calendar will be on cover 2 and a metric conversion table will be on cover 3. A film positive for the title page and a blank form for the bibliographic data sheet also will be provided with the cover negatives. In addition, a transmittal memorandum will accompany the negatives each year. The memorandum will contain current printing instructions and should be read carefully for any changes. (For example, color of cover ink will change each year.)

   The following three attachments will accompany the memorandum to assist Districts in preparing and submitting their printing and binding requisitions and printer's instructions to GPO: (See Appendix B, examples 9-12.)

   - o A sample copy of a District's transmittal memorandum to GPO.
   - o A sample copy of a District's printing and binding requisition (SF-1).
   - o A sample copy of a District's printer's instructions.

3. When the District has the camera-ready copy of the report ready to submit to GPO, it should phone the PPU to obtain a requisition number. Every printing order requires an individual number. The chargeable account number and the report number also will be supplied at that time. The requisition number may be rescinded if the report is not submitted to GPO within 1 week of the date it was supplied to the District.

4. At the time the report is submitted to GPO, send two photocopies of the completed requisition form (SF-1) to the Publications Planning Unit, MS 418 National Center, Reston, Virginia, 22092. Also attach photocopies (one each) of the transmittal memorandum and printer's instructions. Do <u>not</u> send copies of the SF-1 to the Branch of Financial Management (BFM). All Districts should request two sets of prebinding proofs from the printer for approval before binding. Five or six weeks lead time for these sample books should be adequate.

5. Phone in the bid estimate to PPU not later than 4 weeks after the SF-1 is sent to GPO. If a District has not received a written estimate by then, call GPO to obtain the bid estimate. GPO can provide the bid estimate quickly if they are given the requisition number and date on the submitted SF-1. Districts are requested to inform GPO to call the District for approval before awarding the bid. This request may speed up the notification process and also will allow the District to compare costs with that of the previous year to make sure the bid is reasonable. This is especially true in light of the fact that the less expensive direct-image offset process is now being used. If the freight charges or the GPO 6-percent surcharge are not included in the estimate, make that clear when calling in the bid estimate. Once PPU receives the bid estimate, it will write the estimate on the SF-1 and forward one copy of the requisition to BFM so that funds will be set aside for the billing invoice, which will be sent to BFM by GPO.

6. The District should check the two sample books it receives from the printer for print quality and accuracy before giving approval to bind the job. The reductions, margins, and alinement should be thoroughly checked before giving approval. Also, check all illustrations carefully. After examining covers and text for errors, however, always retain one sample book (with duplicate marked corrections, if any, for the printer) as proof of what has been approved.

7. After the printing is completed, send 22 copies of the data report to PPU. The District should check several of the books in each box delivered by the printer for print quality as soon as possible after the delivery. Call the GPO quality-assurance officer if you discover any serious printing defects. Districts should not instruct the printer to mail the data reports to those on the District's mailing list, for if there are serious printing defects, GPO may require the District to randomly select samples from the boxes delivered to judge the overall quality of the printing. This would not be possible, of course, if the printer did the mailing. The quality-level request on the SF-1 should be Level 4 (Basic Quality). Errata sheets should be avoided; but, if needed, be sure that each of the copies submitted to PPU contain these sheets, so that copies forwarded to the National Technical Information Service (NTIS) to be microfiched will contain the corrections.

Several additional guidelines that should be observed with regard to preparation of data reports are:

1. The District is responsible for the accuracy of the cover negatives supplied by PPU. Negatives for the two outside covers and spine and the title page positive should be carefully proofed immediately after they are received. Notify the PPU immediately if any errors are found.

2. If there are any blank pages in the data report, add the sentence THIS IS A BLANK PAGE to each such page to help users of the report.

3. Be sure the printing instructions make clear that covers 1 to 4 and selected illustrations (those containing half-tones, or detailed linework) should be printed by lithographic offset (using negatives) and collated with the direct-image copy of the text. Send negatives or request that the printer make them.

4. Fold-out maps are not permitted. (Use facing pages for larger-than-page-size maps.)

5. Request perfect (adhesive), not sewn binding.

6. Do not request costly special handling, such as manual wrapping of each copy.

7. Request two sets of prebinding proofs (sample books). Then keep one as a record of what was approved.
8. Request that GPO call the District before awarding bid.

9. Check microfiche copy received from NTIS to make sure it is correct and complete. If not, notify PPU immediately.

10. Call the PPU if you have any questions about the procedures for obtaining printing services from GPO, or if you encounter unusual difficulties.

11. Follow the GPO "Style Manual," 1984 edition, and "Suggestions to Authors" (5th and 6th editions) for rules governing spelling, capitalization, compounding, abbreviations, numerals, and punctuation. Both books also contain suggestions for proofreading. Webster's Third New International Dictionary is accepted by the GPO Style Manual for correct spelling of all words not specifically indicated in the Manual.

12. The entire State data report should be reviewed each year for accuracy. Obsolete statements and typographical errors tend to be repeated year after year. As a final item related to preparation of camera-ready copy, be sure to proofread carefully all typing, especially figures. A reader generally can understand a misspelled word or wrong punctuation, but often cannot detect that a published figure may be incorrect because of a typographical error.

Initial distribution of the State reports for local use will be from the District Office; copies for distribution outside the District and distribution in microfiche and microfilm format will be sold by the U.S. Department of Commerce, National Technical Information Service, Springfield, Virginia, 22161.

REFERENCES

Alberico, N. V., 1984, GWSI annual water-level data report (program L208), in WATSTORE--National Water Data Storage and Retrieval System--User's Guide--Ground-Water Applications Programs, v. 2, chap. IV: U.S. Geological Survey Open-File Report 75-589-IV, p. L1-L35.

Langbein, W. B., and Iseri, K. T., 1960, General introduction and hydrologic definitions: U.S. Geological Survey Water-Supply Paper 1541-A, 29 p.

Martin, R. O., and Hanson, R. L., 1966, Reservoirs in the United States: U.S. Geological Survey Water-Supply Paper 1838, 115 p.

U.S. Geological Survey, 1958, Suggestions to authors of the reports of the United States Geological Survey (5th ed.): 255 p.

U.S. Geological Survey, 1978, Suggestions to authors of the reports of the United States Geological Survey (6th ed.), 273 p.

U.S. Geological Survey, 1962, Surface-water supply of the United States, 1960, pt. 7, Lower Mississippi River basin: U.S. Geological Survey Water-Supply Paper 1711, 594 p.

U.S. Government Printing Office, 1984, Style manual: Washington D.C., 479 p.

U.S. Inter-Agency River Basin Committee, 1951, Inter-Agency coordination of drainage area data Washington D.C., U.S. Inter-Agency River Basin Committee: Bulletin 4, 48 p.

Water Resources Division, 1982a, Change of on-stream site identification numbering system: Memorandum No. 82.84, issued May 13.

Water Resources Division, 1982b, Publications guide: v. 1, 497 p.

Williams, O. O., 1975 , Daily values retrieval (program G490), in WATSTORE--National Water Data Storage and Retrieval System--User's Guide--Instructions for Daily Values File, v. 1, chap. IV: U.S. Geological Survey Open-File Report 73-426, p. B1-B48.

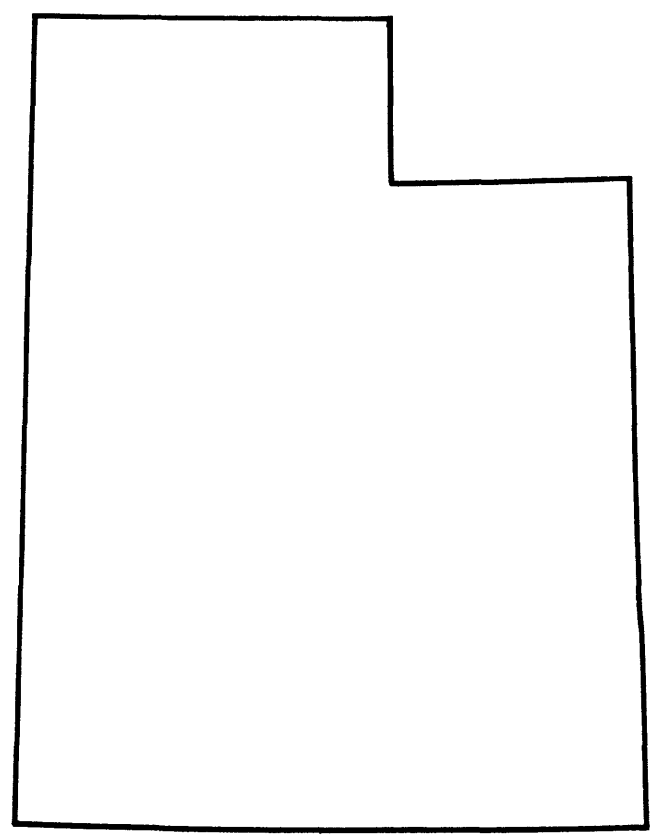
Wilson, T. A., 1977, Daily values table (program H474), in WATSTORE--National Water Data Storage and Retrieval System--User's Guide--Instructions for Daily Values File, v. 1, chap. IV: U.S. Geological Survey Open-File Report 75-426, p. C1-C25.

APPENDIX A

Example 1.--Title page

Water Resources Data
Utah
Water Year 1983

by M.D. ReMillard, G.A. Birdwell, R.B. Garrett, and G.W. Sandberg



U.S. GEOLOGICAL SURVEY WATER-DATA REPORT UT-83-1

Prepared in cooperation with the State of Utah
and with other agencies

Example 2.--Back-of-title page

UNITED STATES DEPARTMENT OF THE INTERIOR

WILLIAM P. CLARK, Secretary

GEOLOGICAL SURVEY

Dallas L. Peck, Director

For information on the water program in Wyoming write to
District Chief, Water Resources Division
U.S. Geological Survey
2120 Capitol Avenue
P.O. Box 1125
Cheyenne, Wyoming 82003

1984

PREFACE

This volume of the annual hydrologic data report of Wisconsin is one of a series of annual reports that document hydrologic data gathered from the U. S. Geological Survey's surface- and ground-water data-collection networks in each state, Puerto Rico, and the Trust Territories. These records of streamflow, gound-water levels, and water quality provide the hydrologic information needed by state, local, and federal agencies, and the private sector for developing and managing our Nation's land and water resources.

The report is the culmination of a concerted effort by dedicated personnel of the U. S. Geological Survey who collected, compiled, analyzed, verified, and organized the data, and who typed, edited, and assembled the report. The authors had primary responsibility for assuring that the information contained herein is accurate, complete, and adheres to Geological Survey policy and established guidelines. Most of the data were collected, computed, and processed from area field offices. Technicians-in-charge of the field offices are:

Jack T. Freshwaters, Rice Lake, northwest
James W. George, Merrill, northeast
Josef Habale, Madison, southwest
Fredren E. Warner, Wales, subdistrict office, southeast

The data were collected, computed, and processed by the following personnel:

G.J. Allord	S.J. Field	K.J.Hedmark	D.L. Olson
R.H. Biller	G.W. Gill	J.A. Kammer	T.J. Popowski
R.B. Bodoh	G.L. Goddard	K.R. Koenig	W.J. Rose
P.F. Boetcher	D.J. Graczyk	S.A. March	P.A. Stark
L.A. Cannon	S.Q. Hamilton	T.J. McElhone	D.A. Wentz
D.H. Conger	J.J. Hanig	R.D. McFarlane	T.A. Wittwer
M.D. Duerk	H.L. Hanson	R.A. Miller	J.K. Zahn

This report was prepared in cooperation with the State of Wisconsin and with other agencies under the general supervision fof Warren A. Gebert, Hydrologic Systems and Data Section Chief; and Vernon W. Norman, District Chief, Wisconsin.

iii

NOTE: Districts publishing more than one volume should include an additional paragraph similar to:

Hydrologic data for Illinois are contained in two volumes:

Volume 1 Illinois except Illinois River basin

Volume 2 Illinois River basin

Example 4.--Report documentation page (Optional Form 272)

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. USGS/WRD/HD-84-030	2.	3. Recipient's Accession No.
4. Title and Subtitle Water Resources Data--Virginia Water Year 1983			5. Report Date May 1984 6.
7. Author(s) Byron J. Prugh, Jr., Fred J. Easton, and Dennis D. Lynch			8. Performing Organization Rept. No. USGS-WDR-VA-83-1
9. Performing Organization Name and Address U.S. Geological Survey, Water Resources Division Room 304, 200 West Grace Street Richmond, Virginia 23220			10. Project/Task/Work Unit No. 11. Contract(C) or Grant(G) No. (C) (G)
12. Sponsoring Organization Name and Address U.S. Geological Survey, Water Resources Division Room 304, 200 West Grace Street Richmond, Virginia 23220			13. Type of Report & Period Covered Annual - Oct. 1, 1982, to Sept. 30, 1983 14.

15. Supplementary Notes

Prepared in cooperation with the State of Virginia and with other agencies

16. Abstract (Limit: 200 words)

Water resources data for the 1983 water year for Virginia consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground-water wells. This volume contains records for water discharge at 196 gaging stations; stage only at 1 gaging station; stage and contents at 10 lakes and reservoirs; water quality at 47 gaging stations and 2 wells; and water levels at 60 observation wells. Also included are data for 77 crest-stage partial-record stations. Locations of these sites are shown on Figures 5 and 6. Additional water data were collected at various sites not involved in the systematic data-collection program. Discharge measurements were made at 220 low-flow partial-record stations. Miscellaneous data were collected at 215 measuring sites and 51 water-quality sampling sites. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Virginia.

17. Document Analysis a. Descriptors

*Virginia, *Hydrologic data, *Surface water, *Ground water, *Water quality, Flow rate, Gaging stations, Lakes, Reservoirs, Chemical analyses, Sediments, Water temperatures, Sampling sites, Water levels, Water analyses.

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages
No restriction on distribution. This report may be purchased: National Technical Information Service Springfield, VA 22161	UNCLASSIFIED	454
	20. Security Class (This Page) UNCLASSIFIED	22. Price

(See ANSI-Z39.18) See Instructions on Reverse OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

Example 5.--Contents, illustrations, and tables[1]

CONTENTS

	Page
Preface	iii
List of surface-water stations, in downstream order, for which records are published	vii
List of ground-water wells, by county, for which records are published	x
Introduction	1
Cooperation	1
Summary of hydrologic conditions	2
Streamflow	
Chemical quality of streamflow	
Ground-water levels	
Ground-water quality	
Special networks and programs	
Explanation of records	
Station identification numbers	
Downstream order system	
Latitude-longitude system	
Records of stage and water discharge	
Data collection and computation	
Data presentation	
Identifying estimated daily discharge	
Accuracy of the records	
Other records available	
Records of surface-water quality	
Classification of records	
Arrangement of records	
On-site measurements and sample collection	
Water temperature	
Sediment	
Laboratory measurements	
Data presentation	
Remark codes	
Records of ground-water levels	
Data collection and computation	
Data presentation	
Records of ground-water quality	
Data collection and computation	
Data presentation	
Access to WATSTORE data	
Definition of terms	
Publications on Techniques of Water-Resources Investigations	
Station records, surface water	
Discharge at partial-record stations and miscellaneous sites	
Crest-stage partial-record stations	
Low-flow partial-record stations	
Miscellaneous sites	
Analyses of samples collected at water-quality partial-record stations and miscellaneous sites	
Station records, ground water	
Ground-water levels	
Quality of ground water	
Index	

v

Note.--The format of this example shows the "sink" and position of page number for the first page of the contents. The first page must be a right-hand (odd-numbered) page using Roman numerals. The page number must be alined with the right end of leaders and two lines below the last listing on the page. Use a 5-space indention for 2d-order headings, a 10-space indention for 3d-order headings, and so forth.

[1]Modified from WDR-NE-82-1.

ILLUSTRATIONS

Page

Figure 1. Graphs showing comparison of 1982 water-year precipitation and streamflow to long-term means..

2. Hydrographs of representative observation wells, 1981 and 1982..................

3. Map showing locations of active surface-water gaging stations...................

4. Map showing locations of active surface-water-quality stations...................

5. Map showing location of observation wells in the national network................

__Note__.--Districts may use more than one map to show locations of the different types of hydrologic-data sites or for covering parts of large States that cannot conveniently be shown on one page.

TABLES

Table 1. Precipitation and departures from normal, in inches...............................

2. Peak discharges for the 1982 water year and for the period of record at selected stations..

3. Results of t-tests comparing specific-conductance means for the 1982 water year with means for the period of record for streamflow leaving Nebraska.....

Example 6.--List of surface-water stations[1]

SURFACE-WATER STATIONS, IN DOWNSTREAM ORDER, FOR WHICH RECORDS ARE PUBLISHED vii

Note.--Data for partial-record stations and miscellaneous sites for both surface-water quantity and quality are published in separate sections of the data report. See references at the end of this list for page numbers for these sections.

[Letters after station name designate type of data: (d) discharge, (c) chemical, (b) biological, (m) microbiological, (t) water temperature, (s) sediment, (e) elevation, gage heights, or contents]

Page

NORTH ATLANTIC SLOPE BASINS
NASSAWADOX CREEK BASIN
Nassawadox Creek:
Guy Creek (head of Holly Grove Cove) near Nassawadox (d)
POTOMAC RIVER BASIN
Potomac River:
Back Creek:
Hogue Creek near Hayfield (d)
Opequon Creek near Berryville (d)
Abrams Creek near Winchester (d)
North River (head of Shenandoah River) near Stokesville (d)
North River near Burketown (d)
Middle River near Verona (d)
Christians Creek near Fishersville (d)
Middle River near Grottoes (d)
South River near Waynesboro (d)
South River near Dooms (d)
South River at Harriston (d)
South Fork Shenandoah River:
Madison Run:
White Oak Run near Grottoes (d)
South Fork Shenandoah River (continuation of North River) near Lynnwood (d)
South Fork Shenandoah River near Luray (d)
South Fork Shenandoah River at Front Royal (d,c)
North Fork Shenandoah River at Cootes Store (d)
Smith Creek near New Market (d)
North Fork Shenandoah River at Mount Jackson (d)
North Fork Shenandoah River near Strasburg (d,c)
Cedar Creek near Winchester (d)
Passage Creek near Buckton (d)
Shenandoah River at Millville, WV (d,c,t,m,s)
Catoctin Creek at Taylorstown (d)
Potomac River at Point of Rocks, MD (d,c,t,s)
Goose Creek near Middleburg (d)
Goose Creek near Leesburg (d)
Difficult Run near Great Falls (d)
Potomac River near Washington, DC (d)
Potomac River at Chain Bridge at Washington, DC (c,m,s))
Accotink Creek near Annandale (d)
Cedar Run (head of Occoquan River) near Warrenton (d)
Cedar Run near Catlett (d)
Cedar Run near Aden (d)
Broad Run at Buckland (d)
Broad Run near Bristow (d)
Bull Run near Catharpin (d)
Cub Run near Bull Run (d)
Bull Run near Clifton (d)
Quantico Creek near Dumfries (d,c,s)
South Fork Quantico Creek near Independent Hill (d,c,s)
South Fork Quantico Creek at Camp 5, near Joplin (d,c,s)
South Fork Quantico Creek near Dumfries (d,c,s)
Aquia Creek near Garrisonville (d)
GREAT WICOMICO RIVER BASIN
Great Wicomico River:
Crawley Creek:
Bush Mill Stream near Heathsville (d)
RAPPAHANNOCK RIVER BASIN
Rappahannock River near Warrenton (d)
Hazel River:
Thornton River:
Battle Run near Laurel Mills (d)
Hazel River at Rixeyville (d)
Rappahannock River at Remington (d,c,t,s)
Mountain Run near Culpeper (d)
Rapidan River near Ruckersville (d)
Robinson River near Locust Dale (d)

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[1]Modified from WDR: VA-83-1.

Page

NORTH ATLANTIC SLOPE BASINS--Continued
RAPPAHANNOCK RIVER BASIN--Continued
Rappahannock River--Continued
Rapidan River near Culpeper (d)........
Rappahannock River near Fredericksburg (d,c,m,s)........
Cat Point Creek near Montross (d)........
Hoskins Creek near Tappahannock (d)........
Piscataway Creek near Tappahannock (d)........

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

SOUTH ATLANTIC SLOPE BASINS
JAMES RIVER BASIN
Jackson River (head of James River) near Bacova (d,t)........
Back Creek near Sunrise (d)........
Back Creek on Rt. 600, near Mountain Grove (d)........
Back Creek near Mountain Grove (d,t)........
Lake Moomaw near Hot Springs (e)........
Jackson River below Gathright Dam, near Hot Springs (d,c,t)........
Jackson River at Falling Spring (d,c,t)........
Jackson River at Filtration Plant, at Covington (t)........
Dunlap Creek near Covington (d)........

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

OHIO RIVER BASIN
Ohio River:
KANAWHA RIVER BASIN
South Fork New River (head of Kanawha River) near Jefferson, NC (d)........
New River near Galax (d,c,t)........
Chestnut Creek at Galax (d)........
Reed Creek:
Glade Creek at Grahams Forge (d)........
Reed Creek at Grahams Forge (d)........
Big Reed Island Creek near Allisonia (d)........
New River at Allisonia (d)........

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

Discharge at partial-record stations and miscellaneous sites........
Crest-stage partial-record stations........
Low-flow partial-record stations........
Special study and miscellaneous sites........
Analyses of samples collected at water-quality partial-record stations
and miscellaneous sites........

Example 7.--List of ground-water wells[1]

GROUND-WATER WELLS, BY COUNTY, FOR WHICH RECORDS ARE PUBLISHED ix

GROUND-WATER LEVELS

Page

BRADLEY COUNTY
Well 350503084505000 Local number Br:E-1 263
CANNON COUNTY
Well 354823086104400 Local number Cn:D-1 263
CARTER COUNTY
Well 361738082132900 Local number Ct:H-1 264
DYER COUNTY
Well 360200089280100 Local number Dy:H-1 264
FAYETTE COUNTY
Well 352226089330101 Local number Fa:R-1 265
Well 352226089330102 Local number Fa:R-2 265
HAMILTON COUNTY
Well 350234085181200 Local number Hm:G-36 266
Well 351428085003600 Local number Hm:O-15 266
HUMPHREYS COUNTY
Well 360020087573300 Local number Hs:H-1 267
LAUDERDALE COUNTY
Well 353839089493500 Local number Ld:F-4 267
Well 354158089384300 Local number Ld:G-12 268
Well 354357089271701 Local number Ld:J-5 268
Well 354552089455900 Local number Ld:L-2 269
Well 355251089350500 Local number Ld:S-2 269
LINCOLN COUNTY
Well 350033086422900 Local number Li:G-4 270
MADISON COUNTY
Well 354223088380200 Local number Md:N-1 270
PUTNAM COUNTY
Well 360521085432600 Local number Pm:C-1 271
SHELBY COUNTY
Well 350514089553700 Local number Sh:K-75 271
Well 351435090005200 Local number Sh:O-1 272
Well 350923090023500 Local number Sh:O-124 272
Well 351320089535800 Local number Sh:P-1 273
Well 350735089593300 Local number Sh:P-76 273
Well 350900089482300 Local number Sh:Q-1 274
Well 352112089571200 Local number Sh:U-1 274
Well 352110089571300 Local number Sh:U-2 275
WILLIAMSON COUNTY
Well 355505086541100 Local number Wm:M-1 275
Well 355749086533300 Local number Wm:M-8 276
CRITTENDEN COUNTY, ARKANSAS
Well 350958090173800 Local number AR:C-1 276
Well 350344090130000 Local number AR:H-2 277
Well 351349090062800 Local number AR:O-1 277

QUALITY OF GROUND WATER

BENTON COUNTY
Well 360441087594801 Local number Bn:J-1 278
CLAIBORNE COUNTY
Well 352449083371801 Local number Cl:G-103 278
DECATUR COUNTY
Well 352717088111501 Local number Dc:A-10 278
GREENE COUNTY
Well 360912082391501 Local number Gr:M-11 279
HAMBLEN COUNTY
Well 361300083164201 Local number Hb:D-12 279
HAWKINS COUNTY
Well 361827083030801 Local number Hk:D-1 280
LAUDERDALE COUNTY
Well 354731089314301 Local number Ld:N-4 280
Well 355229089234001 Local number Ld:O-15 281
Well 355236089234301 Local number Ld:T-5 281
LINCOLN COUNTY
Well 350737086250901 Local number Li:O-6 282
Well 360658086432101 Local number Li:G-10 282
MAURY COUNTY
Well 353125087143101 Local number My:F-13 282

[1]Modified from WDR: TN-83-1.

Example 8.--Introductory text (NE-82-1)[1]

NOTE TO DISTRICT: The originally published introductory text has been slightly modified and updated for these guidelines. Also, because both examples 1 and 2 in Appendix B contain a SUMMARY OF HYDROLOGIC CONDITIONS section from a State data report, that section has been deleted from this example.

WATER RESOURCES DATA - NEBRASKA, 1982

INTRODUCTION

The Water Resources Division of the U.S. Geological Survey, in cooperation with State agencies, obtains a large amount of data pertaining to the water resources of Nebraska each water year. These data, accumulated during many water years, constitute a valuable data base for developing an improved understanding of the water resources of the State. To make these data readily available to interested parties outside the Geological Survey, the data are published annually in this report series entitled "Water Resources Data - Nebraska."

This report includes records on both surface and ground water in the State. Specifically, it contains: (1) Discharge records for 157 streamflow-gaging stations, for 27 partial-record or miscellaneous streamflow stations, and for 5 crest-stage, partial-record streamflow stations; (2) stage and content records for 10 lakes and reservoirs; (3) water-quality records for 47 streamflow-gaging stations, for 29 ungaged streamsites, and for 57 wells; and (4) water-level records for 59 observation wells. Records included for stream stages and for ground-water levels are only a small fraction of those obtained during the water year.

This series of annual reports for Nebraska began with the 1961 water year with a report that contained only data relating to the quantities of surface water. For the 1964 water year, a similar report was introduced that contained only data relating to water quality. Beginning with the 1975 water year, the report format was changed to present, in one volume, data on quantities of surface water, quality of surface and ground water, and ground-water levels.

Prior to introduction of this series and for several water years concurrent with it, water-resources data for Nebraska were published in U.S. Geological Survey Water-Supply Papers. Data on stream discharge and stage and on lake or reservoir contents and stage, through September 1960, were published annually under the title "Surface-Water Supply of the United States, Parts 6A and 6B." For the 1961 through 1970 water years, the data were published in two 5-year reports. Data on chemical quality, temperature, and suspended sediment for the 1941 through 1970 water years were published annually under the title "Quality of Surface Waters of the United States," and water levels for the 1935 through 1974 water years were published under the title "Ground-Water Levels in the United States." The above mentioned Water-Supply Papers may be consulted in the libraries of the principal cities of the United States and may be purchased from Distribution Branch, Text Products Section, U.S. Geological Survey, 604 South Pickett Street, Alexandria, VA 22304.

Publications similar to this report are published annually by the Geological Survey for all States. These official Survey reports have an identification number consisting of the two-letter State abbreviation, the last two digits of the water year, and the volume number. For example, this volume is identified as "U.S. Geological Survey Water-Data Report NE-82-1." For archiving and general distribution, the reports for 1971-74 water years also are identified as water-data reports. These water-data reports are for sale in paper copy or in microfiche by the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161.

Additional information, including current prices, for ordering specific reports may be obtained from the District Chief at the address given on back of title page or by telephone (402) 471-5082.

COOPERATION

The U.S. Geological Survey and agencies of the State of Nebraska have had cooperative agreements for the collection of water-resource records since 1930. Organizations that assisted in collecting the data in this report through cooperative agreement with the Survey are: Nebraska Department of Water Resources, J. Michael Jess, Director; Conservation and Survey Division, University of Nebraska-Lincoln, Vincent H. Dreeszen, Director; Nebraska Department of Environmental Control, George H. Ludwig, Acting Director; Big Blue River Compact Administration; Central Platte Natural Resources District; Little Blue Natural Resources District; and City of Lincoln.

Nebraska Department of Water Resources (NDWR) personnel in Bridgeport, Cambridge, Lincoln, Norfolk, and Ord contributed significantly in the collection and computation of records under a USGS-NDWR cooperative agreement.

[1]Edit to meet District needs. Each section may need minor changes to reflect local conditions. Some Districts may wish to combine the two sections, "Records of Surface-Water Quality" and "Records of Ground-Water Quality," into one section, "Records of Water Quality."

Assistance with funds or services was given by the U.S. Army Corps of Engineers in collecting records for 25 streamflow-gaging stations and 5 crest-stage gages; and by the U.S. Bureau of Reclamation in collecting records for 2 streamflow-gaging stations, 2 lake stations, and in providing elevations or capacity tables for 8 reservoir stations.

The following organizations aided in collecting records: Central Nebraska Public Power and Irrigation District, Nebraska Public Power District, and Loup River Public Power District.

SUMMARY OF HYDROLOGIC CONDITIONS

NOTE TO DISTRICT: This section has been deleted. See examples 1 and 2 in Appendix B for a SUMMARY OF HYDROLOGIC CONDITIONS section from each of two State data reports.

SPECIAL NETWORKS AND PROGRAMS[1]

Hydrologic Bench-Mark Network is a network of 57 sites in small drainage basins around the country whose purpose is to provide consistent data on the hydrology, including water quality, and related factors in representative undeveloped watersheds nationwide, and to provide analyses on a continuing basis to compare and contrast conditions observed in basins more obviously affected by the activities of man.

National Stream Quality Accounting Network (NASQAN) is a nationwide data-collection network designed by the U.S. Geological Survey to meet many of the information needs of government agencies and other groups involved in natural or regional water-quality planning and management. The 500 or so sites in NASQAN are generally located at the downstream ends of hydrologic accounting units designated by the U.S. Geological Survey Office of Water Data Coordination in consultation with the Water Resources Council. The objectives of NASQAN are (1) to obtain information on the quality and quantity of water moving within and from the United States through a systematic and uniform process of data collection, summarization, analysis, and reporting such that the data may be used for, (2) description of the areal variability of water quality in the Nation's rivers through analysis of data from this and other programs, (3) detection of changes or trends with time in the pattern of occurrence of water-quality characteristics, and (4) providing a nationally consistent data base useful for water-quality assessment and hydrologic research.

The National Trends Network (NTN) is a 150-station network for sampling atmospheric deposition in the United States. The purpose of the network is to determine the variability, both in location and in time, of the composition of atmospheric deposition, which includes snow, rain, dust particles, aerosols, and gases. The core from which the NTN was built was the already-existing deposition-monitoring network of the National Atmospheric Deposition Program (NADP).

Radiochemical program is a network of regularly sampled water-quality stations where samples are collected to be analyzed for radioisotopes. The streams that are sampled represent major drainage basins in the conterminous United States.

Tritium network is a network of stations which has been established to provide basaline information on the occurrence of tritium in the Nation's surface waters. In addition to the surface-water stations in the network, tritium data are also obtained at a number of precipitation stations. The purpose of the precipitation stations is to provide an estimate sufficient for hydrologic studies of the tritium input to the United States.

EXPLANATION OF THE RECORDS

The surface-water and ground-water records published in this report are for the 1982 water year that began October 1, 1981, and ended September 30, 1982. A calendar of the water year is provided on the inside of the front cover. The records contain streamflow data, stage and content data for lakes and reservoirs, water-quality data for surface and ground water, and ground-water-level data. The locations of the stations and wells where the data were collected are shown in figures 3, 4, and 5. The following sections of the introductory text are presented to provide users with a more detailed explanation of how the hydrologic data published in this report were collected, analyzed, computed, and arranged for presentation.

Station Identification Numbers

Each data station, whether streamsite or well, in this report is assigned a unique identification number. This number is unique in that it applies specifically to a given station and to no other. The number usually is assigned when a station is first established and is retained for that station idefinitely. The systems used by the U.S. Geological Survey to assign identification numbers for surface-water stations and for ground-water well sites differ, but both are based on geographic location. The "downstream order" system is used for regular surface-water stations and the "latitude-longitude" system is used for wells and, in Nebraska, for surface-water stations where only miscellaneous measurements are made.

[1]The pesticide program should no longer be listed. Districts should include only those networks or programs for which there are data in the data report.

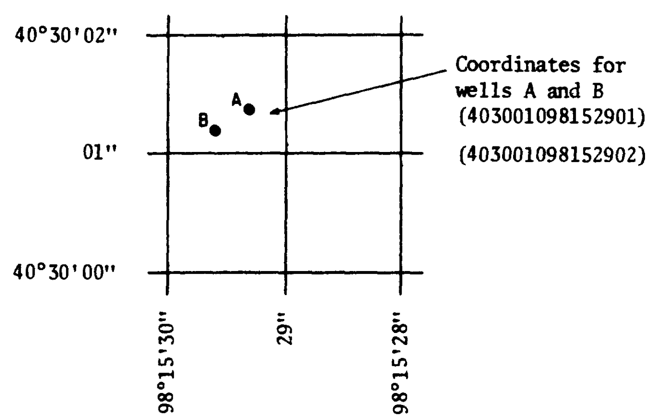
Downstream Order System[1]

Since October 1, 1950, the order of listing hydrologic-station records in Survey reports is in a downstream direction along the main stream. All stations on a tributary entering upstream from a mainstream station are listed before that station. A station on a tributary that enters between two mainstream stations is listed between them. A similar order is followed in listing stations on first rank, second rank, and other ranks of tributaries. The rank of any tributary with respect to the stream to which it is immediately tributary is indicated by an indention in the "List of Stations" in the front of this report. Each indention represents one rank. This downstream order and system of indention show which stations are on tributaries between any two stations and the rank of the tributary on which each station is situated.

The station-identification number is assigned according to downstream order. In assigning station numbers, no distinction is made between partial-record stations and other stations; therefore, the station number for a partial-record station indicates downstream-order position in a list made up of both types of stations. Gaps are left in the series of numbers to allow for new stations that may be established; hence, the numbers are not consecutive. The complete eight-digit number for each station, such as 06797000, which appears just to the left of the station name, includes the two-digit Part number "06" plus the six-digit downstream-order number "797000." The Part number designates the major river basin; for example, part "06" is the Missouri River basin.

Latitude-Longitude System[2]

The identification numbers for wells and miscellaneous surface-water sites are assigned according to the grid system of latitude and longitude. The number consists of 15 digits. The first six digits denote the degrees, minutes, and seconds of latitude, the next seven digits denote degrees, minutes, and seconds of longitude, and the last two digits (assigned sequentially) identify the wells or other sites within a 1-second grid. This site-identification number, once assigned, is a pure number, and has no locational significance. In the rare instance where the initial determination of latitude and longitude are found to be in error, the station will retain its initial identification number; however, its true latitude and longitude will be listed in the LOCATION paragraph of the station description. (See figure below.)



System for numbering wells and miscellaneous sites (latitude and longitude).

[1]The second paragraph of this section will need to be modified if more than eight digits are used in assigning station numbers.

[2]If appropriate, an additional paragraph should be used in this section to explain the local well-numbering system. (See Appendix B, example 21.)

Records of Stage and Water Discharge

Records of stage and water discharge may be complete or partial. Complete records of discharge are those obtained using a continuous stage-recording device through which either instantaneous or mean daily discharges may be computed for any time, or any period of time, during the period of record. Complete records of lake or reservoir content, similarly, are those for which stage or content may be computed or estimated with reasonable accuracy for any time, or period of time. They may be obtained using a continuous stage-recording device, but need not be. Because daily mean discharges and end-of-day contents commonly are published for such stations, they are referred to as "daily stations."

By contrast, partial records are obtained through discrete measurements without using a continuous stage-recording device and pertain only to a few flow characteristics, or perhaps only one. The nature of the partial record is indicated by table titles such as "Crest-stage partial records," or "Low-flow partial records." Records of miscellaneous discharge measurements or of measurements from special studies, such as low-flow seepage studies, may be considered as partial records, but they are presented separately in this report. Location of all complete-record and crest-stage partial-record stations for which data are given in this report are shown in figure 3.

Data Collection and Computation

The data obtained at a complete-record gaging station on a stream or canal consist of a continuous record of stage, individual measurements of discharge throughout a range of stages, and notations regarding factors that may affect the relationships between stage and discharge. These data, together with supplemental information, such as weather records, are used to compute daily discharges. The data obtained at a complete-record gaging station on a lake or reservoir consist of a record of stage and of notations regarding factors that may affect the relationship between stage and lake content. These data are used with stage-area and stage-capacity curves or tables to compute water-surface areas and lake storage.

Continuous records of stage are obtained with analog recorders that trace continuous graphs of stage or with digital recorders that punch stage values on paper tapes at selected time intervals. Measurements of discharge are made with current meters using methods adapted by the Geological Survey as a result of experience accumulated since 1880. These methods are described in standard textbooks, in Water-Supply Paper 2175, and in U.S. Geological Survey Techniques of Water-Resources Investigations, Book 3, Chapter A6.

In computing discharge records, results of individual measurements are plotted against the corresponding stages, and stage-discharge relation curves are then constructed. From these curves, rating tables indicating the approximate discharge for any stage within the range of the measurements are prepared. If is necessary to define extremes of discharge outside the range of the current-meter measurements, the curves are extended using: (1) logarithmic plotting; (2) velocity-area studies; (3) results of indirect measurements of peak discharge, such as slope-area or contracted-opening measurements, and computations of flow-over-dams or weirs; or (4) step-backwater techniques.

Daily mean discharges are computed by applying the daily mean stages (gage heights) to the stage-discharge curves or tables. If the stage-discharge relation is subject to change because of frequent or continual change in the physical features that form the control, the daily mean discharge is determined by the shifting-control method, in which correction factors based on the individual discharge measurements and notes of the personnel making the measurements are applied to the gage heights before the discharges are determined from the curves or tables. This shifting-control method also is used if the stage-discharge relation is changed temporarily because of aquatic growth or debris on the control. For some stations, formation of ice in the winter may so obscure the stage-discharge relations that daily mean discharges must be estimated from other information such as temperature and precipitation records, notes of observations, and records for other stations in the same or nearby basins for comparable periods.

At some stream-gaging stations the stage-discharge relation is affected by the backwater from reservoirs, tributary streams, or other sources. This necessitates the use of the slope method in which the slope or fall in a reach of the stream is a factor in computing discharge. The slope or fall is obtained by means of an auxiliary gage set at some distance from the base gage. At some stations the stage-discharge relation is affected by changing stage; at these stations the rate of change in stage is used as a factor in computing discharge.

In computing records of lake or reservoir contents, it is necessary to have available from surveys, curves, or tables defining the relationship of stage and content. The application of stage to the stage-content curves or tables gives the contents from which daily, monthly, or yearly changes then are determined. If the stage-content relationship changes because of deposition of sediment in a lake or reservoir, periodic resurveys may be necessary to redefine the relationship. Even when this is done, the contents computed may become increasingly in error as time since the last survey increases. Discharges over lake or reservoir spillways are computed from stage-discharge relationships much as other stream discharges are computed.

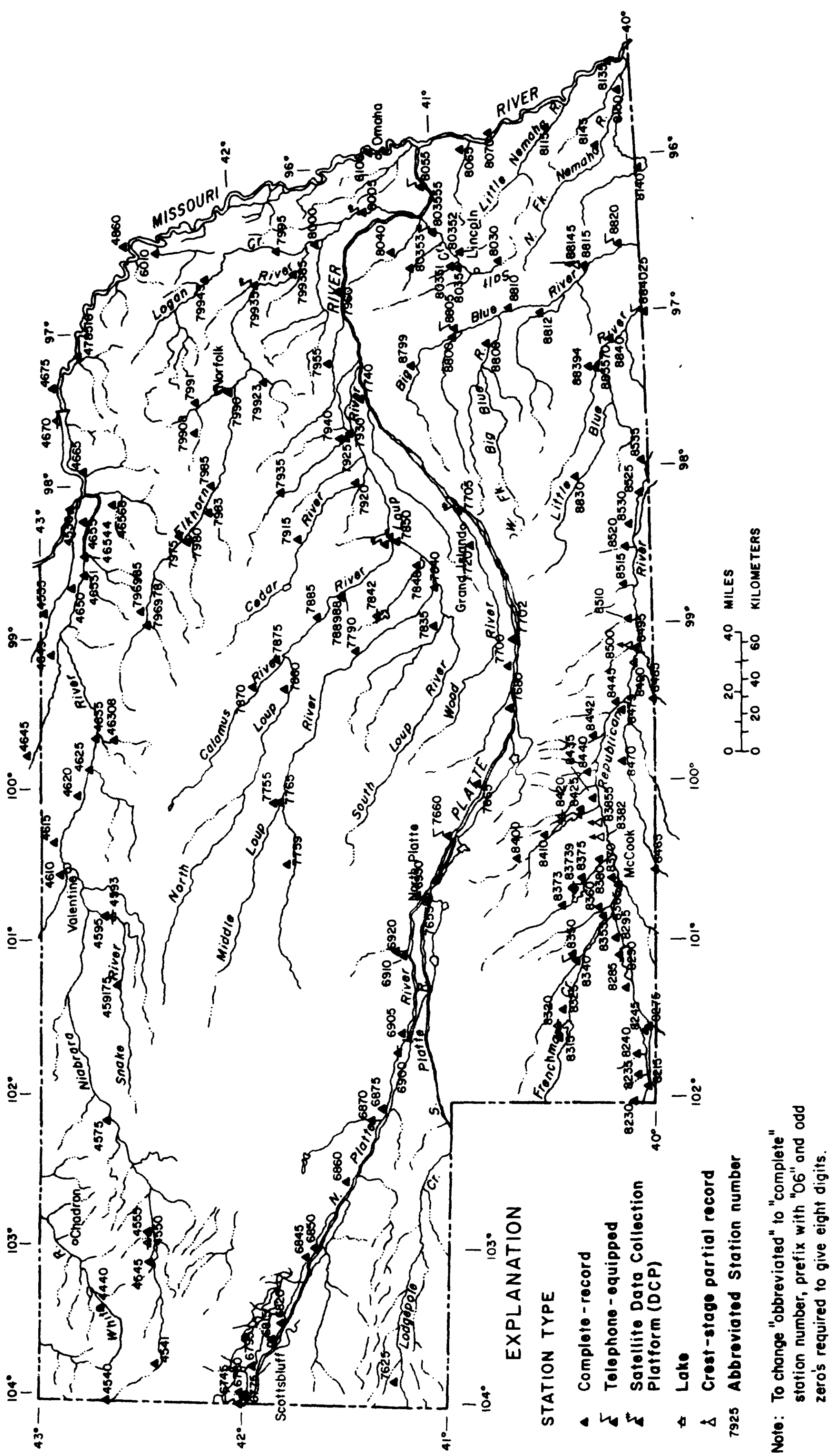


Figure 3.--Location of active surface-water gaging stations.

For some gaging stations there are periods when no gage-height record is obtained, or the recorded gage height is so faulty that it cannot be used to compute daily discharge or contents. This happens when the recorder stops or otherwise fails to operate properly, intakes are plugged, the float is frozen in the well, or for various other reasons. For such periods, the daily discharges are estimated from the recorded range in stage, previous or following record, discharge measurements, weather records, and comparison with other station records from the same or nearby basins. Likewise, daily contents may be estimated from operator's logs, previous or following record, inflow-outflow studies, and other information. Information explaining how estimated daily-discharge values are identified in station records is included in the next two sections, "Data Presentation" (REMARKS paragraph) and "Identifying Estimated Daily Discharge."

Data Presentation

The records published for each gaging station consist of two parts, the manuscript or station description and the data table for the current water year. The manuscript provides, under various headings, descriptive information, such as station location; period of record; average discharge; historical extremes; record accurscy; and other remarks pertinent to station operation and regulation. The following information, as appropriate, is provided with each continuous record of discharge or lake content. Comments to follow clarify information presented under the various headings of the station description.

LOCATION.--Information on locations is obtained from the most accurate maps available. The location of the gage with respect to the cultural and physical features in the vicinity and with respect to the reference place mentioned in the station name is given. River mileages, given for only a few stations, were determined by methods given in "River Mileage Measurement," Bulletin 14, Revision of October 1968, prepared by the Water Resources Council or were provided by the U.S. Army Corps of Engineers.

DRAINAGE AREA.--Drainage areas are measured using the most accurate maps available. Because the type of maps available varies from one drainage basin to another, the accuracy of drainage areas likewise varies. Drainage areas are updated as better maps become available.

PERIOD OF RECORD.--This indicates the period for which there are published records for the station or for an equivalent station. An equivalent station is one that was in operation at a time that the present station was not, and whose location was such that records from it can reasonably be considered equivalent with records from the present station.

REVISED RECORDS.--Published records, because of new information, occasionally are found to be incorrect, and revisions are printed in later reports. Listed under this heading are all the reports in which revisions have been published for the station and the water years to which the revisions apply. If a revision did not include daily, monthly, or annual figures of discharge, that fact is noted after the year dates as follows: "(M)" means that only the instantaneous maximum discharge was revised; "(m)" that only the instantaneous minimum was revised; and "(P)" that only peak discharges were revised. If the drainage area has been revised, the report in which the most recently revised figure was first published is given.

GAGE.--The type of gage in current use, the datum of the current gage referred to National Geodetic Vertical Datum of 1929 (see glossary), and a condensed history of the types, locations, and datums of previous gages are given under this heading.

REMARKS.--All periods of estimated daily-discharge record will either be identified by date in this paragraph of the station description for water-discharge stations or flagged in the daily-discharge table. (See next section, "Identifying Estimated Daily Discharge.") If a remarks statement is used to identify estimated record, the paragraph will begin with this information presented as the first entry. The paragraph is also used to present information relative to the accuracy of the records, to special methods of computation, to conditions that affect natural flow at the station and, possibly, to other pertinent items. For reservoir stations, information is given on the dam forming the reservoir, the capacity, outlet works and spillway, and purpose and use of the reservoir.

COOPERATION.--Records provided by a cooperating organization or obtained for the Geological Survey by a cooperating organization are identified here.

AVERAGE DISCHARGE.--The discharge value given is the arithmetic mean of the water-year mean discharges. It is computed only for stations having at least 5 water years of complete record, and only water years of complete record are included in the computation. It is not computed for stations where diversions, storage, or other water-use practices cause the value to be meaningless. If water developments significantly altering flow at a station are put into use after the station has been in operation for a period of years, a new average is computed as soon as 5 water years of record have accumulated following the development. The median of yearly mean discharges also is given under this heading for stations having 10 or more water years of record, if the median differs from the average given by more than 10 percent.

EXTREMES FOR PERIOD OF RECORD.--Extremes may include maximum and minimum stages and maximum and minimum discharges or content. Unless otherwise qualified, the maximum discharge or content is the instantaneous maximum corresponding to the highest stage that occurred. The highest stage may have been obtained from a graphic or digital recorder, a crest-stage gage, or by direct observation of a nonrecording gage. If the maximum stage did not occur on the same day as the maximum discharge or content, it is given separately. Similarly, the minimum is the instantaneous minimum discharge, unless otherwise qualified, and was determined and is reported in the same manner as the maximum.

EXTREMES OUTSIDE PERIOD OF RECORD.--Included here is information concerning major floods or unusually low flows that occurred outside the stated period of record. The information may or may not have been obtained by the U.S. Geological Survey.

EXTREMES FOR CURRENT YEAR.--Extremes given here are similar to those for the period of record, except the peak discharge listing may include secondary peaks. For stations meeting certain criteria, all peak discharges and stages occurring during the water year and greater than a selected base discharge are presented under this heading. The peaks greater than the base discharge, excluding the highest one, are referred to as secondary peaks. Peak discharges are not published for canals, ditches, drains, or streams for which the peaks are subject to substantial control by man. The time of occurrence for peaks is expressed in 24-hour local standard time. For example, 12:30 a.m. is 0030, and 1:30 p.m. is 1330. The minimum for the current water year appears below the table of peak data.

REVISIONS.--If a critical error in published records is discovered, a revision is included in the first report published following discovery of the error.

Although rare, occasionally the records of a discontinued gaging station may need revision. Because, for these stations, there would be no current or, possibly, future station manuscript published to document the revision in a "Revised Records" entry, users of data for these stations who obtained the record from previously published data reports may wish to contact the District office to determine if the published records were ever revised after the station was discontinued. Of course, if the data were obtained by computer retrieval, the data would be current and there would be no need to check because any published revision of data is always accompanied by revision of the corresponding data in computer storage.

Manuscript information for lake or reservoir stations differs from that for stream stations in the nature of the "Remarks" and in the inclusion of a skeleton stage-capacity table when daily contents are given.

The daily table for stream-gaging stations gives mean discharge for each day and is followed by monthly and yearly summaries. In the monthly summary below the daily table, the line headed "TOTAL" gives the sum of the daily figures. The line headed "MEAN" gives the average flow in cubic feet per second during the month. The lines headed "MAX" and "MIN" give the maximum and minimum daily discharges, respectively, for the month. Discharge for the month also is usually expressed in cubic feet per second per square mile (line headed "CFSM"), or in inches (line headed "IN."), or in acre-feet (line headed "AC-FT"). Figures for cubic feet per second per square mile and runoff in inches are ommitted if there is extensive regulation or diversion or if the drainage area includes large noncontributing areas. In the yearly summary below the monthly summary, the figures shown are the appropriate discharges for the calendar and water years. At some stations monthly and (or) yearly observed discharges are adjusted for reservoir storage or diversion, or diversions or reservoir contents are given. These figures are identified by a symbol and corresponding footnote.

Data collected at partial-record stations follow the information for continuous-record sites. Data for partial-record discharge stations are presented in two tables. The first is a table of annual maximum stage and discharge at crest-stage stations, and the second is a table of discharge measurements at low-flow partial-record stations. The tables of partial-record stations are followed by a listing of discharge measurements made at sites other than continuous-record or partial-record stations. These measurements are generally made in times of drought or flood to give better areal coverage to those events. Those measurements and others collected for some special reason are called measurements at miscellaneous sites.

Identifying Estimated Daily Discharge

Estimated daily-discharge values published in the water-discharge tables of annual State data reports are identified either by flagging individual daily values with the letter symbol "e" and printing a table footnote, "e Estimated," or by listing the dates of the estimated record in the REMARKS paragraph of the station desciption.

Accuracy of the Records

The accuracy of streamflow records depends primarily on: (1) The stability of the stage-discharge relation or, if the control is unstable, the frequency of discharge measurements; and (2) the accuracy of measurements of stage, measurements of discharge, and interpretation of records.

The accuracy attributed to the records is indicated under "REMARKS." "Excellent" means that about 95 percent of the daily discharges are within 5 percent of the true; "good," within 10 percent; and "fair," within 15 percent. Records that do not meet the criteria mentioned, are rated "poor." Different accuracies may be attributed to different parts of a given record.

Daily mean discharges in this report are given to the nearest hundredth of a cubic foot per second for values less than 1 ft^3/s; to the nearest tenth between 1.0 and 10 ft^3/s; to whole numbers between 10 and 1,000 ft^3/s; and to 3 significant figures for more than 1,000 ft^3/s. The number of significant figures used is based solely on the magnitude of the discharge value. The same rounding rules apply to discharges listed for partial-record stations and miscellaneous sites.

Discharge at many stations, as indicated by the monthly mean, may not reflect natural runoff due to the effects of diversion, consumption, regulation by storage, increase or decrease in evaporation due to artificial causes, or to other factors. For such stations, figures of cubic feet per second per square mile and of runoff, in inches, are not published unless satisfactory adjustments can be made for diversions, for changes in contents of reservoirs, or for other changes incident to use and control. Evaporation from a reservoir is not included in the adjustments for changes in reservoir contents, unless it is so stated. Even at those stations where adjustments are made, large errors in computed runoff may occur if adjustments or losses are large in comparison with the observed discharge.

Other Records Available

Records of daily diversions of water from streams by canals are collected by and published in Hydrographic Reports of the Nebraska Department of Water Resources. Included are discharge records for streams and storage records for reservoirs not published in reports of the Geological Survey. Copies of the Hydrographic Reports may be obtained from the Nebraska Department of Water Resources, 301 Centennial Mall, South, P.O. Box 94676, Lincoln, NE 68509 (telephone number: 402-471-2363).

Records of discharge, not published by the Geological Survey, are collected in Nebraska at several sites by the U.S. Army Corps of Engineers. The National Water Data Exchange (NAWDEX), U.S. Geological Survey, Reston, VA 22092, maintains an index of these sites as well as an index of records of discharge collected by other agencies but not published by the Geological Survey. Information on records at specific sites can be obtained from that office upon request.

Information used in the preparation of the records in this publication, such as discharge-measurement notes, gage-height records, temperature measurements, and rating tables are on file in the Nebraska District office. Also, most of the daily mean discharges are in computer-readable form and have been analylzed statistically. Information on the availability of the unpublished information or on the results of statistical analyses of the published records may be obtained from the District office.

Records of Surface-Water Quality

Records of surface-water quality ordinarily are obtained at or near stream-gaging stations because interpretation of records of surface-water quality nearly always requires corresponding discharge data. Records of surface-water quality in this report may involve a variety of types of data and measurement frequencies.

Classification of records

Water-quality data for surface-water sites are grouped into one of three classifications. A continuing-record station is a site where data are collected on a regularly scheduled basis. Frequency may be once or more times daily, weekly, monthly, or quarterly. A partial-record station is a site where limited water-quality data are collected systematically over a period of years. Frequency of sampling is usually less than quarterly. A miscellaneous sampling site is a location other than a continuing or partial-record station, where random samples are collected to give better areal coverage to define water-quality conditions in the river basin.

A careful distinction needs to be made between "continuing records" as used in this report and "continuous recordings," which refers to a continuous graph or a series of discrete values punched at short intervals on a paper tape. Some records of water quality, such as temperature and specific conductance, may be obtained through continuous recordings; however, because of costs, most data are obtained only monthly or less frequently. Locations of stations for which records on the quality of surface water appear in this report are shown in figure 4.

Arrangement of Records

Water-quality records collected at a surface-water daily record station are published immediately following that record, regardless of the frequency of sample collection. Station number and name are the same for both records. Where a surface-water daily record station is not available or where the water quality differs significantly from that at the nearby surface-water station, the continuing water-quality record is published with its own station number and name in the regular downstream-order sequence. Water-quality data for partial-record stations and for miscellaneous sampling sites appear in separate tables following the table of discharge measurements at miscellaneous sites.

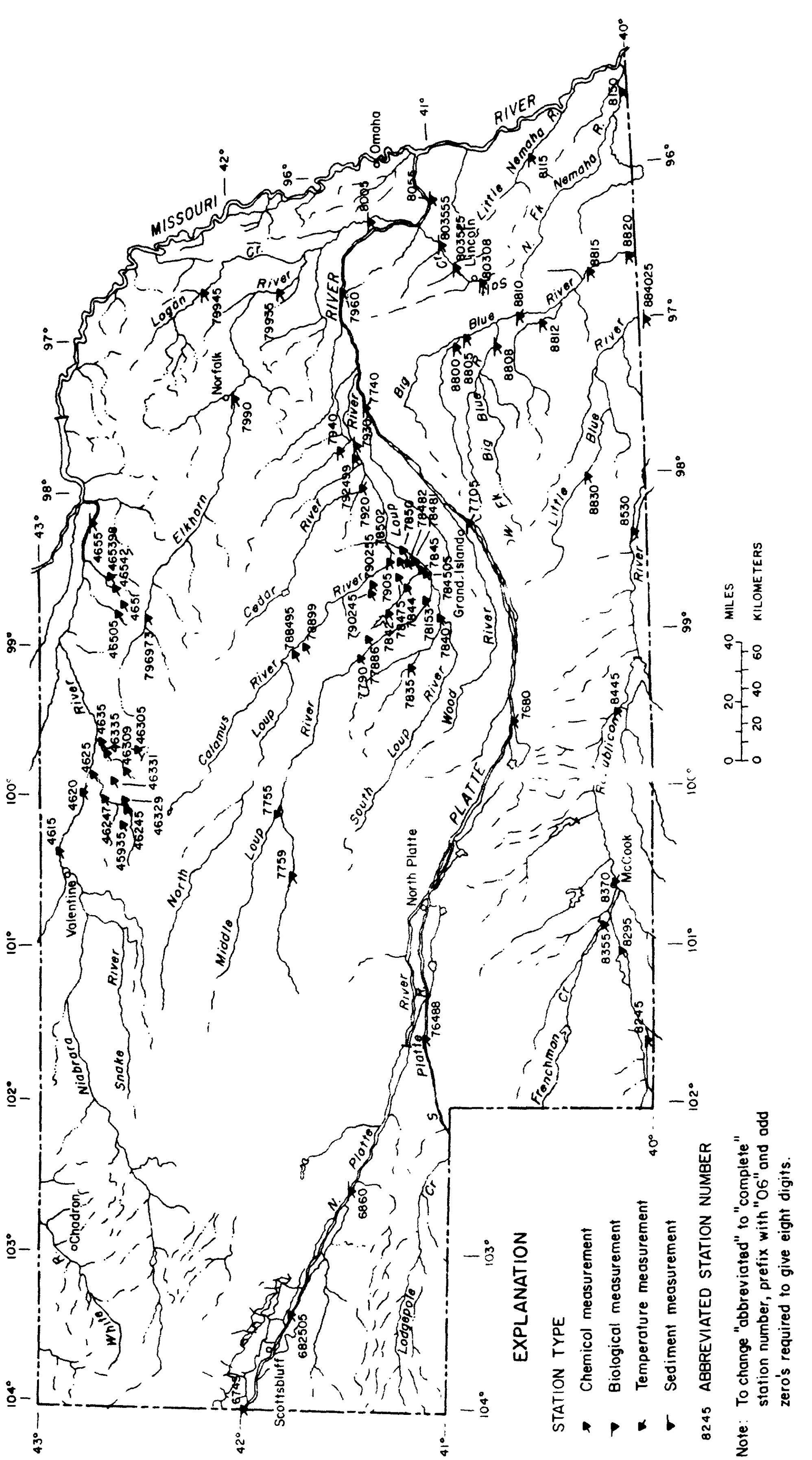


Figure 4.-- Location of active surface-water-quality stations.

On-site Measurements and Sample Collection

In obtaining water-quality data, a major concern needs to be assuring that the data obtained represent the in situ quality of the water. To assure this, certain measurements, such as water temperature, pH, and dissolved oxygen, need to be made onsite when the samples are taken. To assure that measurements made in the laboratory also represent the in situ water, carefully prescribed procedures need to be followed in collecting the samples, in treating the samples to prevent changes in quality pending analysis, and in shipping the samples to the laboratory. Procedures for onsite measurements and for collecting, treating, and shipping samples are given in publications on "Techniques of Water-Resources Investigations," Book 1, Chap. D2; Book 3, Chap. C2; Book 5, Chap. A1, A3, and A4. All of these references are listed on p. 22 of this report. Also, detailed information on collecting, treating, and shipping samples may be obtained from the Geological Survey District office.

One sample can define adequately the water quality at a given time if the mixture of solutes throughout the stream cross section is homogeneous. However, the concentration of solutes at different locations in the cross section may vary widely with different rates of water discharge, depending on the source of material and the turbulence and mixing of the stream. Some streams must be sampled through several vertical sections to obtain a representative sample needed for an accurate mean concentrstion and for use in calculating load. All samples obtained for the National Stream Quality Accounting Network (see definitions) are obtained from at least several verticals. Whether samples are obtained from the centroid of flow or from several verticals, depends on flow conditions and other factors which must be evaluated by the collector.

Chemical-quality data published in this report are considered to be the most representative values available for the stations listed. The values reported represent water-quality conditions at the time of sampling as much as possible, consistent with available sampling techniques and methods of analysis. In the rare case where an apparent inconsistency exists between a reported pH value and the relative abundance of carbon dioxide species (carbonate and bicarbonate), the inconsistency is the result of a slight uptake of carbon dioxide from the air by the sample between measurement of pH in the field and determination of carbonate and bicarbonate in the laboratory.

For chemical-quality stations equipped with digital monitors, the records consist of daily maximum, minimum, and mean values for each constituent measured and are based upon hourly punches beginning at 0100 hours and ending at 2400 hours for the day of record. More detailed records (hourly values) may be obtained from the U.S.G.S. District Office whose address is given on the back of the title page of this report.

Water temperature

Water temperatures are measured at most of the water-quality stations. In addition, water temperatures are taken at time of discharge measurements for water-discharge stations. For stations where water temperatures are taken manually once or twice daily, the water temperatures are taken at about the same time each day. Large streams have a small diurnal temperature change; shallow streams may have a daily range of several degrees and may follow closely the changes in air temperature. Some streams may be affected by waste-heat discharges.

At stations where recording instruments are used, either mean temperatures or maximum and minimum temperatures for each day are published. Water temperatures measured at the time of water-discharge measurements are on file in the District office.

Sediment

Suspended-sediment concentrations are determined from samples collected by using depth-integrating samplers. Samples usually are obtained at several verticals in the cross section, or a single sample may be obtained at a fixed point and a coefficient applied to determine the mean concentration in the cross sections.

During periods of rapidly changing flow or rapidly changing concentration, samples may have been collected more frequently (twice daily or, in some instances, hourly). The published sediment discharges for days of rapidly changing flow or concentration were computed by the subdivided-day method (time-discharge weighted average). Therefore, for those days when the published sediment discharge value differs from the value computed as the product of discharge times mean concentration times 0.0027, the reader can assume that the sediment discharge for that day was computed by the subdivided-day method. For periods when no samples were collected, daily discharges of suspended sediment were estimated on the basis of water discharge, sediment concentrations observed immediately before and after the periods, and suspended-sediment loads for other periods of similar discharge.

At other stations, suspended-sediment samples were collected periodically at many verticals in the stream cross section. Although data collected periodically may represent conditions only at the time of observations, such data are useful in establishing seasonal relations between quality and streamflow and in predicting long-term sediment-discharge characteristics of the stream.

In addition to the records of suspended-sediment discharge, records of the periodic measurements of the particle-size distribution of the suspended sediment and bed material are included for some stations.

Laboratory Measurements

Sediment samples, samples for biochemical-oxygen demand (BOD), samples for indicator bacteria, and daily samples for specific conductance are analyzed locally. all other samples are analyzed in the Geological Survey laboratories in Arvada, Colo., or Doraville, Ga. Methods used in analyzing sediment samples and computing sediment records are given in TWRI, Book 5, Chap. C1. Methods used by the Geological Survey laboratories are given in TWRI, Book 1, Chap. D2; Book 3, Chap. C2; Book 5, Chap. A1, A3, and A4.

Data Presentation

For continuing-record stations, information pertinent to the history of station operation is provided in descriptive headings preceding the tabular data. These descriptive headings give details regarding location, drainage area, period of record, type of data available, instrumentation, general remarks, cooperation, and extremes for parameters currently measured daily. Tables of chemical, physical, biological, radiochemical data, and so forth, obtained at a frequency less than daily are presented first. Tables of "daily values" of specific conductance, pH, water temperature, dissolved oxygen, and suspended sediment then follow in sequence.

In the descriptive headings, if the location is identical to that of the discharge gaging station, neither the LOCATION nor the DRAINAGE AREA statements are repeated. the following information, as appropriate, is provided with each continuous-record station. Comments that follow clarify information presented under the various headings of the station description.

LOCATION.--See Data Presentation under "Records of Stage and Water Discharge;" same comments apply.

DRAINAGE AREA.--See Data Presentation under "Records of Stage and Water Discharge;" same comments apply.

PERIOD OF RECORD.--This indicates the periods for which there are published water-quality records for the station. The periods are shown separately for records of parameters measured daily or continuously and those measured less than daily. For those measured daily or continuously, periods of record are given for the parameters individually.

INSTRUMENTATION.--Information on instrumentation is given only if a water-quality monitor temperature record, sediment pumping sampler, or other sampling device is in operation at a station.

REMARKS.--Remarks provide added information pertinent to the collection, analysis, or computation of the records.

COOPERATION.--Records provided by a cooperating organization or obtained for the Geological Survey by a cooperating organization are identified here.

EXTREMES.--Maximums and minimums are given only for parameters measured daily or more frequently. None are given for parameters measured weekly or less frequently, because the true maximums or minimums may not have been sampled. Extremes, when given, are provided for both the period of record and for the current water year.

REVISIONS.--If errors in published water-quality records are discovered after publication, appropriate updates are made to the Water-Quality File in the U.S. Geological Survey's computerized data system, WATSTORE, and subsequently by monthly transfer of update transactions to the U.S. Environmental Protection Agency's STORET system. Because the usual volume of updates makes it impractical to document individual changes in the State data-report series or elsewhere, potential users of U.S. Geological Survey water-quality data are encouraged to obtain all required data from the appropriate computer file to insure the most recent updates.

The surface-water-quality records for partial-record stations and miscellaneous sampling sites are published in separate tables following the table of discharge measurements at miscellaneous sites. No descriptive statements are given for these records. Each station is published with its own station number and name in the regular downstream-order sequence.

Remark Codes

The following remark codes may appear with the water-quality data in this report:

PRINTED OUTPUT	REMARK
E	Estimated value
>	Actual value is known to be greater than the value shown
<	Actual value is known to be less than the value shown
K	Results based on colony count outside the acceptance range (non-ideal colony count)
L	Biological organism count less than 0.5 percent (organism may be observed rather than counted)
D	Biological organism count equal to or greater than 15 percent (dominant)
&	Biological organism estimated as dominant

Records of Ground-Water Levels[1]

Only water-level data from a national network of observation wells are given in this report. These data are intended to provide a sampling and historical record of water-level changes in the Nation's most important aquifers. Locations of the observation wells in this network in Nebraska are shown in figure 5.

Although, in this report, records of water levels are presented for fewer than 100 wells, records are obtained through cooperative efforts of many Federal, State, and local agencies for several thousand observation wells throughout Nebraska and are placed in computer storage. Each spring, the Nebraska District and the Conservation and Survey Division of the University of Nebraska publish a report for the previous calendar year entitled "Groundwater levels in Nebraska, 19___". This report contains hydrographs of recorder wells, detailed maps showing changes in water levels from the previous year, and other useful items. Information about the availability of the data in the water-level file may be obtained from the District Chief, Nebraska District. (See address on back of front page.)

Data Collection and Computation

Measurements of water levels are made in many types of wells under varying conditions, but the methods of measurement are standardized to the extent possible. The equipment and measuring techniques used at each observation well ensure that measurements at each well are of consistent accuracy and reliability.

Tables of water-level data are presented by counties arranged in alphabetical order. The prime identification number for a given well is the 15-digit number that appears in the upper left corner of the table. The secondary identification number is the local well number, an alphanumeric number, derived from the township-range location of the well.

Water-level records are obtained from direct measurements with a steel tape or from the graph or punched tape of a water-stage recorder. The water-level measurements in this report are given in feet with reference to land-surface datum (lsd). Land-surface datum is a datum plane that is approximately at land surface at each well. If known, the elevation of the land-surface datum is given in the well description. The height of the measuring point (MP) above or below land-surface datum is given in each well description. Water levels in wells equipped with recording gages are reported for every fifth day and the end of each month (eom).

Water levels are reported to as many significant figures as can be justified by the local conditions. For example, in a measurement of a depth to water of several hundred feet, the error of determining the absolute value of the total depth to water may be a few tenths of a foot, whereas the error in determining the net change of water level between successive measurements may be only a hundredth or a few hundredths of a foot. For lesser depths to water, the accuracy is greater. Accordingly, most measurements are reported to a hundredth of a foot, but some are given to a tenth of a foot or a larger unit.

Data Presentation

Each well record consists of two parts, the station description and the data table of water levels observed during the water year. The description of the well is presented first through use of descriptive headings preceding the tabular data. The comments to follow clarify information presented under the various headings.

LOCATION.--This paragraph follows the well-identification number and reports the latitude and longitude (given in degrees, minutes, and seconds); a landline location designation; the hydrologic-unit number; the distance and direction from a geographic point of reference; and the owner's name.

AQUIFER.--This entry designates by name (if a name exists) and geologic age the aquifer(s) open to the well.

WELL CHARACTERISTICS.--This entry describes the well in terms of depth, diameter, casing depth and/or screened interval, method of construction, use, and additional information such as casing breaks, collapsed screen, and other changes since construction.

INSTRUMENTATION.--This paragraph provides information on both the frequency of measurement and the collection method used, allowing the user to better evaluate the reported water-level extremes by knowing whether they are based on weekly, monthly, or some other frequency of measurement.

DATUM.--This entry describes both the measuring point and the land-surface elevation at the well. The measuring point is described physically (such as top of collar, notch in top of casing, plug in pump base and so on), and in relation to land surface (such as 1.3 ft above land-surface datum). The elevation of the land-surface datum is described in feet above (or below) National Geodetic Vertical Datum of 1929 (NGVD of 1929); it is reported with a precision depending on the method of determination.

[1]This section, especially the first two paragraphs, will need to be edited to meet District needs. Many Districts now publish data from project wells outside the national network in the State data report and this should be noted, if appropriate. The second paragraph can be used to provide users an overview of other ground-water-level data available in the State.

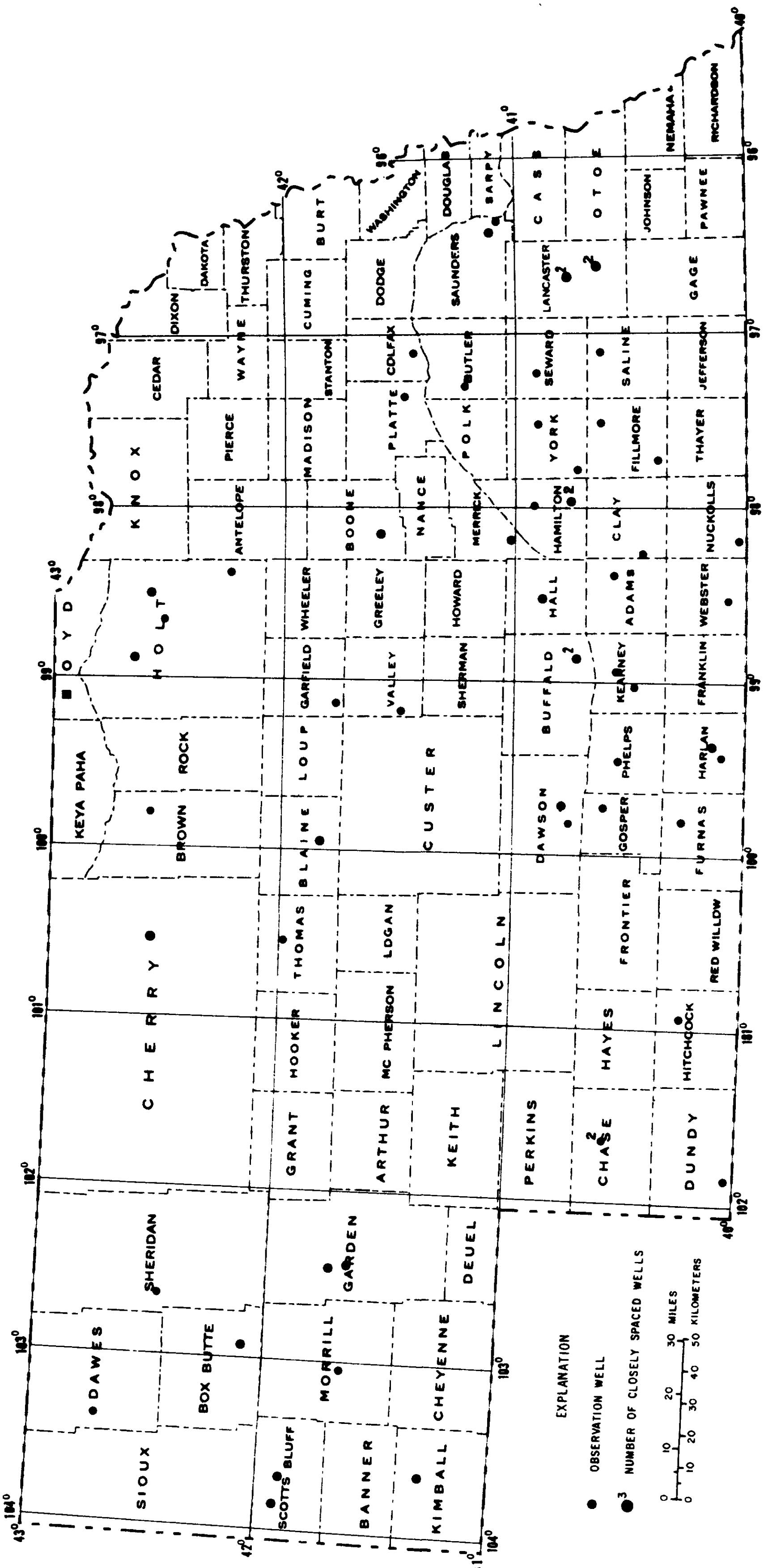


Figure 5.-- Location of observation wells in the national network.

REMARKS.--This entry describes factors that may influence the water level in a well or the measurement of the water level. It should identify wells that also are water-quality observation wells, and may be used to acknowledge the assistance of local (non-Survey) observers.

PERIOD OF RECORD.--This entry indicates the period for which there are published records for the well. It reports the month and year of the start of publication of water-level records by the U.S. Geological Survey and the words "to current year" if the records are to be continued into the following yesr. Periods for which water-level records are available, but are not published by the Geological Survey, may be noted.

EXTREMES FOR PERIOD OF RECORD.--This entry contains the highest and lowest water levels of the period of published record, with respect to land-surface datum, and the dates of their occurrence.

A table of water levels follows the station description for each well. Water levels are reported in feet below land-surface datum and all taped measurements of water level are listed. For wells equipped with recorders, only abbreviated tables are published; generally, only water-level lows are listed for every fifth day and at the end of the month (eom). The highest and lowest water levels of the water year and their dates of occurrence are shown on a line below the abbreviated table. Because all values are not published for wells with recorders, the extremes may be values that are not listed in the table. Missing records are indicated by dashes in place of the water level.

Records of Ground-Water Quality

Records of ground-water quality in this report differ from other types of records in that for most sampling sites they consist of only one set of measurements for the water year. The quality of ground water ordinarily changes only slowly; therefore, for most general purposes one annual sampling, or only a few samples taken at infrequent intervals during the year, is sufficient. Frequent measurement of the same constituents is not necessary unless one is concerned with a particular problem, such as monitoring for trends in nitrate concentration. In the special cases where the quality of ground water may change more rapidly, more frequent measurements are made to identify the nature of the changes.

Data Collection and Computation

The records of ground-water quality in this report were obtained mostly as a part of special studies in specific areas. Consequently, a number of chemical analyses are presented for some counties but none are presented for others. As a result, the records for this year, by themselves, do not provide a balanced view of ground-water quality Statewide. Such a view can be attained only by considering records for this year in context with similar records obtained for these and other counties in earlier years.

Most methods for collecting and analyzing water samples are described in the "U.S. Geological Survey Techniques of Water-Resources Investigations" manuals listed on a following page. The values reported in this report represent water-quality conditions at the time of sampling as much as possible, consistent with available sampling techniques and methods of analysis. All samples were obtained by trained personnel. The wells sampled were pumped long enough to assure that the water collected came directly from the aquifer and had not stood for a long time in the well casing where it would have been exposed to the atmosphere and to the material, possibly metal, comprising the casings.

Data Presentation

The records of ground-water quality are published in a section titled QUALITY OF GROUND WATER immediately following the ground-water-level records. Data for quality of ground water are listed alphabetically by County, and are identified by well number. The prime identification number for wells sampled is the 15-digit number derived from the latitude-longitude locations. No descriptive statements are given for ground-water-quality records; however, the well number, depth of well, date of sampling, and other pertinent dsta are given in the table containing the chemical analyses of the ground water. The REMARK codes listed for surface-water-quslity records are also applicable to ground-water-quality records.

ACCESS TO WATSTORE DATA

The National WATer Data STOrage and REtrievsl System (WATSTORE) was established for handling water data collected through the activities of the U.S. Geological Survey and to provide for more effective and efficient means of releasing the data to the public. The system is operated and maintained on the central computer facilities of the Survey at its National Center in Reston, Virginia.

WATSTORE can provide a variety of useful products ranging from simple data tables to complex statistical analyses. A minimal fee, plus the actusl computer cost incurred in producing s desired product, is charged to the requester. Information about the availability of specific types of data, the acquisition of data or products, and user chsrges csn be obtained locally from each of the Water Resources Division's District offices (see address given on the back of the title page).

General inquires about WATSTORE may be directed to:

Chief Hydrologist
U.S. Geological Survey
437 National Center
Reston, Virginia 22092

DEFINITION OF TERMS

Terms related to streamflow, water-quality, and other hydrologic data, as used in this report, are defined below. See also table for converting English units to International System (SI) Units on the inside of the back cover.

Acre-foot (AC-FT, acre-ft) is the quantity of water required to cover 1 acre to a depth of 1 foot and is equal to 43,560 cubic feet or about 326,000 gallons or 1,233 cubic meters.

Adenosine triphosphate (ATP) is an organic, phosphate-rich, compound important in the transfer of energy in organisms. Its central role in living cells makes it an excellent indicator of the presence of living material in water. A measure of ATP therefore provides a sensitive and rapid estimate of biomass. ATP is reported in micrograms per liter of the original water sample.

Algae are mostly aquatic single-celled, colonial, or multicelled plants, containing chlorophyll and lacking roots, stems, and leaves.

Algal growth potential (AGP) is the maximum algal dry weight biomass that can be produced in a natural water sample under standardized laboratory conditions. The growth potential is the algal biomass present at stationary phase and is expressed as milligrams dry weight of algae produced per liter of sample.

Aquifer is a geologic formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs.

Artesian means confined and is used to describe a well in which the water level stands above the top of the aquifer tapped by the well. A flowing artesian well is one in which the water level is above the land surface.

Bacteria are microscopic unicellular organisms, typically spherical, rodlike, or spiral and threadlike in shape, often clumped into colonies. Some bacteria cause disease, while others perform an essential role in nature in the recycling of materials; for example, by decomposing organic matter into a form available for reuse by plants.

Total coliform bacteria are a particular group of bacteria that are used as indicators of possible sewage pollution. They are characterized as aerobic or facultative anaerobic, gram-negative, nonspore-forming, rod-shaped bacteria which ferment lactose with gas formation within 48 hours at 35°C. In the laboratory these bacteria are defined as all the organisms that produce colonies with a golden-green metallic sheen within 24 hours when incubated at 35°C 1.0°C on M-Endo medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample.

Fecal coliform bacteria are bacteria that are present in the intestine or feces of warm-blooded animals. They are often used as indicators of the sanitary quality of the water. In the laboratory they are defined as all organisms that produce blue colonies within 24 hours when incubated at 44.5°C ± 0.2°C on M-FC medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample.

Fecal streptococcal bacteria are bacteria found also in the intestine of warmblooded animals. Their presence in water is considered to verify fecal pollution. They are characterized as Gram-positive, cocci bacteria which are capable of growth in brain-heart infusion broth. In the laboratory they are defined as all the organisms which produce red or pink colonies within 48 hours at 35°C ± 1.0°C on KF-streptococcus medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample.

Bed material is the sediment mixture of which a streambed, lake, pond, reservoir, or estuary bottom is composed.

Biochemical oxygen demand (BOD) is a measure of the quantity of dissolved oxygen, in milligrams per liter, necessary for the decomposition of organic matter by micro-organisms, such as bacteria.

Biomass is the amount of living matter present at any given time, expressed as the mass per unit area or volume of habitat.

Ash mass is the mass or amount of residue present after the residue from the dry mass determination has been ashed in a muffle furnace at a temperature or 500°C for 1 hour. The ash mass values of zooplankton and phytoplankton are expressed in grams per cubic meter (g/m^3), and periphyton and benthic organisms in grams per square meter (g/m^2).

Dry mass refers to the mass of residue present after drying in an oven at 105°C for zooplankton and periphyton, until the mass remains unchanged. This mass represents the total organic matter, ash and sediment, in the sample. Dry-mass values are expressed in the same units as ash mass.

Organic mass or volatile mass of the living substance is the difference between the dry mass and the ash mass and represents the actual mass of the living matter. The organic mass is expressed in the ssme units as for ash and dry mass.

Wet mass is the mass of living matter plus contained water.

Bottom material: See Bed material.

Cells/volume refers to the number of cells of any organism which is counted by using a microscope and grid or counting cell. Many planktonic organisms are multicelled and are counted according to the number of contained cells per sample, usually milliliters (mL) or liters (L).

Cubic foot per second-day $(ft^3)/d$ is the volume of water represented by a flow of 1 cubic foot per second for 24 hours. It is equivalent to 86,400 cubic feet, approximately 1.9835 acre-feet, about 646,000 gallons, or 2,445 cubic meters.

Chemical oxygen demand (COD) is a measure of the chemically oxidizable material in the water, and furnishes an approximation of the amount of organic and reducing material present. The determined value may correlate with natural water color or with carbonaceous organic pollution from sewage or industrial wastes.

Chlorophyll refers to the green pigments of plants. Chlorophyll a and b are the two most common green pigments in plants.

Color unit is produced by one milligram per liter of platinum in the form of the chloroplatinate ion. Color is expressed in units of the platinum-cobalt scale.

Contents is the volume of water in a reservoir or lake. Unless otherwise indicated, volume is computed on the basis of a level pool and does not include bank storage.

Control designates a feature downstream from the gage that determines the stage-discharge relation at the gage. This feature may be a natural constriction of the channel, an artificial structure, or a uniform cross section over a long reach of the channel.

Control structure as used in this report is a structure on a stream or canal that is used to regulete the flow or stage of the stream or to prevent the intrusion of salt water.

Cubic foot per second (ft^3/s)[1] is the rate of discharge representing a volume of 1 cubic foot passing a given point during 1 second and is equivalent to 7.48 gallons per second or 448.8 gellons per minute or 0.02832 cubic meters per second.

Cubic feet per second per square mile $[(ft^3/s)/mi^2]$[1] is the average number of cubic feet of water flowing per second from each square mile of area drained, assuming that the runoff is distributed uniformly in time and area.

Discharge is the volume of water (or more broadly, volume of fluid plus suspended sediment) that passes a given point within a given period of time.

Mean discharge (MEAN) is the arithmetic mean of individual daily mean discharges during a specific period.

Instantaneous discharge is the discharge at a particular instant of time.

Dissolved refers to that material in a representative water sample which passes through a 0.45 µm membrane filter. This is a convenient operational definition used by Federal agencies that collect water data. Determinations of "dissolved" constituents are made on subsamples of the filtrate.

Dissolved-solids concentraton of water is determined either analytically by the "residue-on-eveporation" method, or mathematically by totaling the concentrations of individual constituents reported in a comprehensive chemical analysis. During the analytical determination of dissolved solids, the bicarbonate (generally a major dissolved component of water) is converted to carbonate. Therefore, in the mathematical calculation of dissolved-solids concentration, the bicarbonate value, in milligrams per liter, is multiplied by 0.492 to reflect the change.

Drainage area of a stream at a specified location is that area, measured in a horizontal plane, enclosed by a topographic divide from which direct surface runoff from precipitation normally drains by gravity into the stream above the specified point. Figures of drainage area given herein include all closed basins, or noncontributing areas, within the area unless otherwise noted.

Drainage basin is a part of the surface of the earth that is occupied by a drainage system, which consists of a surface stream or a body of impounded surface water together with all tributary surface streams and bodies of impounded surface water.

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[1] Until appropriate changes can be made to the WATSTORE and Prime computer systems, the unit abbreviations "CFS" and "CFSM" will appear in some computer-generated table headings and summaries.

Gage height (G.H.) is the water-surface elevation referred to some arbitrary gage datum. Gage height is often used interchangeably with the more general term "stage," although gage height is more appropriate when used with a reading on a gage.

Gaging station is a particular site on a stream, canal, lake, or reservoir where systematic observations of hydrologic data are obtained.

Hardness of water is a physical-chemical characteristic that is commonly recognized by the increased quantity of soap required to produce lather. It is computed as the sum of equivalents of polyvalent cations and is expressed as the equivalent concentration of calcium carbonate ($CaCO_3$).

Hydrologic Bench-Mark Network is a network of 57 sites in small drainage basins around the country whose purpose is to provide consistent data on the hydrology, including water quality, and related factors in representative undeveloped watersheds nationwide, and to provide analyses on a continuing basis to compare and contrast conditions observed in basins more obviously affected by the activities of man.

Hydrologic unit is a geographic area representing part or all of a surface drainage basin or distinct hydrologic feature as delineated by the Office of Water Data Coordination on the State Hydrologic Unit Maps; each hydrologic unit is identified by an eight-digit number.

Land-surface datum (lsd) is a datum plane that is approximately at land surface at each ground-water observation well.

Measuring point (MP) is an arbitrary permanent reference point from which the distance to the water surface in a well is measured to obtain the water level.

Metamorphic stage refers to the stage of development that an organism exhibits during its transformation from an immature form to an adult form. This developmental process exists for most insects, and the degree of difference from the immature stage to the adult form varies from relatively slight to pronounced, with many intermediates. Examples of metamorphic stages of insects are egg-larva-adult or egg-nymph-adult.

Methylene blue active substances (MBAS) are apparent detergents. The determination depends on the formation of a blue color when methylene blue dye reacts with synthetic anionic detergent compounds.

Micrograms per gram (μg/g) is a unit expressing the concentration of a chemical constituent as the mass (micrograms) of the element per unit mass (gram) of material analyzed.

Micrograms per liter (UG/L, μg/L) is a unit expressing the concentration of chemical constituents in solution as mass (micrograms) of solute per unit volume (liter) of water. One thousand micrograms per liter is equivalent to one milligram per liter.

Milligrams per liter (MG/L, mg/L) is a unit for expressing the concentration of chemical constituents in solution. Milligrams per liter represents the mass of solute per unit volume (liter) of water. Concentration of suspended sediment also is expressed in mg/L and is based on the mass of dry sediment per liter of water-sediment mixture.

National Geodetic Vertical Datum of 1929 (NGVD of 1929)[1] is a geodetic datum derived from a general adjustment of the first order level nets of both the United States and Canada. It was formerly called "Sea Level Datum of 1929" or "mean sea level" in this series of reports. Although the datum was derived from the average sea level over a period of many years at 26 tide stations along the Atlantic, Gulf of Mexico, and Pacific Coasts, it does not necessarily represent local mean sea level at any particular place.

National Stream Quality Accounting Network (NASQAN) is a nationwide data-collection network designed by the U.S. Geological Survey to meet many of the information needs of government agencies and other groups involved in natural or regional water-quality planning and management. The 500 or so sites in NASQAN are generally located at the downstream ends of hydrologic accounting units designated by the U.S. Geological Survey Office of Water Data Coordination in consultation with the Water Resources Council. The objectives of NASQAN are (1) to obtain information on the quality and quantity of water moving within and from the United States through a systematic and uniform process of data collection, summarization, analysis, and reporting such that the data may be used for, (2) description of the areal variability of water quality in the Nation's rivers through analysis of data from this and other programs, (3) detection of changes or trends with time in the pattern of occurrence of water-quality characteristics, and (4) providing a nationally consistent data base useful for water-quality assessment and hydrologic research.

The National Trends Network (NTN) is a 150-station network for sampling atmospheric deposition in the United States. The purpose of the network is to determine the variability, both in location and in time, of the composition of atmospheric deposition, which includes snow, rain, dust particles, aerosols, and gases. The core from which the NTN was built was the already-existing deposition-monitoring network of the National Atmospheric Deposition Program (NADP).

Organism is any living entity.

Organism count/area refers to the number of organisms collected and enumerated in a sample and adjusted to the number per unit area habitat, usually square meter (m^2), acre, or hectare. Periphyton, benthic organisms, and macrophytes are expressed in these terms.

[1]The phrase "NGVD of 1929" is abbreviated as "NGVD" in some computer-generated table headings in this report.

Organism count/volume refers to the number of organisms collected and enumerated in a sample and adjusted to the number per sample volume, usually milliliter (mL) or liter (L). Numbers of planktonic organisms can be expressed in these terms.

Total organism count is the total number of organisms collected and enumerated in any particular sample.

Parameter Code is a 5-digit number used in the U.S. Geological Survey computerized data system, WATSTORE, to uniquely identify a specific constituent. The codes used in WATSTORE are the same as those used in the U.S. Environmental Protection Agency data system, STORET. The Environmental Protection Agency assigns and approves all requests for new codes.

Partial-record station is a particular site where limited streamflow and/or water-quality data are collected systematically over a period of years for use in hydrologic analyses.

Particle size is the diameter, in millimeters (mm), of a particle determined by either sieve or sedimentation methods. Sedimentation methods (pipet, bottom-withdrawal tube, visual-accumulation tube) determine fall diameter of particles in either distilled water (chemically dispersed) or in native water (the river water at the time and point of sampling).

Particle-size classification used in this report agrees with the recommendation made by the American Geophysical Union Subcommittee on Sediment Terminology. The classification is as follows:

Classification	Size (mm)	Method of analysis
Clay..........	0.00024 - 0.004	Sedimentation
Silt..........	.004 - .062	Sedimentation
Sand..........	.062 - 2.0	Sedimentation or sieve
Gravel........	2.0 - 64.0	Sieve

The particle-size distributions given in this report are not necessarily representative of all particles in transport in the stream. Most of the organic matter is removed and the sample is subjected to mechanical and chemical dispersion before analysis in distilled water. Chemical dispersion is not used for native-water analysis.

Percent composition is a unit for expressing the ratio of a particular part of a sample or population to the total sample or population in terms of types, numbers, mass, or volume.

Periphyton is the assemblage of microorganisms attached to and living upon submerged solid surfaces. While primarily consisting of algae, they also include bacteria, fungi, protozoa, rotifers, and other small organisms.

Pesticides are chemical compounds used to control undesirable organisms. Major categories of pesticides include insecticides, miticides, fungicides, herbicides, and rodenticides.

Picocurie (PC, pCi) is one trillionth (1×10^{-12}) of the amount of ratioactivity represented by a curie (Ci). A curie is the amount of radioactivity that yields 3.7×10^{10} radioactive disintegrations per second. A picocurie yields 2.22 dpm (disintegrations per minute).

Plankton is the community of suspended, floating, or weakly swimming organisms that live in the open water of lakes and rivers.

Phytoplankton is the plant part of the plankton. They are usually microscopic and their movement is subject to the water currents. Phytoplankton growth is dependent upon solar radiation and nutrient substances. Because they are able to incorporate as well as release materials to the surrounding water, the phytoplankton have a profound effect upon the quality of the water. They are the primary food producers in the aquatic environment, and are commonly known as algae.

Blue-green algae are a group of phytoplankton organisms having a blue pigment, in addition to the green pigment called chlorophyll. Blue-green algae often cause nuisance conditions in water.

Diatoms are the unicellular or colonial algae having a siliceous shell. Their concentrations are expressed as number of cells per milliliter (cells/mL) of sample.

Green algae have chlorophyll pigments similar in color to those of higher green plants. Some forms produce algae mats or floating "moss" in lakes. Their concentratins are expressed as number of cells per milliliter (cells/mL) of sample.

Zooplankton is the animal part of the plankton. Zooplankton are capable of extensive movements within the water column and are often large enough to be seen with the unaided eye. Zooplankton are secondary consumers feeding upon bacteria, phytoplankton, and detritus. Because they are the grazers in the aquatic environment, the zooplankton are a vital part of the aquatic food web. The zooplankton community is dominated by small crustaceans and rotifers.

Primary productivity is a measure of the rate at which new organic matter is formed and accumulated through photosynthetic and chemosynthetic activity of producer organisms (chiefly, green plants). The rate of primary production is estimated by measuring the amount of oxygen released (oxygen method) or the amount of carbon assimilated by the plants (carbon method).

Milligrams of carbon per area or volume per unit time [mg C/(m^2.time)] for periphyton and macrophytes and [mg C/(m^3.time)] for phytoplankton are units for expressing primary productivity. They define the amount of carbon dioxide consumed as measured by radioactive carbon (carbon 14). The carbon 14 method is of greater sensitivity than the oxygen light and dark bottle method, and is preferred for use in unenriched waters. Unit time may be either the hour or day, depending on the incubation period.

Milligrams of oxygen per area or volume per unit time [mgO /(m^2.time)] for periphyton and macrophytes and [mgO /(m^3.time)] for phytoplankton are the units for expressing primary productivity. They define production and respiration rates as estimated from changes in the measured dissolved-oxygen concentration. The oxygen light and dark bottle method is preferred if the rate of primary production is sufficient for accurate measurements to be made within 24 hours. Unit time may be either the hour or day, depending on the incubation period.

Radiochemical program is a network of regularly sampled water-quality stations where samples are collected to be analyzed for radioisotypes. The streams that are sampled represent major drainage basins in the conterminous United States.

Recoverable from bottom material is the amount of a given constituent that is in solution after a representative sample of bottom material has been digested by a method (usually using an acid or mixture of acids) that results in dissolution of readily soluble substances. Complete dissolution of all bottom material is not achieved by the digestion treatment and thus the determination represents less than the total amount (that is, less than 95 percent) of the constituent in the sample. To achieve comparability of analytical data, equivalent digestion procedures would be required of all laboratories performing such analyses because different digestion procedures are likely to produce different analytical results.

Return period is the average time interval between occurrences of a hydrological event of a given or greater magnitude, usually expressed in years. May also be called recurrence interval.

Runoff in inches (IN, in) shows the depth to which the drainage area would be covered if all the runoff for a given time period were uniformly distributed on it.

Sediment is solid material that originates mostly from disintegrated rocks and is transported by, suspended in, or deposited from water; it includes chemical and biochemical precipitates and decomposed organic material such as humus. The quantity, characteristics, and cause of the occurrence of sediment in streams are influenced by environmental factors. Some major factors are degree of slope, length of slope, soil characteristics, land usage, and quantity and intensity of precipitation.

Bed load is the sediment that is transported in a stream by rolling, sliding, or skipping along the bed and very close to it. In this report, bed load is considered to consist of particles in transit within 0.25 ft of the streambed.

Bed load discharge (tons per day) is the quantity of bed load measured by dry weight that moves past a section as bed load in a given time.

Suspended sediment is the sediment that at any given time is maintained in suspension by the upward components of turbulent currents or that exists in suspension as a colloid.

Suspended-sediment concentration is the velocity-weighted concentration of suspended sediment in the sampled zone (from the water surface to a point approximately 0.3 ft above the bed) expressed as milligrams of dry sediment per liter of water-sediment mixture (mg/L).

Mean concentration is the time-weighted concentration of suspended sediment passing a stream section during a 24-hour day.

Suspended-sediment discharge (tons/day) is the rate at which dry mass of sediment passes a section of a stream or is the quantity of sediment, as measured by dry mass or volume, that passes a section in a given time. It is calculated in units of tons per day as follows: concentration (mg/L) x discharge (ft^3/s) x 0.0027.

Suspended-sediment load is a general term that refers to material in suspension. It is not synonymous with either discharge or concentration.

Total sediment discharge (tons/day) is the sum of the suspended-sediment discharge and the bed-load discharge. It is the total quantity of sediment, as measured by dry mass or volume, that passes a section during a given time.

Total-sediment load or total load is a term which refers to the total sediment (bed load plus suspended-sediment load) that is in transport. It is not synonymous with total-sediment discharge.

7-day 10-year low flow (7 Q_{10}) is the discharge at the 10-year recurrence interval taken from a frequency curve of annual values of the lowest mean discharge for 7 consecutive days (the 7-day low flow).

Sodium-adsorption-ratio (SAR) is the expression of relative activity of sodium ions in exchange reactions within soil and is an index of sodium or alkali hazard to the soil. Waters range in respect to sodium hazard from those which can be used for irrigation on almost all soils to those which are generally unsatisfactory for irrigation.

Solute is any substance that is dissolved in water.

Specific conductance is a measure of the ability of a water to conduct an electrical current. It is expressed in microsiemens per centimeter at 25°C. Specific conductance is related to the type and concentration of ions in solution and can be used for approximating the dissolved-solids content of the water. Commonly, the concentration of dissolved solids (in milligrams per liter) is about 65 percent of the specific conductance (in microsiemens). This relation is not constant from stream to stream, and it may vary in the same source with changes in the composition of the water.

Stage-discharge relation is the relation between gage height (stage) and the volume of water, per unit of time, flowing in a channel.

Streamflow is the discharge that occurs in a natural channel. Although the term "discharge" can be applied to the flow of a canal, the word "streamflow" uniquely describes the discharge in a surface stream course. The term "streamflow" is more general than "runoff" as streamflow may be applied to discharge whether or not it is affected by diversion or regulation.

Substrate is the physical surface upon which an organism lives.

Natural substrate refers to any naturally occurring emersed or submersed solid surface, such as a rock or tree, upon which an organisum lives.

Artificial substrate is a device which is purposely placed in a stream or lake for colonization of organisms. The artificial substrate simplifies the community structure by standardizing the substrate from which each sample is taken. Examples of artificial substrates are basket samplers (made of wire cages filled with clean streamside rocks) and multiplate samplers (made of hardboard) for benthic organism collection, and plexiglass strips for periphyton.

Surface area of a lake is that area outlined on the latest U.S.G.S. topographic map as the boundary of the lake and measured by a planimeter in acres. In localities not covered by topographic maps, the areas are computed from the best maps available at the time planimetered. All areas shown are those for the stage when the planimetered map was made.

Surficial bed material is the part (0.1 to 0.2 ft) of the bed material that is sampled using U.S. Series Bed-Material Samplers.

Suspended (as used in tables of chemical analyses) refers to the amount (concentration) of undissolved material in a water-sediment mixture. It is associated with the material retained on a 0.45-micrometer filter.

Suspended, recoverable is the amount of a given constituent that is in solution after the part of a representative water-suspended sediment sample that is retained on a 0.45 µm membrane filter has been digested by a method (usually using a dilute acid solution) that results in dissolution of only readily soluble sustances. Complete dissolution of all the particulate matter is not achieved by the digestion treatment and thus the determination represents something less than the "total" amount (that is, less than 95 percent) of the constituent present in the sample. To achieve comparability of analytical data, equivalent digestion procedures are required of all laboratories performing such analyses because different digestion procedures are likely to produce different analytical results.

Determinations of "suspended, recoverable" constituents are made either by analyzing portions of the material collected on the filter or, more commonly, by difference, based on determinations of (1) dissolved and (2) total recoverable concentrations of the constituent.

Suspended, total is the total amount of a given constituent in the part of a representative water-suspended sediment sample that is retained on a 0.45 µm membrane filter. This term is used only when the analytical procedure assures measurement of at least 95 percent of the constituent determined. A knowledge of the expected form of the constituent in the sample, as well as the analytical methodology used, is required to determine when the results should be reported as "suspended, total."

Determinations of "suspended, total" constituents are made either by analyzing portions of the material collected on the filter or, more commonly, by difference, based on determinations of (1) dissolved and (2) total concentrations of the constituent.

Taxonomy is the division of biology concerned with the classification and naming of organisms. The classification of organisms is based upon a hierarchial scheme beginning with Kingdom and ending with Species at the base. The higher the classification level, the fewer features the organisms have in common. For example, the taxonomy of a particular mayfly, Hexagenia limbata, is the following:

Kingdom.................... Animal
Phylum..................... Arthropoda
Class...................... Insecta
Order...................... Ephemeroptera
Family..................... Ephemeridae
Genus...................... Hexagenia
Species.................... Hexagenia limbata

Thermograph is an instrument that continuously records variations of tempeature on a chart. The more general term "temperature recorder" is used in the table headings and refers to any instrument that records temperature whether on a chart, a tape, or any other medium.

Time-weighted average is computed by multiplying the number of days in the sampling period by the concentrations of individual constituents for the corresponding period and dividing the sum of the products by the total number of days. A time-weighted average represents the composition of water that would be contained in a vessel or reservoir that had received equal quantities of water from the stream each day for the year.

Tons per acre-foot indicates the dry mass of dissolved solids in 1 acre-foot of water. It is computed by multiplying the concentration of the constituent, in milligrams per liter, by 0.00136.

Tons per day (T/DAY) is the quantity of a substance in solution or suspension that passes a stream section during a 24-hour period.

Total is the total amount of a given constituent in a representative water-suspended sediment sample, regardless of the constituent's physical or chemical form. This term is used only when the analytical procedure assures measurement of at least 95 percent of the constituent present in both the dissolved and suspended phases of the sample. A knowledge of the expected form of the constituent in the sample, as well as the analytical methodology used, is required to judge when the results should be reported as "total." (Note that the word "total" does double duty here, indicating both that the sample consists of a water-suspended sediment mixture and that the analytical method determined all of the constituent in the sample.)

Total discharge is the total quantity of any individual constituent, as measured by dry mass or volume, that passes through a stream cross-section per unit of time. This term needs to be qualified, such as "total sediment discharge," "total chloride discharge," and so on.

Total, recoverable is the amount of a given constituent that is in solution after a repreaentative water-suspended sediment sample has been digested by a method (usually using a dilute acid solution) that results in dissolution of only readily soluble substances. Complete dissolution of all particulate matter is not achieved by the digestion treatment, and thus the determination represents something less than the "total" amount (that is, less than 95 percent) of the constituent present in the dissolved and suspended phases of the sample. To achieve comparability of analytical data, equivalent digestion procedures are required of all laboratories performing such analyses, because different digestion procedures are likely to produce different analytical results.

Tritium Network is a network of stations which has been established to provide baseline information on the occurrence of tritium in the Nation's surface waters. In addition to the surface-water stations in the network, tritium data are also obtained at a number of precipitation stations. The purpose of the precipitation stations is to provide an estimate sufficient for hydrologic studies of the tritium input to the United States.

Water year in Geological Survey reports dealing with surface-water supply is the 12-month period, October 1 through September 30. The water year ia designated by the calendar year in which it ends and which includes 9 of the 12 months. Thus, the year ending September 30, 1980, is called the "1980 water year."

WDR is used a an abbreviation for "Water-Data Report" in the REVISED RECORDS paragraph to refer to State annual hydrologic-data reports (WRD was used as an abbreviation for "Water-Resources Data" in reports published prior to 1976).

Weighted average is used in this report to indicate discharge-weighted average. It is computed by multiplying the discharge for a sampling period by the concentrations of individual constituents for the corresponding period and dividing the sum of the products by the sum of the discharges. A discharge-weighted average approximates the composition of water that would be found in a reservoir containing all the water passing a given location during the water year after thorough mixing in the reservoir.

WSP is used as an abbreviation for "Water-Supply Paper" in references to previously published reports.

PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS

The U.S. Geological Survey publishes a series of manuals on techniques describing procedures for planning and executing specialized work in water-resources investigations. The material is grouped under major subject headings called books and is further divided into sections and chapters. For example, Section A of Book 3 (Applications of Hydraulics) is on surface water. The chapter, the unit of publication, is limited to a narrow field of subject matter. This format permits flexibility in revision and publication as the need arises. The reports listed below are for sale by the U.S. Geological Survey, Branch of Distribution, 604 South Pickett St., Alexandria, VA 22304 (authorized agent of the Superintendent of Documents, Government Printing Office).

NOTE: When ordering any of these publications, please give the title, book number, chapter number, and "U.S. Geological Survey Techniques of Water-Resources Investigations".

1-D1. *Water temperature--influential factors, field measurement and data presentation* by H. H. Stevens, Jr., J. F. Ficke, and G. F. Smoot: USGS--TWRI Book 1, Chapter D1. 1975. 65 pages.

1-D2. *Guidelines for collection and field analysis of ground-water samples for selected unstable constituents,* by W. W. Wood: USGS--TWRI Book 1, Chapter D2. 1976. 24 pages.

2-D1. *Application of surface geophysics to ground-water investigations* by A. A. R. Zohdy, G. P. Eaton, and D. R. Mabey: USGS--TWRI Book 2, Chapter D1. 1974. 116 pages.

2-E1. *Application of borehole geophysics to water-resources investigations* by W. S. Keys and L. M. MacCary: USGS--TWRI Book 2, Chapter E1. 1971. 126 pages.

3-A1. *General field and office procedures for indirect discharge measurements,* by M. A. Benson and Tate Dalrymple: USGS--TWRI Book 3, Chapter A1. 1967. 30 pages.

3-A2. *Measurement of peak discharge by the slope-area method,* by Tate Dalrymple and M. A. Benson: USGS--TWRI Book 3, Chapter A2. 1967. 12 pages.

3-A3. *Measurement of peak discharge at culverts by indirect methods,* by G. L. Bodhaine: USGS--TWRI Book 3, Chapter A3. 1968. 60 pages.

3-A4. *Measurement of peak discharge at width contractions by indirect methods,* by H. F. Matthai: USGS--TWRI Book 3, Chapter A4. 1967. 44 pages.

3-A5. *Measurement of peak discharge at dams by indirect methods,* by Harry Hulsing: USGS--TWRI Book 3, Chapter A5. 1967. 29 pages.

3-A6. *General procedure for gaging streams* by R. W. Carter and Jacob Davidian: USGS--TWRI Book 3, Chapter A6. 1968. 13 pages.

3-A7. *Stage measurements at gaging stations,* by T. J. Buchanan and W. P. Somers: USGS--TWRI Book 3, Chapter A7. 1968. 28 pages.

3-A8. *Discharge measurements at gaging stations,* by T. J. Buchanan and W. P. Somers: USGS--TWRI Book 3, Chapter A8. 1969. 65 pages.

3-A9. *Measurement of time of travel and dispersion in streams by dye tracing,* by E. F. Hubbard, F. A. Kilpatrick, L. A. Martens, and J. F. Wilson, Jr.: USGS--TWRI Book 3, Chapter A9. 1982. 44 pages.

3-A11. *Measurement of discharge by moving-boat method,* by G. F. Smoot and C. E. Novak: USGS--TWRI Book 3, Chapter A11. 1969. 22 pages.

3-A13. *Computation of continuous records of streamflow,* by E. J. Kennedy: USGS--TWRI Book 3, Chapter A13. 1983. 53 pages.

3-A14. *Use of flumes in measuring discharge,* by F. A. Kilpatrick and V. R. Schneider: USGS--TWRI Book 3, Chapter A14. 1983. 46 pages.

3-B1. *Aquifer-test design, observation, and data analysis,* by R. W. Stallman: USGS--TWRI Book 3, Chapter B1. 1971. 26 pages.

3-B2. *Introduction to ground-water hydraulics, a programed text for self-instruction,* by G. D. Bennett: USGS--TWRI Book 3, Chapter B2. 1976. 172 pages.

3-B3. *Type curves for selected problems of flow to wells in confined aquifers,* by J. E. Reed: USGS--TWRI Book 3, Chapter B3. 1980. 106 pages.

3-C1. *Fluvial sediment concepts,* by H. P. Guy: USGS--TWRI Book 3, Chapter C1. 1970. 55 pages.

3-C2. *Field methods for measurement of fluvial sediment* by H. P. Guy and V. W. Norman: USGS--TWRI Book 3, Chapter C2. 1970. 59 pages.

3-C3. *Computation of fluvial-sediment discharge,* by George Porterfield: USGS--TWRI Book 3, Chapter C3. 1972. 66 pages.

4-A1. *Some statistical tools in hydrology,* by H. C. Riggs: USGS--TWRI Book 4, Chapter A1. 1968. 39 pages.

4-A2. *Frequency curves,* by H. C. Riggs: USGS--TWRI Book 4, Chapter A2. 1968. 15 pages.

4-B1. *Low-flow investigations,* by H. C. Riggs: USGS--TWRI Book 4, Chapter B1. 1972. 18 pages.

4-B2. *Storage analyses for water supply,* by H. C. Riggs and C. H. Hardison: USGS--TWRI Book 4, Chapter B2. 1973. 20 pages.

4-B3. *Regional analyses of streamflow characteristics* by H. C. Riggs: USGS--TWRI Book 4, Chapter B3. 1973. 15 pages.

4-D1. *Computation of rate and volume of stream depletion by wells,* by C. T. Jenkins: USGS--TWRI Book 4, Chapter D1. 1970. 17 pages.

5-A1. *Methods for determination of inorganic substances in water and fluvial sediments* by M. W. Skougstad and others, editors: USGS--TWRI Book 5, Chapter A1. 1979. 626 pages.

5-A2. *Determination of minor elements in water by emission spectroscopy* by P. R. Barnett and E. C. Mallory, Jr.: USGS--TWRI Book 5, Chapter A2. 1971. 31 pages.

5-A3. *Methods for analysis of organic substances in water,* by D. F. Goerlitz and Eugene Brown: USGS--TWRI Book 5, Chapter A3. 1972. 40 pages.

5-A4. *Methods for collection and analysis of aquatic biological and microbiological samples,* edited by P. E. Greeson, T. A. Ehlke, G. A. Irwin, B. W. Lium, and K. V. Slack: USGS--TWRI Book 5, Chapter A4. 1977. 332 pages.

PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS--Continued

5-A5. *Methods for determination of radioactive substances in water and fluvial sediments* by L. L. Thatcher, V. J. Janzer, and K. W. Edwards: USGS--TWRI Book 5, Chapter A5. 1977. 95 pages.

5-A6 *Quality assurance practices for the chemical and biological analyses of water and fluvial sediments,* by L. C. Friedman and D. E. Erdmann: USGS--TWRI Book 5, Chapter A6. 1982. 181 pages.

5-C1. *Laboratory theory and methods for sediment analysis.* by H. P. Guy: USGS--TWRI Book 5, Chapter C1. 1969. 58 pages.

7-C1. *Finite difference model for aquifer simulation in two dimensions with results of numerical experiments,* by P. C. Trescott, G. F. Pinder, and S. P. Larson: USGS--TWRI Book 7, Chapter C1. 1976. 116 pages.

7-C2. *Computer model of two-dimensional solute transport and dispersion in ground water* by L. F. Konikow and J. D. Bredehoeft: USGS--TWRI Book 7, Chapter C2. 1978. 90 pages.

7-C3. *A model for simulation of flow in singular and interconnected channels.* by R. W. Schaffranek, R. A. Baltzer, and D. E. Goldberg: USGS--TWRI Book 7, Chapter C3. 1981. 110 pages.

8-A1. *Methods of measuring water levels in deep wells.* by M. S. Garber and F. C. Koopman: USGS--TWRI Book 8, Chapter A1. 1968. 23 pages

8-A2. *Installation and service manual for U.S. Geological Survey manometers.* by J. D. Craig: USGS--TWRI Book 8, Chapter A2. 1983. 57 pages.

8-B2. *Calibration and maintenance of vertical-axis type current meters* by G. F. Smoot and C. E. Novak: USGS--TWRI Book 8, Chapter B2. 1968. 15 pages.

Example 9.--Introductory page to surface-water records[1]
(with REMARK CODES)

SURFACE-WATER RECORDS

REMARK CODES.--The following remark codes may appear with the water-quality data in this section:

PRINTED OUTPUT	REMARK
E	Estimated value
>	Actual value is known to be greater than the value shown.
<	Actual value is known to be less than the value shown
K	Results based on colony count outside the acceptance range (non-ideal colony count)
L	Biological organism count less than 0.5 percent (organism may be observed rather than counted)
D	Biological organism count equal to or greater than 15 percent (dominant)
&	Biological organism estimated as dominant

[1]This page must be a right-hand (odd-numbered) page.

Example 10.--Introductory page to ground-water-quality records[1]
(with REMARK CODES)

GROUND-WATER-QUALITY RECORDS

REMARK CODES.--The following remark codes may appear with the water-quality data in this section:

PRINTED OUTPUT	REMARK
E	Estimated value
>	Actual value is known to be greater than the value shown.
<	Actual value is known to be less than the value shown
K	Results based on colony count outside the acceptance range (non-ideal colony count)
L	Biological organism count less than 0.5 percent (organism may be observed rather than counted)
D	Biological organism count equal to or greater than 15 percent (dominant)
&	Biological organism estimated as dominant

[1]This page must be a right-hand (odd-numbered) page.

Example 11.--Supplemental water-quality data[1] for gaging stations

SUPPLEMENTAL WATER-QUALITY DATA FOR GAGING STATIONS

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT^3/S)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	TEMPER ATURE, WATER (DEG C)	DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT^3/S)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	TEMPER-ATURE, WATER (DEG C)
09418500 MEADOW VALLEY WASH NEAR CALIENTE, NV (LAT 37 33 20 LONG 114 33 50)									
JAN, 1981					MAY, 1981				
28...	1400	9.0	928	7.5	27...	0915	7.0	1100	15.5
FEB					JUN				
23...	1400	9.0	911	15.5	25...	0900	2.0	817	19.0
MAR					JUL				
25...	1315	9.0	1010	16.0	28...	0915	2.0	792	--
APR					SEP				
28...	0930	6.0	990	13.0	24...	0845	2.0	845	16.5
09419000 MUDDY RIVER NEAR GLENDALE, NV (LAT 36 38 35 LONG 114 32 20)									
OCT, 1980					MAY, 1981				
03...	1400	26	1560	24.5	04...	0930	32	1560	21.5
17...	1300	26	1480	18.5	JUN				
DEC					04...	1200	33	1480	24.5
04...	1000	35	1600	18.5	JUL				
30...	1015	38	1540	17.0	03...	1200	30	1470	25.5
FEB, 1981					AUG				
03...	1030	38	1600	15.5	07...	1100	29	1430	26.0
MAR					SEP				
03...	1115	46	1610	18.5	02...	1045	32	1670	26.0
31...	1315	35	1520	19.5					
10244720 FRANKLIN RIVER NEAR ARTHUR, NV (LAT 40 49 25 LONG 115 08 10)									
OCT, 1980					MAY, 1981				
29...	1405	1.9	215	6.5	22...	1030	8.3	77	7.5
NOV					JUL				
21...	1150	1.5	212	1.0	14...	1120	1.4	154	15.0
JAN, 1981					SEP				
15...	1305	2.4	190	1.0	09...	1100	.72	258	11.0
MAR									
05...	1020	2.2	199	2.0					
10244745 OVERLAND CREEK NEAR RUBY VALLEY, NV (LAT 40 27 30 LONG 115 23 30)									
OCT, 1980					MAY, 1981				
29...	1115	1.5	89	3.0	22...	1405	14	65	11.5
JAN, 1981					JUL				
15...	1050	1.6	85	.0	14...	1655	3.4	79	17.0
MAR					SEP				
05...	1205	1.6	84	3.0	09...	1505	1.1	102	14.0
10245900 PINE CREEK NEAR BELMONT, NV (LAT 38 47 40 LONG 116 51 13)									
NOV, 1980					JUN, 1981				
18...	0915	1.8	70	.0	23...	1500	5.3	54	12.5
MAR, 1981					AUG				
24...	1200	1.3	76	3.0	31...	1705	1.3	73	11.0
MAY									
12...	1020	7.3	58	6.5					
10245910 MOSQUITO CREEK NEAR BELMONT, NV (LAT 38 48 22 LONG 116 40 43)									
NOV, 1980					MAY, 1981				
19...	0800	1.0	114	.0	12...	1120	2.1	84	7.0
FEB, 1981					JUN				
10...	1455	.59	100	1.0	21...	1050	3.6	94	10.0
MAR					SEP				
25...	0735	.57	104	2.0	01...	1025	.70	98	9.5
10245925 STONEBERGER CREEK NEAR AUSTIN, NV (LAT 39 08 24 LONG 116 36 05)									
NOV, 1980					MAY, 1981				
17...	1640	.25	488	3.0	12...	0900	1.3	306	7.0
FEB, 1981					JUN				
10...	1145	.41	452	5.0	23...	1245	1.3	283	15.5
MAR					AUG				
24...	0945	.38	443	2.5	31...	1505	.12	510	14.0
10246846 LITTLE CURRANT CREEK NEAR CURRANT, NV (LAT 38 50 50 LONG 115 22 00)									
OCT, 1980					MAY, 1981				
20...	1530	1.6	377	9.0	14...	0845	6.8	329	8.0
NOV					JUN				
21...	0835	2.1	394	1.5	18...	0835	6.0	350	8.5
DEC					JUL				
18...	0755	1.3	342	2.0	23...	0925	1.5	340	10.0
JAN, 1981					AUG				
21...	1150	.81	331	3.0	20...	0935	.96	340	12.0
MAR					SEP				
18...	1325	1.1	347	2.5	22...	1805	.48	346	12.5
APR									
23...	0950	6.7	318	10.5					

[1]Reprinted as originally published from WDR: NV-81-1. The WATSTORE and Prime computer systems will soon be changed so that the term "MICROSIEMENS" will replace "MICROMHOS" under SPECIFIC CONDUCTANCE.

Example 12.--Table showing summary of floods at selected sites[1]

WATER RESOURCES DATA - *(State)*, 1976

SUMMARY OF FLOOD STAGE AND DISCHARGE

The following table contains the record of peak flows at selected sites for floods which occurred during June 15-19, 1976. Most of the sites are gaging stations or former gaging stations where new peak discharges for the period of record occurred. Six indirect discharge measurements were made to determine peaks of the flood. Other peaks were determined from established or extended rating tables. Flood hydrographs of representative stations for the flood period appear on the following page.

Table 1.--Peak discharges at selected sites during flood of June 15-19, 1976

				Maximum previously known			Maximum June 1976		
Station number	Station name	Drainage area (mi^2)	Period of record	Date	Gage height (feet)	Discharge (ft^3/s)	Day	Gage height (feet)	Discharge (ft^3/s)
	SALMON RIVER BASIN								
13295000	Valley Creek near Stanley	147	1911-13, 1921-72	5-24-56	3.92	2,000	17	3.25	1,520
13295500	Salmon River below Valley Creek, at Stanley	501	1925-60	5-27-56	4.62	5,070	17	4.95	5,650
13296000	Yankee Fork Salmon River near Clayton	195	1921-49	6-12-21	6.79	3,360	17	11.50	4,900
13296500	Salmon River below Yankee Fork, near Clayton	802	1921-72, 1973-76†	5-24-56	11.60	10,300	17	11.86	10,500
13297300	Holman Creek near Clayton	6.10	1962-71†	6-13-65	-	25	17	5.06	23
13298500	Salmon River near Challis	[a]1,800	1928-72, 1973-76†	5-25-56	10.95	15,400	17	11.40	17,300
13302500	Salmon River at Salmon	[a]3,760	1912-16, 1919-76	5-25-56	8.25	16,500	17	8.67	17,700
13306500	Panther Creek near Shoup	529	1944-76	5-13-71	5.86	3,030	16	5.95	3,050
13307000	Salmon River near Shoup	[a]6,270	1944-76	5-26-56	13.00	24,900	18	13.13	25,700
13308500	Middle Fork Salmon River Cape Horn	138	1928-72	5-24-56	6.96	2,980	17	7.00	3,320
13310700	South Fork Salmon River near Kressel ranger station	[a]330	1966-76	6-10-72	8.83	5,630	17	10.00	6,740
13313000	Johnson Creek at Yellow Pine	213	1928-76	5-27-56	7.64	5,440	17	8.32	6,230
13316500	Little Salmon River at	576	1948†, 1951-55, 1956-76	1-16-76	11.00	9,700	17	11.05	12,600
13317000	Salmon River at White Bird	[a]13,550	1894†, 1910-17, 1919-76	June 1894	37.5	120,000	17	35.81	130,000
	SNAKE RIVER MAIN STEM								
13334300	Snake River near Anatone	[a]92,960	1958-76	5-29-71	19.98	151,000	18	24.45	216,000

† Peak discharge determined only.
a Approximately.

[1]Typed tables in the introductory text and station manuscripts of State data reports that list discharge data should use commas to separate thousands, millions, and so on, in numbers of four or more digits.

Example 13.--Flood hydrographs at selected sites

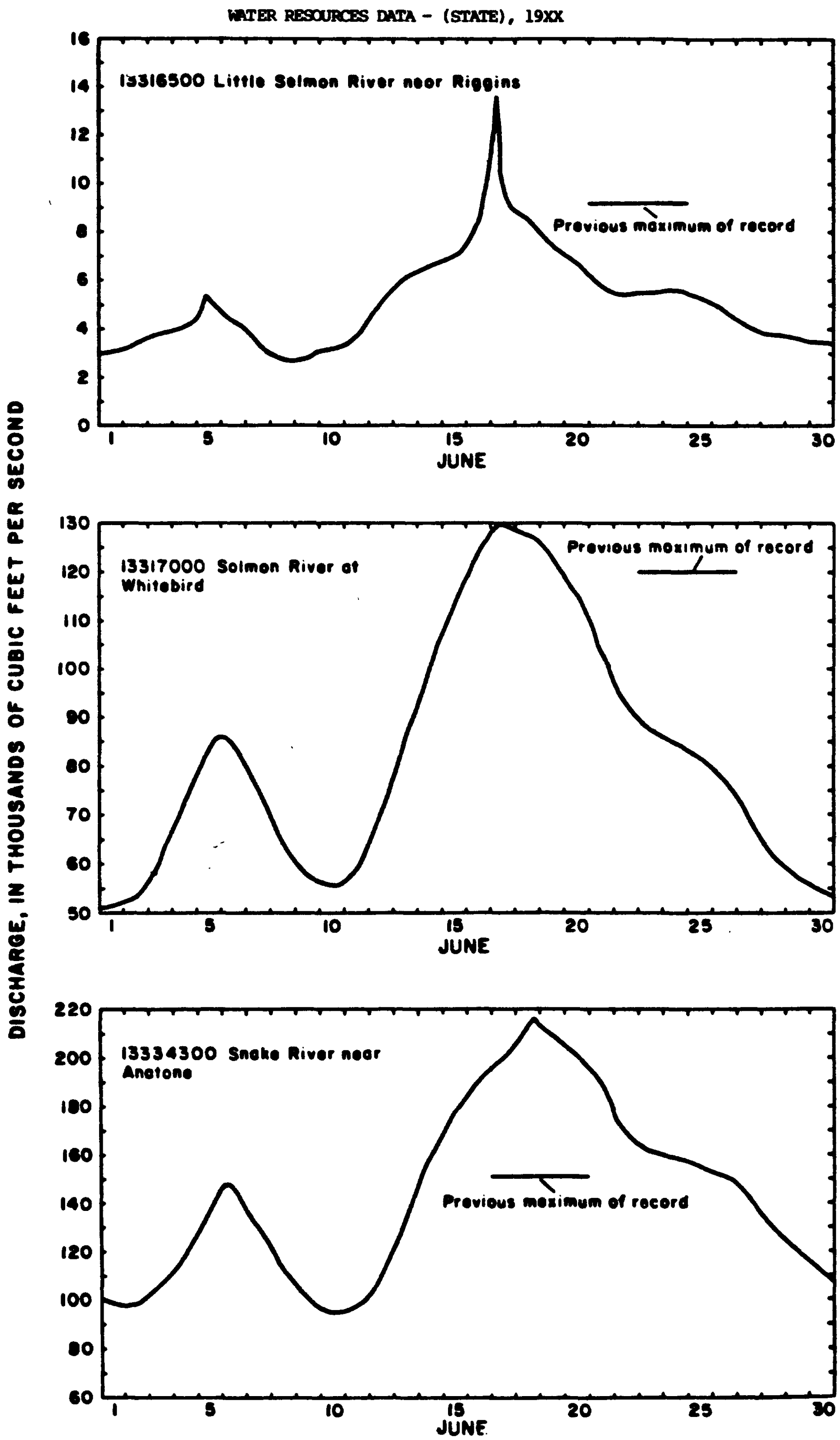

FIGURE 3.--Discharge at selected gaging stations, floods of June 15-19.

Example 14.--Map showing location of observation wells (Recording and nonrecording)

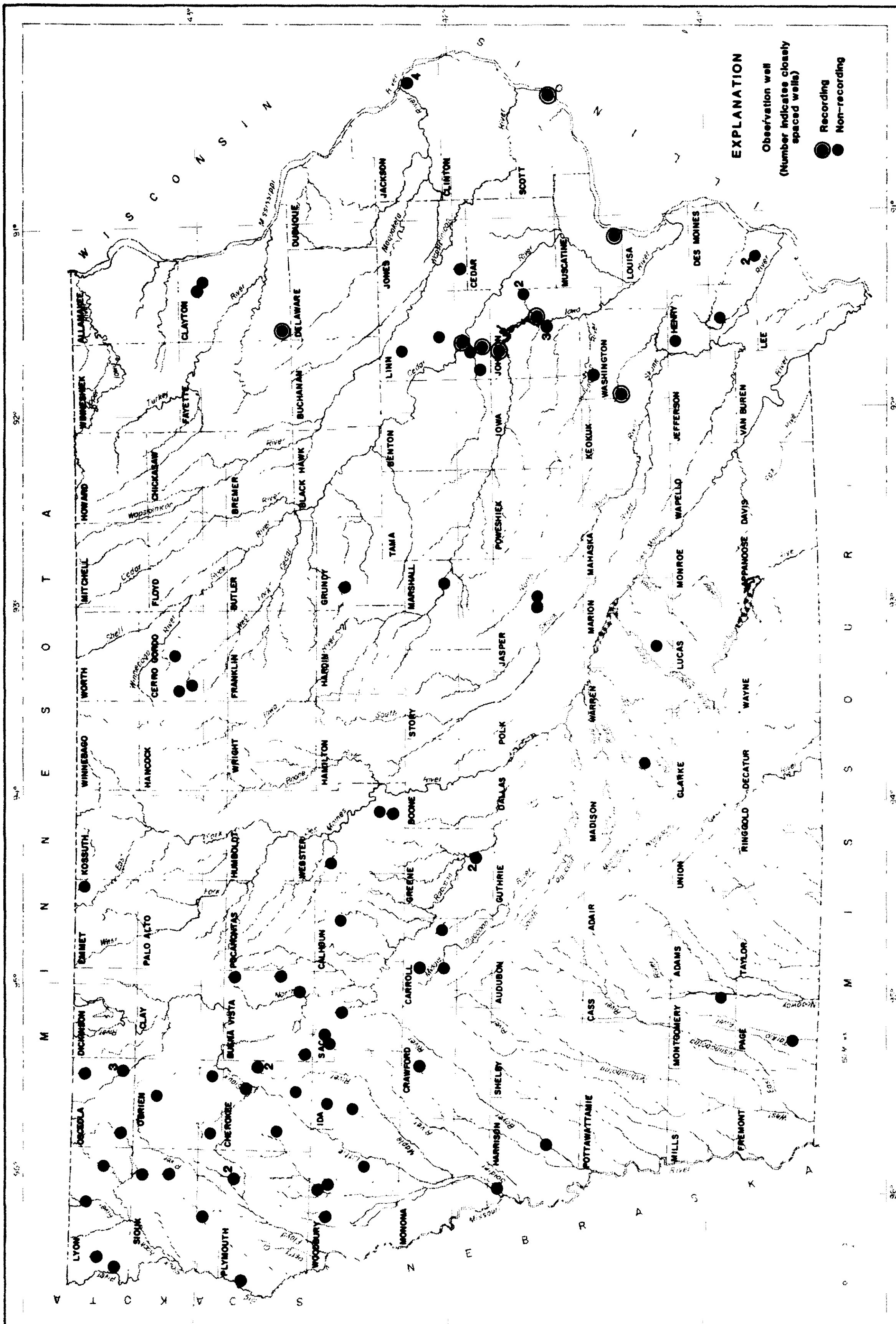

Figure 12.-Location of observation wells in Iowa.

Example 15A.--Water-discharge station only[1] *(data table flagged)*

01632000 NORTH FORK SHENANDOAH RIVER AT COOTES STORE, VA

LOCATION.--Lat 38°38'13", long 78°51'11", Rockingham County, Hydrologic Unit 02070006, on right bank at Cootes Store, 300 ft upstream from bridge on State Highway 259, and 3.7 mi upstream from Linville Creek.

DRAINAGE AREA.--210 mi^2.

PERIOD OF RECORD.--February 1925 to current year.

REVISED RECORDS.--WSP 726: 1928-31. WSP 951: 1936, 1939(M). WSP 1171: 1935, 1937, 1938(M). WSP 1502: 1926, 1927-28(M), 1929, 1930-34(M). WSP 2103: Drainage area.

GAGE.--Water-stage recorder and concrete control. Datum of gage is 1,051.8 ft above National Geodetic Vertical Datum of 1929 (U.S. Army Corps of Engineers bench mark). Prior to Nov. 15, 1937, nonrecording gage at same site and datum.

REMARKS.--Records good except for estimated daily discharges, which are fair. National Weather Service gage-height telemeter at station. Several observations of water temperature were made during the year. Water-quality records for some prior periods have been collected at this location.

AVERAGE DISCHARGE.--58 years, 191 ft^3/s, 12.35 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 50,000 ft^3/s, Oct. 15, 1942, gage height, 25.3 ft, from floodmark, from rating curve extended above 9,000 ft^3/s on basis of contracted-opening measurement of peak flow; minimum, 0.20 ft^3/s, Aug. 28, 29, Sept. 4, 1957, Sept. 7-10, 1966; minimum gage height, 1.74 ft, Sept. 7-10, 1966.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum stage since at least 1836, that of Oct. 15, 1942.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 3,500 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 19	0615	*6470	*10.56	Apr. 15	1700	6440	10.54
Apr. 3	0300	3990	8.48	Apr. 24	1615	5200	9.58

Minimum discharge, 1.1 ft^3/s, Sept. 11, 12, gage height, 1.83 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.6	13	258	52	85	216	304	227	101	21	21	2.6
2	5.4	13	312	48	366	200	374	199	88	23	21	2.4
3	5.1	12	238	45	1250	184	2660	181	75	22	20	2.2
4	5.0	50	187	42	694	171	1070	168	76	21	24	2.1
5	4.7	93	152	39	416	162	616	145	66	43	23	2.2
6	4.5	57	129	37	312	163	442	125	57	30	28	1.8
7	4.4	43	107	36	251	170	370	108	57	23	18	1.6
8	4.1	37	91	35	205	220	340	98	50	21	7.5	1.4
9	4.4	34	78	34	170	686	396	93	43	18	5.8	1.4
10	5.4	33	68	38	e138	612	2050	82	39	16	5.3	1.3
11	5.5	30	62	44	e128	450	2080	73	35	14	4.9	1.2
12	5.2	29	63	45	e145	352	989	66	32	12	6.4	1.2
13	7.6	28	55	44	e125	280	600	62	29	11	7.7	1.7
14	9.6	26	48	44	e108	231	430	60	27	9.4	6.7	1.8
15	8.4	24	45	44	115	199	3170	64	25	8.0	5.5	1.6
16	8.7	22	1020	44	217	172	2350	1130	24	7.3	4.6	1.5
17	8.9	21	717	42	445	149	955	1570	24	10	4.1	1.4
18	8.9	20	396	36	736	252	587	675	30	17	3.9	1.9
19	8.7	18	276	36	608	4200	421	417	104	17	3.5	2.4
20	8.9	19	211	35	516	1380	333	320	68	17	2.9	2.2
21	8.7	18	169	39	480	1510	267	378	52	16	2.5	2.5
22	8.3	18	135	35	574	1210	219	642	48	20	2.2	3.5
23	8.3	18	112	40	771	688	197	629	37	21	3.1	2.6
24	7.9	17	98	e53	719	462	3060	460	30	25	3.8	2.7
25	12	17	87	e57	492	355	2570	341	26	25	3.5	2.7
26	16	16	79	e60	357	274	1010	266	23	26	3.0	2.6
27	17	16	73	e65	275	391	590	211	21	24	2.7	2.6
28	17	19	68	e69	235	763	418	173	19	23	2.6	2.6
29	15	168	65	e74	---	550	331	157	19	22	3.1	2.5
30	15	221	61	e78	---	416	270	136	21	20	2.6	4.0
31	14	---	56	e82	---	357	---	115	---	21	2.3	---
TOTAL	268.2	1150	5516	1472	10933	17425	29469	9371	1346	603.7	255.2	64.2
MEAN	8.65	38.3	178	47.5	390	562	982	302	44.9	19.5	8.23	2.14
MAX	17	221	1020	82	1250	4200	3170	1570	104	43	28	4.0
MIN	4.1	12	45	34	85	149	197	60	19	7.3	2.2	1.2
CFSM	.04	.18	.85	.23	1.86	2.68	4.68	1.44	.21	.09	.04	.01
IN.	.05	.20	.98	.26	1.94	3.09	5.22	1.66	.24	.11	.05	.01

CAL YR 1982 TOTAL 74134.2 MEAN 203 MAX 3870 MIN 2.9 CFSM .97 IN 13.13
WTR YR 1983 TOTAL 77873.3 MEAN 213 MAX 4200 MIN 1.2 CFSM 1.01 IN 13.79

e Estimated

[1]Modified from WDR: VA-83-1.

Example 15B.--Water-discharge station only[1]
(data table not flagged)

01632000 NORTH FORK SHENANDOAH RIVER AT COOTES STORE, VA

LOCATION.--Lat 38°38'13", long 78°51'11", Rockingham County, Hydrologic Unit 02070006, on right bank at Cootes Store, 300 ft upstream from bridge on State Highway 259, and 3.7 mi upstream from Linville Creek.

DRAINAGE AREA.--210 mi^2.

PERIOD OF RECORD.--February 1925 to current year.

REVISED RECORDS.--WSP 726: 1928-31. WSP 951: 1936, 1939(M). WSP 1171: 1935, 1937, 1938(M). WSP 1502: 1926, 1927-28(M), 1929, 1930-34(M). WSP 2103: Drainage area.

GAGE.--Water-stage recorder and concrete control. Datum of gage is 1,051.8 ft above National Geodetic Vertical Datum of 1929 (U.S. Army Corps of Engineers bench mark). Prior to Nov. 15, 1937, nonrecording gage at same site and datum.

REMARKS.--Estimated daily discharges: Jan. 24-31 and Feb. 10-14. Records good except for estimated daily discharges, which are fair. National Weather Service gage-height telemeter at station. Several observations of water temperature were made during the year. Water-quality records for some prior periods have been collected at this location.

AVERAGE DISCHARGE.--58 years, 191 ft^3/s, 12.35 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 50,000 ft^3/s, Oct. 15, 1942, gage height, 25.3 ft, from floodmark, from rating curve extended above 9,000 ft^3/s on basis of contracted-opening measurement of peak flow; minimum, 0.20 ft^3/s, Aug. 28, 29, Sept. 4, 1957, Sept. 7-10, 1966; minimum gage height, 1.74 ft, Sept. 7-10, 1966.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum stage since at least 1836, that of Oct. 15, 1942.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 3,500 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 19	0615	*6470	*10.56	Apr. 15	1700	6440	10.54
Apr. 3	0300	3990	8.48	Apr. 24	1615	5200	9.58

Minimum discharge, 1.1 ft^3/s, Sept. 11, 12, gage height, 1.83 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.6	13	258	52	85	216	304	227	101	21	21	2.6
2	5.4	13	312	48	366	200	374	199	88	23	21	2.4
3	5.1	12	238	45	1250	184	2660	181	75	22	20	2.2
4	5.0	50	187	42	694	171	1070	168	76	21	24	2.1
5	4.7	93	152	39	416	162	616	145	66	43	23	2.2
6	4.5	57	129	37	312	163	442	125	57	30	28	1.8
7	4.4	43	107	36	251	170	370	108	57	23	18	1.6
8	4.1	37	91	35	205	220	340	98	50	21	7.5	1.4
9	4.4	34	78	34	170	686	396	93	43	18	5.8	1.4
10	5.4	33	68	38	138	612	2050	82	39	16	5.3	1.3
11	5.5	30	62	44	128	450	2080	73	35	14	4.9	1.2
12	5.2	29	63	45	145	352	989	66	32	12	6.4	1.2
13	7.6	28	55	44	125	280	600	62	29	11	7.7	1.7
14	9.6	26	48	44	108	231	430	60	27	9.4	6.7	1.8
15	8.4	24	45	44	115	199	3170	64	25	8.0	5.5	1.6
16	8.7	22	1020	44	217	172	2350	1130	24	7.3	4.6	1.5
17	8.9	21	717	42	445	149	955	1570	24	10	4.1	1.4
18	8.9	20	396	36	736	252	587	675	30	17	3.9	1.9
19	8.7	18	276	36	608	4200	421	417	104	17	3.5	2.4
20	8.9	19	211	35	516	1380	333	320	68	17	2.9	2.2
21	8.7	18	169	39	480	1510	267	378	52	16	2.5	2.5
22	8.3	18	135	35	574	1210	219	642	48	20	2.2	3.5
23	8.3	18	112	40	771	688	197	629	37	21	3.1	2.6
24	7.9	17	98	53	719	462	3060	460	30	25	3.8	2.7
25	12	17	87	57	492	355	2570	341	26	25	3.5	2.7
26	16	16	79	60	357	274	1010	266	23	26	3.0	2.6
27	17	16	73	65	275	391	590	211	21	24	2.7	2.6
28	17	19	68	69	235	763	418	173	19	23	2.6	2.6
29	15	168	65	74	---	550	331	157	19	22	3.1	2.5
30	15	221	61	78	---	416	270	136	21	20	2.6	4.0
31	14	---	56	82	---	357	---	115	---	21	2.3	---
TOTAL	268.2	1150	5516	1472	10933	17425	29469	9371	1346	603.7	255.2	64.2
MEAN	8.65	38.3	178	47.5	390	562	982	302	44.9	19.5	8.23	2.14
MAX	17	221	1020	82	1250	4200	3170	1570	104	43	28	4.0
MIN	4.1	12	45	34	85	149	197	60	19	7.3	2.2	1.2
CFSM	.04	.18	.85	.23	1.86	2.68	4.68	1.44	.21	.09	.04	.01
IN.	.05	.20	.98	.26	1.94	3.09	5.22	1.66	.24	.11	.05	.01

CAL YR 1982 TOTAL 74134.2 MEAN 203 MAX 3870 MIN 2.9 CFSM .97 IN 13.13
WTR YR 1983 TOTAL 77873.3 MEAN 213 MAX 4200 MIN 1.2 CFSM 1.01 IN 13.79

[1]Modified from WDR: VA-83-1.

Example 16.--Water-quality station at nongaged site[1] *(with daily record)*

POTOMAC RIVER BASIN

01643020 MONOCACY RIVER AT REICH'S FORD BRIDGE NEAR FREDERICK, MD

LOCATION.--Lat 39°23'16", long 77°22'40", Frederick County, Hydrologic Unit 02070009, at Reich's Ford Bridge, 1.1 mi downstream from U.S. Highway 40, 1.2 mi downstream from gaging station, 2 mi southeast of Frederick, and 15.0 mi upstream from mouth.

DRAINAGE AREA.--817 mi^2.

PERIOD OF RECORD.--Water years 1961 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURE: October 1960 to current year.
SUSPENDED-SEDIMENT DISCHARGE: October 1960 to current year.

REMARKS.--Water temperatures are measured daily in field by local observer at time of sampling. Water-discharge records for Monocacy River at Jug Bridge near Frederick (station 01643000) are used for computation of sediment loads. Prior to 1970, published as Monocacy River at Jug Bridge near Frederick (station 01643000).

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURE (water years 1961-72, 1975, 1977, 1980-83): Maximum daily, 32.0°C, July 21, 1980; minimum daily, 0.0°C on many days during winter.
SEDIMENT CONCENTRATION: Maximum daily mean, 2,000 mg/L, July 10, 1970; minimum daily mean, 1 mg/L on many days in water years 1961-67, 1970, 1972, and 1982.
SEDIMENT LOAD: Maximum daily, 134,000 tons, June 22, 1972; minimum daily, 0.39 ton, Dec. 14, 1981.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURE:--Maximum daily, 29°C, July 16, 31; minimum daily, 2.0°C, Jan. 16, 23.
SEDIMENT CONCENTRATION: Maximum daily mean, 490 mg/L, Mar. 28; minimum daily mean, 2 mg/L, Jan. 8, 9.
SEDIMENT LOAD: Maximum daily, 23,600 tons, Apr. 10; minimum daily, 1.1 tons, Jan. 9.

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE, AIR (DEG C)	TEMPER-ATURE (DEG C)	COLOR (PLAT-INUM-COBALT UNITS)	OXYGEN, DIS-SOLVED (MG/L)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)
DEC											
28...	1115	311	300	7.6	--	8.5	--	--	110	30	32
JAN											
27...	1700	450	254	9.2	3.5	1.9	10	13.6	93	18	27
FEB											
24...	1145	3880	220	7.3	6.5	4.0	--	12.8	76	35	21
JUL											
19...	1915	229	298	7.7	30.0	27.8	17	6.3	140	6	43
26...	1130	214	345	7.6	3.5	24.0	--	7.2	140	25	45

DATE	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	ALKA-LINITY FIELD (MG/L AS CACO3)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)
DEC											
28...	7.3	11	17	.5	2.9	--	3.9	23	18	.10	3.5
JAN											
27...	6.1	12	21	.6	3.1	75	.9	21	23	<.10	6.1
FEB											
24...	5.7	6.8	16	.4	3.4	--	4.0	24	15	.20	7.3
JUL											
19...	6.9	9.2	13	.4	3.2	130	5.0	20	21	.10	3.8
26...	7.4	12	15	.5	3.2	--	5.7	18	22	.20	4.6

DATE	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS NO3)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS TOTAL (MG/L AS PO4)
DEC											
28...	191	146	.26	160	--	2.7	--	--	--	--	--
JAN											
27...	135	143	.18	164	2.5	--	--	--	--	.250	.77
FEB											
24...	130	108	.18	1360	--	3.2	--	--	--	--	--
JUL											
19...	216	185	.29	134	2.8	--	.80	3.6	16	.160	.49
26...	198	184	.27	114	--	2.8	--	--	--	--	--

[1]Modified from WDR: MD-DE-83-1.

Example 16.--Water-quality station at nongaged site (with daily record)--Continued

POTOMAC RIVER BASIN

01643020 MONOCACY RIVER AT REICH'S FORD BRIDGE NEAR FREDERICK, MD--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	PHOS-PHORUS, ORTHO, TOTAL (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE)	IRON, SUS-PENDED RECOV-ERABLE (UG/L AS FE)	IRON, DIS-SOLVED (UG/L AS FE)	MANGA-NESE, TOTAL RECOV-ERABLE (UG/L AS MN)	MANGA-NESE, SUS-PENDED RECOV. (UG/L AS MN)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	CARBON, ORGANIC TOTAL (MG/L AS C)
DEC										
28...	--	.190	.58	--	--	21	--	--	28	--
JAN										
27...	.240	--	--	590	560	29	60	50	11	4.5
FEB										
24...	--	.110	.34	--	--	72	--	--	14	--
JUL										
19...	.120	--	--	260	250	7	40	30	15	4.5
26...	--	.200	.61	--	--	15	--	--	27	--

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
ONCE-DAILY

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	20.0	14.0	9.0	6.0	7.0	4.0	7.0	9.0	9.0	22.0	27.0	27.0
2	20.0	18.0	10.0	4.0	8.0	---	8.0	---	10.0	25.0	25.0	27.0
3	20.0	14.0	10.0	4.0	6.0	9.0	8.0	---	11.0	27.0	26.0	27.0
4	20.0	12.0	13.0	5.0	5.0	5.0	5.0	---	---	27.0	26.0	28.0
5	21.0	11.0	15.0	7.0	5.0	8.0	---	6.0	---	27.0	26.0	28.0
6	20.0	12.0	14.0	7.0	4.0	5.0	---	7.0	---	24.0	27.0	28.0
7	22.0	11.0	9.0	7.0	5.0	5.0	5.0	7.0	---	24.0	28.0	28.0
8	23.0	7.0	12.0	7.0	5.0	5.0	6.0	6.0	---	25.0	28.0	28.0
9	22.0	8.0	9.0	5.0	5.0	7.0	7.0	7.0	---	22.0	28.0	28.0
10	17.0	11.0	5.0	7.0	5.0	5.0	6.0	6.0	---	25.0	25.0	28.0
11	15.0	13.0	4.0	6.0	---	5.0	5.0	6.0	---	25.0	26.0	27.0
12	15.0	14.0	4.0	4.0	---	5.0	7.0	7.0	---	25.0	25.0	27.0
13	16.0	9.0	3.0	4.0	---	6.0	7.0	6.0	---	26.0	24.0	26.0
14	17.0	8.0	3.0	5.0	---	6.0	9.0	7.0	---	27.0	24.0	26.0
15	17.0	7.0	5.0	5.0	---	6.0	7.0	6.0	---	28.0	25.0	25.0
16	15.0	5.0	7.0	2.0	---	10.0	8.0	6.0	---	29.0	25.0	25.0
17	16.0	8.0	4.0	5.0	---	9.0	7.0	6.0	---	28.0	25.0	24.0
18	12.0	8.0	4.0	3.0	4.0	7.0	5.0	6.0	---	28.0	26.0	25.0
19	15.0	7.0	3.0	3.0	4.0	5.0	5.0	7.0	---	28.0	27.0	26.0
20	15.0	10.0	4.0	4.0	5.0	5.0	5.0	6.0	---	28.0	27.0	26.0
21	15.0	13.0	4.0	4.0	5.0	5.0	7.0	6.0	---	27.0	26.0	25.0
22	13.0	12.0	5.0	3.0	7.0	7.0	6.0	7.0	---	27.0	26.0	21.0
23	11.0	12.0	5.0	2.0	6.0	6.0	8.0	7.0	25.0	27.0	26.0	17.0
24	10.0	10.0	5.0	4.0	5.0	5.0	6.0	7.0	---	27.0	26.0	16.0
25	11.0	9.0	7.0	5.0	5.0	5.0	6.0	7.0	---	27.0	25.0	15.0
26	9.0	9.0	9.0	4.0	5.0	6.0	5.0	7.0	---	27.0	24.0	15.0
27	14.0	9.0	---	3.0	10.0	5.0	5.0	7.0	21.0	27.0	---	19.0
28	13.0	5.0	---	4.0	7.0	7.0	6.0	6.0	24.0	27.0	---	19.0
29	15.0	9.0	---	5.0	---	6.0	5.0	7.0	23.0	27.0	---	19.0
30	14.0	9.0	---	5.0	---	7.0	7.0	7.0	22.0	28.0	---	17.0
31	16.0	---	---	6.0	---	6.0	---	7.0	---	29.0	---	---

Example 16.--Water-quality station at nongaged site (with daily record)--Continued

POTOMAC RIVER BASIN

01643020 MONOCACY RIVER AT REICH'S FORD BRIDGE NEAR FREDERICK, MD--Continued

SUSPENDED-SEDIMENT, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	25	11	22	9.1	48	71	3	2.1	4	5.7	21	82
2	25	9.8	25	10	46	59	6	4.1	39	70	68	369
3	21	7.6	21	8.3	55	75	12	7.8	253	3790	32	138
4	17	5.9	22	16	39	43	18	11	387	3020	22	69
5	19	6.4	100	184	31	31	26	15	150	502	24	65
6	46	16	70	109	25	22	9	5.2	18	45	19	45
7	68	23	28	23	22	17	3	1.8	10	22	45	169
8	43	14	26	16	22	15	2	1.2	9	20	83	850
9	45	15	30	16	19	12	2	1.1	8	16	32	422
10	36	11	26	13	15	8.5	118	101	7	12	13	124
11	45	14	19	9.0	11	6.0	363	1680	5	6.6	12	94
12	45	14	18	8.5	40	22	30	140	5	4.1	13	67
13	40	15	29	21	41	22	16	31	10	13	14	55
14	38	16	49	42	35	17	10	14	15	31	16	53
15	23	10	18	12	30	14	9	12	15	28	18	52
16	10	4.8	15	8.4	28	30	3	11	15	27	22	57
17	5	2.0	14	6.9	80	229	5	7.0	18	36	15	35
18	22	7.9	15	7.0	12	19	45	36	20	48	10	28
19	15	5.1	16	6.9	7	7.8	61	46	18	56	409	13600
20	22	7.4	16	6.8	9	8.6	57	53	20	71	339	5250
21	36	13	17	7.1	10	9.2	48	38	32	118	116	1180
22	20	7.0	19	8.0	13	11	37	26	34	153	101	1500
23	9	3.2	21	8.8	19	15	22	18	50	362	22	140
24	8	2.8	16	6.7	25	19	11	17	52	476	18	86
25	53	24	12	5.0	38	34	8	15	17	122	16	65
26	44	25	13	5.3	30	26	7	9.9	18	119	14	49
27	33	21	14	5.6	25	21	4	5.0	27	112	24	138
28	35	18	16	6.9	20	17	5	5.8	65	244	490	7950
29	21	9.6	117	258	15	13	5	5.5	---	---	350	2430
30	14	6.2	114	382	10	9.2	5	5.2	---	---	108	493
31	16	6.8	---	---	5	4.0	4	4.7	---	---	44	170
TOTAL	---	352.5	---	1226.3	---	907.3	---	2330.4	---	9529.4	---	35825
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	22	77	16	60	10	23	120	220	12	5.3	15	5.2
2	24	75	14	48	9	19	78	124	15	7.0	15	5.1
3	329	6520	14	46	8	15	55	78	16	7.6	13	4.2
4	63	714	16	53	8	15	50	64	14	6.8	12	3.7
5	20	108	20	64	30	83	48	58	12	6.5	10	3.1
6	10	43	18	49	25	58	50	77	66	95	9	2.7
7	5	20	16	39	20	37	51	72	50	40	7	2.0
8	8	41	14	32	15	25	44	49	20	12	7	1.9
9	25	313	20	48	10	15	39	39	10	5.1	6	1.5
10	368	23600	18	39	10	14	38	36	10	4.6	6	1.5
11	226	12200	14	27	9	12	36	32	10	4.6	6	1.5
12	70	801	10	18	9	11	27	24	15	7.7	6	1.5
13	38	306	8	14	8	9.4	25	26	20	11	8	2.4
14	25	159	6	10	8	8.8	29	23	20	10	15	5.3
15	310	9150	15	27	8	8.4	26	19	20	9.8	12	4.1
16	328	16600	27	86	10	11	19	13	18	8.1	9	2.7
17	66	807	75	561	10	10	22	15	17	7.2	9	2.6
18	30	263	55	205	60	154	27	17	16	6.5	9	2.5
19	20	143	35	94	150	1440	20	12	14	5.6	9	2.5
20	15	88	129	795	220	2060	13	8.5	13	5.1	8	2.0
21	15	75	175	865	400	6790	32	24	13	4.8	10	3.1
22	15	63	215	1630	250	1420	29	19	13	4.6	10	3.9
23	15	56	375	6080	75	245	21	13	14	4.6	10	3.9
24	60	1450	260	1820	60	148	15	8.8	13	4.3	10	3.7
25	200	5780	80	359	50	106	14	8.2	13	4.4	10	3.2
26	90	936	25	92	42	76	14	8.1	10	3.3	10	3.0
27	64	468	19	80	36	57	13	7.0	10	3.2	12	3.5
28	43	254	15	47	30	45	13	6.7	25	11	18	5.1
29	28	136	15	43	274	1760	13	6.3	20	8.2	16	4.2
30	16	67	16	48	175	496	12	5.6	15	5.5	18	5.7
31	---	---	15	39	---	---	12	5.4	15	5.3	---	---
TOTAL	---	81313	---	13418	---	15171.6	---	1118.6	---	324.7	---	97.3

TOTAL LOAD FOR YEAR: 161614.1 TONS.

Example 17.--Water-quality station at nongaged site[1]

OHIO RIVER MAIN STEM

03049625 ALLEGHENY RIVER AT NEW KENSINGTON, PA

(National stream quality accounting network station and radiochemical progam station)[2]

LOCATION.--Lat 40°33'52", long 79°46'22", Allegheny County, Hydrologic Unit 05010009, at New Kensington highway bridge, 5.1 mi downstream from dam at lock 4 at Natrona, 5.3 mi downstream from gaging station at Natrona, and 19.0 mi from mouth.

DRAINAGE AREA.--11,500 mi².

PERIOD OF RECORD.--July 1972 to December 1973, October 1974 to current year.

REMARKS.--Records of discharge are given for station 03049500 Allegheny River at Natrona, Pa.

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT^3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (NTU)	OXYGEN, DIS-SOLVED (MG/L)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)
OCT												
28...	1315	3810	--	--	11.5	--	--	--	--	--	--	--
NOV												
17...	0930	14100	255	7.5	6.5	7.0	12.0	260	140	94	57	27
FEB												
23...	0930	13100	290	7.0	4.5	7.0	12.4	230	48	100	73	28
MAY												
18...	0930	24300	245	7.1	13.5	6.8	9.4	150	21	90	73	24
AUG												
25...	0915	4400	275	7.2	27.0	2.4	7.0	1300	2000	120	97	35

DATE	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)
OCT												
28...	--	--	--	--	2.0	--	--	--	--	--	--	--
NOV												
17...	6.5	14	24	.7	1.8	2.3	37	21	.10	4.9	161	135
FEB												
23...	7.4	13	22	.6	1.6	5.4	75	22	.10	5.2	178	170
MAY												
18...	7.3	9.4	18	.4	1.4	2.6	77	11	.20	4.7	160	146
AUG												
25...	8.6	18	24	.7	2.2	3.2	100	19	.20	3.8	205	203

DATE	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS NH4)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS TOTAL (MG/L AS PO4)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	SEDI-MENT, SUS-PENDED (MG/L)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT												
28...	--	--	--	--	--	--	--	--	--	--	--	--
NOV												
17...	.22	6130	.50	.130	.17	.50	.040	.12	.010	94	--	86
FEB												
23...	.24	6320	.90	.100	.13	.40	.060	.18	.020	5	--	100
MAY												
18...	.22	10500	.52	.090	.12	.30	.080	.25	.050	25	1640	90
AUG												
25...	.28	2440	.51	.090	.12	.30	.030	.09	.060	1	12	100

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[1]Modified from WDR: PA-93-1.

[2]For gaged sites, the reference to a special network or program station would be placed (centered, in parentheses) under the station name on the page containing the water-discharge records. An additional reference placed on the beginning page for the water-quality records would be optional.

Example 17.--Water-quality station at nongaged site--Continued

OHIO RIVER MAIN STEM

03049625 ALLEGHENY RIVER AT NEW KENSINGTON, PA--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, DIS- SOLVED (UG/L AS BA)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, DIS- SOLVED (UG/L AS FE)
NOV								
17...	0930	2	68	<1	<1	<3	4	120
FEB								
23...	0930	1	64	1	<1	5	2	180
MAY								
18...	0930	<1	66	<1	2	8	4	28
AUG								
25...	0915	2	74	2	<1	3	2	3

DATE	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, DIS- SOLVED (UG/L AS AG)	ZINC, DIS- SOLVED (UG/L AS ZN)
NOV							
17...	2	200	<.1	6	<1	<1	6
FEB							
23...	8	460	<.1	22	<1	<1	22
MAY							
18...	9	540	<.1	27	<1	<1	28
AUG							
25...	1	240	<.1	11	<1	<1	26

DATE	TIME	SUSP. TOTAL (PCI/L AS U-NAT)	DIS- SOLVED (UG/L AS U-NAT)	SUSP. TOTAL (UG/L AS U-NAT)	DIS- SOLVED (PCI/L AS CS-137)	SUSP. TOTAL (PCI/L AS CS-137)	DIS- SOLVED (PCI/L AS SR/ YT-90)	SUSP. TOTAL (PCI/L AS SR/ YT-90)	DIS- SOLVED, RADON METHOD (PCI/L)	DIS- SOLVED, EXTRAC- TION (UG/L)
OCT										
28...	1315	--	<6.0	<.6	<3.2	<.6	<3.1	<.6	.06	--
FEB										
23...	0930	.5	<4.8	.7	3.2	1.1	3.1	1.1	.11	.34
AUG										
25...	0915	.3	<5.3	.5	<2.7	.6	<2.6	.5	.07	<.01

DATE	TIME	GROSS ALPHA, SUSP. TOTAL (PCI/L AS U-NAT)	GROSS ALPHA, DIS- SOLVED (UG/L AS U-NAT)	GROSS ALPHA, SUSP. TOTAL (UG/L AS U-NAT)	GROSS BETA, DIS- SOLVED (PCI/L AS CS-137)	GROSS BETA, SUSP. TOTAL (PCI/L AS CS-137)	GROSS BETA, DIS- SOLVED (PCI/L AS SR/ YT-90)	GROSS BETA, SUSP. TOTAL (PCI/L AS SR/ YT-90)	RADIUM 226, DIS- SOLVED, RADON METHOD (PCI/L)	URANIUM DIS- SOLVED, EXTRAC- TION (UG/L)
OCT										
28...	1315	--	<6.0	<.6	<3.2	<.6	<3.1	<.6	.06	--
FEB										
23...	0930	.5	<4.8	.7	3.2	1.1	3.1	1.1	.11	.34
AUG										
25...	0915	.3	<5.3	.5	<2.7	.6	<2.6	.5	.07	<.01

Example 18A.--Water-discharge and water-quality[1] stations interleafed

01664000 RAPPAHANNOCK RIVER AT REMINGTON, VA

LOCATION.--Lat 38°31'50", long 77°48'50", Fauquier County, Hydrologic Unit 02080103, on left bank 80 ft upstream from bridge on alternate U.S. Highway 29, at Remington, 0.3 mi upstream from Tinpot Run, 0.4 mi downstream from Ruffans Run, 2.5 mi downstream from Hazel River, and at mile 35.2.

DRAINAGE AREA.--620 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1942 to current year.

REVISED RECORDS.--WSP 1171: 1944. WSP 2103: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 252.53 ft above National Geodetic Vertical Datum of 1929. Prior to Nov. 21, 1951, nonrecording gage at bridge 80 ft downstream at same datum.

REMARKS.--Records good. Gage-height telemeter at station.

AVERAGE DISCHARGE.--41 years, 677 ft^3/s, 14.83 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 90,000 ft^3/s, Oct. 16, 1942, gage height, 30.0 ft, from floodmarks, from rating curve extended above 43,000 ft^3/s on basis of slope-area determination of peak flow; minimum, 2.8 ft^3/s, Sept. 13, 1966, gage height, 2.31 ft.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum flood since at least 1828, that of Oct. 16, 1942.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 6,000 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 19	1545	8110	13.03	Apr. 16	0830	14400	16.28
Apr. 3	1645	9660	14.16	Apr. 25	0300	14300	16.26
Apr. 10	2215	*17700	*17.39	May 17	0145	7160	12.26

Minimum discharge, 8.8 ft^3/s, Sept. 11, 12, gage height, 2.55 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	108	125	631	263	306	906	1110	1460	715	407	48	23
2	98	119	832	259	456	914	1000	1320	698	431	47	20
3	89	116	612	250	2350	818	6430	1220	634	401	47	20
4	81	442	502	238	1450	749	3440	1150	808	332	49	20
5	81	1260	427	230	1030	712	2230	1040	745	348	53	17
6	82	508	381	238	850	684	1810	957	611	525	147	16
7	80	316	343	240	795	888	1710	884	750	337	95	15
8	80	255	306	232	753	1340	1710	847	684	263	84	13
9	81	224	280	223	657	1900	1840	896	538	231	62	11
10	85	205	263	292	598	1470	11100	778	498	215	54	12
11	94	190	259	887	525	1250	10700	716	482	197	90	10
12	97	183	288	716	633	1060	4020	676	454	182	110	10
13	102	196	271	532	1210	918	2800	638	429	170	161	33
14	140	204	254	455	1020	827	2240	618	409	159	97	180
15	171	184	315	420	776	772	4830	658	392	141	73	152
16	135	167	1350	389	838	698	11100	2170	380	134	64	70
17	106	158	1650	338	924	644	3960	4460	364	122	54	46
18	94	156	929	336	1220	1450	2880	1800	349	120	51	37
19	89	154	700	e265	1580	6950	2300	1340	446	112	52	32
20	90	156	606	e305	1610	3900	1910	1250	400	112	52	31
21	90	176	530	e335	1580	2700	1640	1430	813	127	49	32
22	91	187	453	e315	1720	2080	1430	2100	1220	144	41	79
23	91	178	411	e415	2030	1570	1300	1950	724	115	34	68
24	89	168	381	621	2120	1330	7510	1390	538	103	32	53
25	118	158	362	478	1600	1180	9960	1150	449	100	33	44
26	383	148	343	408	1340	1050	3950	1020	384	93	42	38
27	342	144	324	375	1110	1250	2820	1040	342	85	44	36
28	208	151	310	355	973	2810	2270	879	318	77	36	35
29	164	953	306	334	---	1600	1890	852	356	67	30	33
30	143	896	288	324	---	1290	1640	901	503	60	26	43
31	133	---	271	321	---	1170	---	793	---	54	26	---
TOTAL	3835	8477	15178	11389	32054	46880	113530	38383	16433	5964	1883	1229
MEAN	124	283	490	367	1145	1512	3784	1238	548	192	60.7	41.0
MAX	383	1260	1650	887	2350	6950	11100	4460	1220	525	161	180
MIN	80	116	254	223	306	644	1000	618	318	54	26	10
CFSM	.20	.46	.79	.59	1.85	2.44	6.10	2.00	.88	.31	.10	.07
IN.	.23	.51	.91	.68	1.92	2.81	6.81	2.30	.99	.36	.11	.07

CAL YR 1982 TOTAL 219729 MEAN 602 MAX 5360 MIN 52 CFSM .97 IN 13.18
WTR YR 1983 TOTAL 295235 MEAN 809 MAX 11100 MIN 10 CFSM 1.31 IN 17.71

e Estimated

[1]Modified from WDR: VA-83-1.

01664000 RAPPAHANNOCK RIVER AT REMINGTON, VA--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1951 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: October 1951 to September 1956, October 1965 to current year.
WATER TEMPERATURE: May 1951 to September 1956, October 1965 to September 1976, October 1977 to current year.
SUSPENDED-SEDIMENT DISCHARGE: April 1951 to current year.

REMARKS.--Water temperatures were measured daily in field by local observer at time of sampling.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: Maximum daily, 150 microsiemens, Sept. 3, 1974; minimum daily, 24 microsiemens, July 6, 1975.
WATER TEMPERATURE: Maximum, 32.5°C, July 19, 1980, July 18, 21, 1981; minimum, 0.0°C on many days during winter.
SEDIMENT CONCENTRATION: Maximum daily mean, 1,870 mg/L, June 13, 1982; minimum daily mean, 1 mg/L on many days during each year.
SEDIMENT LOAD: Maximum daily, 55,600 tons, Sept. 26, 1975; minimum daily, 0.03 ton, Sept. 9, 11, 1983.

EXTREMES FOR CURRENT YEAR.--
SPECIFIC CONDUCTANCE: Maximum daily, 122 microsiemens, Apr. 2; minimum daily, 48 microsiemens, Apr. 10.
WATER TEMPERATURE: Maximum daily, 28.0°C on several days in July and September; minimum observed, 2.0°C, Feb. 12, 13.
SEDIMENT CONCENTRATION: Maximum daily mean, 460 mg/L, Apr. 25; minimum daily mean, 1 mg/L many days July to September.
SEDIMENT LOAD: Maximum daily, 12,400 tons, Apr. 25; minimum daily, 0.03 ton, Sept. 9, 11.

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT^3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	COLOR (PLAT-INUM-COBALT UNITS)	OXYGEN, DIS-SOLVED (MG/L)	HARD-NESS (MG/L AS CACO3)	HARD-NESS NONCAR-BONATE (MG/L AS CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)
OCT												
20...	1100	92	62	7.4	17.0	16	--	27	0	7.1	2.3	4.0
DEC												
07...	1430	338	60	7.0	12.5	17	--	25	3	6.4	2.2	3.8
JAN												
19...	0900	267	72	6.9	3.5	10	--	22	4	5.4	2.0	3.5
MAR												
16...	0900	707	69	7.0	10.5	10	--	21	5	5.3	1.9	3.1
MAY												
24...	1440	1340	90	7.5	16.0	6	--	22	5	5.8	1.9	2.7
JUL												
11...	0900	196	68	7.2	28.0	17	--	24	2	6.5	1.9	3.9
AUG												
22...	1510	39	78	7.8	23.5	5	8.8	28	1	7.6	2.2	4.6

DATE	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	ALKA-LINITY LAB (MG/L AS CACO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	IRON, DIS-SOLVED (UG/L AS FE)
OCT												
20...	2.1	28	5.0	4.9	<.10	11	51	53	<.010	.10	.010	180
DEC												
07...	1.1	22	7.0	4.4	<.10	12	53	50	<.010	.42	<.010	200
JAN												
19...	1.2	18	5.0	3.8	<.10	13	48	45	<.010	.64	<.010	150
MAR												
16...	.90	16	8.7	3.7	<.10	12	48	45	<.010	.63	<.010	120
MAY												
24...	1.1	17	9.6	2.6	<.10	13	66	47	.010	.54	--	110
JUL												
11...	1.6	22	5.3	3.8	.10	13	62	49	<.010	.45	<.010	130
AUG												
22...	2.3	27	6.6	4.4	<.10	7.8	53	52	.030	.16	<.010	87

Example 18A.--Water-discharge and water-quality stations interleafed--Continued

01664000 RAPPAHANNOCK RIVER AT REMINGTON, VA--Continued

SPECIFIC CONDUCTANCE (MICROSIEMENS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
ONCE-DAILY

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	76	54	55	60	60	74	82	90	85	74	80	78
2	69	54	60	60	61	70	90	85	85	68	70	78
3	62	55	60	60	67	69	90	80	85	79	80	75
4	69	54	55	63	59	63	95	92	80	70	70	75
5	68	73	55	60	60	70	95	85	85	74	80	75
6	68	72	95	63	60	64	101	90	82	66	80	75
7	69	64	60	63	63	64	122	92	85	68	72	75
8	67	67	50	56	63	70	82	100	90	68	68	75
9	68	69	58	60	63	66	75	99	70	66	70	75
10	70	69	58	62	63	70	48	90	80	68	70	65
11	68	73	55	56	60	70	70	90	80	68	70	60
12	71	70	55	67	60	70	80	90	85	68	70	60
13	68	74	55	65	61	69	95	90	80	68	68	63
14	68	70	50	66	60	68	85	89	85	68	65	61
15	66	72	73	64	62	68	57	95	70	66	68	61
16	65	72	65	75	62	69	81	95	70	66	68	68
17	70	73	60	70	65	68	91	92	80	80	68	68
18	69	73	55	71	69	65	85	95	75	65	68	68
19	70	74	53	72	71	56	82	90	75	66	75	68
20	62	73	55	74	70	54	82	90	75	65	78	68
21	64	74	55	79	69	74	90	85	75	65	78	68
22	64	73	55	69	70	79	85	90	75	65	78	69
23	64	74	55	74	70	79	118	90	75	75	78	68
24	65	74	50	65	70	79	89	90	78	75	78	68
25	64	85	50	61	71	78	90	90	76	75	78	68
26	65	76	50	67	71	80	95	89	75	70	78	68
27	64	66	55	71	70	80	81	90	75	72	78	68
28	65	69	60	64	69	75	90	80	75	70	75	68
29	64	60	50	63	---	76	89	85	75	70	78	68
30	63	80	70	64	---	79	89	85	75	72	78	68
31	65	---	63	60	---	84	---	85	---	70	78	---
MEAN	67	70	58	65	65	71	87	90	79	70	74	69

WTR YR 1983 MEAN 72 MAX 122 MIN 48

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
ONCE-DAILY

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	16.0	11.5	13.5	9.0	6.0	7.0	8.0	19.5	21.5	26.0	22.5	28.0
2	17.0	14.5	13.5	7.0	5.0	9.0	9.0	20.5	22.5	27.0	24.5	27.0
3	17.0	11.5	12.5	7.0	5.0	10.5	9.0	21.5	21.5	27.0	23.5	28.0
4	16.0	12.5	12.5	9.0	6.0	12.5	10.5	19.5	19.0	28.0	23.5	27.0
5	15.0	11.5	10.5	8.0	5.0	11.5	9.5	20.5	18.0	28.0	21.5	28.0
6	15.0	13.5	11.5	7.0	6.0	8.0	10.5	19.5	20.5	26.0	22.5	28.0
7	16.0	14.5	12.5	9.0	5.0	8.0	11.5	10.5	23.5	25.0	21.5	28.0
8	17.0	15.0	11.5	8.0	4.0	9.0	12.5	17.0	20.5	27.0	23.5	22.0
9	16.0	16.0	7.0	8.0	4.0	10.5	11.5	18.0	22.5	27.0	23.5	21.0
10	15.0	11.5	8.0	7.0	3.0	9.0	12.5	16.0	23.5	27.0	22.5	20.0
11	11.0	12.5	8.0	9.0	3.0	10.5	11.5	16.0	24.5	28.0	23.5	25.0
12	10.5	17.5	8.0	6.0	2.0	11.5	12.5	17.0	22.5	28.0	22.5	18.0
13	12.5	16.5	7.0	7.0	2.0	10.5	11.5	15.0	22.5	25.0	23.5	18.0
14	13.5	15.5	5.0	6.0	3.0	11.5	12.5	18.0	23.5	24.0	24.5	17.0
15	10.5	11.5	4.0	2.5	4.0	9.0	11.5	17.0	24.5	22.5	24.5	17.0
16	12.5	10.5	5.0	3.5	3.0	10.5	10.5	16.0	25.0	27.0	24.5	16.0
17	11.5	15.5	4.0	5.0	4.0	8.0	11.5	15.0	25.0	25.0	22.5	17.0
18	11.5	14.5	5.0	4.5	5.0	9.0	10.5	17.0	27.0	25.0	23.5	16.0
19	12.5	11.5	5.0	3.5	6.0	10.5	12.5	16.0	26.0	26.0	21.5	15.0
20	13.5	12.5	4.5	6.5	5.0	9.0	11.5	17.0	25.0	27.0	22.5	17.0
21	14.5	11.5	3.5	2.5	4.0	8.0	12.5	15.0	24.5	28.0	24.5	17.0
22	17.5	12.5	4.5	3.5	6.0	9.0	9.0	18.0	24.5	23.5	23.5	16.0
23	18.0	18.5	4.5	2.5	7.0	7.0	8.0	15.0	23.5	24.5	26.0	16.0
24	17.0	17.5	9.5	2.5	6.0	8.0	7.0	16.0	24.5	23.5	27.0	15.0
25	13.5	15.5	10.5	3.5	7.0	9.0	8.0	17.0	22.5	22.5	26.0	16.0
26	15.5	12.5	11.5	3.5	7.0	9.0	9.0	17.0	23.0	23.5	26.0	20.0
27	16.5	11.5	10.5	4.5	6.0	8.0	10.0	18.0	25.0	22.5	27.0	25.0
28	12.5	14.5	9.5	5.0	8.0	7.0	17.0	19.0	26.0	24.5	26.0	21.0
29	11.5	15.5	6.5	6.0	---	6.0	19.0	17.0	26.0	22.5	27.0	24.0
30	14.5	18.5	8.5	7.0	---	7.0	20.5	16.0	25.0	21.5	25.0	20.0
31	13.0	---	7.5	5.0	---	8.0	---	---	---	23.5	26.0	---
MEAN	14.5	14.0	8.0	5.5	5.0	9.0	11.5	17.0	23.5	25.5	24.0	21.0

WTR YR 1983 MEAN 15.0 MAX 28.0 MIN 2.0

Example 18A.--Water-discharge and water-quality stations interleafed--Continued

01664000 RAPPAHANNOCK RIVER AT REMINGTON, VA--Continued

SUSPENDED SEDIMENT, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	3	.87	10	3.4	30	51	10	7.1	7	5.8	12	29
2	3	.79	10	3.2	45	101	10	7.0	42	78	12	30
3	2	.48	10	3.1	32	53	10	6.8	439	2910	10	22
4	2	.44	45	54	27	37	9	5.8	80	313	10	20
5	2	.44	85	289	25	29	10	6.2	38	106	8	15
6	2	.44	39	53	15	15	12	7.7	30	69	8	15
7	2	.43	21	18	8	7.4	10	6.5	23	49	13	31
8	2	.43	20	14	8	6.6	9	5.6	15	30	28	101
9	3	.66	15	9.1	8	6.0	8	4.8	12	21	33	169
10	5	1.1	14	7.7	8	5.7	15	12	12	19	20	79
11	7	1.8	12	6.2	12	8.4	26	62	7	9.9	19	64
12	9	2.4	13	6.4	10	7.8	19	37	15	26	17	49
13	15	4.1	15	7.9	8	5.9	15	22	17	56	15	37
14	21	7.9	15	8.3	5	3.4	12	15	15	41	12	27
15	20	9.2	10	5.0	12	10	11	12	13	27	12	25
16	15	5.5	10	4.5	140	510	10	11	15	34	10	19
17	12	3.4	9	3.8	92	410	10	9.1	17	42	10	17
18	12	3.0	10	4.2	30	75	11	10	26	86	56	219
19	10	2.4	8	3.3	27	51	8	5.7	34	145	300	5630
20	9	2.2	8	3.4	25	41	8	6.6	30	130	88	927
21	8	1.9	10	4.8	20	29	10	9.0	30	128	50	364
22	8	2.0	12	6.1	20	24	8	6.8	36	167	32	180
23	7	1.7	10	4.8	18	20	10	11	45	247	30	127
24	7	1.7	10	4.5	15	15	17	29	40	229	25	90
25	13	4.1	8	3.4	15	15	15	19	29	125	22	70
26	24	25	5	2.0	12	11	13	14	20	72	20	57
27	20	18	5	1.9	12	10	12	12	17	51	34	115
28	16	9.0	7	2.9	12	10	10	9.6	14	37	50	379
29	12	5.3	80	206	12	9.9	8	7.2	---	---	30	130
30	12	4.6	49	119	11	8.6	8	7.0	---	---	24	84
31	11	4.0	---	---	11	8.0	7	6.1	---	---	24	76
TOTAL	---	125.28	---	862.9	---	1594.7	---	390.6	---	5253.7	---	9197

DAY	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)	MEAN CONCEN-TRATION (MG/L)	LOADS (T/DAY)
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	22	66	30	118	14	27	10	11	1	.13	1	.06
2	20	54	28	100	15	28	15	17	1	.13	1	.05
3	270	4690	24	79	12	21	11	12	1	.13	1	.05
4	69	641	20	62	20	44	8	7.2	1	.13	1	.05
5	39	235	18	51	15	30	10	9.4	3	.43	1	.05
6	35	171	18	47	12	20	12	17	10	4.0	2	.09
7	37	171	15	36	16	32	8	7.3	7	1.8	1	.04
8	35	162	15	34	15	28	6	4.3	4	.91	1	.04
9	40	199	19	46	10	15	5	3.1	3	.50	1	.03
10	311	11700	16	34	10	13	5	2.9	2	.29	2	.06
11	250	7220	15	29	10	13	5	2.7	7	1.7	1	.03
12	80	868	15	27	9	11	4	2.0	10	3.0	2	.05
13	58	438	13	22	9	10	3	1.4	14	6.1	6	.53
14	48	290	12	20	9	9.9	3	1.3	6	1.6	12	5.8
15	250	3260	15	27	8	8.5	3	1.1	4	.79	9	3.7
16	300	8990	195	1640	8	8.2	3	1.1	3	.52	3	.57
17	72	770	190	2290	8	7.9	3	.99	3	.44	2	.25
18	60	467	50	243	7	6.6	3	.97	2	.28	2	.20
19	55	342	37	134	10	12	2	.60	2	.28	2	.17
20	40	206	30	101	10	11	2	.60	2	.28	1	.08
21	30	133	42	162	26	57	3	1.0	2	.26	3	.26
22	30	116	47	266	50	165	4	1.6	2	.22	5	1.1
23	26	91	40	211	20	39	3	.93	1	.09	3	.55
24	374	11000	30	113	10	15	2	.56	3	.26	2	.29
25	460	12400	28	87	9	11	2	.54	5	.45	1	.12
26	85	907	25	69	7	7.3	2	.50	6	.68	1	.10
27	60	457	25	70	7	6.5	2	.46	5	.59	1	.10
28	48	294	20	47	6	5.2	2	.42	3	.29	1	.09
29	42	214	17	39	5	4.8	2	.36	2	.16	1	.09
30	35	155	20	49	13	18	1	.16	1	.07	2	.23
31	---	---	14	30	---	---	1	.15	1	.07	---	---
TOTAL	---	66707	---	6283	---	684.9	---	110.64	---	26.58	---	14.83

TOTAL LOAD FOR YEAR: 91251.13 TONS.

Example 18B.--Water-discharge and water-quality stations interleaved[1] *(with water-quality monitor)*

POTOMAC RIVER BASIN

01595800 NORTH BRANCH POTOMAC RIVER AT BARNUM, WV

LOCATION.--Lat 39°26'44", long 79°06'39", Mineral County, W. Va., Hydrologic Unit 02070002, on right bank at highway bridge at Barnum, W. Va., 0.4 mi upstream from Folly Run, and 4.0 mi southwest of Piedmont, W. Va., and at mi 59.4.

DRAINAGE AREA.--266 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--July 1966 to current year.

GAGE.--Water-stage recorder and crest-stage gage. Datum of gage is 1,151.82 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Water-discharge records good. Prior to July 1981 regulation at low flow by Stony River Reservoir, 39 mi upstream from station (see station 01595200). Since July 1981 complete regulation by Bloomington Lake, 1.5 mi upstream from station, capacity 96,600 acre-ft.

AVERAGE DISCHARGE.--17 years, 532 ft^3/s, 27.16 in/yr, adjusted for storage since October 1981.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 27,100 ft^3/s, July 3, 1978, gage height, 13.37 ft, from rating curve extended above 8,000 ft^3/s on basis of slope-area measurement of peak flow; minimum discharge, 0.91 ft^3/s, Aug. 12, 1981, gage height, 1.76 ft.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 5,620 ft^3/s, Apr. 24, gage height, 7.64 ft; minimum discharge, 1.4 ft^3/s, Oct. 27, gage height, 1.79 ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e 252	250	242	777	e 299	308	822	758	612	273	332	181
2	252	249	e 256	772	291	292	821	799	518	273	204	181
3	252	249	256	571	285	761	826	1050	480	272	195	181
4	252	250	256	323	272	975	882	1880	482	271	188	181
5	252	237	256	273	266	286	994	1650	480	271	187	180
6	250	222	434	272	266	283	993	1130	478	263	186	178
7	248	222	441	273	266	255	1150	624	476	261	186	178
8	247	222	258	289	266	258	1290	486	475	247	185	178
9	245	222	256	288	266	270	1570	611	475	237	177	179
10	246	222	256	289	270	270	1950	487	452	237	183	183
11	245	221	256	288	276	266	2020	436	407	217	e 186	183
12	224	219	256	288	273	266	1400	476	407	201	184	182
13	246	219	245	288	273	266	1150	446	405	201	183	184
14	244	219	243	288	273	298	890	447	344	201	183	183
15	459	219	259	288	285	322	1460	448	306	201	183	183
16	425	219	257	288	297	322	1400	1530	291	201	183	183
17	242	227	252	288	300	324	922	2100	300	201	183	183
18	242	226	252	288	314	332	887	2280	272	201	183	183
19	242	213	252	287	327	361	887	1460	271	201	182	437
20	242	214	250	283	327	344	887	1110	267	371	182	263
21	242	213	664	281	330	1340	759	1010	266	386	182	182
22	242	217	870	282	333	2110	529	1550	266	198	181	177
23	242	215	299	281	321	1290	510	2600	269	195	183	181
24	242	215	299	281	310	742	2620	1530	274	194	182	181
25	249	215	299	281	311	546	4410	1030	274	194	181	181
26	256	215	301	281	311	577	1400	e 901	273	193	181	181
27	221	216	479	281	310	584	1070	761	273	233	181	181
28	255	220	705	281	319	732	1080	621	273	196	181	181
29	395	221	e 780	281	---	833	977	519	275	198	488	180
30	501	219	782	282	---	833	960	598	273	198	539	183
31	252	---	779	281	---	833	---	670	---	198	178	---
TOTAL	8404	6707	11690	10094	8237	17479	37516	31998	10914	7184	6512	5772
MEAN	271	224	377	326	294	564	1251	1032	364	232	210	192
MAX	501	250	870	777	333	2110	4410	2600	612	386	539	437
MIN	221	213	242	272	266	255	510	436	266	193	177	177
(≠)	58240	58000	63660	53660	65390	93170	97880	96920	90130	81450	71870	62800

CAL YR 1982 TOTAL 169098 MEAN 463 MAX 4910 MIN 38
WTR YR 1983 TOTAL 162507 MEAN 445 MAX 4410 MIN 177

≠ Monthend contents, in acre-feet, in Bloomington Lake (contents on Sept. 30, 1982, 70,270 acre-feet). Records furnished by U.S. Army Corps of Engineers.

e Estimated

[1]Modified from WDR: MD-DE-83-1.

POTOMAC RIVER BASIN

01595800 NORTH BRANCH POTOMAC RIVER AT BARNUM, WV--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1967 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: October 1980 to current year.
pH: October 1980 to current year.
WATER TEMPERATURE: October 1980 to current year.
DISSOLVED OXYGEN: October 1980 to current year.

INSTRUMENTATION.--Water-quality monitor since October 1980.

REMARKS.--Interruptions in record were due to malfunction of the recording instruments.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water years 1982-83): Maximum, 525 microsiemens, Oct. 20, 21, 1981; minimum, 172 microsiemens, Mar. 24, 1982.
pH (water year 1982): Maximum, 7.0 units, June 5, 1982; minimum, 4.9 units, Oct. 3-7, 9, 1981.
WATER TEMPERATURE (water years 1982-83): Maximum, 22.0°C, Aug. 19, Sept. 9, 1982; minimum 0.5°C on several days during Jan. 1982.
DISSOLVED OXYGEN (water year 1983): Maximum, 14.6 mg/L, Jan. 24, 1983; minimum, 8.1 mg/L, June 25, 26, 1983.

EXTREMES FOR CURRENT YEAR.--
SPECIFIC CONDUCTANCE: Maximum, 439 microsiemens, Sept. 27; minimum, 212 microsiemens, Apr. 28, 29.
pH: Maximum, 7.0 units, Oct. 20, 25, 30, 31, Nov. 1, 2; minimum, 5.7 units, Aug. 1.
WATER TEMPERATURE: Maximum, 21.0°C, July 27; minimum, 3.0°C, Jan. 29.
DISSOLVED OXYGEN: Maximum, 14.6 mg/L, Jan. 24; minimum, 8.1 mg/L, June 25, 26.

SPECIFIC CONDUCTANCE (MICROSIEMENS/CM at 25 DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
1	310	302	305	318	303	312	414	365	390	349	328	335
2	314	297	306	322	299	312	414	411	413	357	331	335
3	323	313	320	323	305	310	412	406	411	355	341	348
4	324	312	318	315	307	311	408	374	386	353	341	349
5	323	315	320	343	284	320	396	375	384	355	350	352
6	322	310	315	311	281	298	383	338	364	364	352	356
7	314	303	310	322	304	312	358	343	353	364	362	363
8	316	307	312	322	300	310	358	350	354	363	362	362
9	324	313	319	349	298	324	365	349	357	362	357	360
10	331	323	328	356	339	346	357	349	351	357	351	353
11	338	327	334	355	325	339	351	348	350	357	351	354
12	330	318	323	340	314	326	357	344	349	354	349	351
13	354	335	346	335	317	328	361	349	357	358	354	356
14	351	337	341	355	328	345	362	346	349	360	357	358
15	351	341	344	344	317	328	361	348	354	361	357	359
16	365	336	350	353	307	322	366	360	363	361	357	358
17	356	333	344	359	289	327	365	358	362	---	---	---
18	351	334	342	312	302	308	360	357	358	---	---	---
19	361	338	344	312	307	309	360	359	360	---	---	---
20	364	344	354	318	309	314	361	358	360	---	---	---
21	358	328	340	321	317	320	360	355	358	379	376	377
22	339	333	337	339	321	330	363	355	359	377	373	376
23	343	336	338	347	338	342	363	362	363	389	376	381
24	345	341	343	352	342	348	363	361	362	401	391	398
25	349	312	332	354	342	346	362	361	362	408	402	405
26	325	310	315	361	341	349	363	362	362	410	406	408
27	323	314	319	366	352	359	364	359	360	410	408	410
28	329	321	324	373	364	367	359	339	353	409	406	407
29	333	327	329	378	365	372	340	324	332	407	402	405
30	346	318	336	367	361	363	340	329	334	403	397	400
31	329	304	321	---	---	---	352	323	336	403	397	400
MONTH	365	297	329	378	281	330	414	323	361	410	328	371

Example 18B.--Water-discharge and water-quality stations interleafed (with water-quality monitor)--Continued

POTOMAC RIVER BASIN

01595800 NORTH BRANCH POTOMAC RIVER AT BARNUM, WV--Continued

SPECIFIC CONDUCTANCE (MICROSIEMENS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	412	399	406	---	---	---	---	---	---	216	213	215
2	407	402	404	---	---	---	---	---	---	217	214	215
3	396	348	377	336	328	332	---	---	---	245	212	224
4	349	338	340	337	328	332	---	---	---	256	242	250
5	340	331	333	334	330	332	---	---	---	256	226	244
6	331	322	323	338	333	336	---	---	---	240	214	227
7	317	314	315	335	328	332	268	258	263	221	213	217
8	314	307	308	---	---	---	268	257	259	223	218	220
9	305	299	302	---	---	---	272	270	271	222	215	218
10	---	---	---	---	---	---	285	270	279	221	217	220
11	---	---	---	---	---	---	285	270	279	226	216	221
12	---	---	---	---	---	---	270	249	260	222	218	220
13	---	---	---	---	---	---	254	222	244	226	222	223
14	---	---	---	---	---	---	223	219	221	228	221	224
15	---	---	---	---	---	---	276	219	251	227	223	225
16	---	---	---	---	---	---	278	227	250	252	219	233
17	356	347	349	---	---	---	228	219	224	263	230	243
18	358	343	351	---	---	---	228	219	224	247	238	242
19	344	342	343	256	243	247	229	225	227	260	234	239
20	---	---	---	247	245	246	227	224	225	235	225	232
21	---	---	---	301	240	265	230	227	229	237	225	229
22	---	---	---	315	271	286	233	230	232	242	230	235
23	---	---	---	272	225	255	238	232	233	237	233	235
24	---	---	---	255	225	231	288	220	254	239	226	232
25	---	---	---	231	228	229	287	261	274	233	219	226
26	---	---	---	228	227	228	262	222	241	226	220	224
27	---	---	---	235	228	232	239	221	230	228	221	224
28	---	---	---	232	226	228	235	212	226	227	221	225
29	---	---	---	---	---	---	225	212	220	229	218	222
30	---	---	---	---	---	---	224	214	221	227	219	223
31	---	---	---	---	---	---	---	---	---	223	216	220
MONTH	412	299	346	338	225	274	288	212	243	263	212	227

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	221	217	219	258	252	256	324	293	302	302	296	298
2	222	218	220	257	251	255	313	293	304	303	295	298
3	224	221	223	259	254	257	310	299	305	315	295	311
4	228	222	225	262	254	258	310	297	303	320	311	315
5	225	221	223	266	257	262	---	---	---	323	312	318
6	225	220	222	264	254	259	---	---	---	326	315	320
7	227	221	225	265	254	260	---	---	---	327	314	322
8	229	223	225	267	261	264	---	---	---	326	308	317
9	230	225	227	269	260	265	---	---	---	313	304	308
10	234	228	231	277	259	269	---	---	---	318	303	309
11	230	224	227	276	270	272	---	---	---	319	305	313
12	230	227	228	276	267	272	303	286	294	323	310	316
13	232	227	229	280	270	275	295	283	287	323	301	313
14	235	226	230	279	273	276	298	283	288	319	288	302
15	234	232	233	279	264	272	293	285	288	320	306	313
16	243	233	236	275	259	267	290	285	288	341	310	324
17	251	233	238	282	263	271	290	285	288	339	315	328
18	249	236	241	276	267	272	288	281	285	343	323	334
19	245	238	241	283	273	277	291	284	287	349	324	335
20	248	238	242	285	274	279	290	284	288	369	336	354
21	275	238	249	295	273	284	293	285	290	381	349	364
22	278	260	272	294	287	290	293	286	289	381	353	366
23	268	253	258	297	285	292	298	281	289	381	368	375
24	257	249	253	296	283	289	297	287	291	394	379	389
25	269	250	258	311	289	298	297	290	293	417	395	408
26	266	256	261	310	301	306	299	287	292	427	416	421
27	269	260	264	318	289	302	294	284	290	439	384	414
28	263	235	249	307	286	298	295	287	291	410	393	401
29	261	229	247	298	286	290	306	280	295	414	399	407
30	259	251	255	304	294	300	301	293	296	420	404	415
31	---	---	---	304	293	300	301	293	297	---	---	---
MONTH	278	217	238	318	251	277	324	280	293	439	288	344

POTOMAC RIVER BASIN

01595800 NORTH BRANCH POTOMAC RIVER AT BARNUM, WV--Continued

PH (STANDARD UNITS), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	6.8	6.8	6.8	7.0	6.7	6.8	6.6	6.4	6.5	6.6	6.6	6.6
2	6.8	6.8	6.8	7.0	6.8	6.9	6.6	6.4	6.5	6.6	6.6	6.6
3	6.8	6.7	6.8	6.9	6.5	6.7	6.6	6.5	6.6	6.6	6.5	6.5
4	6.8	6.7	6.8	6.6	6.5	6.5	6.6	6.5	6.5	6.6	6.5	6.5
5	6.8	6.6	6.7	6.7	6.6	6.6	6.6	6.6	6.6	6.6	6.5	6.5
6	6.8	6.6	6.7	6.8	6.8	6.8	6.7	6.6	6.6	6.5	6.5	6.5
7	6.7	6.6	6.7	6.8	6.8	6.8	6.6	6.6	6.6	6.5	6.3	6.4
8	6.7	6.7	6.7	6.8	6.7	6.8	6.7	6.6	6.7	6.4	6.3	6.3
9	6.7	6.7	6.7	6.8	6.6	6.8	6.7	6.5	6.6	6.3	6.2	6.3
10	6.9	6.7	6.8	6.6	6.5	6.6	6.7	6.6	6.6	6.3	6.2	6.3
11	6.8	6.8	6.8	6.6	6.5	6.6	6.9	6.6	6.7	6.3	6.3	6.3
12	6.8	6.7	6.8	6.7	6.6	6.6	6.9	6.8	6.8	6.3	6.1	6.2
13	6.9	6.8	6.8	6.7	6.6	6.7	6.8	6.8	6.8	6.1	6.0	6.1
14	6.9	6.8	6.8	6.7	6.6	6.6	6.9	6.8	6.8	6.1	6.0	6.0
15	6.9	6.7	6.8	6.7	6.6	6.6	6.8	6.7	6.7	6.1	6.0	6.0
16	6.9	6.7	6.8	6.7	6.6	6.6	6.8	6.7	6.7	6.2	6.1	6.2
17	6.8	6.8	6.8	6.6	6.6	6.6	---	---	---	---	---	---
18	6.8	6.7	6.8	6.6	6.4	6.5	6.8	6.7	6.7	---	---	---
19	6.8	6.7	6.7	6.4	6.2	6.3	6.7	6.7	6.7	---	---	---
20	7.0	6.7	6.8	6.3	6.1	6.2	6.7	6.6	6.6	---	---	---
21	6.9	6.8	6.8	6.3	6.1	6.1	6.6	6.3	6.5	6.4	6.3	6.3
22	6.8	6.8	6.8	---	---	---	6.4	6.3	6.3	6.5	6.3	6.4
23	6.8	6.8	6.8	---	---	---	---	---	---	6.5	6.4	6.4
24	6.8	6.8	6.8	---	---	---	---	---	---	6.5	6.3	6.4
25	7.0	6.8	6.8	6.6	6.4	6.5	6.5	6.5	6.5	6.5	6.3	6.4
26	6.9	6.7	6.8	6.5	6.4	6.4	---	---	---	6.4	6.3	6.3
27	6.9	6.8	6.8	6.7	6.3	6.6	---	---	---	6.6	6.3	6.4
28	6.8	6.7	6.7	6.8	6.7	6.7	---	---	---	6.6	6.3	6.4
29	6.9	6.6	6.8	6.7	6.6	6.7	6.7	6.5	6.6	6.7	6.4	6.5
30	7.0	6.6	6.7	6.6	6.5	6.6	6.7	6.6	6.7	6.8	6.5	6.6
31	7.0	6.7	6.9	---	---	---	6.6	6.6	6.6	6.8	6.5	6.6
MONTH	7.0	6.6	6.8	7.0	6.1	6.6	6.9	6.3	6.6	6.8	6.0	6.4

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	6.8	6.4	6.6	---	---	---	---	---	---	6.2	6.2	6.2
2	---	---	---	---	---	---	---	---	---	6.2	6.1	6.2
3	---	---	---	6.5	6.2	6.3	---	---	---	6.2	6.1	6.1
4	---	---	---	6.8	6.3	6.5	---	---	---	6.2	6.1	6.1
5	---	---	---	6.8	6.6	6.7	---	---	---	6.1	6.0	6.0
6	---	---	---	6.8	6.6	6.7	---	---	---	6.0	6.0	6.0
7	---	---	---	6.9	6.6	6.7	6.6	6.3	6.5	6.1	5.9	6.0
8	---	---	---	---	---	---	6.4	6.3	6.3	6.1	6.0	6.1
9	---	---	---	---	---	---	6.4	6.3	6.4	6.1	5.9	6.0
10	---	---	---	---	---	---	6.5	6.4	6.4	6.1	6.0	6.0
11	---	---	---	---	---	---	6.5	6.3	6.4	6.2	6.1	6.1
12	---	---	---	---	---	---	6.4	6.2	6.3	6.2	6.1	6.1
13	---	---	---	---	---	---	6.3	6.2	6.3	6.2	6.2	6.2
14	---	---	---	---	---	---	6.3	6.2	6.3	6.3	6.1	6.2
15	---	---	---	---	---	---	6.5	6.3	6.4	6.3	6.2	6.2
16	---	---	---	---	---	---	6.5	6.3	6.4	6.6	6.1	6.3
17	6.6	6.2	6.3	---	---	---	6.4	6.3	6.4	6.3	6.0	6.1
18	6.9	6.2	6.6	6.6	6.5	6.6	6.4	6.3	6.3	6.1	6.0	6.0
19	6.6	6.2	6.4	6.7	6.5	6.6	6.4	6.4	6.4	6.2	6.1	6.1
20	---	---	---	6.6	6.4	6.4	6.4	6.4	6.4	6.2	6.1	6.1
21	---	---	---	6.6	6.3	6.4	6.5	6.3	6.4	6.2	6.0	6.1
22	---	---	---	6.5	6.2	6.3	6.5	6.4	6.5	6.3	6.0	6.1
23	---	---	---	6.3	6.2	6.2	6.6	6.4	6.5	6.1	6.0	6.0
24	---	---	---	6.3	6.1	6.2	6.8	6.4	6.6	6.2	6.0	6.1
25	---	---	---	6.4	6.2	6.3	6.4	6.3	6.3	6.3	6.1	6.2
26	---	---	---	6.3	6.2	6.3	6.4	6.3	6.3	6.2	6.2	6.2
27	---	---	---	6.3	6.1	6.2	6.4	6.3	6.3	6.3	6.2	6.2
28	---	---	---	6.1	6.0	6.1	6.3	6.3	6.3	6.3	6.2	6.3
29	---	---	---	---	---	---	6.3	6.2	6.2	6.5	6.3	6.4
30	---	---	---	---	---	---	6.3	6.2	6.2	6.5	6.3	6.3
31	---	---	---	---	---	---	---	---	---	6.3	6.2	6.3
MONTH	6.9	6.2	6.5	6.9	6.0	6.4	6.8	6.2	6.4	6.6	5.9	6.1

Example 18B.--Water-discharge and water-quality stations interleafed (with water-quality monitor)--Continued

POTOMAC RIVER BASIN

01595800 NORTH BRANCH POTOMAC RIVER AT BARNUM, WV--Continued

PH (STANDARD UNITS), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	JUNE			JULY			AUGUST			SEPTEMBER		
1	6.4	6.2	6.3	6.8	6.6	6.7	6.1	5.7	6.0	6.4	6.3	6.3
2	6.5	6.3	6.4	6.6	6.5	6.6	6.1	6.0	6.0	6.4	6.3	6.3
3	6.5	6.4	6.4	6.6	6.5	6.6	6.3	6.0	6.1	6.4	6.3	6.3
4	6.5	6.4	6.5	6.6	6.5	6.5	6.3	6.2	6.2	6.4	6.3	6.3
5	6.5	6.4	6.5	6.5	6.4	6.5	6.2	6.2	6.2	6.4	6.3	6.3
6	6.5	6.4	6.4	6.5	6.4	6.4	---	---	---	6.4	6.3	6.4
7	6.5	6.4	6.5	6.4	6.3	6.4	---	---	---	6.4	6.3	6.3
8	6.5	6.4	6.4	6.4	6.3	6.3	---	---	---	6.4	6.3	6.4
9	6.5	6.4	6.5	6.4	6.3	6.3	---	---	---	6.4	6.3	6.3
10	6.5	6.4	6.5	6.3	6.2	6.3	---	---	---	6.4	6.3	6.4
11	6.5	6.4	6.4	6.4	6.2	6.3	---	6.2	---	6.4	6.3	6.3
12	6.5	6.4	6.4	6.4	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
13	6.5	6.4	6.4	6.3	6.2	6.3	6.3	6.2	6.3	6.4	6.3	6.3
14	6.5	6.4	6.5	6.3	6.2	6.3	6.3	6.2	6.3	6.4	6.3	6.3
15	6.5	6.5	6.5	6.3	6.2	6.3	6.3	6.2	6.3	6.4	6.3	6.3
16	6.6	6.5	6.5	6.3	6.2	6.3	6.3	6.2	6.3	6.3	6.3	6.3
17	6.7	6.5	6.5	6.3	6.2	6.2	6.3	6.2	6.3	6.3	6.3	6.3
18	6.6	6.5	6.5	6.3	6.1	6.2	6.4	6.2	6.3	6.3	6.3	6.3
19	6.6	6.5	6.5	6.4	6.1	6.3	6.4	6.3	6.4	6.3	6.0	6.1
20	6.6	6.4	6.5	6.3	5.9	6.2	6.4	6.3	6.4	6.2	6.0	6.1
21	6.5	6.4	6.5	6.3	5.9	6.1	6.4	6.3	6.3	6.3	6.2	6.2
22	6.4	6.3	6.4	6.3	6.2	6.2	6.4	6.3	6.4	6.3	6.2	6.3
23	6.4	6.4	6.4	6.3	6.2	6.2	6.4	6.2	6.3	6.3	6.2	6.2
24	6.5	6.4	6.4	6.2	6.1	6.2	6.3	6.2	6.3	6.2	6.2	6.2
25	6.4	6.4	6.4	6.2	6.0	6.1	6.4	6.3	6.3	6.2	6.2	6.2
26	6.6	6.4	6.4	6.1	6.0	6.1	6.4	6.3	6.4	6.3	6.2	6.2
27	6.6	6.4	6.5	6.2	5.8	6.1	6.4	6.2	6.3	6.4	6.2	6.3
28	6.7	6.4	6.5	6.3	6.0	6.1	6.4	6.3	6.3	6.3	6.3	6.3
29	6.8	6.5	6.7	6.2	6.1	6.1	6.4	6.0	6.2	6.3	6.3	6.3
30	6.8	6.7	6.7	6.2	6.0	6.1	6.3	6.0	6.1	6.4	6.2	6.3
31	---	---	---	6.2	6.1	6.1	6.4	6.3	6.3	---	---	---
MONTH	6.8	6.2	6.5	6.8	5.8	6.3	6.4	5.7	6.3	6.4	6.0	6.3

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
1	17.0	15.5	16.0	11.5	10.0	10.5	10.0	8.0	9.0	7.0	6.5	7.0
2	17.0	15.5	16.0	12.0	10.0	10.5	11.0	10.0	10.5	7.0	6.5	6.5
3	17.0	15.5	16.0	11.5	10.0	10.5	10.5	10.0	10.5	7.0	6.0	6.5
4	17.0	16.0	16.0	10.5	10.0	10.5	11.0	10.0	10.5	6.5	5.5	6.0
5	17.0	15.5	16.0	10.5	8.5	10.0	11.0	10.0	10.5	6.5	5.5	5.5
6	17.0	15.5	16.0	10.5	8.5	9.0	11.0	9.5	10.0	6.0	5.5	5.5
7	16.5	15.0	15.5	10.5	9.0	9.5	10.0	9.0	9.5	6.0	5.5	5.5
8	16.0	15.5	15.5	10.5	8.5	9.5	9.5	8.5	9.0	6.0	5.5	5.5
9	16.0	15.0	15.5	11.0	9.0	10.0	9.0	8.5	8.5	5.5	5.5	5.5
10	15.5	15.0	15.0	11.0	10.0	10.0	8.5	8.0	8.5	5.5	5.0	5.5
11	15.5	15.0	15.0	10.0	9.5	9.5	8.5	8.0	8.5	6.0	5.0	5.5
12	16.0	15.0	15.5	11.0	9.5	10.0	8.5	7.5	8.0	5.0	4.0	4.5
13	15.5	15.0	15.0	9.5	9.0	9.0	8.5	7.5	8.0	5.0	4.0	4.5
14	15.5	15.0	15.0	9.5	9.0	9.0	8.0	7.5	7.5	5.5	4.5	4.5
15	15.5	14.5	15.0	9.0	8.5	9.0	8.5	7.5	8.0	5.0	4.5	4.5
16	15.0	13.0	14.5	9.5	8.0	8.5	8.5	8.0	8.0	4.5	4.5	4.5
17	13.5	12.5	13.0	9.5	8.0	8.5	8.0	7.5	8.0	---	---	---
18	14.0	12.5	13.0	8.5	7.5	8.0	8.0	7.0	7.5	---	---	---
19	14.0	12.5	13.0	8.5	7.5	8.0	7.5	7.0	7.0	---	---	---
20	14.0	13.0	13.5	8.0	8.0	8.0	7.5	7.0	7.0	---	---	---
21	13.0	12.0	12.5	8.5	8.0	8.0	7.0	7.0	7.0	4.5	---	---
22	12.5	11.5	12.0	8.5	8.0	8.5	7.5	6.5	7.0	4.5	3.5	4.0
23	12.5	11.0	11.5	9.0	8.5	8.5	7.5	7.0	7.0	4.5	4.0	4.0
24	12.0	11.0	11.5	8.5	7.5	8.5	7.5	7.0	7.0	4.0	3.5	4.0
25	11.5	10.5	11.0	9.0	7.5	8.0	7.5	7.0	7.5	4.0	3.5	3.5
26	11.5	10.0	10.5	9.0	7.5	8.0	7.5	7.5	7.5	4.0	3.5	3.5
27	12.0	10.0	10.5	8.5	8.0	8.0	7.5	7.0	7.5	4.0	3.5	3.5
28	11.5	10.0	10.5	8.0	8.0	8.0	7.5	7.0	7.5	4.0	3.5	3.5
29	11.5	10.0	10.5	8.5	8.0	8.0	7.5	7.0	7.5	4.5	3.0	3.5
30	11.5	10.0	11.0	9.0	8.0	8.0	7.5	7.0	7.0	4.0	3.5	4.0
31	11.5	10.0	10.5	---	---	---	7.0	6.5	7.0	4.5	3.5	4.0
MONTH	17.0	10.0	13.5	12.0	7.5	9.0	11.0	6.5	8.0	7.0	3.0	5.0

Example 18B.--Water-discharge and water-quality stations interleafed (with water-quality monitor)--Continued

POTOMAC RIVER BASIN

01595800 NORTH BRANCH POTOMAC RIVER AT BARNUM, WV--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	FEBRUARY			MARCH			APRIL			MAY		
1	4.0	3.5	3.5	---	---	---	---	---	---	9.5	9.0	9.0
2	3.5	3.5	3.5	---	---	---	---	---	---	10.0	9.0	9.5
3	4.0	3.5	3.5	5.5	4.0	4.5	---	---	---	9.5	8.0	9.0
4	4.0	3.5	3.5	4.5	4.0	4.5	---	---	---	8.0	6.5	7.0
5	4.5	3.5	3.5	6.0	4.0	4.5	---	---	---	10.0	7.0	8.0
6	4.0	3.5	4.0	4.5	4.5	4.5	---	---	---	10.5	8.0	9.5
7	4.0	3.5	4.0	6.0	4.5	5.0	6.0	5.5	5.5	12.0	10.0	11.0
8	4.0	3.5	3.5	---	---	---	6.0	5.5	6.0	11.5	10.5	11.0
9	4.5	3.5	4.0	---	---	---	5.5	5.0	5.5	11.0	10.0	10.5
10	4.5	3.5	4.0	---	---	---	5.5	5.0	5.5	11.5	10.0	10.5
11	---	---	---	---	---	---	6.0	5.5	5.5	12.5	10.0	11.0
12	---	---	---	---	---	---	6.5	6.0	6.0	13.0	10.5	11.5
13	---	---	---	---	---	---	7.5	6.5	6.5	13.0	11.5	12.0
14	---	---	---	---	---	---	8.0	7.0	7.5	12.5	11.5	12.0
15	---	---	---	---	---	---	8.0	5.5	6.5	13.0	12.0	12.5
16	---	---	---	---	---	---	8.0	6.0	7.0	12.0	6.5	10.0
17	4.5	3.5	4.0	---	---	---	8.0	7.5	8.0	12.0	6.5	8.5
18	4.5	3.5	4.0	---	---	---	8.0	6.0	7.5	8.5	7.5	8.0
19	4.5	3.5	4.0	6.5	5.5	6.0	7.0	6.5	6.5	10.5	8.5	9.5
20	---	---	---	7.5	6.0	6.5	7.5	6.5	7.0	13.0	10.5	11.5
21	---	---	---	6.0	5.0	5.5	7.5	6.5	7.0	13.0	9.0	12.0
22	---	---	---	5.5	4.5	5.0	7.5	6.5	7.0	11.0	8.5	10.0
23	---	---	---	6.0	5.0	5.5	7.5	6.5	6.5	9.0	8.0	8.5
24	---	---	---	6.0	5.5	6.0	7.0	4.5	6.0	12.0	9.0	10.5
25	---	---	---	6.5	5.5	6.0	6.0	4.5	5.5	14.0	11.5	13.0
26	---	---	---	7.0	5.5	6.0	9.0	6.0	7.5	14.5	13.5	14.0
27	---	---	---	6.0	5.5	6.0	8.5	7.5	8.0	14.0	13.5	13.5
28	---	---	---	6.0	5.5	5.5	9.0	7.5	8.0	15.0	13.5	14.0
29	---	---	---	---	---	---	9.0	8.5	8.5	15.5	14.0	14.5
30	---	---	---	---	---	---	9.0	8.0	8.5	15.5	14.0	14.5
31	---	---	---	---	---	---	---	---	---	15.0	14.0	14.0
MONTH	4.5	3.5	4.0	7.5	4.0	5.5	9.0	4.5	7.0	15.5	6.5	11.0

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	JUNE			JULY			AUGUST			SEPTEMBER		
1	15.0	14.0	14.5	18.0	16.0	17.0	19.5	16.5	17.5	19.0	16.5	17.5
2	15.5	14.5	15.0	19.0	16.5	17.5	19.5	17.0	18.0	19.0	16.5	17.5
3	16.0	15.0	15.5	18.5	16.5	17.5	20.0	17.0	18.0	19.0	16.5	17.5
4	16.5	15.0	15.5	19.5	16.5	17.5	19.5	17.0	18.0	18.0	17.0	17.5
5	17.0	15.0	16.0	18.5	17.0	17.5	---	---	---	19.0	17.0	17.5
6	17.0	15.5	16.0	17.5	15.5	17.0	---	---	---	19.5	17.0	18.0
7	17.0	16.0	16.5	18.5	15.5	16.5	---	---	---	19.0	17.0	18.0
8	17.0	16.0	16.5	18.5	16.0	17.0	---	---	---	19.5	16.5	17.5
9	17.0	16.0	16.5	18.5	16.0	17.0	---	---	---	18.5	15.5	17.0
10	18.0	15.5	16.5	19.0	16.0	17.0	---	---	---	19.0	16.0	17.0
11	17.0	15.0	16.0	19.0	16.0	17.0	---	---	---	19.0	16.0	17.0
12	17.0	15.5	16.0	19.0	16.0	17.0	18.0	15.5	17.0	17.5	16.0	17.0
13	17.5	15.5	16.5	19.5	16.5	17.5	17.5	15.5	16.0	16.5	15.5	16.0
14	18.0	16.0	16.5	19.0	16.5	17.5	18.0	15.5	16.5	17.0	15.0	15.5
15	18.0	16.0	17.0	18.5	16.5	17.5	18.0	15.5	16.5	17.5	15.0	15.5
16	19.0	16.5	17.0	18.5	16.0	17.0	18.5	15.5	16.5	16.5	15.0	15.5
17	18.0	16.5	17.0	18.5	15.5	17.0	18.0	15.5	16.5	18.0	15.5	16.5
18	17.5	16.0	16.5	18.5	16.0	17.0	17.5	16.0	16.5	18.5	15.5	16.5
19	18.0	16.5	17.0	18.0	16.0	17.0	19.0	16.0	17.0	16.5	16.0	16.0
20	18.0	16.5	17.0	19.5	16.5	17.5	19.5	16.0	17.0	18.5	16.0	17.0
21	16.5	16.5	16.5	19.5	17.5	18.5	19.0	16.0	17.0	16.5	16.0	16.5
22	18.0	16.5	17.0	19.5	16.0	17.5	19.5	16.0	17.0	16.5	15.5	16.0
23	19.0	16.5	17.0	17.5	16.0	16.5	17.5	16.5	16.5	17.0	15.5	16.0
24	19.0	16.5	17.5	19.0	16.5	17.5	17.0	16.0	16.5	17.5	15.0	16.0
25	18.5	16.5	17.5	18.0	16.0	17.0	18.0	16.0	16.5	17.5	15.0	16.0
26	19.0	17.0	17.5	19.5	16.5	17.5	18.5	16.0	17.0	17.0	15.5	16.0
27	20.0	17.0	18.0	21.0	16.5	18.0	18.0	16.5	17.0	17.5	15.0	16.0
28	18.5	14.5	16.5	18.5	16.0	17.0	18.5	16.5	17.0	17.0	14.5	15.5
29	16.5	14.5	15.5	18.5	15.5	17.0	17.0	15.5	16.0	16.5	14.5	15.5
30	16.5	16.0	16.5	19.5	16.5	17.5	18.0	15.5	16.5	15.5	14.5	15.0
31	---	---	---	19.0	16.5	17.5	17.5	17.0	17.0	---	---	---
MONTH	20.0	14.0	16.5	21.0	15.5	17.5	20.0	15.5	17.0	19.5	14.5	16.5

POTOMAC RIVER BASIN

01595800 NORTH BRANCH POTOMAC RIVER AT BARNUM, WV--Continued

OXYGEN, DISSOLVED (DO), MG/L, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
1	9.5	8.9	9.3	10.9	10.6	10.8	11.1	10.4	10.8	10.4	10.2	10.3
2	9.4	9.1	9.3	11.1	10.6	10.9	10.6	10.4	10.5	10.5	10.3	10.4
3	9.5	9.0	9.3	11.1	10.7	10.9	10.5	10.4	10.4	10.6	10.4	10.5
4	9.5	9.3	9.3	10.9	10.8	10.8	10.5	10.2	10.4	10.9	10.6	10.7
5	9.6	9.2	9.4	11.2	10.7	11.0	10.5	10.2	10.4	11.0	10.8	10.8
6	9.7	9.5	9.5	11.4	10.9	11.1	11.0	10.3	10.6	11.1	10.8	11.0
7	9.7	9.5	9.6	11.1	10.7	10.9	11.2	10.7	11.1	11.3	11.0	11.1
8	9.7	9.5	9.6	11.0	10.5	10.8	11.2	11.0	11.1	11.5	11.2	11.5
9	9.7	9.5	9.6	11.0	10.5	10.8	11.3	11.1	11.2	11.7	11.4	11.7
10	9.8	9.5	9.6	10.8	10.5	10.7	11.4	11.1	11.3	11.9	11.7	11.9
11	9.6	9.4	9.5	10.7	10.5	10.6	11.2	11.1	11.1	12.0	11.9	12.0
12	9.7	9.4	9.5	10.7	10.1	10.5	11.4	11.2	11.3	12.5	12.0	12.4
13	9.6	9.4	9.5	10.8	10.6	10.7	11.5	11.2	11.4	12.7	12.4	12.6
14	9.6	9.4	9.5	10.7	10.5	10.6	11.5	11.3	11.4	12.8	12.5	12.7
15	9.6	9.4	9.5	10.9	10.7	10.8	11.5	11.1	11.3	12.7	12.4	12.6
16	9.9	9.5	9.7	11.0	10.7	10.9	11.4	11.2	11.3	---	---	---
17	10.1	9.8	10.0	11.2	10.7	10.9	11.6	11.3	11.5	---	---	---
18	10.2	9.8	10.0	11.3	11.1	11.2	11.7	11.4	11.6	---	---	---
19	10.1	9.7	10.0	11.3	11.2	11.2	11.7	11.4	11.5	---	---	---
20	10.0	9.7	9.8	11.3	11.2	11.3	11.6	11.4	11.5	---	---	---
21	10.2	9.9	10.1	11.3	11.1	11.2	12.3	11.6	11.9	13.2	12.9	13.1
22	10.4	10.2	10.3	11.2	11.0	11.1	12.4	11.8	12.0	13.6	13.2	13.4
23	10.5	10.2	10.4	11.4	11.0	11.1	11.9	11.7	11.8	14.2	13.6	13.9
24	10.6	10.3	10.4	11.5	11.0	11.2	11.9	11.7	11.8	14.6	14.2	14.4
25	10.7	10.3	10.4	11.6	11.3	11.4	11.9	11.8	11.8	14.5	13.9	14.2
26	10.7	10.4	10.6	11.4	11.1	11.2	11.8	11.5	11.7	14.0	13.0	13.5
27	10.8	10.2	10.6	11.3	11.2	11.3	12.0	11.8	11.9	13.0	12.2	12.6
28	10.8	10.4	10.6	11.3	11.0	11.2	12.0	11.8	11.9	12.2	11.8	12.0
29	10.8	10.4	10.6	11.1	10.8	10.9	12.0	10.8	11.6	12.0	11.6	11.8
30	10.9	10.6	10.7	11.2	11.0	11.1	11.0	10.3	10.7	12.1	11.7	11.9
31	10.9	10.5	10.7	---	---	---	10.6	10.2	10.4	12.5	12.0	12.2
MONTH	10.9	8.9	9.9	11.6	10.1	11.0	12.4	10.2	11.3	14.6	10.2	12.1

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	FEBRUARY			MARCH			APRIL			MAY		
1	12.7	12.2	12.5	---	---	---	---	---	---	11.9	11.7	11.8
2	12.2	11.5	11.8	---	---	---	---	---	---	11.8	11.6	11.7
3	11.7	11.4	11.6	12.9	11.9	12.5	---	---	---	---	---	---
4	11.9	11.6	11.8	12.5	11.7	12.1	---	---	---	---	---	---
5	11.9	11.7	11.8	11.7	11.2	11.5	---	---	---	13.7	11.3	12.6
6	11.9	11.8	11.8	11.9	11.6	11.7	---	---	---	12.5	10.6	11.6
7	12.0	11.7	11.8	11.7	11.2	11.5	12.9	12.7	12.8	11.2	10.0	10.6
8	12.0	11.7	11.9	---	---	---	13.0	12.7	12.8	10.8	10.4	10.6
9	12.1	11.8	11.9	---	---	---	13.2	13.0	13.1	11.0	10.5	10.8
10	---	---	---	---	---	---	13.5	13.0	13.3	11.1	10.3	10.7
11	---	---	---	---	---	---	13.5	12.8	13.2	10.8	9.9	10.5
12	---	---	---	---	---	---	13.0	12.6	12.8	10.8	10.0	10.4
13	---	---	---	---	---	---	12.7	12.1	12.5	10.4	10.0	10.2
14	---	---	---	---	---	---	12.3	12.0	12.2	10.3	10.0	10.2
15	---	---	---	---	---	---	13.3	12.1	12.8	10.1	9.8	10.0
16	---	---	---	---	---	---	13.3	12.2	12.7	13.1	10.1	11.1
17	12.7	12.0	12.3	---	---	---	12.3	12.1	12.2	13.2	9.8	11.7
18	13.2	12.2	12.4	---	---	---	12.5	12.2	12.4	12.6	11.4	12.1
19	12.6	12.0	12.2	11.8	11.4	11.5	12.7	12.5	12.6	11.7	10.5	11.0
20	---	---	---	11.4	11.0	11.2	12.6	12.5	12.5	10.7	9.7	10.3
21	---	---	---	12.4	10.8	11.5	12.6	12.1	12.4	11.2	9.8	10.0
22	---	---	---	12.7	12.1	12.3	12.3	12.1	12.2	11.5	10.2	10.8
23	---	---	---	12.4	11.7	12.1	12.3	11.8	12.1	12.2	11.3	11.8
24	---	---	---	11.9	11.4	11.7	14.2	11.9	13.0	11.7	10.1	10.7
25	---	---	---	11.4	11.3	11.4	14.3	12.9	13.8	10.4	9.4	9.8
26	---	---	---	11.5	11.3	11.4	13.1	11.9	12.5	9.8	9.4	9.6
27	---	---	---	11.4	11.3	11.3	12.3	12.0	12.1	9.8	9.3	9.6
28	---	---	---	11.5	11.3	11.5	12.3	11.7	12.1	9.7	9.2	9.5
29	---	---	---	---	---	---	12.1	11.8	12.0	9.4	9.0	9.2
30	---	---	---	---	---	---	12.1	11.7	12.0	9.5	9.2	9.3
31	---	---	---	---	---	---	---	---	---	9.6	9.4	9.5
MONTH	13.2	11.4	12.0	12.9	10.8	11.7	14.3	11.7	12.6	13.7	9.0	10.6

Example 18B.--Water-discharge and water-quality stations interleafed (with water-quality monitor)--Continued

POTOMAC RIVER BASIN

01595800 NORTH BRANCH POTOMAC RIVER AT BARNUM, WV--Continued

OXYGEN, DISSOLVED (DO), MG/L, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	9.7	9.5	9.6	9.1	8.7	8.9	9.0	8.6	8.8	9.1	8.6	8.9
2	9.7	9.3	9.5	9.0	8.7	8.9	9.0	8.6	8.9	9.2	8.8	9.0
3	9.4	9.1	9.2	9.0	8.7	8.9	9.0	8.5	8.8	9.2	8.8	9.0
4	9.2	8.9	9.0	9.0	8.6	8.8	9.0	8.6	8.8	9.1	8.9	9.0
5	9.3	8.9	9.1	8.9	8.6	8.8	---	---	---	9.1	8.8	9.0
6	9.3	8.8	9.0	9.1	8.8	8.9	---	---	---	9.1	8.7	8.9
7	9.2	8.8	9.0	9.2	8.4	8.9	---	---	---	9.1	8.8	9.0
8	9.2	8.8	9.0	8.8	8.3	8.6	---	---	---	9.3	8.9	9.1
9	9.2	9.0	9.1	8.8	8.3	8.5	---	---	---	9.5	9.0	9.3
10	9.4	8.9	9.2	8.9	8.4	8.7	---	---	---	9.6	9.1	9.4
11	9.6	9.1	9.3	9.0	8.6	8.9	---	---	---	9.5	9.1	9.3
12	9.5	9.1	9.3	9.1	8.6	8.9	9.2	8.7	8.9	9.6	9.0	9.4
13	9.3	9.1	9.3	9.1	8.6	8.9	9.3	9.0	9.2	9.7	9.1	9.3
14	9.3	9.0	9.2	9.2	8.7	9.0	9.4	9.0	9.2	9.5	9.2	9.4
15	9.2	9.0	9.1	9.2	8.9	9.0	9.4	8.9	9.2	9.6	9.2	9.4
16	9.3	8.9	9.1	9.4	8.9	9.2	9.3	8.9	9.2	9.6	9.3	9.5
17	9.2	9.0	9.2	9.4	8.9	9.2	9.3	9.0	9.2	9.6	9.2	9.4
18	9.3	9.1	9.2	9.5	9.0	9.3	9.3	9.1	9.2	9.7	9.3	9.5
19	9.3	9.1	9.2	9.6	9.0	9.3	9.4	8.9	9.2	10.0	9.6	9.8
20	9.3	9.1	9.2	9.4	8.9	9.2	9.4	8.8	9.2	10.0	9.4	9.7
21	9.3	9.3	9.3	9.4	8.9	9.1	9.3	8.9	9.2	9.9	9.6	9.7
22	9.4	9.1	9.2	9.4	8.9	9.2	9.3	8.7	9.0	10.1	9.8	10.0
23	9.3	8.9	9.2	9.5	8.7	9.2	9.0	8.9	8.9	10.4	10.0	10.2
24	9.3	8.8	9.1	8.8	8.4	8.7	9.0	8.8	8.9	10.2	9.9	10.1
25	9.0	8.1	8.6	8.9	8.6	8.8	8.9	8.7	8.8	10.3	9.8	10.1
26	8.5	8.1	8.3	8.9	8.5	8.8	8.9	8.5	8.7	10.1	9.8	9.9
27	8.8	8.3	8.5	9.0	8.2	8.7	8.8	8.5	8.7	10.3	9.9	10.1
28	9.4	8.6	9.0	9.2	8.8	9.0	8.8	8.5	8.7	10.3	10.0	10.2
29	9.4	9.0	9.2	9.2	8.8	9.0	9.3	8.7	9.0	10.3	9.9	10.1
30	9.1	9.0	9.0	9.1	8.6	8.9	9.4	8.6	9.0	10.1	9.9	10.0
31	---	---	---	9.0	8.6	8.8	8.8	8.7	8.8	---	---	---
MONTH	9.7	8.1	9.1	9.6	8.2	8.9	9.4	8.5	9.0	10.4	8.6	9.5

Example 19.--Daily reservoir record[1]

08294200 NAMBE FALLS RESERVOIR NEAR NAMBE, NM

LOCATION.--Lat 35°50'46", long 105°54'17", in NE¼SW¼, sec.29, T.19 N., R.10 E., Santa Fe County, Hydrologic Unit 13020101, in Nambe Indian Reservation, 300 ft upstream from Nambe Falls, 2.6 mi upstream from Rio En Medio, 4.4 mi southeast of Nambe Pueblo, and 5.4 mi southeast of Nambe.

DRAINAGE AREA.--34.1 mi^2.

PERIOD OF RECORD.--February 1976 to current year.

REVISED RECORDS.--WDR NM-77-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by Bureau of Reclamation). Prior to July 22, 1976, nonrecording gage at same site and datum.

REMARKS.--Reservoir is formed by a concrete arch and earthfill dam, storage began Feb. 23, 1976. Total capacity, 2,020 acre-ft at elevation 6,826.6 ft, crest of ogee weir spillway, including 237 acre-ft of storage in a permanent pool between elevation 6,760.9 ft, invert of outlet conduits, and 6,780.0 ft. Dead storage 121 acre-ft below elevation 6,760.9 ft. Outlet conduits are one 6-in and two 12-in diameter pipes. Reservoir is used for storage of irrigation water and for recreation. Figures given herein represent total storage.

COOPERATION.--Records furnished by Bureau of Reclamation.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents, 2,060 acre-ft, June 9, 1979, elevation, 6,827.24 ft; no storage prior to Feb. 23, 1976.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 2,050 acre-ft, May 30 to June 5, June 7-13. Maximum elevation, 6,827.10 ft; minimum contents, 1,320 acre-ft, Oct. 1, elevation, 6,817.10 ft.

Capacity table (elevation, in feet, and contents, in acre-feet)
(Based on survey by Bureau of Reclamation in 1976)

6,815	1,420	6,825	1,930
6,820	1,660	6,830	2,230

RESERVOIR STORAGE (AC-FT), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
INSTANTANEOUS OBSERVATIONS AT 2400

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1540	1760	1980	1970	1940	1990	1960	1970	2050	2030	2030	2030
2	1570	1760	1970	1970	1940	1990	1970	1970	2050	2030	2040	2030
3	1600	1760	1960	1970	1940	1980	1980	1970	2050	2030	2040	2030
4	1620	1750	1950	1970	1940	1980	2000	1970	2050	2030	2040	2030
5	1650	1750	1950	1970	1940	1970	2010	1970	2050	2040	2040	2030
6	1680	1740	1950	1970	1950	1970	2010	1990	2040	2040	2040	2030
7	1700	1740	1950	1970	1950	1970	2010	2000	2050	2040	2040	2030
8	1730	1750	1950	1970	1960	1960	2000	2020	2050	2040	2040	2030
9	1740	1770	1950	1980	1960	1960	2000	2030	2050	2030	2040	2030
10	1760	1780	1940	1980	1980	1960	1990	2030	2050	2030	2030	2030
11	1780	1800	1940	1980	1970	1960	1990	2030	2050	2040	2040	2030
12	1780	1810	1940	1970	1980	1960	1970	2040	2050	2040	2040	2030
13	1780	1810	1940	1970	1980	1960	1960	2040	2050	2040	2040	2030
14	1770	1820	1930	1970	1980	1970	1960	2040	2050	2030	2040	2000
15	1770	1830	1930	1960	1980	1970	1960	2030	2050	2030	2040	1970
16	1760	1840	1930	1950	1980	1970	1960	2030	2040	2030	2040	1960
17	1760	1850	1920	1950	1980	1980	1950	2030	2040	2030	2040	1960
18	1760	1870	1920	1940	1980	1980	1960	2030	2040	2030	2040	1960
19	1770	1870	1920	1940	1980	1980	1970	2030	2040	2030	2040	1960
20	1770	1880	1930	1930	1980	1990	1980	2030	2040	2040	2040	1960
21	1780	1890	1930	1930	1980	1990	1980	2030	2040	2030	2040	1960
22	1790	1900	1940	1920	1980	1980	1960	2030	2040	2030	2040	1960
23	1790	1910	1950	1920	1980	1980	1940	2030	2040	2030	2040	1960
24	1800	1920	1960	1910	1980	1970	1930	2030	2040	2030	2040	1960
25	1790	1930	1960	1920	1980	1960	1940	2040	2040	2030	2040	1960
26	1790	1930	1970	1930	1980	1950	1970	2040	2040	2040	2040	1960
27	1790	1940	1970	1930	1980	1940	1960	2040	2040	2030	2040	1960
28	1780	1950	1970	1930	1990	1930	1980	2040	2040	2030	2040	1950
29	1780	1960	1970	1930	---	1930	1970	2040	2040	2030	2030	1950
30	1770	1970	1970	1930	---	1930	1970	2050	2040	2030	2030	1960
31	1770	---	1970	1940	---	1940	---	2050	---	2030	2030	---
MAX	1800	1970	1980	1980	1990	1990	2010	2050	2050	2040	2040	2030
MIN	1540	1740	1920	1910	1940	1930	1930	1970	2040	2030	2030	1950
(†)	6822.03	6825.65	6825.75	6825.10	6825.97	6825.08	6825.76	6827.00	6826.85	6826.80	6826.73	6825.47
(††)	+250	+200	0	-30	+50	-50	+30	+80	-10	-10	0	-70

CAL YR 1982 MAX 1980 MIN 665 (††) 0
WTR YR 1983 MAX 2050 MIN 1540 (††) +440

(†) ELEVATION, IN FEET, AT END OF MONTH
(††) CHANGE IN CONTENTS, IN ACRE-FEET

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[1]Reprinted from WDR: NM-83-1. Note that for the 1985 water year, except for the unit abbreviation "in/yr," periods will be placed after abbreviations of inch (in.) that appear in station manuscripts. Also, the term "furnished" will be replaced by "provided," and the footnotes will be indented three spaces, not two.

Example 20.--Monthly reservoir record[1]

03312900 BARREN RIVER LAKE NEAR FINNEY, KY

LOCATION.--Lat 36°53'31", long 86°07'27", Allen County, Hydrologic Unit 05110002, in intake structure of Barren River Dam on Barren River, 1.0 mi upstream from Difficult Creek, 1.9 mi southwest of Finney, and at mile 79.2.

DRAINAGE AREA.--942 mi^2, revised, of which about 77 mi^2 does not contribute directly to surface runoff.

PERIOD OF RECORD.--March 1964 to current year (monthend contents only). Prior to October 1969, published as "Barren River Reservoir".

GAGE.--Water-stage recorder. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers).

REMARKS.--Lake is formed by rolled-earth and rockfill dam. Gates closed and storage began Mar. 5, 1964. Releases controlled by three gates 6.5 ft wide and 14 ft high, in semi-elliptical concrete conduit through dam with inlet invert elevation at 478.00 ft. Low flow releases controlled by two bypass valves. Total capacity at ungated spillway level, elevation 590.00 ft, is 815,200 acre-ft, of which a maximum of 749,200 acre-ft, contents between elevations 525.00 ft and 590.00 ft or a minimum of 558,800 acre-ft, contents between elevations of 552.00 ft and 590.00 ft is reserved for flood control depending on season. Contents of 190,400 acre-ft between minimum pool elevation of 525.00 ft and seasonal pool elevation of 552.00 ft is available for seasonal low-flow augmentation. Capacity at minimum pool elevation, 525.00 ft is 66,030 acre-ft. Lake is used for flood control, low-flow augmentation, and recreation. Figures given herein include dead storage of 32 acre-ft below invert of conduit, elevation 478.00 ft.

COOPERATION.--Capacity table furnished by U.S. Army Corps of Engineers.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents, 613,530 acre-ft, Jan. 9, 1979, elevation, 578.99 ft; minimum since first filling, 28,680 acre-ft, Apr. 24, 1964, elevation, 514.05 ft.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 484,090 acre-ft, Oct. 1, elevation, 570.65 ft; minimum, 64,950 acre-ft, Feb. 28, elevation, 524.75 ft.

MONTHEND ELEVATION, IN FEET NGVD, AND CONTENTS AT 2400, WATER YEAR OCTOBER 1979 TO SEPTEMBER 1980

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30	570.65	484,090	-
Oct. 31	561.64	363,700	-120,390
Nov. 30	558.00	320,540	-43,160
Dec. 31	556.50	303,690	-16,850
CAL YR 1979	-	-	-209,520
Jan. 31	539.90	151,810	-151,880
Feb. 29	524.92	65,680	-86,130
Mar. 31	550.64	242,960	+177,280
Apr. 30	552.03	256,700	+13,740
May 31	552.02	256,600	-100
June 30	552.65	262,920	+6,320
July 31	552.23	258,700	-4,220
Aug. 31	552.20	258,400	-300
Sept. 30	551.15	247,940	-10,460
WTR YR 1980	-	-	-236,150

[1]Modified from WDR: KY-80-1.

Example 21A.--Group reservoir records (large reservoirs)[1]

RESERVOIRS IN YAKIMA RIVER BASIN, WA

12474000 KEECHELUS LAKE.--Lat 47°19'21", long 121°20'18", in SW¼NE¼ sec.12, T.21 N., R.11 E., Kittitas County, Hydrologic Unit 17030001, Wenatchee National Forest, at headgate tower of outlet at dam on Yakima River 3.0 mi northwest of Martin, 10 mi northwest of Easton, and at mile 214.5. DRAINAGE AREA, 54.7 mi². PERIOD OF RECORD, January 1906 to current year. GAGE, water-stage recorder and low-water staff gages. Datum of gage is National Geodetic Vertical Datum of 1929 (Bureau of Reclamation datum). Prior to Mar. 24, 1967, nonrecording gage at same site and datum.

REMARKS.--Reservoir is formed on natural lake by earth-filled dam completed in 1917; storage began behind crib dam Jan. 12, 1906, behind present dam Aug. 19, 1914. Initial filling of present reservoir June 15, 1920. Usable capacity, 157,800 acre-ft between elevation 2,425.00 ft, invert of gate sill, and 2,517.00 ft, spillway crest. Spillway raised 2 ft, Sept. 12, 1952. Figures given herein represent usable contents. Water is used for irrigation.

COOPERATION.--Records furnished by Bureau of Reclamation.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents, 160,940 acre-ft, June 5, 1969, elevation, 2,518.23 ft; minimum observed, 448 acre-ft, Sept. 6, 12, 13, 1906 (original crib dam); minimum elevation observed, 2,428.30 ft, Sept. 20, 1926.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 153,550 acre-ft, May 22-25, elevation, 2,515.34 ft; minimum, 7,460 acre-ft, Oct. 15-17, elevation, 2,430.95 ft.

12475500 KACHESS LAKE.-- * * * *(Format similar to the above)*

12478500 CLE ELUM LAKE.--* * * *(Format similar to the above)*

12487500 BUMPING LAKE.--Lat 46°52'25", long 121°17'57", in SW¼ sec.14 (unsurveyed), T.16 N., R.12 E., Yakima County, Hydrologic Unit 17030002, Snoqualmie National Forest, at outlet of dam on Bumping River, 2.2 mi southwest of Goose Prairie, 10 mi southwest of town of American River, 19 mi west of Nile, and at mile 17.0. DRAINAGE AREA, 69.3 mi². PERIOD OF RECORD, June to July 1906, April 1909 to current year. GAGE, water-stage recorder. Datum of gage is National Geodetic Vertical Datum of 1929 (Bureau of Reclamation datum). Prior to Nov. 23, 1966, nonrecording gage at same site and datum.

REMARKS.--Reservoir is formed on natural lake by earth-fill dam completed in 1910; storage began Nov. 3, 1910. Usable capacity, 33,700 acre-ft between elevation 3,389.00 ft, invert of gate sill and 3,426.00 ft, spillway crest. Figures given herein represent usable contents. Water is used for irrigation.

COOPERATION.--Records furnished by Bureau of Reclamation.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents observed, 39,840 acre-ft, June 21, 22, 1925, elevation, 3,430.55 ft; minimum observed, 1,130 acre-ft, Feb. 5-9, 1949, elevation, 3,390.80 ft.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 35,550 acre-ft, May 23, elevation, 3,427.40 ft; minimum, 3,220 acre-ft, Nov. 29, 30, elevation, 3,394.05 ft.

MONTHEND ELEVATION AND CONTENTS AT 2400, WATER YEAR OCTOBER 1979 TO SEPTEMBER 1980

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)
	12474000 KEECHELUS LAKE			12475500 KACHESS LAKE		
Sept. 30	2,431.19	7,760	-	2,203.18	28,890	-
Oct. 31	2,433.17	10,280	+2,520	2,200.60	21,700	-7,190
Nov. 30	2,437.02	15,200	+4,920	2,201.74	24,870	+3,170
Dec. 31	2,469.05	59,270	+44,070	2,214.34	60,320	+35,450
CAL YR 1979	-	-	-1,550	-	-	-112,500
Jan. 31	2,474.13	67,350	+8,080	2,217.42	69,120	+8,800
Feb. 29	2,481.02	79,140	+11,790	2,220.37	77,580	+8,460
Mar. 31	2,489.27	94,640	+15,500	2,225.47	92,610	+15,030
Apr. 30	2,506.81	132,650	+38,010	2,235.21	127,550	+34,940
May 31	2,512.70	146,920	+14,270	2,244.45	163,370	+35,820
June 30	2,503.54	125,060	-21,860	2,247.97	177,840	+14,470
July 31	2,481.03	79,160	-45,900	2,241.64	152,160	-25,680
Aug. 31	2,459.64	45,480	-33,680	2,233.89	122,660	-29,500
Sept. 30	2,445.38	26,110	-19,370	2,227.07	98,180	-24,480
WTR YR 1980	-	-	+18,350	-	-	+69,290
	12478500 CLE ELUM LAKE			12487500 BUMPING LAKE		
Sept. 30	2,223.22	359,460	-	3,394.39	3,450	-
Oct. 31	2,223.55	360,930	+1,470	3,395.28	4,040	+590
Nov. 30	2,223.56	360,970	+40	3,394.05	3,220	-820
Dec. 31	2,225.04	367,550	+6,580	3,404.60	10,850	+7,630
CAL YR 1979	-	-	+312,540	-	-	+6,960
Jan. 31	2,223.44	360,440	-7,110	3,402.53	9,210	-1,640
Feb. 29	2,224.27	364,120	+3,680	3,410.87	16,440	+7,230
Mar. 31	2,224.21	363,850	-270	3,421.01	27,470	+11,030
Apr. 30	2,227.32	377,770	+13,920	3,426.31	34,120	+6,650
May 31	2,239.98	436,850	+59,080	3,426.40	34,230	+110
June 30	2,238.95	431,910	-4,940	3,422.63	29,440	-4,790
July 31	2,214.96	323,650	-108,260	3,416.41	22,190	-7,250
Aug. 31	2,169.84	152,080	-171,570	3,411.55	17,100	-5,090
Sept. 30	2,137.29	57,410	-94,670	3,401.60	8,500	-8,600
WTR YR 1980	-	-	-302,050	-	-	+5,050

[1]Modified from WDR: WA-80-1.

Example 21B.--Group reservoir records (small reservoirs)[1]

RESERVOIRS IN ANDROSCOGGIN RIVER BASIN

01050500 RANGELEY LAKE on Rangeley Stream, at Oquossoc, Maine, used for power, has usable capacity of 1,339,200,000 ft^3 in top 4.0 ft of lake (top of flashboards). Gage-height record furnished by Union Water Power Co.

01051000 MOOSELOOKMEGUNTIC LAKE at Upper Dam, in Richardson Township, Maine, used for power, has usable capacity of 8,370,000,000 ft^3 between gage heights 8.3 ft and 20.5 ft. Gage-height record furnished by Union Water Power Co.

01051500 UPPER AND LOWER RICHARDSON LAKES on Rapid River, at Middle Dam, Maine, used for power, has usable capacity of 5,691,500,000 ft^3 between gage heights 3.0 ft and 20.5 ft. Gage-height record furnished by Union Water Power Co.

01052000 AZISCOHOS LAKE on Magalloway River in Lincoln Township, 3 mi east of village of Wilsons Mills, Maine, completed in 1911 for power, has usable capacity of 9,593,000,000 ft^3 between elevations 1,490.0 ft and 1,535.0 ft. Elevation record furnished by Union Water Power Co.

01053000 UMBAGOG LAKE on Androscoggin River at Errol Dam, 0.6 mi northeast of Errol, NH, used for power, has usable capacity of 3,080,160,000 ft^3 between gage heights 5.5 ft and 15.0 ft. Gage-height record furnished by Union Water Power Co.

01056000 GULF ISLAND POND on Androscoggin River, 3 mi upstream from Lewiston, Maine, completed in 1928 for power, has capacity of 1,100,000,000 ft^3 in top 10 ft of pond below elevation 262.0 ft. Elevation record furnished by Central Maine Power Co.

01056500 LAKE AUBURN on outlet stream to Androscoggin River at East Auburn, Maine, used for storing water supply of Auburn and Lewiston, has usable capacity of 580,000,000 ft^3 between elevations 254.7 ft and 260.7 ft. Elevation record furnished by Auburn Water District.

01058000 THOMPSON LAKE on short outlet stream to Little Androscoggin River at Oxford, Maine, used for process water, has usable capacity of 950,000,000 ft^3 between gage heights 95.0 ft and 100.0 ft. Gage-height record furnished by Robinson Manufacturing Co.

MONTHEND CONTENTS IN MILLIONS OF CUBIC FEET, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	RANGELEY LAKE	MOOSELOOKMEGUNTIC LAKE	UPPER AND LOWER RICHARDSON LAKES	AZISCOHOS LAKE
Sept. 30, 1982	670	4,368	3,640	5,918
Oct. 31	445	2,838	2,158	5,577
Nov. 30	754	2,906	3,124	6,464
Dec. 31	767	2,097	4,250	6,632
Jan. 31, 1983	920	1,864	3,603	5,904
Feb. 28	824	1,798	2,722	4,929
Mar. 31	934	2,702	1,898	4,485
Apr. 30	1,507	6,651	4,306	7,164
May 31	1,313	8,370	5,710	9,934
June 30	1,229	7,652	5,275	9,469
July 31	1,229	6,687	4,380	8,275
Aug. 31	1,313	6,154	3,658	7,402
Sept. 30	863	4,300	3,362	6,338

DATE	UMBAGOG LAKE	GULF ISLAND POND	LAKE AUBURN	THOMPSON LAKE
Sept. 30, 1982	1,488	2,372	463	1,638
Oct. 31	1,092	2,464	419	1,518
Nov. 30	1,092	2,458	408	1,586
Dec. 31	865	2,425	375	1,613
Jan. 31, 1983	1,332	2,458	452	1,696
Feb. 28	1,300	2,443	496	1,727
Mar. 31	1,220	2,455	520	1,987
Apr. 30	2,632	2,479	628	2,012
May 31	2,904	2,484	688	1,909
June 30	2,514	1,888	544	1,829
July 31	2,110	2,489	508	1,856
Aug. 31	1,920	2,331	463	1,837
Sept. 30	1,740	2,333	408	1,740

NOTE.--Contents of Gulf Island Pond at 2400, Thompson Lake at 0800. Contents of all others at 0700 on first day of following month.

[1]Modified from WDR: ME-83-1.

Example 22.--Daily gage-height record[1]

MOBILE RIVER MAIN STEM

02423000 ALABAMA RIVER AT SELMA, AL

LOCATION.--Lat 32°24'20", long 87°01'07", in SE¼ sec. 36, T. 17 N., R. 10 E., Dallas County, Hydrologic Unit 03150201, in first pier from right bank of Edmund Pettus Bridge on U.S. Highway 80, in Selma, 1 mi upstream from Valley Creek, and at mi 214.8.

DRAINAGE AREA.--17,100 mi², approximately.

PERIOD OF RECORD.-- October 1971 to current year (gage heights only). Gage-height records December 1890 to December 1971 are contained in reports of National Weather Service.

REVISED RECORDS.--WSP 662: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 61.80 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Records good. Stage affected by Millers Ferry lock and dam since November 1968.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 57.97 ft, Mar. 1, 1961; minimum gage height, -2.20 ft, Nov. 1, 1904.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Apr. 8, 1886, reached a stage of 57.0 ft present site and datum, from floodmarks established by U.S. Army Corps of Engineers.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 49.22 ft, Apr. 11; minimum, 17.93 ft, Aug. 4.

GAGE HEIGHT (FEET ABOVE DATUM), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18.60	---	25.19	24.12	24.45	24.88	28.83	21.38	20.68	22.18	18.45	19.16
2	18.51	18.24	28.69	27.39	33.16	27.12	28.94	21.14	21.40	20.75	18.29	19.10
3	18.29	18.11	29.97	33.05	40.24	25.58	28.95	20.65	20.12	19.74	18.10	19.15
4	18.18	18.85	31.06	35.20	42.32	23.93	28.15	20.62	19.42	19.03	17.93	18.82
5	18.13	19.19	31.58	33.72	41.29	23.74	26.65	20.39	18.94	19.24	18.11	18.50
6	18.20	18.72	32.56	30.20	38.72	30.02	27.09	20.64	18.94	19.75	18.46	18.46
7	18.42	18.53	33.23	26.63	35.88	36.35	31.20	19.94	19.73	20.88	18.29	19.04
8	18.96	18.29	32.14	23.90	34.26	37.99	37.13	19.36	20.92	20.01	18.46	19.62
9	18.64	18.22	30.94	23.54	31.58	---	45.05	19.38	21.76	19.83	18.83	19.47
10	18.53	18.35	29.75	23.11	29.43	---	48.69	19.42	20.53	19.24	19.08	19.10
11	18.48	18.45	29.30	22.59	28.96	---	49.22	20.26	19.68	18.48	19.39	18.70
12	18.73	18.52	35.15	22.51	27.59	---	48.33	20.21	19.48	18.39	19.44	18.75
13	20.50	18.25	37.77	22.09	26.60	---	45.26	21.42	18.93	18.65	19.13	19.85
14	20.38	17.95	37.34	21.35	26.56	22.56	41.68	20.04	18.42	19.13	18.52	21.90
15	20.48	18.37	35.32	21.23	25.86	22.69	39.80	19.46	18.29	19.18	18.42	21.16
16	20.74	18.76	34.13	21.22	24.83	22.03	38.45	21.92	18.65	18.96	18.45	20.59
17	20.73	19.93	33.10	21.19	24.54	23.00	36.11	25.86	20.33	18.23	18.65	19.58
18	20.73	20.65	32.96	21.66	23.02	21.20	32.27	27.33	19.58	17.95	18.82	18.65
19	19.53	20.95	31.32	21.53	22.26	22.49	27.87	25.50	19.64	18.34	19.09	18.73
20	19.01	20.68	28.53	21.23	22.10	22.51	25.50	28.50	19.38	18.76	19.26	18.89
21	18.56	19.88	26.44	22.86	21.43	24.98	24.38	32.81	20.11	18.99	18.88	18.90
22	---	19.51	25.21	23.04	22.19	25.18	23.71	35.74	22.22	19.05	18.94	18.77
23	---	19.24	25.15	21.66	23.69	24.78	27.12	36.74	21.86	19.07	18.93	19.19
24	---	19.46	25.16	21.99	24.01	25.86	30.97	35.20	21.47	18.72	19.05	18.95
25	---	19.59	24.98	22.79	23.55	26.53	30.12	32.03	20.90	18.51	19.01	18.69
26	---	19.69	24.25	22.74	23.61	26.26	28.29	27.14	19.38	18.64	19.22	18.61
27	---	20.15	24.07	22.71	22.27	30.69	27.61	24.00	20.20	18.95	19.13	18.33
28	---	19.87	24.36	21.25	22.44	34.58	26.02	23.18	21.07	19.26	18.85	18.38
29	---	20.28	26.09	22.59	---	35.28	24.83	23.21	22.30	19.18	18.72	18.38
30	---	21.83	27.12	21.96	---	33.92	23.06	21.75	20.97	19.14	18.89	18.58
31	---	---	25.73	21.92	---	31.59	---	20.77	---	18.67	19.13	---
MEAN	---	---	29.63	23.97	28.10	---	32.71	24.06	20.18	19.19	18.77	19.13
MAX	---	---	37.77	35.20	42.32	---	49.22	36.74	22.30	22.18	19.44	21.90
MIN	---	---	24.07	21.19	21.43	---	23.06	19.36	18.29	17.95	17.93	18.33

[1] Modified from WDR: Al-83-1.

Example 23.--Crest-stage partial-record stations[1]

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

As the number of streams on which streamflow information is likely to be desired far exceeds the number of stream-gaging stations feasible to operate at one time, the Geological Survey collects limited streamflow data at sites other than stream-gaging stations. When limited streamflow data are collected on a systematic basis over a period of years for use in hydrologic analyses, the site at which the data are collected is called a partial-record station. Data collected at these partial-record stations are usable in low-flow or floodflow analyses, depending on the type of data collected. In addition, discharge measurements are made at other sites not included in the partial-record program. These measurements are generally made in times of drought or flood to give better areal coverage to those events. Those measurements and others collected for some special reason are called measurements at miscellaneous sites.

Records collected at crest-stage partial-record stations are presented in the following table. Discharge measurements made at low-flow partial-record sites and at miscellaneous sites and for special studies are given in separate tables.

Crest-stage partial-record stations

The following table contains annual maximum discharges for crest-stage stations. A crest-stage gage is a device which will register the peak stage occurring between inspections of the gage. A stage-discharge relation for each gage is developed from discharge measurements made by indirect measurements of peak flow or by current meter. The date of the maximum discharge is not always certain but is usually determined by comparison with nearby continuous-record stations, weather records, or local inquiry. Only the maximum discharge for each water year is given. Information on some lower floods may have been obtained but is not published herein. The years given in the period of record represent water years for which the annual maximum has been determined.

Annual maximum discharge at crest-stage partial-record stations during water year 1983

Station No.	Station Name	Location	Drainage area (mi^2)	Period of record	Annual Maximum Date	Gage height (ft)	Discharge (ft^3/s)
		POTOMAC RIVER BASIN					
01622400	Buffalo Branch tributary near Christian, Va.	Lat 38°11'55", long 79°13'10", Augusta County, Hydrologic Unit 02070005, at culvert on State Highway 42, 1.3 mi north of Christian. Datum of gage is 1,622.53 ft above National Geodetic Vertical Datum of 1929.	0.49	1967-83	3-19-83	2.92	(*)
01652500	Fourmile Run at Alexandria, Va.	Lat 38°50'35", long 77°05'09", Arlington County, Hydrologic Unit 02070010, at upstream side of bridge on Shirlington Road, at Arlington County-Alexandria City line, 0.1 mi upstream from Interstate Highway 95, and 2.5 mi upstream from mouth. Datum of gage is 28.57 ft above National Geodetic Vertical Datum of 1929.	13.8	1951-69‡, 1970-73[a], 1974-75‡, 1976-77, 1979-82‡, 1983	6-21-83	7.92	2,770

* Discharge not determined.
‡ Operated as a continuous-record gaging station.
a Prior to Sept. 28, 1973, at site 0.4 mi downstream at datum 6.02 ft lower.

Example 24.--Low-flow partial-record stations[1]

Low-flow partial-record stations

Measurements of streamflow in the area covered by this report made at low-flow partial-record stations are given in the following table. These measurements were made during periods of base flow when streamflow is primarily from ground-water storage. These measurements, when correlated with the simultaneous discharge of a nearby stream when continuous records are available, will give a picture of the low-flow potentiality of a stream. The column headed "Period of record" shows the water years in which measurements were made at the same, or practically the same, site.

Discharge measurements made at low-flow partial-record stations during water year 1983

Station No.	Station Name	Location	Drainage area (mi^2)	Period of record	Measurements Date	Discharge (ft^3/s)
		POTOMAC RIVER BASIN				
01621000	Dry River at Rawley Springs, Va.	Lat 38°30'10", long 79°03'14", Rockingham County, Hydrologic Unit 02070005, at bridge on State Highway 847, at Rawley Springs, and 1.2 mi below Harrisonburg Reservoir.	72.6	1946-48‡, 1952-55, 1963, 1982	11-17-82 7-27-83	25.7 1.38
01622230	Middle River at Trimbles Mill, near Swoope, Va.	Lat 38°08'10", long 79°13'06", Augusta County, Hydrologic Unit 02070005, at bridge on State Highway 707, at Trimbles Mill, and 1.7 mi southwest of Swoope.		1982	11-17-82 7-27-83	5.88 5.57

‡ Operated as a continuous-record gaging station.

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[1]Modified from WDR: VA-83-1.

Example 25.--Discharge measurements at miscellaneous sites[1]

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Special study and miscellaneous sites

Discharge measurements in the following table were made at special study and miscellaneous sites throughout the State. Data for miscellanous sites furnished by the Virginia State Water Control Board are noted by an "a/".

Discharge measurements made at special study and miscellaneous sites during water year 1983

Stream	Tributary to	Location	Drainage area (mi^2)	Measured previously (water years)	Measurements Date	Measurements Discharge (ft^3/s)
		NASSAWADOX CREEK BASIN				
Nassawadox Creek a/	Chesapeake Bay	Lat 37°31'31", long 75°52'37", Northampton County, Hydrologic Unit 02080110, at culvert on State Highway 606, 2.7 mi upstream from Kelly Cove, and 3.5 mi north of Nassawadox.	b4.2	1968-82	1- 5-83 4- 6-83 7-13-83	*6.98 12 *.67
		POTOMAC RIVER BASIN				
01626000 South River	South Fork Shenandoah River	Lat 38°03'27", long 78°54'30", Waynesboro City, Hydrologic Unit 02070005, at bridge on State Highway 664, at Waynesboro.	127	1953-82‡	9- 9-83	35.6

* Base flow.
‡ Operated as a continuous-record gaging station.
a Furnished by Virginia State Water Control Board.
b Approximately.

Example 26.--Seepage investigation

RIO GRANDE BASIN

Pecos River seepage investigations--Acme to Artesia, NM

Two series of discharge measurements were made during the 1976 water year, on Jan. 20 and Mar. 31, on the Pecos River and tributaries and diversions in New Mexico, to study channel gains and losses. The reach is 81.5 mi in length and extends from the gaging station Pecos River near Acme (08386000) to the gaging station Pecos River near Artesia (08396500). The measurements were made during periods of constant base flow of the stream; for 10 days before the investigations, no measurable precipitation had fallen. Tributary flow was considered a contribution and not a gain; diversion was considered a deduction and not a loss. Indicated gains or losses may be substantially in error as affected by small inaccuracies in open-channel measurements. Previous seepage investigations of this reach were made at least once each year 1953-60, 1962-66.

Pecos River mile	Stream	Location	Jan. 20, 1976 Meas. disch. (ft^3/s)	Jan. 20, 1976 Gain or loss	Jan. 20, 1976 Water temp. (°C)	Mar. 31, 1976 Meas. disch. (ft^3/s)	Mar. 31, 1976 Gain or loss	Mar. 31, 1976 Water temp. (°C)
94.0	Pecos River	Gaging station near Acme (08386000)......	4.83	-	9.0	40.9	-	14.0
89.1	....do.....	SW¼SE¼ sec.27, T.9 S., R.25 E., above Bitter Lakes..........................	2.33	-2.50	9.0	28.3	-12.6	14.5
78.4	....do.....	NE¼NE¼ sec.33, T.10 S., R.25 E., at mouth of Bitter Creek.......................	4.25	+1.92	9.5	33.8	+5.5	14.0
78.4	Bitter Creek	NE¼NE¼ sec.33, T.10 S., R.25 E., at mouth.................................	2.96	-	10.0	5.8	-	15.0
74.7	Pecos River	SE¼NE¼ sec.9, T.11 S., R.25 E., above Rio Hondo.............................	8.79	+1.58	9.0	43.8	+4.2	14.5
74.6	Rio Hondo	NE¼SE¼ sec.9, T.11 S., R.25 E., at mouth.	7.14	-	9.0	7.2	-	15.0
*	* * * * *		*	*	*	*	*	
46.7	Pecos River	NE¼NE¼ sec. 12, T.14 S., R.26 E., at Hagerman bridge......................	31.82	+9.74	8.5	70.9	+15.4	14.0
*	* * * * *		*	*	*	*	*	
46.5	Diversion	----------	9.42	-	9.5	15.7	-	15.0
44.2	Pecos River	SW¼SE¼ sec.13, T.14 S., R.26 E..........	22.55	+.15	9.0	58.6	+3.4	14.5
*	* * * * *		*	*	*	*	*	
30.6	Pecos River	Gaging station near Lake Arthur (08395500)	25.77	+2.78	8.0	54.1	-4.2	14.5
*	* * * * *		*	*	*	*	*	
12.4	Pecos River	Gaging station near Artesia (08396500)	34.01	+2.78	8.0	54.1	-4.2	14.5
		Overall net gain or loss.................		+14.85			+1.4	

Note.--In the above example, many lines have been omitted as indicated by asterisks, but the figures of "gain or loss" are based on complete data.

[1]Modified from WDR: VA-83-1.

Example 27.--Water-quality partial-record stations[1] and miscellaneous sites

402 ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Water-quality partial-record stations are particular sites where chemical-quality, biological and/or sediment data are collected systematically over a period of years for use in hydrologic analyses. These data are collected usually less than quarterly. Samples collected at sites other than gaging stations and partial-record stations to give better areal coverage in a river basin are referred to as miscellaneous sites.

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT^3/S)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)
ROANOKE RIVER BASIN--CONTINUED									
02075275 - SANDY CR (RIVER) AT U.S. HWY 58 NR RINGGOLD, VA (LAT 36 34 50 LONG 079 13 31)									
SEP , 1983									
28...	1015	2.3	100	7.6	13.0	30	0	7.6	2.6
02076220 - BEARSKIN CREEK AT RT 612 NEAR CHATHAM, VA (LAT 36 48 00 LONG 079 28 23)									
SEP , 1983									
27...	1245	4.4	45	7.7	15.0	11	0	2.7	1.1
02076260 - WHITE OAK CREEK NEAR DRY FORK, VA (LAT 36 44 54 LONG 079 25 14)									
SEP , 1983									
27...	1615	--	51	7.1	16.5	14	0	3.2	1.5
02076320 - CHERRYSTONE CREEK AT CHATHAM, VA (LAT 36 48 13 LONG 079 23 37)									
SEP , 1983									
27...	1415	5.7	60	7.5	14.5	17	0	4.2	1.6
02076500 - GEORGES CREEK NEAR GRETNA, VA. (LAT 36 56 11 LONG 079 18 42)									
SEP , 1983									
27...	1510	3.2	69	6.4	14.5	14	0	3.3	1.3
02076550 - SHOCKOE CREEK NEAR JAVA, VA (LAT 36 52 02 LONG 079 13 52)									
SEP , 1983									
28...	1050	.20	50	6.2	12.0	10	0	2.6	.9
02076600 - STINKING RIVER NEAR MOUNT AIRY, VA (LAT 36 55 56 LONG 076 14 30)									
SEP , 1983									
27...	1555	6.4	41	6.5	15.0	11	0	2.6	1.1
02076650 - BANISTER RIVER AT RT 640 NR MOUNT AIRY, VA (LAT 36 54 39 LONG 079 11 00)									
SEP , 1983									
28...	1430	46	47	8.0	16.0	12	0	3.0	1.2
02076740 - ELKHORN CREEK NEAR RICEVILLE, VA (LAT 36 52 09 LONG 079 09 04)									
SEP , 1983									
28...	1330	3.5	76	7.1	14.0	21	0	5.6	1.8

[1]Modified from WDR: VA-83-1.

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	SODIUM, DIS-SOLVED (MG/L AS NA)	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	ALKA-LINITY LAB (MG/L AS CACO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	ALUM-INUM, DIS-SOLVED (UG/L AS AL)
ROANOKE RIVER BASIN--CONTINUED									
02075275 - SANDY CR (RIVER) AT U.S. HWY 58 NR RINGGOLD, VA (LAT 36 34 50 LONG 079 13 31)									
SEP , 1983									
28...	7.9	2.9	38	4.5	6.2	24	79	.13	10
02076220 - BEARSKIN CREEK AT RT 612 NEAR CHATHAM, VA (LAT 36 48 00 LONG 079 28 23)									
SEP , 1983									
27...	3.6	1.9	19	2.4	3.3	15	42	.12	<10
02076260 - WHITE OAK CREEK NEAR DRY FORK, VA (LAT 36 44 54 LONG 079 25 14)									
SEP , 1983									
27...	4.1	2.1	21	1.9	3.0	16	45	.11	30
02076320 - CHERRYSTONE CREEK AT CHATHAM, VA (LAT 36 48 13 LONG 079 23 37)									
SEP , 1983									
27...	4.3	2.1	22	2.6	3.9	13	45	.47	<10
02076500 - GEORGES CREEK NEAR GRETNA, VA. (LAT 36 56 11 LONG 079 18 42)									
SEP , 1983									
27...	7.2	1.7	17	4.5	6.6	11	46	.91	10
02076550 - SHOCKOE CREEK NEAR JAVA, VA (LAT 36 52 02 LONG 079 13 52)									
SEP , 1983									
28...	5.9	1.4	20	2.9	4.0	20	50	.21	10
02076600 - STINKING RIVER NEAR MOUNT AIRY, VA (LAT 36 55 56 LONG 076 14 30)									
SEP , 1983									
27...	3.3	1.1	18	1.5	2.3	15	38	.11	<10
02076650 - BANISTER RIVER AT RT 640 NR MOUNT AIRY, VA (LAT 36 54 39 LONG 079 11 00)									
SEP , 1983									
28...	4.4	1.6	20	3.1	3.1	14	43	.10	<10
02076740 - ELKHORN CREEK NEAR RICEVILLE, VA (LAT 36 52 09 LONG 079 09 04)									
SEP , 1983									
28...	6.5	1.4	31	4.4	3.0	26	68	.51	<10

< Actual value is known to be less than the value shown.

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	ARSENIC TOTAL (UG/L AS AS)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	MANGA-NESE, TOTAL RECOV-ERABLE (UG/L AS MN)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	ZINC, TOTAL RECOV-ERABLE (UG/L AS ZN)
ROANOKE RIVER BASIN--CONTINUED								
02075275 - SANDY CR (RIVER) AT U.S. HWY 58 NR RINGGOLD, VA (LAT 36 34 50 LONG 079 13 31)								
SEP , 1983								
28...	1	<10	1600	590	<100	130	120	30
02076220 - BEARSKIN CREEK AT RT 612 NEAR CHATHAM, VA (LAT 36 48 00 LONG 079 28 23)								
SEP , 1983								
27...	1	10	680	100	<100	30	25	40
02076260 - WHITE OAK CREEK NEAR DRY FORK, VA (LAT 36 44 54 LONG 079 25 14)								
SEP , 1983								
27...	1	<10	3100	450	<100	110	110	60
02076320 - CHERRYSTONE CREEK AT CHATHAM, VA (LAT 36 48 13 LONG 079 23 37)								
SEP , 1983								
27...	1	<10	1000	79	<100	80	69	30
02076500 - GEORGES CREEK NEAR GRETNA, VA. (LAT 36 56 11 LONG 079 18 42)								
SEP , 1983								
27...	1	<10	780	180	<100	20	14	10
02076550 - SHOCKOE CREEK NEAR JAVA, VA (LAT 36 52 02 LONG 079 13 52)								
SEP , 1983								
28...	1	<10	560	130	<100	60	45	10
02076600 - STINKING RIVER NEAR MOUNT AIRY, VA (LAT 36 55 56 LONG 076 14 30)								
SEP , 1983								
27...	1	<10	760	140	<100	50	32	40
02076650 - BANISTER RIVER AT RT 640 NR MOUNT AIRY, VA (LAT 36 54 39 LONG 079 11 00)								
SEP , 1983								
28...	1	<10	870	240	<100	20	5	10
02076740 - ELKHORN CREEK NEAR RICEVILLE, VA (LAT 36 52 09 LONG 079 09 04)								
SEP , 1983								
28...	1	<10	1300	810	<100	60	47	20

< Actual value is known to be less than the value shown.

Example 28.--Ground-water levels, 12-column format[1]
(skeleton every 5th day-eom)

GROUND-WATER LEVELS

ROCKINGHAM COUNTY

382150078424001. Local number, 41Q1.
LOCATION.--Lat 38°21'50", long 78°42'40", Hydrologic Unit 02070005, at Virginia Department of Highways and Transportation garage near McGaheysville. Owner: U.S. Geological Survey.
AQUIFER.--Conococheague limestone of Late Cambrian age.
WELL CHARACTERISTICS.--Drilled observation water well, diameter 6 1/4 in., depth 310 ft, cased to 131 ft, open hole 131 to 310 ft.
INSTRUMENTATION.--Water-level recorder.
DATUM.--Elevation of land-surface datum is 1,105 ft above National Geodetic Vertical Datum of 1929, from topographic map. Measuring point: Top edge of recorder shelf, 3.50 ft above land-surface datum.
PERIOD OF RECORD.--August 1970 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level recorded, 60.38 ft below land-surface datum, Dec. 26, 1972; lowest recorded, 87.18 ft below land-surface datum, Oct. 26, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	73.32	76.01	76.07	71.52	72.79	68.43	65.68	64.46	64.70	66.09	68.04	71.10
10	73.87	76.11	75.60	71.48	71.81	68.14	65.54	64.81	65.09	66.35	68.42	71.72
15	74.39	76.33	75.27	71.69	71.07	68.03	64.41	65.04	65.41	66.62	68.86	72.28
20	74.90	76.60	75.11	72.14	70.34	65.85	64.39	64.53	65.55	66.93	69.32	72.86
25	75.36	76.94	72.94	72.55	69.14	65.88	64.07	64.18	65.60	67.25	69.86	73.48
EOM	75.75	76.98	71.94	73.00	68.76	66.10	64.08	64.54	65.88	67.67	70.52	74.04

WTR YR 1983 HIGHEST 63.81 APR 27, 1983 LOWEST 77.12 NOV 28, 1982

Example 29.--Ground-water levels, 6-column format[1]

CITY OF HOPEWELL

371801077164201. Local number, 52G1.
LOCATION.--Lat 37°18'01", long 77°16'42", Hydrologic Unit 02080206, in the city of Hopewell. Owner: Virginia American Water Corporation.
AQUIFER.--Sand of undifferentiated Cretaceous age.
WELL CHARACTERISTICS.--Drilled unused water well, diameter 6 in., depth 300 ft, screen depth unknown.
INSTRUMENTATION.--Weekly measurement with chalked tape by USGS personnel.
DATUM.--Elevation of land-surface datum is 50.26 ft above National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 0.34 ft above land-surface datum.
REMARKS.--Well also sampled for water quality.
PERIOD OF RECORD.--May 1939 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 20.56 ft below land-surface datum, Sept. 7, 1979; lowest measured, 56.95 ft below land-surface datum, Aug. 14, 1943.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 1	35.26	DEC 3	34.57	FEB 4	35.03	APR 15	33.52	JUN 17	34.96	AUG 12	34.86
8	35.24	10	34.33	11	33.96	22	33.36	24	34.83	19	34.90
15	34.96	17	34.95	25	34.06	29	34.20	JUL 1	34.82	26	35.01
22	35.28	24	34.77	MAR 4	31.35	MAY 6	34.91	8	34.86	SEP 2	34.41
29	35.18	31	35.18	11	34.37	13	35.00	15	34.83	9	34.84
NOV 5	35.02	JAN 7	33.96	18	34.48	20	35.03	22	34.91	16	34.96
12	35.14	14	34.91	25	34.00	27	34.79	29	34.97	23	35.01
19	34.65	21	35.02	APR 1	34.72	JUN 3	34.87	AUG 5	35.01	30	34.93
26	34.62	28	35.07	8	34.04	10	34.89				

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[1]Modified from WDR: VA-83-1.

Example 30.--Ground-water record with 3-year hydrograph[1]

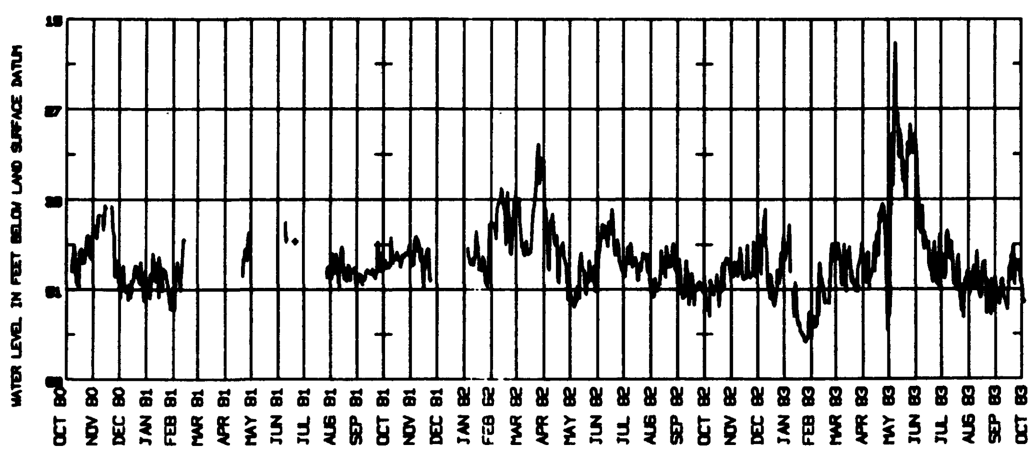
DAVIESS COUNTY

374638087054101. Map number 1.
LOCATION.--Lat 37°46'38", long 87°05'41", Hydrologic Unit 05140201, County Code 059, Owensboro East quadrangle, at Owensboro Municipal Utilities water treatment plant, 100 ft (30 m) south of south bank of Ohio River, 0.1 mi (0.2 km) northeast of Daviess County High School, 0.3 mi (0.5 km) north of U.S. Highway 60, in Owensboro. Owner: Owensboro Municipal Utilities.
AQUIFER.--Glacial sand and gravel of Quaternary age. Aquifer code: 112OTSH.
WELL CHARACTERISTICS.--Drilled unused water-table well, diameter 12 in (0.30 m), depth 104 ft (32 m), screened 74-104 ft (22.6-31.7 m).
DATUM.--Altitude of land-surface datum (from topographic map) is about 405 ft (123 m). Measuring point: Floor of recorder shelter 4.33 ft (1.32 m) above land-surface datum.
REMARKS.--Water level affected by pumping from nearby wells.
PERIOD OF RECORD.--February 1951 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 18.16 ft (5.54 m) below land-surface datum, May 5, 1983; lowest, 63.21 ft (19.27 m) below land-surface datum, Sept. 17, 1970.

DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
INSTANTANEOUS OBSERVATIONS AT 1200

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	54.51	48.05	44.14	45.55	55.92	46.52	49.32	30.32	39.39	49.56	50.40	52.97
2	45.52	48.78	44.89	42.32	55.71	47.08	46.04	37.11	43.03	46.96	49.74	52.09
3	49.65	49.23	42.17	48.59	50.84	50.39	46.63	30.69	43.46	43.70	47.87	50.16
4	50.28	47.17	41.20	---	54.38	48.90	50.79	23.20	40.92	43.12	50.86	49.67
5	51.37	47.45	40.22	51.32	45.47	45.12	49.66	18.16	39.86	43.78	49.27	49.56
6	51.73	45.38	45.11	51.86	47.42	44.92	49.22	28.90	44.66	46.53	46.02	51.96
7	50.62	44.26	46.65	54.53	49.47	50.32	48.96	28.47	45.58	46.73	45.89	52.22
8	50.52	48.66	50.93	50.86	49.55	51.26	48.30	27.63	43.41	46.97	50.27	52.65
9	50.46	49.47	51.10	50.03	50.56	46.75	47.17	33.41	44.45	44.56	51.56	53.00
10	48.95	49.71	52.16	53.13	51.64	46.18	44.81	29.76	45.36	46.37	52.15	53.72
11	49.73	49.33	48.94	55.51	52.82	46.06	48.56	30.56	45.28	48.84	51.81	51.17
12	53.23	45.17	45.31	55.70	52.60	45.24	44.51	32.32	44.70	50.40	48.77	50.51
13	52.18	49.42	52.21	55.38	52.57	46.85	43.11	36.60	47.52	50.28	47.64	47.95
14	50.43	45.01	52.60	56.60	52.71	45.85	43.37	33.91	48.44	50.69	47.33	49.76
15	51.24	46.35	53.19	56.69	52.75	46.49	46.45	34.71	46.62	51.11	48.69	46.50
16	48.23	49.28	52.60	57.13	52.86	50.37	40.75	38.66	49.25	46.99	47.21	46.90
17	47.42	49.06	51.52	56.99	53.56	45.86	41.50	38.75	50.07	46.41	54.22	45.49
18	50.62	45.44	50.82	57.53	45.01	51.15	40.23	35.06	45.93	50.27	49.64	45.21
19	47.59	48.89	48.32	57.91	46.07	50.12	39.89	31.50	44.65	52.16	51.62	50.40
20	47.57	49.03	45.03	58.08	44.87	45.83	39.63	33.13	48.77	53.80	52.71	47.47
21	46.74	44.61	50.09	57.66	46.79	51.26	39.66	32.90	47.03	50.68	51.68	47.11
22	46.85	48.48	49.07	57.51	45.64	47.97	41.17	29.09	50.37	54.70	54.36	47.31
23	47.49	49.23	46.04	57.24	46.34	47.57	43.74	32.48	49.25	53.55	49.65	48.40
24	47.00	46.70	46.70	54.06	46.52	47.24	49.85	31.00	53.57	50.17	52.56	47.14
25	48.45	45.21	46.57	57.11	46.78	46.67	56.44	32.85	43.75	49.45	53.84	48.26
26	49.19	43.85	44.01	56.98	46.87	45.59	50.24	30.61	46.19	49.59	53.75	50.06
27	48.69	45.49	44.86	57.27	44.76	44.76	54.55	30.44	47.23	48.50	49.29	49.65
28	49.15	43.70	47.03	55.13	45.86	46.11	52.02	30.24	48.72	48.89	49.44	52.42
29	49.24	45.13	45.73	54.57	---	46.92	41.06	31.82	46.42	51.62	52.73	52.46
30	47.34	48.89	45.69	54.85	---	47.53	36.55	34.75	47.30	49.14	51.46	52.77
31	47.37	---	44.73	55.99	---	50.07	---	36.29	---	46.82	52.22	---
MAX	54.51	49.71	53.19	58.08	55.92	51.26	56.44	38.75	53.57	54.70	54.36	53.72
MIN	46.74	43.70	40.22	42.32	44.76	44.76	36.55	18.16	39.39	43.12	45.89	45.21

WTR YR 1983 HIGH 18.16 LOW 58.08



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[1]Reprinted as originally published in WDR: KY-83-1. To update the station record to reflect current guideline recommendations, the following changes would be needed: (1) an INSTRUMENTATION paragraph (a new entry) should precede the DATUM paragraph in the station manuscript, (2) the term "elevation" should replace "altitude", and (3) a period should follow the abbreviation for the unit inch (in.). Also, the use of International System (SI) units is now optional.

Example 31.--Ground-water levels multiple-station[1] line format (even-numbered page)

County codes: 510, Carson City; 001, Churchill; 003, Clark; 005, Douglas; 007, Elko; 009, Esmeralda, 011, Eureka; 013; Humboldt; 015, Lander; 017, Lincoln; 019, Lyon; 021, Mineral; 023, Nye; 027, Pershing; 029, Storey; 031, Washoe; 033, White Pine.
Water-use codes: H, domestic; I, irrigation; N, industrial; P, public supply; S, stock; U, unused.
Geologic-unit codes: 110LSVG, Quaternary Las Vegas Formation; 110VLFL, Quaternary valley fill, undifferentiated; 111FLDP, Holocene flood-plain deposits; 121 KTPK, Pliocene Kate Peak Formation; 121 MDCK, Pliocene Muddy Creek Formation; 122ALTA, Miocene Alta Formation.
Aquifer codes: A, artesian; U, unknown; W, water table.

LOCAL WELL NO	SITE ID	OWNER	COUNTY	USE	GEOLOGIC UNIT	AQUIFER	WELL DEPTH (FEET)
1 N47 E30 15CDCD1	415800118370001	PINE FOREST FRM	13	I	110VLFL	U	200.
9 N43 E19 33BB 1	413630119520001		31	S	110VLFL	U	70.
21 N31 E19 26B 1	403200119490001	USBLM	31	S	110VLFL	U	111.
22 N30 E23 29B 1	402700119250001		31	U	110VLFL	U	109.
24 N35 E23 35CD 1	405211119202901	USGS	27	U	110VLFL	U	134.
24 N35 E24 32DDC 1	405208119161501	USGS	27	U	110VLFL	W	15.
24 N35 E24 32DDC 2	405208119161502	USGS	27	U	110VLFL	A	66.
32 N42 E37 32AAAC1	412054117495001	E F RUNOW	13	I	110VLFL	U	250.
32 N42 E37 33BDAB1	413310117482002	DREES	13	I	110VLFL	U	95.
33A N42 E37 03BBAB1	413320117482001	GEORGE REED	13	I	110VLFL	U	160.
33A N42 E37 04BDCA1	413300117494001	DONALD MORRIS	13	I	110VLFL	U	360.
33A N44 E37 33AAAA1	412934117483001	ALBISU	13	I	110VLFL	U	550.
36 N41 E52 28AADA2	412534116072602	ELLISON	7	U	110VLFL	U	114.
42 N37 E59 25BCBC1	410400115164001	MARBLE RANCH	7	H	110VLFL	U	14.
45 N33 E58 19ADDD1	404350115281001	H CONRAD	7	N	110VLFL	W	16.
45 N34 E57 24CDDD1	404522115300801	BALBOA	7	H	110VLFL	A	97.
46 N31 E56 16ADDA1	403400115400001		7	S	110VLFL	U	
48 N33 E56 08CAAD1	404521115395801	MOFAT	7	H	110VLFL	W	12.
52 N33 E52 27DDBA1	404240116025001	CARLIN TOWN GOVT	7	U	110VLFL	U	500.
54 N29 E48 03BDCB1	402450116324001	DEAN RANCH	11	S	110VLFL	U	
54 N29 E48 29CACC2	402100116352001	BEOWANE FARMS	11	I	110VLFL	U	300.
54 N31 E49 05CACC1	403500116284501	WILLIAM CONNELLY	11	H	110VLFL	W	10.
56 N18 E43 06D 1	392700117110001	DARRELL BLANTON	15	I	110VLFL	U	241.
56 N24 E43 35CC 1	395335117062401	STIENEN RANCH	15	I	110VLFL	U	202.
59 N30 E44 18ADBD1	402831117034201	COPPER CANYON MINE	15	I	110VLFL	U	300.
59 N31 E44 01DACA1	403520117181101	USGS	15	U	110VLFL	W	52.
59 N32 E47 03DAAC1	404032116391101	USGS	15	U	110VLFL	W	16.
61 N32 E45 11DACD1	403920116520001	US[illegible]	15	U	110VLFL	U	171.
69 N37 E39 15CBC 1	410448117344901	USGS	13	U	110VLFL	W	30.
69 N38 E39 09CCAB1	411056117354901	DWIGHT C VEDDER	13	S	110VLFL	U	58.
69 N30 E39 28CDDD1	410806117353501	W G LONG	13	I	110VLFL	U	256.
69 N41 E40 30AABB1	412421117303301	SHELTON SCHOOL	13	U	110VLFL	W	27.
70 N36 E38 05DDCD1	410111117431801	USGS	13	U	110VLFL	W	24.
70 N36 E38 16BCCA1	405940117423001	GEORGE HAY CO	13	I	110VLFL	U	55.
70 N36 E40 30AACA1	405810117302801	DIAMOND S RANCH	13	U	110VLFL	U	101.
71 N33 E38 32BABB1	404138117441501	BLM GUTHRIE WELL	27	U		W	55.
71 N34 E37 22ACAA1	404940117475001	J BALLARD	27	U	110VLFL	U	50.

[1]Reprinted as published in WDR: NV-81-1. format is similar to that of data tables retrieved from Ground-Water Retrieval Program L208, WATSTORE, v. 2, chap. 4, section L.

Depths, diameter, and altitude: Depths are referenced to land-surface datum (LSD). Well depth, perforated interval, and altitude are rounded to nearest foot. Well diameter is rounded to nearest inch. Altitude is that of LSD, with reference to sea level.
Period of record: Interval shown spans period from earliest measurement to latest measurement, and may include intervals with no record.
Water levels: Levels above LSD are listed as negative values.

DIAM-ETER (INCH)	PERFORATED INTERVAL (FEET)	ALTITUDE (FEET)	PERIOD OF RECORD	WATER LEVELS (FEET BELOW LAND SURFACE) HIGHEST	DATE	LOWEST	DATE	CURRENT	DATE
16.		4380.	1968-	45.58	03/20/68	56.80	05/01/69	51.55	03/17/81
6.		5200.	1968-	10.22	03/13/72	14.66	04/10/79	12.34	04/07/81
6.		4000.	1966-	37.91	09/15/66	54.97	04/17/79	54.41	03/24/81
6.		4013.	1966-	45.20	04/09/69	50.11	03/26/81	50.11	03/23/81
2.	131.- 134.	4250.	1979-	29.53	04/17/79	31.25	03/23/81	31.25	03/23/81
2.		4031.	1967-	3.77	04/16/73	14.21	03/23/81	14.21	03/23/81
2.		4031.	1967-	-2.25	06/14/67	9.37	03/23/81	9.37	03/23/81
16.	150.- 250.	4200.	1971-	50.96	04/30/73	78.11	04/29/71	58.24	03/17/81
18.		4220.	1948-	36.54	04/21/48	116.58	03/23/77	72.17	03/17/81
12.	10.- 150.	4260.	1949-	16.55	01/20/50	123.19	03/23/77	91.85	03/17/81
16.		4235.	1973-	88.02	03/18/74	108.39	03/23/77	98.71	03/17/81
16.	175.- 545.	4280.	1972-	95.69	04/06/78	138.66	03/17/81	138.66	03/17/81
2.		5700.	1970-	46.59	04/16/71	47.78	04/16/81	47.78	04/16/81
48.		5350.	1938-	0.32	04/28/69	20.80	02/26/45	5.74	03/19/81
48.		5950.	1934-	0.09	04/28/46	18.00	11/01/40	11.37	03/31/81
8.		5550.	1944-	-1.48	02/26/53	7.10	12/26/52	-0.60	03/31/81
6.		5650.	1964-	77.48	04/05/79	90.92	03/17/70	77.89	03/23/81
42.		5500.	1944-	4.30	06/28/58	11.48	09/12/60	7.01	03/20/81
20.		4920.	1938-	2.77	02/20/51	9.05	10/01/44	7.44	03/18/81
8.		4740.	1973-	-0.09	04/10/78	0.40	03/18/81	0.40	03/18/81
14.		4800.	1958-	54.66	04/10/78	69.28	09/28/66	56.52	03/18/81
48.		4698.	1948-	5.48	04/30/69	8.33	09/22/54	7.41	03/18/81
16.		5750.	1969-	6.87	04/07/80	8.40	03/14/75	8.10	03/23/81
12.		6000.	1961-	-1.33	03/19/76	2.78	03/20/68	-0.63	03/20/81
		4609.	1947-	5.25	04/30/69	6.77	03/18/81	6.77	03/18/81
2.		4557.	1964-	29.81	04/13/71	32.48	05/28/64	30.92	03/18/81
0.		4582.	1960-	2.32	04/30/69	8.30	08/16/60	6.11	03/18/81
6.		4520.	1949-	4.08	07/10/52	10.88	10/04/61	9.34	03/18/81
1.	28.- 30.	4326.	1968-	22.77	04/18/72	26.27	09/03/81	26.06 26.10 26.27	03/23/81 07/13/81 09/03/81
10.	20.- 75.	4317.	1968-	8.10	11/08/71	29.80	09/03/81	22.30 24.95 28.28 29.80	12/11/80 04/25/81 07/13/81 09/03/81
16.		4317.	1968-	9.86	04/18/72	24.33	03/25/81	24.33	03/25/81
8.		4414.	1970-	0.69	04/23/71	5.77	03/26/81	5.77	03/26/81
1.		4400.	1960-	4.86	04/25/69	13.49	09/20/66	11.12	03/17/81
12.		4292.	1959-	14.01	04/25/69	21.37	04/12/78	18.98	03/17/81
6.		5200.	1949-	20.17	09/01/58	46.10	03/15/64	35.92	03/17/81
6.		4432.	1939-	28.40	07/24/46	39.46	03/28/79	37.66	03/16/81
6.		4329.	1946-	9.31	03/21/56	13.78	03/16/81	13.78	03/16/81

Example 32.--Ground-water-level record with 5-year hydrograph[1]

GROUND-WATER LEVELS

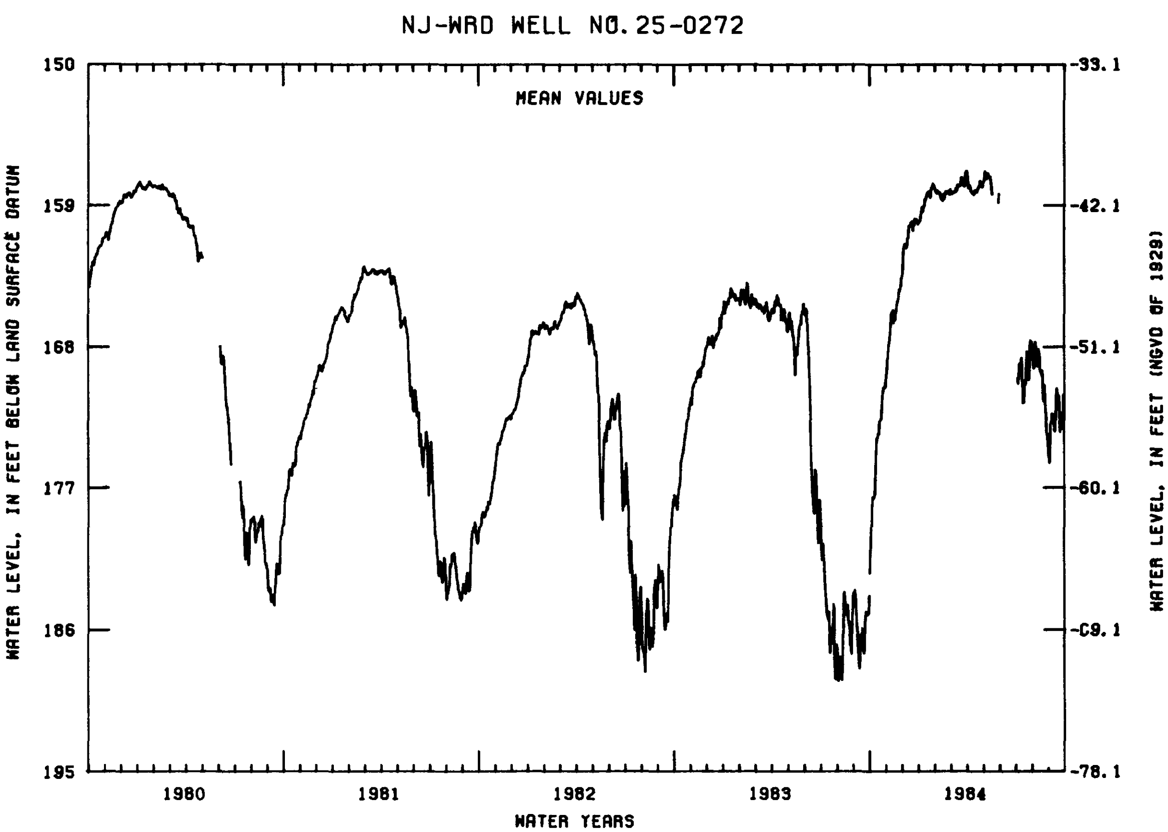
MONMOUTH COUNTY

402208074145201. Local I.D., Marlboro 1 Obs. NJ-WRD Well Number, 25-0272.
LOCATION.--Lat 40°22'08", long 74°14'52", Hydrologic Unit 02030104, on the west side of New Jersey Route 79, 0.9 mi south of Morganville.
Owner: Marlboro Township Municipal Utilities Authority.
AQUIFER.--Farrington aquifer, Potomac-Raritan-Magothy aquifer system of Cretaceous age.
WELL CHARACTERISTICS.--Drilled artesian observation well, diameter 6 in., depth 680 ft, screened 670 to 680 ft.
INSTRUMENTATION.--Digital water-level recorder -- 60-minute punch.
DATUM.--Land-surface datum is 116.93 ft above National Geodetic Vertical Datum of 1929.
Measuring point: Top edge of recorder shelf, 2.50 ft above land-surface datum.
REMARKS.--Water level affected by nearby pumping. Missing record from May 19 to July 4 was due to recorder malfunction.
PERIOD OF RECORD.--March 1977 to current year. Records for 1973 to 1977 are unpublished and are available in files of New Jersey District Office.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 144.06 ft below land-surface datum, Apr. 4, 1973; lowest, 190.49 ft below land-surface datum, July 29, 1983.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	178.44	168.09	161.50	159.63	158.03	158.25	157.72	156.94	---	170.00	169.37	172.95
10	177.44	166.41	161.52	159.12	158.47	158.16	158.17	156.95	---	169.11	168.93	172.67
15	173.78	166.48	160.28	158.45	158.27	157.79	158.00	157.42	---	171.58	168.45	171.39
20	172.68	165.34	160.07	158.25	158.09	157.50	157.99	---	---	170.39	169.50	171.09
25	171.04	164.31	159.81	157.83	158.05	157.69	157.39	---	---	169.74	171.15	172.76
EOM	170.22	163.51	160.20	157.95	157.94	156.78	157.81	---	---	167.63	174.11	171.45
MEAN	174.70	166.15	160.77	158.63	158.27	157.75	157.88	---	---	169.50	169.99	172.60

WTR YR 1984 MEAN 164.15 HIGH 155.71 MAY 5 LOW 182.94 OCT 1



[1]Modified from preliminary station record for 1984 water year.

Example 33.--Ground-water record with long-term hydrograph (Max-Min)[1]

GROUND-WATER LEVELS

RACINE COUNTY

424202087542301. Local number, RA-03/22E/21-0005.

LOCATION.--Lat 42°42'02", long 87°54'23", Hydrologic Unit 04040002. Owner: Chicago, Milwaukee, St. Paul and Pacific Railroad Co.

AQUIFER.--Sandstone.

WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 12 in (0.30 m), depth 1,176 ft (358 m), cased to 586 ft (179 m), 10 in (0.25 m) liner 976-1,083 ft (297-330 m).

DATUM.--Altitude of land-surface is 730 ft (225 m) National Geodetic Vertical Datum of 1929. Measuring point: top of casing, 1.00 ft (0.30 m) above land-surface datum.

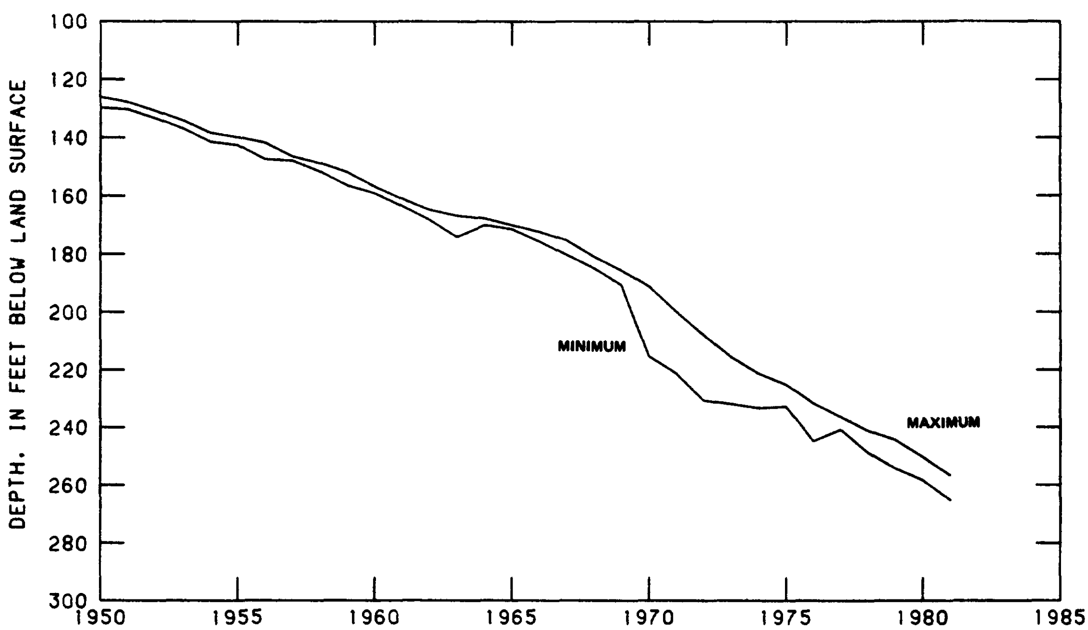
REMARKS.--Water level affected by regional pumping of wells.

PERIOD OF RECORD.--July 1946 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 109.00 ft (33.25 m) below land-surface datum, July 29, 1946; lowest water level measured, 264.70 ft (80.68 m) below land-surface datum, Mar. 3, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1980 TO SEPTEMBER 1981

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
FEB 12	257.00	MAR 17	256.63	MAY 1	262.50	JUN 1	263.30	JUN 29	262.70	SEP 15	263.30
MAR 3	264.70	APR 6	257.40								



RA-03/22E/21-0005

[1]Reprinted as originally published in WDR: WI-81-1. (See footnote for Appendix A, example 30.)

Example 34.--Quality of ground water[1]

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

LOCAL IDENT-I-FIER	STATION NUMBER	GEO-LOGIC UNIT	DATE OF SAMPLE	DEPTH OF WELL, TOTAL (FEET)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (NTU)	HARD-NESS (MG/L AS CACO3)	HARD-NESS NONCAR-BONATE (MG/L AS CACO3)
				BUCHANAN						
14E 26	370527082022902	324NRTN	81-10-14	104	--	7.2	13.0	--	490	100
14E 37	370527082022903	324NRTN	81-10-14	582	750	8.2	14.0	--	8	.00
14E 39	370527082022905	324NRTN	81-10-13	243	280	8.1	13.0	--	100	.00
14E 40	370443082022301	324NRTN	82-08-25	60	222	6.1	15.0	--	75	.00
14E 41	370443082022302	324NRTN	82-08-26	126	295	7.5	13.1	--	82	.00
14E 43	370552082022101	324NRTN	81-10-15	--	190	6.9	14.5	--	51	.00
14E 44	370443082022304	110QRNR	82-08-26	5	205	6.6	22.5	--	61	.00
				GLOUCESTER						
58H 4	372331076312604	217PTXN	82-08-25	1320	2900	7.4	20.5	22	23	.00

LOCAL IDENT-I-FIER	DATE OF SAMPLE	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	NITRO-GEN, NITRITE TOTAL (MG/L AS N)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, ORTHO, TOTAL (MG/L AS P)	ALUM-INUM, DIS-SOLVED (UG/L AS AL)	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS-SOLVED (UG/L AS AS)	BARIUM, TOTAL RECOV-ERABLE (UG/L AS BA)
					BUCHANAN						
14E 26	81-10-14	622	--	.06	--	--	--	<100	--	--	--
14E 37	81-10-14	458	--	.03	--	--	--	50	--	--	--
14E 39	81-10-13	160	--	1.6	--	--	--	20	--	--	--
14E 40	82-08-25	133	--	--	--	--	--	<100	--	--	--
14E 41	82-08-26	154	--	--	--	--	--	<100	--	--	--
14E 43	81-10-15	109	--	.28	--	--	--	1400	--	--	--
14E 44	82-08-26	106	--	--	--	--	--	200	--	--	--
					GLOUCESTER						
58H 4	82-08-25	1870	<.010	<.10	6.40	.070	.060	100	1	1	100

LOCAL IDENT-I-FIER	DATE OF SAMPLE	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)	LEAD, DIS-SOLVED (UG/L AS PB)	MANGA-NESE, TOTAL RECOV-ERABLE (UG/L AS MN)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)	MERCURY DIS-SOLVED (UG/L AS HG)	NICKEL, TOTAL RECOV-ERABLE (UG/L AS NI)	NICKEL, DIS-SOLVED (UG/L AS NI)
					BUCHANAN					
14E 26	81-10-14	1900	--	--	1400	1300	--	--	--	--
14E 37	81-10-14	50	--	--	30	11	--	--	--	--
14E 39	81-10-13	9	--	--	20	19	--	--	--	--
14E 40	82-08-25	6600	--	--	330	330	--	--	--	--
14E 41	82-08-26	5700	--	--	180	150	--	--	--	--
14E 43	81-10-15	2400	--	--	260	270	--	--	--	--
14E 44	82-08-26	580	--	--	420	210	--	--	--	--
					GLOUCESTER					
58H 4	82-08-25	2700	3	3	40	40	.2	.2	2	1

GEOLOGIC UNIT (AQUIFER):

110QRNR - ALLUVIUM, QUATERNARY AGE
217PTXN - POTOMAC GROUP, LOWER CRETACEOUS AGE
324NRTN - NORTON FORMATION, PENNSYLVANIAN AGE

< Less than.

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[1]Modified from WDR: VA-82-1.

WATER QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

LOCAL IDENT-I-FIER	DATE OF SAMPLE	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	ALKA-LINITY LAB (MG/L AS CACO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)
BUCHANAN											
14E 26	81-10-14	110	52	32	10	390	150	10	.7	19	671
14E 37	81-10-14	2.2	.7	170	1.5	220	110	10	.6	11	442
14E 39	81-10-13	27	7.8	18	3.7	130	3.3	.6	.2	20	159
14E 40	82-08-25	20	6.2	12	1.1	75	21	4.8	--	15	140
14E 41	82-08-26	23	6.0	18	6.9	112	12	9.0	--	6.4	149
14E 43	81-10-15	13	4.4	15	.8	73	7.7	1.3	.2	18	97
14E 44	82-08-26	14	6.3	4.8	3.2	83	10	7.4	--	7.7	117
GLOUCESTER											
58H 4	82-08-25	6.0	2.0	720	12	449	85	750	1.8	22	1900

LOCAL IDENT-I-FIER	DATE OF SAMPLE	BARIUM, DIS-SOLVED (UG/L AS BA)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	CADMIUM DIS-SOLVED (UG/L AS CD)	CHRO-MIUM, TOTAL RECOV-ERABLE (UG/L AS CR)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR)	COBALT, TOTAL RECOV-ERABLE (UG/L AS CO)	COBALT, DIS-SOLVED (UG/L AS CO)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU)	COPPER, DIS-SOLVED (UG/L AS CU)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE)
BUCHANAN											
14E 26	81-10-14	--	--	--	--	--	--	--	--	--	3100
14E 37	81-10-14	--	--	--	--	--	--	--	--	--	2000
14E 39	81-10-13	--	--	--	--	--	--	--	--	--	380
14E 40	82-08-25	--	--	--	--	--	--	--	--	--	6500
14E 41	82-08-26	--	--	--	--	--	--	--	--	--	14000
14E 43	81-10-15	--	--	--	--	--	--	--	--	--	3300
14E 44	82-08-26	--	--	--	--	--	--	--	--	--	38000
GLOUCESTER											
58H 4	82-08-25	100	2	<1	10	10	1	<1	8	3	5000

LOCAL IDENT-I-FIER	DATE OF SAMPLE	SELE-NIUM, TOTAL (UG/L AS SE)	SELE-NIUM, DIS-SOLVED (UG/L AS SE)	SILVER, TOTAL RECOV-ERABLE (UG/L AS AG)	SILVER, DIS-SOLVED (UG/L AS AG)	STRON-TIUM, DIS-SOLVED (UG/L AS SR)	ZINC, TOTAL RECOV-ERABLE (UG/L AS ZN)	ZINC, DIS-SOLVED (UG/L AS ZN)
BUCHANAN								
14E 26	81-10-14	--	--	--	--	840	--	--
14E 37	81-10-14	--	--	--	--	95	--	--
14E 39	81-10-13	--	--	--	--	1200	--	--
14E 40	82-08-25	--	--	--	--	--	--	--
14E 41	82-08-26	--	--	--	--	--	--	--
14E 43	81-10-15	--	--	--	--	160	--	--
14E 44	82-08-26	--	--	--	--	--	--	--
GLOUCESTER								
58H 4	82-08-25	<1	<1	<1	<1	--	120	40

< Less than.

Example 35.--Quality of precipitation[1]

CHEMICAL QUALITY OF PRECIPITATION

ST. LAWRENCE RIVER BASIN

NEAR CHAZY, NY

LOCATION.--Lat 44°53'15", long 73°28'01", Clinton County, at Cornell University meteorological station at William H. Miner Agriculture Research Institute, 0.1 mi (0.2 km) southeast of intersection of State Highway 191 and Ridge Road, and 1.4 mi (2.2 km) West of Chazy.

PERIOD OF RECORD.--November 1974 to November 1982 (monthly composite, discontinued).
October 1980 to November 1982 (storm event wetfall, discontinued).
September 1980 to November 1982 (monthly dustfall, discontinued).

EQUIPMENT.--The composite sample collector is a straight-sided polyethylene funnel approximately 6.5 in. (165 mm) in diameter which drains into a Teflon* receiving bottle. A looped plastic tubing connects the funnel with the receiving bottle to retard evaporation. The collector is heated during the cold-weather season to aid in complete collection of snow. The receiving bottle is enclosed in an insulated box. The opening for the collector is approximately 5 ft (1.5 m) above ground level.
The wetfall and dustfall sample collector is an Aerochem Metrics Model 101* wet/dry precipitation collector. An automatic sensor detects occurrences of precipitation, activating a motor which removes a cover from the wetfall collection vessel and covers the dustfall collection vessel. When precipitation ceases the cycle is reversed. The sampling vessels are polyethylene and have a collection diameter of 28.6 cm and a capacity of 13 liters. The opening of the collector is approximately 8 ft (2.5 m) above ground level.

REMARKS.--Inches of precipitation obtained from an on-site recording weighing-bucket gage.

CHEMICAL ANALYSES, SEPTEMBER 1981 TO NOVEMBER 1982

MONTHLY COMPOSITE

PERIOD OF COLLECTION	INCHES OF PRECIPITATION	CALCIUM (CA) (MG/L)	MAGNESIUM (MG) (MG/L)	SODIUM (NA) (MG/L)	POTASSIUM (K) (MG/L)	SULFATE (SO4) (MG/L)
81/09/25 TO 81/11/04	3.85	.26	.03	.07	.04	2.20
81/11/04 TO 81/12/01	.83	.12	.01	.10	.04	2.70
81/12/01 TO 82/01/06	2.40	.51	.11	.22	.07	1.70
82/01/06 TO 82/02/04	.23	.58	.23	.51	.11	1.30
82/02/04 TO 82/03/03	.22	----	----	----	----	----
82/03/03 TO 82/04/03	1.89	1.10	.12	.46	.05	5.00
82/04/05 TO 82/05/06	1.61	.80	.15	.19	.09	3.42
82/05/06 TO 82/06/01	1.82	.99	.14	.10	.14	5.20
82/06/01 TO 82/07/01	2.25	.45	.07	.03	.27	3.32
82/07/01 TO 82/08/02	3.43	.42	.07	.02	.12	5.57
82/08/02 TO 82/09/03	3.25	.41	.05	.01	.04	3.19
82/09/03 TO 82/10/11	3.58	.14	.03	.07	.05	2.99
82/10/11 TO 82/11/04	.98	.66	.10	.13	.07	4.83

PERIOD OF COLLECTION	CHLORIDE (CL) (MG/L)	NITRITE+NITRATE AS N (MG/L)	AMMONIA AS N (MG/L)	PHOSPHORUS (P) (MG/L)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)
81/09/25 TO 81/11/04	.17	.37	.29	.04	19	4.50
81/11/04 TO 81/12/01	.22	.49	.33	.03	21	4.45
81/12/01 TO 82/01/06	.43	.53	.42	.07	14	4.87
82/01/06 TO 82/02/04	.45	.67	.66	.06	21	4.23
82/02/04 TO 82/03/03	----	----	----	----	40	4.40
82/03/03 TO 82/04/03	.38	1.00	.63	.03	34	4.50
82/04/05 TO 82/05/06	.41	.65	.48	<.06	26	4.64
82/05/06 TO 82/06/01	.32	.55	1.00	<.06	28	4.80
82/06/01 TO 82/07/01	.26	.48	.42	<.06	30	4.35
82/07/01 TO 82/08/02	<.20	.50	.50	<.06	46	4.09
82/08/02 TO 82/09/03	<.20	.30	.25	<.06	28	4.32
82/09/03 TO 82/10/11	.26	.24	.25	<.06	25	4.35
82/10/11 TO 82/11/04	.47	.94	.48	<.06	48	4.10

* The use of the brand name in this report is for identification purposes only and does not imply endorsement by the U.S. Geological Survey.

[1]Reprinted from WDR: NY-82-1. Note that for the 1985 water year, dual units are no longer required, a complete station name is rcommended, and the EQUIPMENT paragraph will be called the INSTRUMENTATION paragraph. (See "Precipitation-Quality Data" section of guidelines.) In addition, the unit of measure for specific conductance will be "microsiemens" rather than micromhos.

Example 36.--Index[1]

Page

Aarons Creek near Nelson........................
Abingdon, Spring Creek near.....................
Abrams Creek near Winchester....................
Access to WATSTORE data.........................
Accokeek Creek near Brooke......................
Accomack County, ground-water records in.........
Accotink Creek near Annandale...................
Accotink, Dogue Creek near......................
Accuracy of field data and computed results for
    stage and water-discharge records..........
Acquinton Creek near King William...............
Acre-foot, definition of........................
Aden, Cedar Run near............................
Adenosine triphosphate (ATP), definition of......
Afton, Stockton Creek near......................
Albemarle and Chesapeake Canal tributary
    near Great Bridge.........................
Albemarle County, ground-water records in........
Alexandria, Cameron Run at......................
  Fourmile Run at...............................
Algae, definition of............................
Algal growth potential (AGP), definition of......
Allen Creek, miscellaneous site.................
  near Boydton..................................
Allisonia, Big Reed Island Creek near...........
  New River at..................................
Alps, Beverly Run at Rt. 630, near..............
  Beverly Run at Rt. 721, near..................
Altavista, Roanoke River at.....................

* * * * * * *

Chase City, South Meherrin River near...........
Chatham, Banister River at U.S.
    Highway 29, near..........................
  Bearskin Creek at Rt. 612 near................
  Bearskin Creek near...........................
  Cherrystone Creek at..........................
Chatham Hill, Lick Creek near...................
Chemical oxygen demand (COD), definition of......
Cherrystone Creek, at Chatham...................
  miscellaneous site............................
Chesapeake Bay, low-flow partial-record
    stations in...............................
Chesterfield, Falling Creek near................
Chestnut Creek, at Galax........................
  miscellaneous site............................
Chickahominy River, above Walkers Dam,
    at Walkers................................
  near Providence Forge.........................
Chilhowie, Hutton Creek near....................
  South Fork Holston River at Riverside, near...
Chimney Rock Fork near Ka.......................
Chlorophyll, definition of......................
Chowan River basin, crest-stage partial-record
    stations in...............................
  discharge measurements at miscellaneous
    sites in..................................
  gaging-station records in.....................
  low-flow partial-record stations in...........
Christian, Buffalo Branch tributary near.........

* * * * * * *

Lahore, Pamunkey Creek near.....................
Lake Drummond in Great Dismal Swamp.............
Lake Moomaw near Hot Springs....................
Lakes and reservoirs:
  Claytor Reservoir near Radford................
  Drummond, Lake, in Great Dismal Swamp.........
  Flannagan, John W., Reservoir near Haysi......
  Kerr, John H., Reservoir near Boydton.........
  Leesville Lake near Leesville.................
  Moomaw Lake near Hot Springs..................
  Philpott Lake near Philpott...................
  Pound River, North Fork, Lake near Pound......
  Smith Mountain Lake near Penhook..............
  Talbott Reservoir near Kibler.................
  Townes Reservoir near Kibler..................
Lakeside Village, Willis River at...............

* * * * * * *

Page

Renick Run near Buchanan........................
Reservoirs, See Lakes and reservoirs
  in Big Sandy River basin......................
  in Great Dismal Swamp basin...................
  in James River basin..........................
  in Kanawha River basin........................
  in Roanoke River basin........................
Revised records, explanation of.................
Revisions, water-quality data...................
Rice, Briery Creek near.........................
  Sandy River near..............................
Riceville, Elkhorn Creek near...................

* * * * * * *

Taxonomy, definition of.........................
Taylors Creek near Montpelier...................
Taylorstown, Catoctin Creek at..................
Tazewell, TN, Clinch River above................
Teas, South Fork Holston River at...............
Techniques of water-resources investigations,
    publications on...........................
Tennessee River basin, crest-stage partial-
    record stations in........................
  gaging-station records in.....................
  low-flow partial-record stations in...........
  water-quality analyses in.....................
Thompson Creek near Bath Alum...................
Thompson Valley, Maiden Spring Creek near........

* * * * * * *

Vanderpool, Jackson River at....................
Verona, Middle River near.......................
Victoria, Falls Creek tributary near............
Volney, Wilson Creek at.........................

Water-resources data for Virginia, 1983,
    explanation of............................
Water-resources investigations, publications
    on techniques of..........................
Water temperature, explanation of...............
WATSTORE data, access to........................
Waverly, Otterdam Swamp near....................
Waynesboro, South River near....................
Wayside Spring at Richmond......................
WDR (Water Data Reports), definition of..........
Weighted average, definition of.................
Well descriptions and ground-water levels:
  Accomack County...............................
  Albemarle County..............................
  Appomattox County.............................
  Arlington County..............................
  Buckingham County.............................
  Colonial Heights (independent city)...........
  Fairfax County................................
  Franklin (independent city)...................
  Halifax County................................
West Branch Long Hill Swamp near Lightfoot.......
West Run at Barnetts............................
White Oak Creek (Chowan River basin)
    near Hebron...............................
White Oak Creek (Roanoke River basin),
    miscellaneous site........................
  near Dry Fork.................................
White Oak Run (Potomac River basin)
    near Grottoes.............................
White Oak Run (Rappahannock River basin)
    near Passapatanzy.........................
White Oak Swamp near White Oak Swamp............
White Oak Swamp, White Oak Swamp near............
Whitethorn Creek, miscellaneous site............
Whitetop, Helton Creek near.....................

* * * * * * *

Yarmouth Creek, miscellaneous site..............
York County, ground-water records in............
York River basin, crest-stage partial-record
    stations in...............................

* * * * * * *

Note.--The format of this example shows the "sink" and position of page number for the first page of the index. The first page must be a right-hand (odd-numbered) page; if necessary, it is preceded by a blank page.

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[1]Modified from WDR: VA-83-1.

APPENDIX B

SUMMARY OF HYDROLOGIC CONDITIONS

Surface Water

Nevada has no truly large rivers. The largest streams in the State are the Humboldt, Truckee, Carson, Walker, Muddy, Virgin, and Colorado Rivers. The Colorado River, which is by far the largest of the seven, forms the boundary between southeastern Nevada and northwestern Arizona. Of the remaining listed rivers, only the Humboldt and Muddy begin and terminate in Nevada. The other four enter Nevada from an adjacent state.

The larger rivers typically follow the flow pattern of a gaining stream in the well-watered mountain reaches and a losing stream in the lower altitude reaches. The major cause of the downstream diminution of flow is water use for irrigation.

Much of Nevada is drained by small streams that are dry most of the year. Typically, such streams respond only to intense precipitation, which generally occurs only a few times a year at the most. In many years, the streams have no flow, and even in relatively wet years, total flow duration in such streams may be measured in hours.

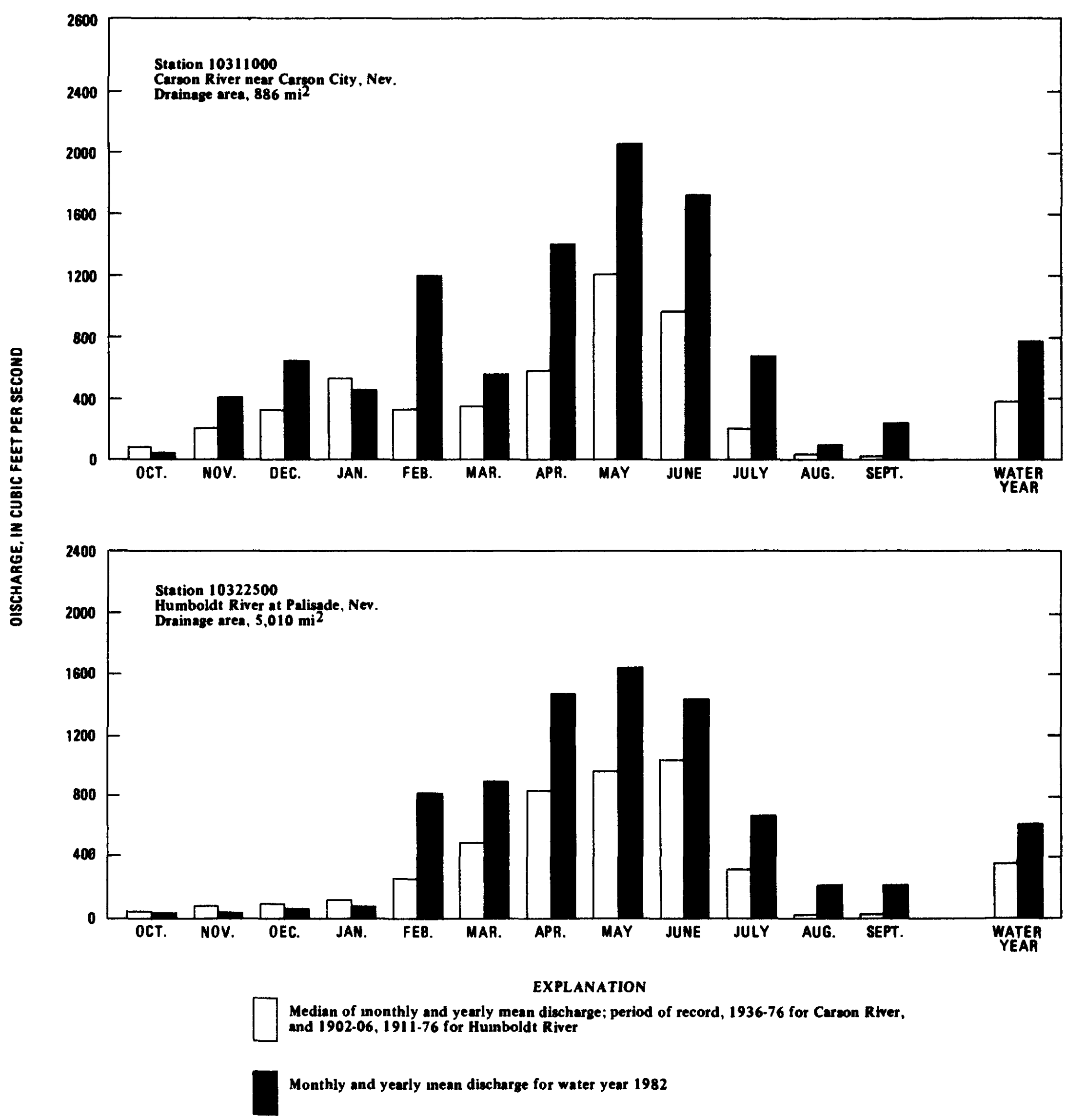

FIGURE 1.–Comparison of discharge during water year 1982 with the long term median discharge at two representative gaging stations.

Surface-Water Conditions

In the Humboldt River basin of northern Nevada, streamflow during the early part of water year 1982 was slightly below average. During the remainder of the water year, flow was well above average. For the entire year, the total discharge at Palisade (station 10322500) was 164 percent of normal. Monthly and annual mean discharges during water year 1982 and during the period 1903-76 for the river at Palisade are shown in figure 1.

The three rivers of far western Nevada--the Carson, Walker, and Truckee--also experienced higher-than-average flows during 1982. Characteristically, low flow is in late summer, and flow then increases through the autumn and winter until the snowmelt season in the spring. Maximum flows for the year can normally be expected in May and June, although many floods have occurred in December, January, or February, as a result of rain on snow. The Carson River lies mostly in Nevada, with its headwaters in the Sierra Nevada of California. During water year 1982, runoff in the river at Carson City (station 10310405) was 201 percent of normal. Monthly and annual mean discharges at Carson City are shown in figure 1.

The Walker River is formed by the confluence of the East and West Forks in Mason Valley. Both forks originate in the Sierras, and their flow is controlled--the East Fork by Bridgeport Reservoir and the West Fork by Topaz Lake. The flow of Walker River at Wabuska (station 10301500) was 210 percent of its 57-year average during water year 1982. The river terminates in Walker Lake, a shrinking, saline remnant of ancient Lake Lahontan, north of Hawthorne. Water-surface altitudes for the lake are shown in figure 2. The lake surface declined about 3-1/2 feet from March 1981 to March 1982, and then rose about 2-1/2 feet during the subsequent runoff period.

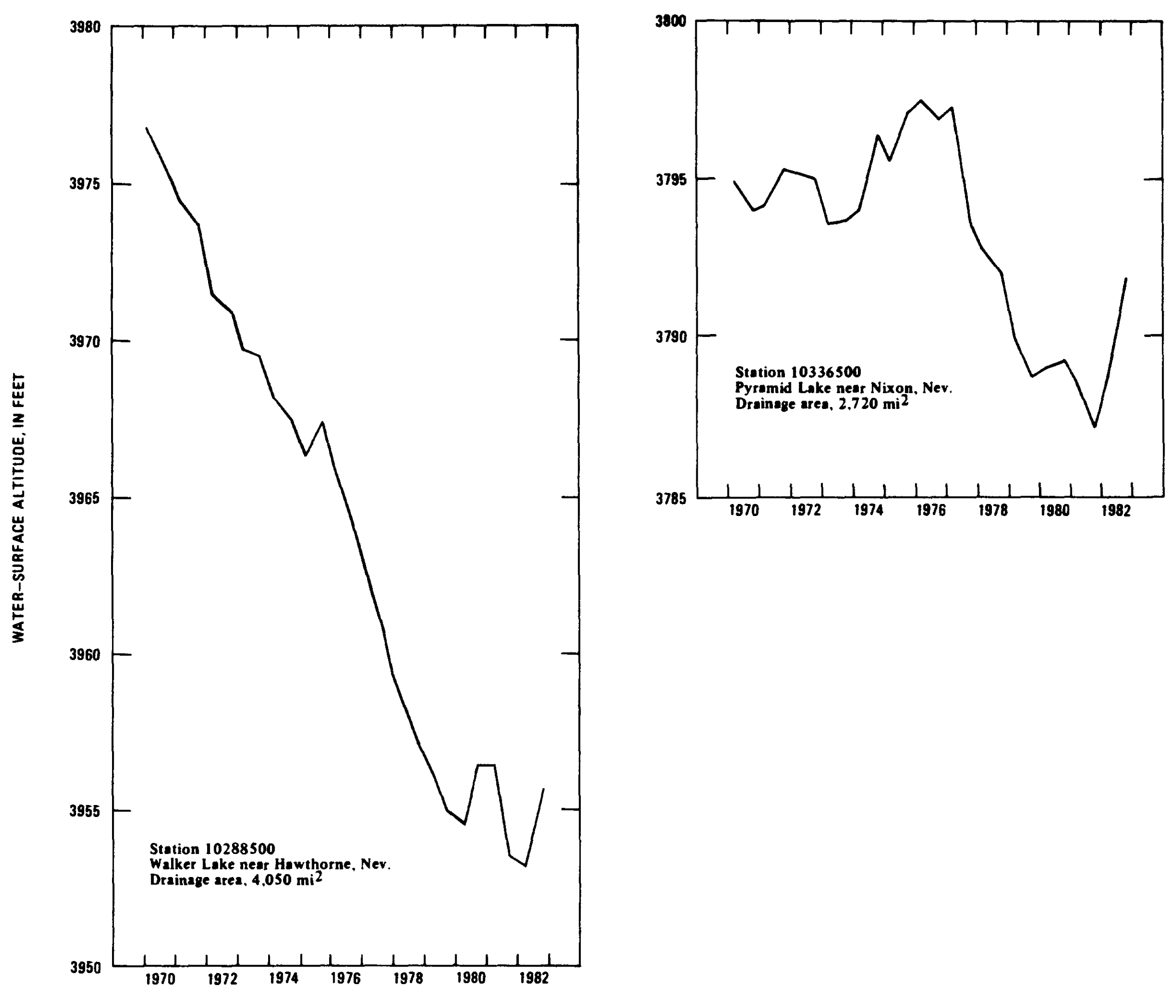

FIGURE 2.—Water-surface altitudes[1] at Walker and Pyramid Lakes, 1970-82.

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[1]The term "elevation" is to be used in place of "altitude" beginning with the 1985 water-year State data reports.

The Truckee River, another major western Nevada stream for which discharge is significantly controlled by reservoirs and regulated lakes in the Sierras, also experienced above-normal flow. At Reno (station 10304800), the mean daily discharge for water year 1982 was 202 percent of the 56-year average. The Truckee River feeds Pyramid Lake, a closed-basin water body similar to Walker Lake. Water-surface altitudes for Pyramid Lake rose slightly from 1970 to 1977. From 1977 through 1981, in contrast, the lake steadily receded. The high flows of 1982 reversed that trend, raising the lake level by more than 4½ feet, as shown in figure 2.

In southeastern Nevada, the Colorado River forms the State boundary with Arizona. Flow is completely controlled by a sequence of impoundments that includes Hoover and Davis Dams in Nevada. Since 1935, the mean annual discharge of the Colorado River below Hoover Dam (station 09421500) has been 13,100 ft^3/s (cubic feet per second). Mean annual discharge there fluctuates on the basis of upstream supply and downstream power and irrigation requirements. During water year 1982, the flow averaged 10,200 ft^3/s. In the Virgin River (one of the major inflows to Lake Mead on the Colorado), flow during 1982 was comparable to the long-term average.

The 1982 water year was significant in terms of flash flooding on ephemeral streams. On July 28, a thunderstorm with total precipitation of 2 to 4 inches caused flooding that damaged crops and roads at a rural community 7 miles northwest of Yerington. Clover Creek near Caliente flooded on August 12, damaging 300 feet of railroad embankment. Another afternoon thunderstorm on August 23 resulted in flooding at the resort area of Willow Beach on Lake Mohave. Peak discharge was an estimated 17,000 ft^3/s on Jumbo Wash near the beach. This peak exceeded the previously estimated 100-year peak flow of 14,000 ft^3/s. Fortunately, no loss of life was incurred because the Jumbo Wash campground was closed as a result of previous flood studies. Flooding near Blue Diamond, southwest of Las Vegas, did take one life the next morning, however. Discharge at the site peaked at about 4,500 ft^3/s.

Surface-Water Quality

The quality of surface water in Nevada varies greatly from place to place, as well as seasonally. Water temperatures and the concentrations of dissolved solids and suspended sediment are generally higher in the southern part of the State than in the northern part. Dissolved-solids values of 1,000 to 3,000 mg/L are quite common in southern water, whereas values exceeding 1,000 mg/L in northern Nevada surface water are uncommon.

The small mountain streams in Nevada have water of generally good quality. Low dissolved-solids concentrations--characteristically less than 500 mg/L and commonly less than 200 mg/L--are the rule for most of the mountain streams. Water temperatures are moderate during the summer, and ice is common during the winter months.

Mining activities in the past have contributed to surface-water quality problems. High mercury concentrations, related to residues from mining operations in the Comstock Lode in and near Virginia City during the 19th Century, have been detected in the lower Carson River and Lahontan Reservoir. Acid drainage from the abandoned Leviathan Mine in California is still affecting water quality in the East Fork Carson River.

Municipal and industrial wastes from the Las Vegas metropolitan area have significantly affected local stream quality. Las Vegas Wash receives treated sewage effluent rich in nutrients. Figure 3 shows pronounced trends in specific conductance (an indicator of dissolved-solids concentration) and discharge for the Wash since 1970. The discharge graph shows that streamflow has increased appreciably during the last decade at both the Henderson and Boulder City gages (6.0 and 0.8 miles, respectively, upstream from the high-water line of Lake Mead). The trend reflects a continuing population growth in Las Vegas Valley and the resulting increase in sewage-effluent discharge to the Wash upstream from the Henderson gage. The discharge graph also shows an increase in flow between the two gages. Much of this inflow apparently is saline ground water. The specific-conductance graph shows that the salinity of the effluent-dominated flow at the Henderson gage has fluctuated little during the period. At the Boulder City gage, in contrast, specific conductance has decreased considerably--from almost 6,000 micromhos in 1970 to about 3,000 micromhos in 1981 and 1982. This change reflects the dilution of saline ground-water inflow between the two gages by the increasing quantities of treated sewage effluent. In July 1981, a specialized chemical-treatment process for phosphorus removal was initiated at the municipal wastewater treatment facilities that discharge to Las Vegas Wash. The effectiveness of the treatment is shown by the following summary:

	Average total phosphorus, in milligrams per liter [1]	
Gage	October 1979 through June 1981	July 1981 through September 1982
Henderson	3.4 (19)	0.46 (15)
Boulder City	2.6 (30)	.54 (15)

[1]Number of samples indicated in parentheses.

The data indicate a 5- to 7-fold reduction in the average concentration of total phosphorus at the Henderson and Boulder City gages.

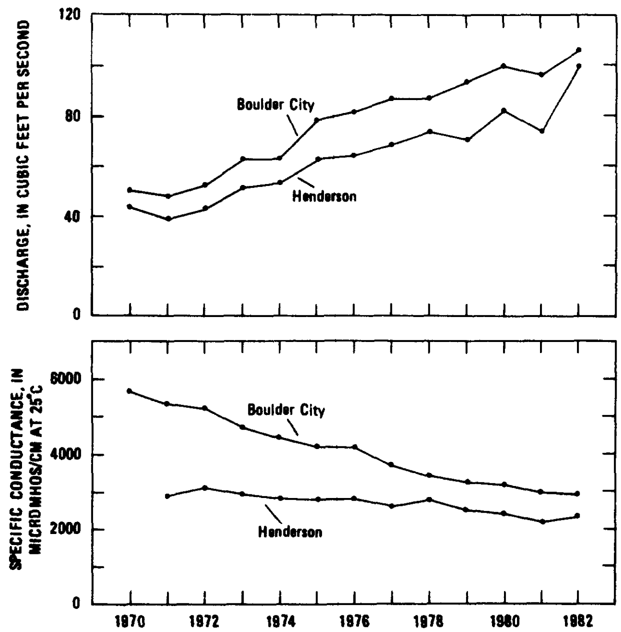


FIGURE 3.–Annual mean discharge and specific conductance of Las Vegas Wash at the Henderson and Boulder City gages (stations 09419700 and 09419800 respectively), 1970–82.

Sediment transport by streamflow varies greatly from place to place, seasonally and annually. Overall, the greatest sediment movement is probably caused by flash flooding--the type of runoff that often produces debris flows. Sediment transport associated with flash floods is difficult to measure and is rarely observed by hydrologists, except after the event. The few available data thus far collected verify the importance of this natural process to erosion and sediment transport. In fact, much of the valley fill throughout the State has been emplaced by flash flooding in the geologic past.

The amount of sediment transported by a stream generally is proportional to the rate of streamflow; thus, except for flash floods, the bulk of fluvial sediment moves during the winter or spring when precipitation and snowmelt are greatest.

Well-known areas of abnormal channel erosion include the terminal reaches of the Truckee and Walker Rivers. Declining levels of Pyramid and Walker Lakes throughout much of this century have lowered the rivers' base levels and caused extensive channel readjustments.

Urbanization in the Las Vegas metropolitan area is believed to have greatly accelerated erosion, and thus increased sediment transport during storms. In Las Vegas Wash downstream from Henderson, sediment transport has generally been intensive since collection of data began at the Boulder City gage (09419800) in January 1974. This is thought to be largely the result of severe channel erosion below Henderson that has probably been occurring since at least the early 1970's in response to progressively increasing water discharge (figure 1). This changing flow regimen has been accompanied by severe lateral and vertical erosion, as the stream channel adjusts to the changing flow conditions. Two events--one mainly natural and the other man caused--accelerated the erosion processes. The first event was a record runoff during July 4-6, 1975, that resulted from an intense rainstorm on July 3 in Las Vegas Valley. The second event was removal of a road culvert at Northshore Road adjacent to the Boulder City gage in May 1978. Both events triggered considerable erosion in the 5-mile reach upstream from the gage. Downcutting has been as great as 20 to 30 feet in some places, and progressive lateral erosion also has been extensive (P. A. Glancy, U.S. Geological Survey, oral communication, 1981). Sediment data are collected only periodically at the Boulder City gage, not frequently or timely enough to allow detailed interpretation of upstream erosion activity (sampling frequencies are listed under "Period of Record" for station 09419800 in the basic-data section of this report). The suspended-sediment and water-discharge records for the period since data collection began at the gage, which are summarized in the following table, show the general character of fluvial-sediment transport past the site.

Summary of data on suspended sediment and water discharge, Las Vegas Wash near Boulder City

Period	Maximum measured sediment concentration (mg/L)	Water discharge (cubic feet per second)	
		At time of maximum measured concentration	Maximum for entire period
Aug. 1969-Dec. 1973	no data	--	485
Jan. 1974-July 3, 1975	288	69	300±
July 4-6, 1975	record high flows		2,430
July 7-Sept. 14, 1975	no data	--	107
Sept. 15, 1975-May 17, 1978	17,300	616	1,050
May 18, 1978	culvert removed		75±
May 19, 1978-Sept. 1979	18,200	176	217
Oct. 1979-Sept. 1980	69,600	350	620
Oct. 1980-Sept. 1981	1,980	92	830
Oct. 1981-Sept. 1982	6,070	151	790

The tabulation on the following page summarizes discharge and selected water-quality characteristics at 17 stream sites in and immediately adjacent to Nevada during water year 1982, and compares those data with the longer term records for each site (new record maximums and minimums are indicated by italics). With few exceptions, the comparisons show no important new extremes in 1982 compared with prior periods of record. For the Quinn River near McDermitt (10353500), new record highs and lows are not of great significance because of the relatively short period of water-quality record (less than 5½ years) at that site.

Ground Water

The geography and geology of Nevada are sufficiently complex that ground-water conditions in the State cannot be summarized easily. Ground water occurs in the unconsolidated valley-fill sedimentary aquifers of more than 250 basins and valleys in the State. Most of these hydrographic areas are topographically closed, but ground water may flow from one valley to another. Ground water also occurs in the bedrock underlying the valley fill. In some areas, several bedrock units form a single aquifer that underlies a number of basins. For the most part, however, the ground-water system in one basin is related in only a minor way to the systems in adjacent basins. Thus, changes in ground-water conditions brought about by variations in recharge or discharge, pumping, land use, or other factors in one basin are limited mostly to that basin.

Water-Level Fluctuations

Ground-water levels fluctuate seasonally and annually in response to a variety of stresses or changes in stress. Short-term climatic fluctuations can lead to changes in natural recharge and discharge. This in turn can cause natural changes in ground-water levels, but the effect may take years to become evident. Long-term climatic fluctuations also affect water-level trends. Superimposed on these changes are the effects of ground-water pumpage for public supply, agriculture, and industry.

During 1982, a wetter-than-normal winter throughout most of Nevada did not significantly lessen the demands on ground-water systems. Agricultural areas continued to rely on ground-water supplies for irrigation. An upturn in mining activities in some areas of the State led to an increase in competition for the existing water resources. Most areas that had experienced ground-water problems in the past continued to experience such problems.

In April 1982, an intensive effort was made to measure ground-water levels in valleys tributary to the Humboldt River. The data for Paradise Valley verified the continuing problem of water-level declines there. Other areas in the 16,800-square-mile Humboldt Basin showing significant water-level declines caused by agricultural pumping were Antelope Valley, middle Reese River Valley, and upper Reese River Valley.

Elsewhere in the State, water levels in Diamond Valley continued to decline as a result of heavy pumping for irrigation.

Station name and number	Maximums and minimums determined for current year (upper numbers[a]) and for prior period of record (lower numbers, in parentheses)									
	Discharge (cubic feet per second)		Specific conductance (micromhos)		Water temperature (degrees Celsius)		Fecal streptococci (colonies per 100 mL)		Suspended sediment (milligrams per liter)	
	Maximums	Minimums	Maximums	Minimums	Maximums	Minimums	Maximums	Minimums	Maximums	Minimums
Virgin R at Littlefield 09415000	1,520 (35,200)	68 (38)	3,640 (4,650)	1,060 (685)	32.0 (33.5)	8.0 (2.0)	-- (46,000)	-- (110)	-- (247,000)	-- (40)
Virgin R nr Riverside 09415230	1,400 (16,000)	12 (0)	4,460 (5,260)	1,410 (900)	*36.5* (35.5)	6.0 (3.5)	*41,000* (15,000)	570 (100)	*12,000* (11,700)	1,910 (166)
Muddy R nr Overton 09419515	44 (5,110)	1.0 (0.32)	*4,560* (4,120)	3,110 (1,880)	24.0 (28.0)	10.5 (7.0)	*86,000* (6,800)	770 (500)	382 (1,520)	148 (121)
Las Vegas Wash nr Henderson 09419700	282 (6,510)	73 (4.8)	2,710 (6,960)	2,060 (1,660)	24.0 (28.0)	11.5 (2.0)	-- --	-- --	38 [b](347)	*2* (3)
Las Vegas Wash nr Boulder City 09419800	346 (2,430)	76 (14)	3,870 (9,120)	*1,780* (2,080)	28.5 (28.5)	7.5 (3.0)	12,000 (16,000)	1,000 (55)	6,070 (69,600)	207 (111)
Colorado R blw Hoover Dam 09421500	23,200 (36,000)	1,390 (152)	1,120 (1,230)	1,000 (1,000)	16.0 (18.5)	10.5 (9.0)	23 (45)	<2 (<1)	*24* (6)	<1 (<1)
Colorado R blw Davis Dam 09423000	21,200 (31,200)	2,200 (285)	1,100 (1,290)	1,060 (900)	21.0 (21.5)	10.0 (8.0)	-- --	-- --	-- --	-- --
Steptoe Ck nr Ely 10244950	28 (37)	3.0 (2.0)	353 (403)	318 (218)	9.5 (11.0)	3.5 (2.5)	170 (1,400)	46 (<1)	92 (810)	3 (3)
S Twin R nr Round Mtn. 10249300	29 (128)	1.1 (0.11)	138 (158)	82 (75)	17.0 (18.0)	0.0 (0.0)	120 (1,500)	6 (<2)	36 (1,970)	2 (<1)
Chiatovich Ck nr Dyer 10249900	20 (527)	5.9 (1.0)	57 (82)	49 (48)	14.5 (36.5)	3.0 (0.0)	280 (600)	150 (2)	44 (195)	21 (13)
Walker R nr Wabuska 10301500	2,050 (3,280)	13 (0)	570 (792)	*165* (183)	21.0 (36.5)	0.5 (0.0)	*2,100* (1,700)	120 (16)	375 (1,720)	17 (10)
Carson R nr Fort Churchill 10312000	5,060 (15,300)	0.05 (0)	668 (840)	94 (81)	21.0 (29.0)	0.0 (0.0)	350 (36,000)	60 (4)	372 (1,950)	10 (4)
Humboldt R nr Carlin 10321000	1,790 (6,160)	11 (0.1)	674 (677)	*193* (209)	26.5 (29.0)	0.5 (0.0)	440 (830)	83 (9)	412 (862)	21 (17)
Humboldt R nr Imlay 10333000	1,160 (6,080)	4.9 (0)	841 (900)	507 (377)	22.5 (30.5)	1.0 (0.0)	-- --	-- --	717 (2,200)	27 (9)
Humboldt R nr Rye Patch 10335000	929 (4,420)	0.30 (0)	1,160 (4,010)	683 (384)	18.5 (29.5)	8.0 (0.0)	1,100 (2,400)	62 (<2)	*136* (107)	19 (14)
Truckee R nr Nixon 10351700	5,510 (14,400)	37 (8.1)	785 (1,110)	*98* (96)	28.5 (28.5)	0.5 (0.0)	770 (5,300)	110 (2)	149 (2,530)	7 (2)
Quinn R nr McDermitt 10353500	1,210 (1,580)	0.27 (0)	*895* (832)	*253* (313)	27.0 (31.0)	0.0 (0.0)	*3,700* (3,000)	*9* (10)	75 (476)	7 (2)

[a] Maximums or minimums for the current year that are, respectively, greater than or less than those for the prior period of record are indicated by italics. Frequency of water-quality measurements may differ from station to station and, for any given station, from year to year (see frequency information listed in "PERIOD OF RECORD" for each station).

[b] Questionable value not verified by duplicate determination; second-highest value for period of record, 73 mg/L.

Example 2.--Summary of hydrologic conditions (WDR: UT-83-1)

SUMMARY OF HYDROLOGIC CONDITIONS

The 1983 water year was one of the wettest recorded in Utah. This coming after the exceptionally wet 1982 water year which climaxed with record September rains, causing soils to be saturated before the winter snows fell in the mountains. Thus, when the spring melting began, it resulted in a number of landslides in the State's mountainous areas. The largest slide, which occurred on April 14, 1983, consisted of about 15 million cubic yards of debris that formed a dam about 1,000 feet long and more than 200 feet high across Spanish Fork Canyon, about 5 miles upstream from streamflow station 10150500, Spanish Fork at Castilla.

Precipitation during the water year was greater than normal throughout the State with a large part of the excess occurring in March, April, and May. March-May and water-year precipitation and the departures from normal, at several sites (fig. 1) as reported by the National Oceanic and Atmospheric Administration are in the following table:

	March-May (inches)		Water-year (inches)	
	Total	Departure	Total	Departure
Blanding	3.42	1.36	17.97	6.52
Callao	1.25	-.20	8.34	3.14
Cedar City	4.39	1.53	14.50	3.95
Green River	2.26	.74	7.23	1.22
Hanksville	1.51	.25	6.94	1.69
Logan	10.53	5.01	30.91	13.28
Milford	3.57	.89	10.58	1.86
Nephi	7.69	3.53	24.16	10.48
Roosevelt	3.07	1.25	9.95	2.64
Salt Lake City	8.18	2.78	20.58	5.14
Zion National Park	8.17	4.47	25.78	10.81

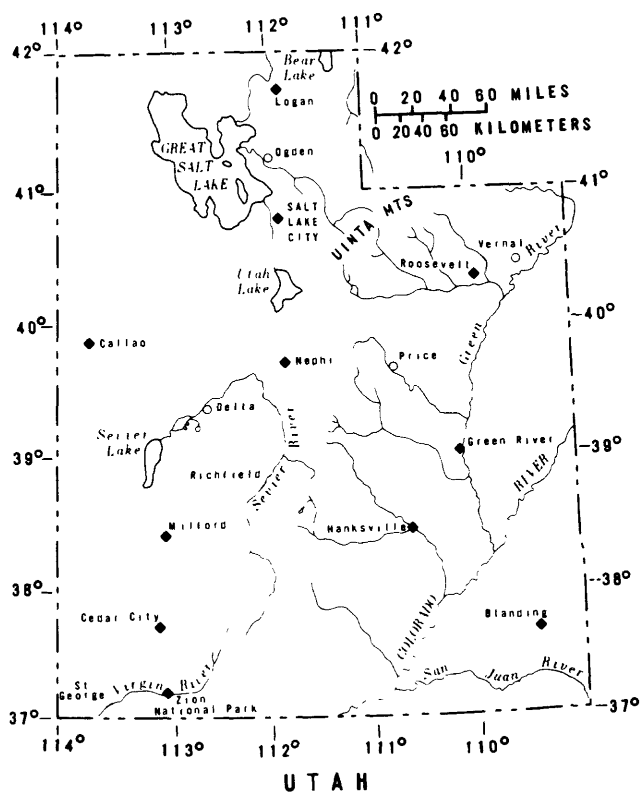


Figure 1.—Precipitation recording sites.

Example 2.--Summary of hydrologic conditions--Continued
(WDR: UT-83-1)

For the selected sites, the water-year total precipitation ranged from 1.22 to 13.28 inches greater than normal, whereas the March-May totals ranged from 0.20 inch less than normal to 5.01 inches greater than normal. Precipitation at Cedar City, Logan, Nephi, Salt Lake City, and Zion National Park, which are all near mountains, ranged from 1.53 to 5.01 inches greater than normal for March-May. This is an indication of the large quantity of late spring snows which fell in the mountains.

Surface Water

Streamflow as measured at seven representative gaging stations averaged 207 percent of the median streamflow for the 1951-80 water years (compared to 129 percent a year ago); it ranged from 157 percent of the median for Weber River near Oakley to 304 percent for Beaver River near Beaver. Discharge for the 1983 water year compared with the median runoff for the 1951-80 water years at the seven representative gaging stations for which long-term records are available is shown in figure 2.

With the exception of the San Juan River and Virgin River drainages in southern Utah, the total runoff throughout the State exceeded that for any year since 1952, with most runoff in the State exceeding that for any year since at least 1922. The following table is a summary of the mean runoff for a number of sites:

Station No.	Length of record (years)	Mean runoff in 1983 water year		Previous maximum runoff	
		Cubic feet per second	Percent of average	Water year	Cubic feet per second
09180000	33	2,041	260	1973	1,852
09180500	72	12,700	168	1921	12,290
09184000	33	25.3	181	1973	23.9
09261000	38	7,615	173	1921	6,403
09266500	70	176	177	1921	178
09275500	39	76.9	157	1952	83.7
09277500	65	329	164	1922	354
				1952	348
09279000	46	253	148	1952	261
09289500	33	169	150	1965	163
09299500	76	209	170	1922	242
09302000	41	1,736	298	1952	1,434
09308500	31	17.1	309	1952	15.4
09310500	45	113	233	1952	107
09314500	37	479	417	1952	341
09315000	84	11,110	176	1907	12,280
				1909	11,850
				1917	11,650
09328500	47	470	309	1917	438
09337000	31	12.5	260	1973	8.9
10011500	41	312	162	1965	286
10090500	40	2,142	239	1907	2,280
10106000	46	194	209	1971	159
10126000	28	3,992	222	1971	2,856
10128500	79	334	151	1907	415
				1909	382
				1921	373
10130500	52	452	220	1952	422
10131000	56	181	275	1952	129
10136500	63	1,313	232	1899	1,223
10137500	62	193	171	1952	181
10170490	40	1,701	398	1982	700
10174500	61	251	198	1922	313
10189000	70	160	205	1922	201
10206000	38	113	467	1973	53.9
10224000	46	1,229	585	1917	304
10234500	69	119	228	1980	93.5
10237000	69	180	474	1969	79.7
10242000	47	86.0	257	1973	79.2

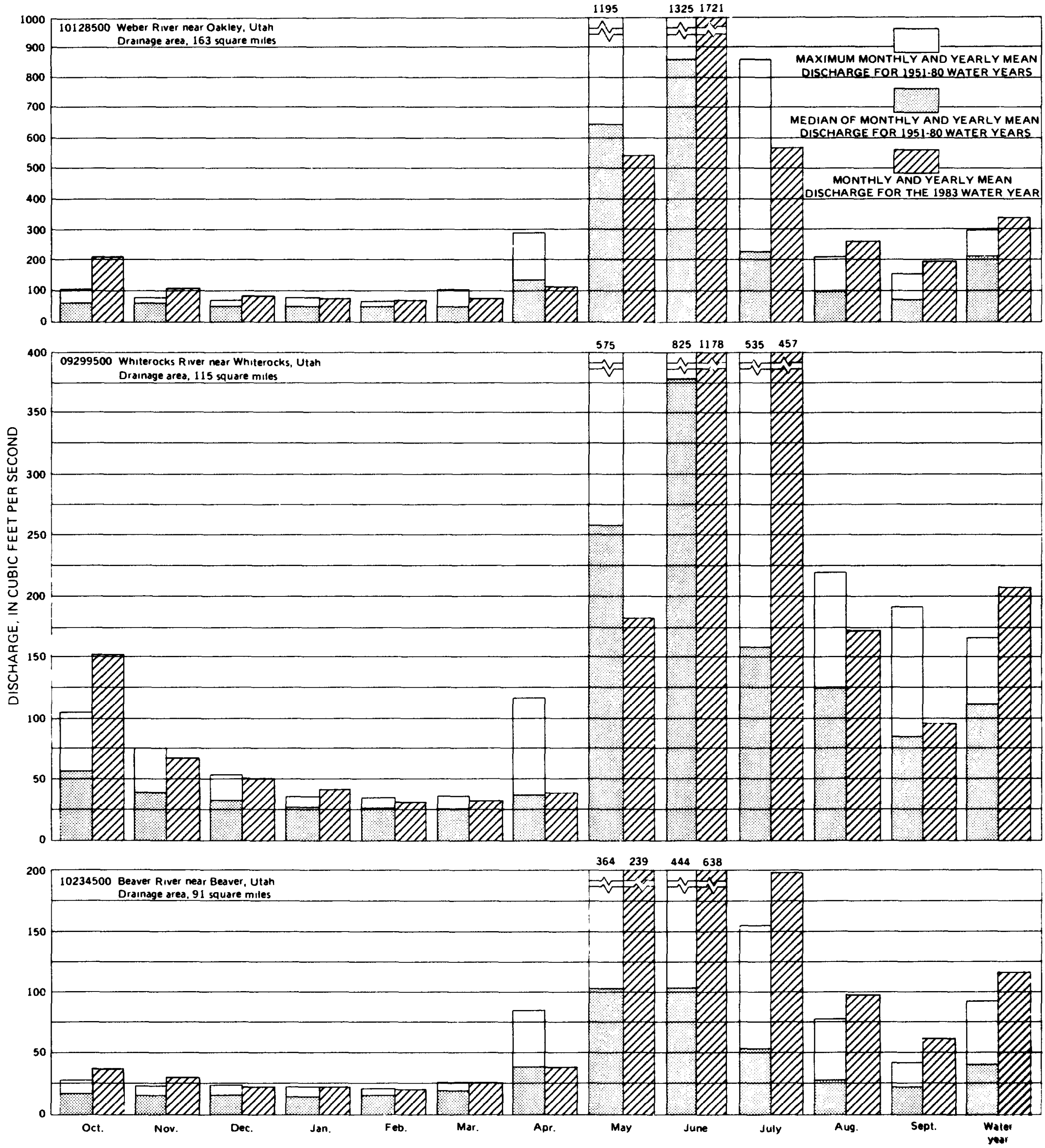


Figure 2.—Comparisons of discharge during the 1983 water year with median and maximum discharge for the 1951-80 water years at seven long-term representative gaging stations.

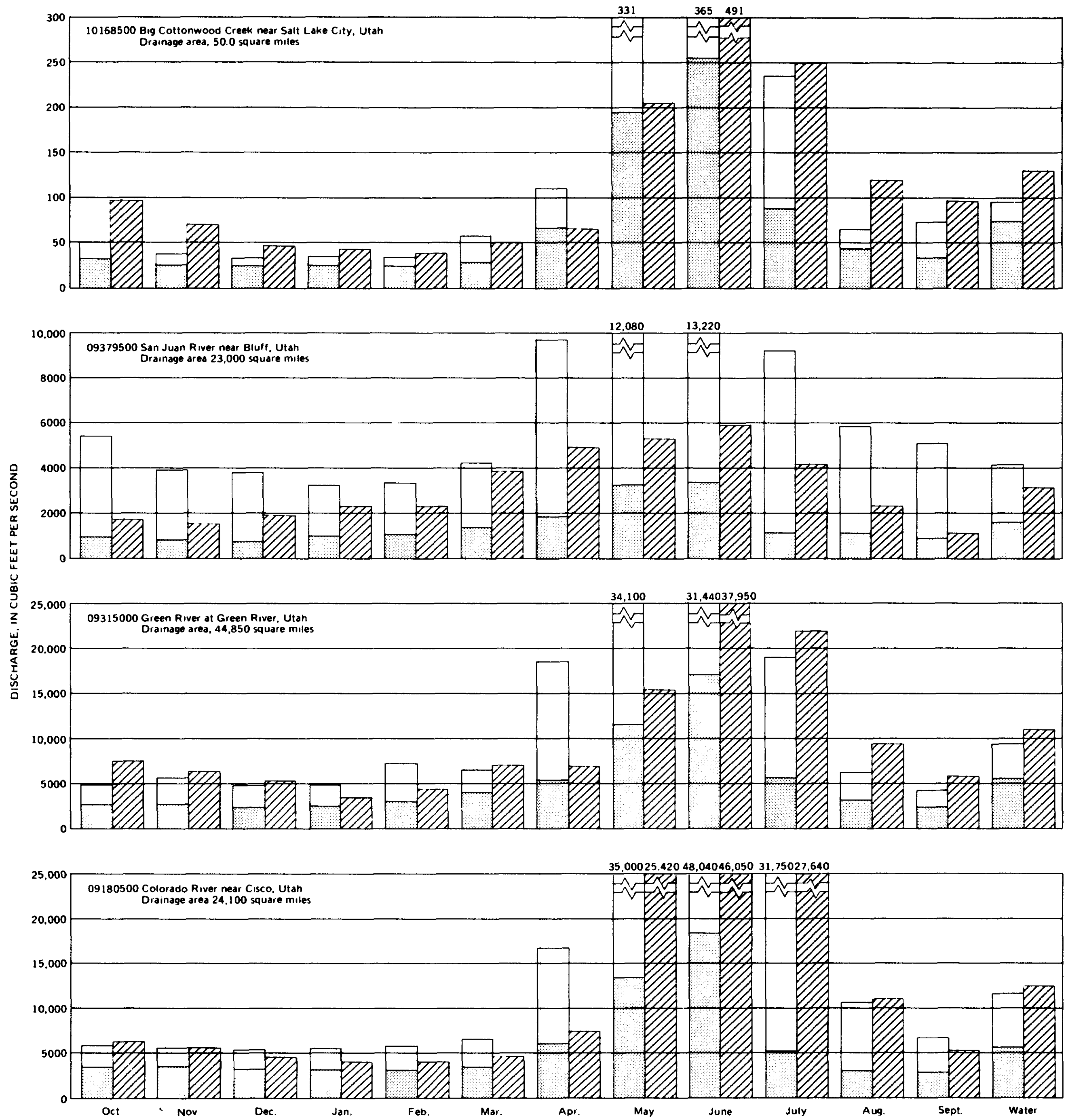


Figure 2.- Comparisons of discharge during the 1983 water year with median and maximum discharge for the 1951-80 water years at seven long-term representative gaging stations—Continued.

Amazingly enough, with the extreme flow volumes, only nine of the sites in the preceding table had record peak discharges; peak discharges for those nine gages are shown in the following table:

Station No.	1983 peak (cubic feet per second)	Previous peak	
		Cubic feet per second	Water year
09292500	2,240	1,880	1949
09299500	4,640	2,750	1922
09302000	11,500	10,300	1965
09310500	1,310	1,160	1973
10126000	9,770	7,880	1980
10131000	1,570	1,540	1952
10170490	3,350	2,480	1982
10224000	5,020	2,980	1962
10237000	1,700	1,090	1941

As of October 1, 1983, reservoir storage in 19 major irrigation reservoirs was 155 percent of the average, compared to 144 percent of the average the previous year. The elevation of Bear Lake was 5,922.24 feet (National Geodetic Vertical Datum of 1929), with contents of 1,321,800 acre-feet, compared 1,240,500 acre-feet a year ago.

Great Salt Lake rose 4.75 feet (which was a record documented rise for 1 year) to reach a seasonal peak stage of 4,204.80 feet on June 30, 1983. The peak stage was 4.10 feet higher than the previous years peak stage and was the highest since 1924. Elevation of the lake on September 30, 1983 was 4,204.35 feet. This was 4.30 feet higher than the level the previous year and 13.00 feet above the documented record low (4,191.35 feet) during October-November 1963.

The historical record for lake elevation begins in 1847, when the pioneers reached the Great Salt Lake Basin. The elevation of the lake at that time was about 4,200 feet. The historical record high occurred during 1873 when the lake level was 4,211.6 feet.

Water Quality

The above average runoff during the 1983 water year resulted in significant increases in turbidity and suspended-sediment transport in many streams throughout the State. Many streams along the Wasatch Front were effected by mud slides and debri flows. Numerous stream habitats were adversely effected by floodwaters, siltation, channel dredging, and channel reconstruction. The rising Great Salt Lake inundated freshwater wildlife habitats around the lake increasing the salinity of the water supporting those habitats.

Summary of Water-Quality Studies

A recently completed study conducted in Salt Lake County, Utah, (Christensen and others, 1984) used rainfall, runoff, atmospheric deposition, and water quality for 306 storms in 12 urban basins east of the Jordan River to define the impact of urban areas on water resources in the Salt Lake Valley (fig. 3). The study showed that water quality in streams in the eastern part of Salt Lake County deteriorates from the headwaters in the Wasatch Range to the downstream reaches of the streams before they empty into the Jordan River. Concentrations of substances in streams entering the urban areas generally were small under base-flow and storm conditions, but large concentrations of sediment, suspended solids, suspended trace metals, phosphorus, and oxygen-demanding substances were common in the storm runoff leaving urban areas.

The relationship between storm runoff, dissolved solids, and suspended solids for a storm drain in Salt Lake County is shown in figure 4. As runoff increased due to a rainstorm in the area, suspended solids also increased, however, dissolved solids decreased.

The quality of the base flow in most of the canals east of the Jordan River was poorer than that of the streams they intersected. During storms, the quality of the canal water deteriorated further. The impact of canal discharges to streams, however, was diminished because of the relatively small quantities of canal water that were released to the storm swollen streams. Storm runoff from areas of industrial and commercial use were of very poor quality and contributed significantly to the pollutant loads in the Jordan River.

Extended dry periods resulted in suspension in the atmosphere of particulate materials by wind, which were then removed by intense storms of short duration, producing rainfall with large concentrations of the major dissolved substances. The mean concentrations of substances in rainfall in the Salt Lake Valley were comparable to, or less than, concentrations published for other areas in the United States and Europe, and seemed to be related to rainfall intensity and previous rainfall. Loads of substances in rainfall during a given storm within a basin generally were greater than the storm-runoff loads leaving the basin for that storm, indicating that a large quantity of the rainfall load is deposited on the soil and does not appear quickly in the storm runoff. Acid rain (pH less than 5.6) appeared in about one-half of the rainfall samples, being most common in September and October (table 1).

Atmospheric-dustfall concentrations of trace metals decreased toward the north part of the valley, except for copper, which decreased with distance from the west part of the valley. Dissolved-chloride concentrations decreased with distance from the Great Salt Lake. Comparison of the average concentration of dustfall constituents with the composition of average soils indicated that the dustfall contained considerably less aluminum, nearly equal concentrations of iron, manganese, and chromium, and concentrations of cadmium, copper, lead, zinc, and chloride that were 17 to 853 times greater than the average soil.

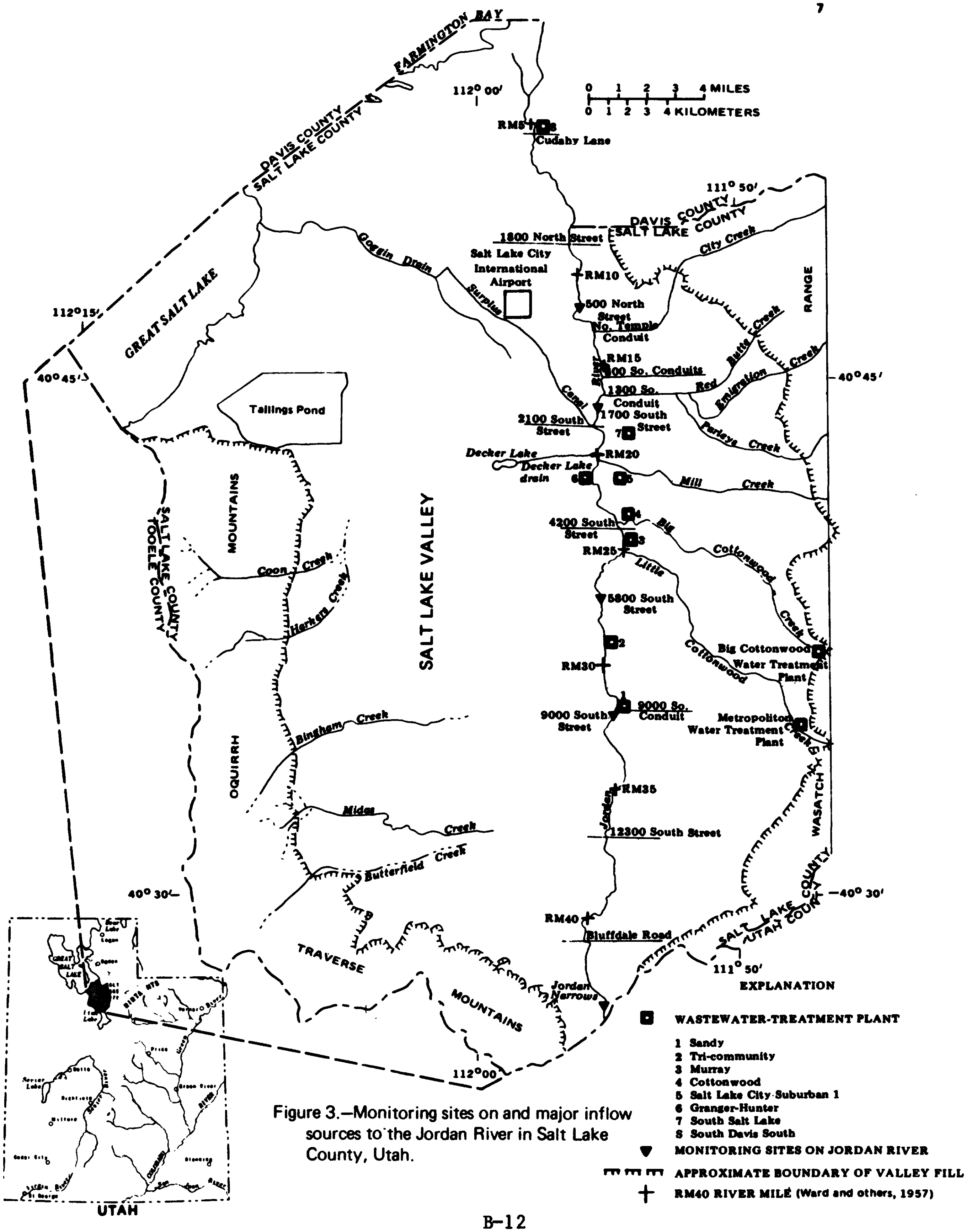


Figure 3.–Monitoring sites on and major inflow sources to the Jordan River in Salt Lake County, Utah.

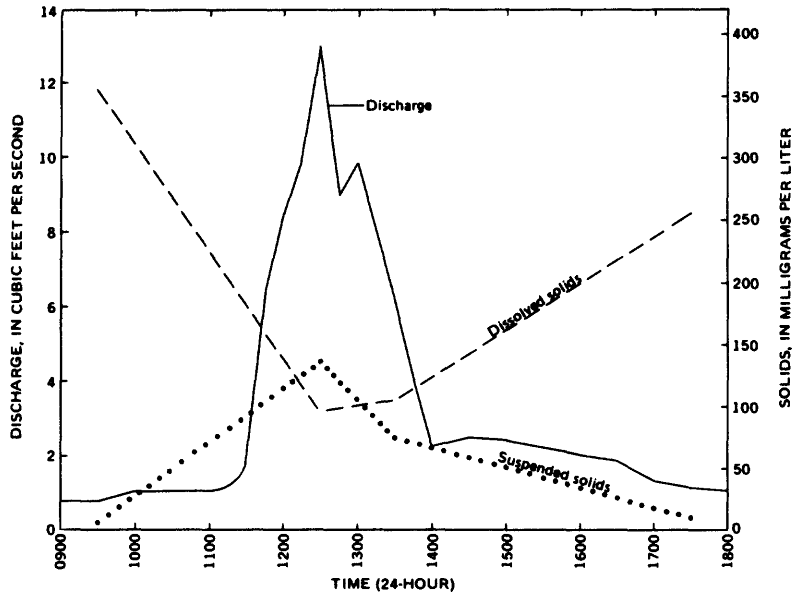


Figure 4.—Relationship of storm discharge to concentrations of dissolved and suspended solids at station Holleday Drain at 4800 South, at Big Cottonwood Creek. The storm date was October 26, 1980.

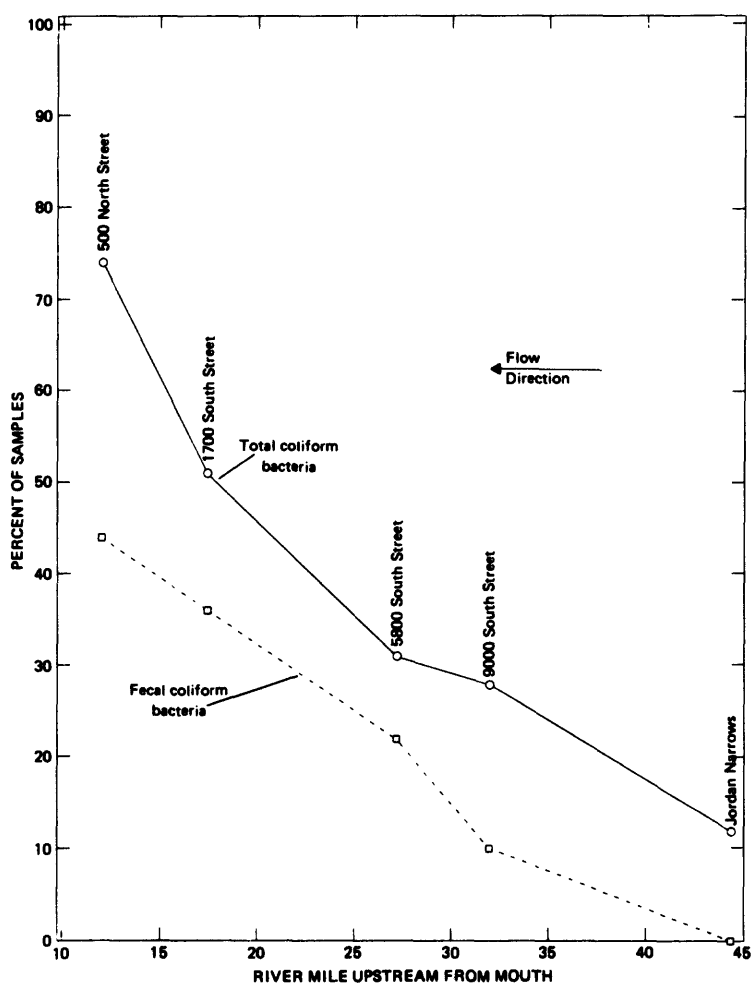


Figure 5.—Percent of samples in which total and fecal coliform bacteria concentrations were greater than Utah's sanitary standards.

Table 1.--Occurrence and frequency of acid rain (pH less than 5.6) in samples collected at six atmospheric-deposition stations

Frequency of acid rain: The number of acid rain samples and the total number of samples.

Station name	Sampling period	Frequency of acid rain	Dates of acid rain
Bells Canyon Conduit	May to November 1981	5/11	May 16, 1981 Sept. 5 Oct. 2 5 10
Sandy City Public Works	September to November 1981	3/6	Oct. 2, 1981 7 28
Dixie Valley Detention Basin	May to November 1981	4/7	Sept. 5, 1981 Oct. 2 7 28
Administration Building	October 1980 to November 1981	8/13	Oct. 7, 1980 Nov. 17 Jan. 16, 1981 May 19 Sept. 5 Oct. 2 7 28
Fort Douglas	March to November 1981	5/10	Mar. 26, 1981 May 6 Sept. 5 Oct. 2 7
Fire Station No. 7	September to November 1981	4/6	Sept. 5, 1981 Oct. 2 7 28

Another recently completed study (Thompson, 1983) identified a serious sanitary problem in the Jordan River in Salt Lake County. Indicator bacteria (total coliform, fecal coliform, and fecal streptococci) rather than specific pathogens were used to establish the sanitary quality of the river. Concentrations of total coliform bacteria commonly exceeded Utah's sanitary standard of 5,000 colonies per 100 milliliters and concentrations of fecal coliform bacteria commonly exceeded Utah's sanitary standard of 2,000 colonies per 100 milliliters in the downstream reaches of the river. At times these concentrations were greatly exceeded. The percentage of samples in which total and fecal coliform bacteria concentrations at five sampling sites on the Jordan River exceeded Utah's sanitary standards is shown in figure 5. A summary of the bacteriological data at these five sites is shown in table 2.

The most conspicuous aspect of the bacteriological data was its extreme varibility. Seven wastewater-treatment plants, seven major tributaries, numerous storm conduits, irrigation-return flow, and other sources all contribute to the dynamic system that determines the sanitary quality of the river. Because of this variability, the sanitary quality of the river could not be predicted at any one time.

In general, concentrations of all three indicator bacteria increased in a downstream direction. The ratio of fecal coliform to fecal streptococcal concentration indicated contamination from animal waste was present in 92 percent of the samples from the upstream sampling site at the Jordan Narrows and decreased to about 50 percent of the samples at downstream sampling sites. No contamination from human waste was found at two upstream sampling sites but such contamination was found in 20 percent of the samples downstream at the sampling site at 1700 South Street.

Analysis of 9 years of data at the sampling site at 1700 South Street showed concentrations of both fecal coliform and fecal streptococcal bacteria have been increasing since 1974. Storm runoff from urban areas was found to contribute large concentrations of indicator bacteria.

A study of turbidity and suspended sediment in the Jordan River in Salt Lake County, during 1981-82 (Weigel, 1984) revealed no dominant source of turbidity could be identified at five sampling sites during November through May. There were indications, however, that clay-size particles could be a source of the turbidity because at least 67 percent of the suspended sediment at the Jordan Narrows was clay size or finer. Organic-suspended sediment showed a significant correlation with turbidity at 1700 South Street during November through May, therefore organic-suspended sediment appeared to be the dominant source of turbidity. This may be due to the organic material discharged from wastewater-treatment plants along the reach of the Jordan River upstream from 1700 South Street. Organic cations in the wastewater could be causing the precipitation of clay particles, thereby affecting the source of turbidity in the river. Variations in turbidity at five sampling sites on the Jordan River are shown in figure 6.

Example 2.--Summary of hydrologic conditions--Continued
(WDR: UT-83-1)

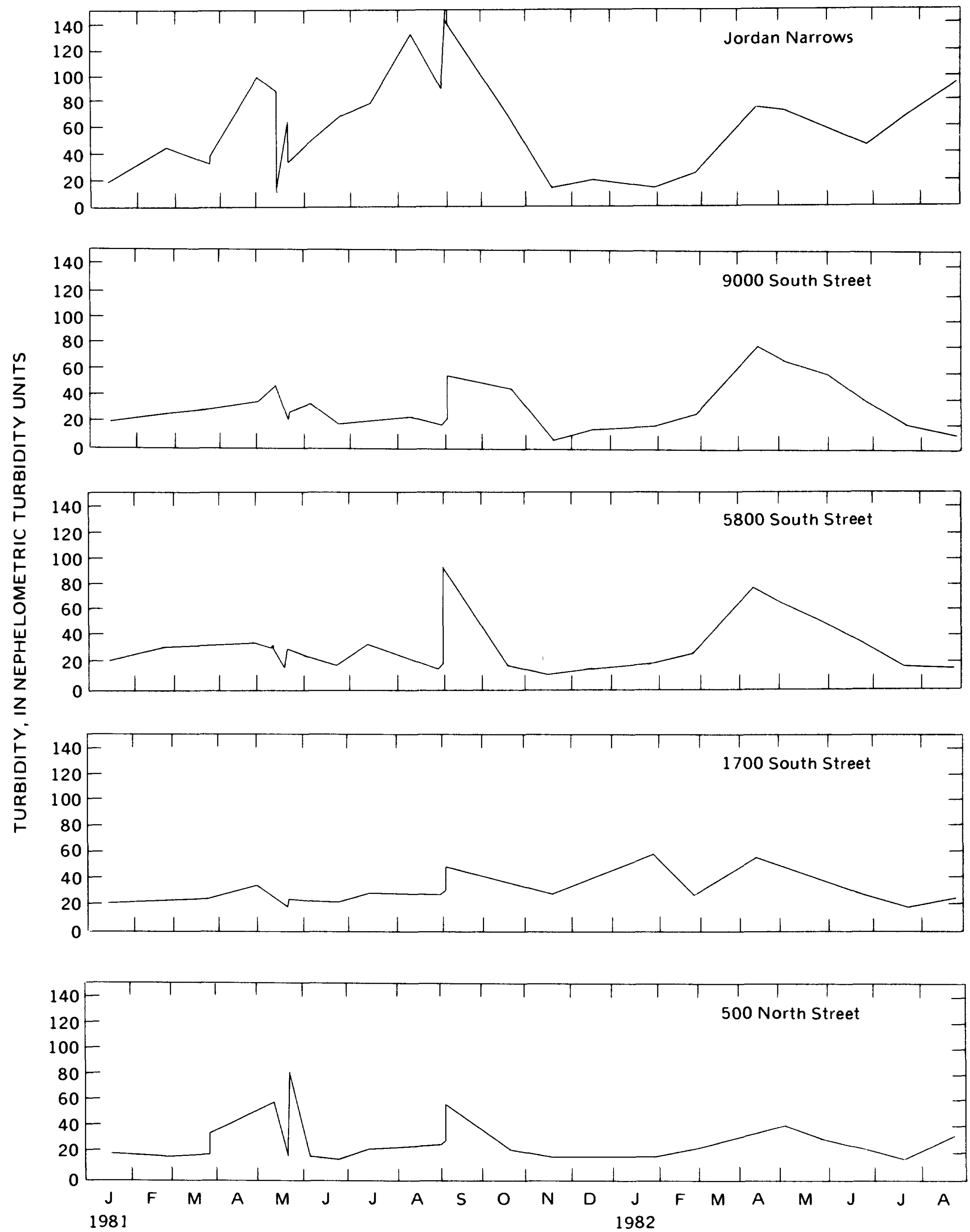


Figure 6.– Variations in turbidity at five sites on the Jordan River, January 1981 - August 1982.

Table 2.--Summary of bacteriological data at five sampling sites on the Jordan River

[Concentrations in colonies per 100 milliliters.]

Sampling site River mile Sampling period	Jordan Narrows 44.3 10/80-8/82	9000 South Street 31.9 8/80-10/82	5800 South Street 27.2 7/80-7/82	1700 South Street 17.4 7/80-9/82	500 North Street 12 8/80-8/82
			Total coliform bacteria		
Number of samples	25	35	32	43	34
Mean	7,320	9,110	19,120	32,070	48,970
Median	200	1,000	2,000	6,000	8,600
Minimum	10	30	120	410	520
Maximum	120,000	118,000	320,000	340,000	850,000
Standard deviation	24,930	22,600	58,400	72,070	145,300
Coefficient of variation	341	248	305	225	297
			Fecal coliform bacteria		
Number of samples	29	38	41	55	39
Mean	82	970	2,820	3,660	3,030
Median	48	220	300	750	1,300
Minimum	1	1	1	1	1
Maximum	500	16,000	40,000	38,000	30,000
Standard deviation	110	2,730	7,680	7,360	5,330
Coefficient of variation	130	280	272	201	176
			Fecal streptococcal bacteria		
Number of samples	27	33	39	55	41
Mean	1,480	1,890	2,410	2,870	11,320
Median	760	950	500	780	1,500
Minimum	10	42	26	2	100
Maximum	8,000	13,000	53,000	43,000	130,000
Standard deviation	1,990	2,940	8,450	7,000	29,630
Coefficient of variation	134	155	350	244	262

During June through October, organic-suspended sediment showed a significant correlation with turbidity and seems to be the dominant source of turbidity in the Jordan River. Phytoplankton from Utah Lake is the probable source of the organic-suspended sediment in the reaches of the Jordan River upstream from 9000 South Street. Downstream from 9000 South Street, the principal source of organic-suspended sediment is the discharge from wastewater-treatment plants.

Turbidity does not seem to be significantly affected by inorganic-suspended sediment during June through October at 1700 South and 500 North Streets. This could be due to the precipitation of clay particles by large quantities of organic material present in the inflow from wastewater-treatment plants.

Control of algal growth in Utah Lake and the Jordan River could decrease the turbidity in the river during June through October. Decrease of turbidity in Utah Lake could decrease turbidity in the Jordan River upstream from 5800 South Street and a decrease in the quantity of organic material discharged from the wastewater-treatment plants into the Jordan River could decrease the turbidity in the river downstream from 5800 South Street.

The shallow unconfined aquifer in Salt Lake Valley was recently studied (Seiler and Waddell, 1983). This aquifer seldom is used for domestic or industrial purposes because it yields water slowly and is easily contaminated; thus it generally yields water that is unsuitable for most uses. In about one-half of the valley, water in the shallow-unconfined aquifer is less than 10 feet below land surface. The general direction of flow in the shallow aquifer is toward the Jordan River, except in the extreme northwest part where it is directly toward the Great Salt Lake.

Water in the aquifer contains the smallest concentrations of dissolved solids along the east side of the valley, and the greatest concentrations in the northwest part of the valley near the Great Salt Lake. Large dissolved-solids concentrations were found in water from wells completed in the aquifer near some landfills and tailings areas.

Nitrate-nitrogen concentrations in water samples from the aquifer ranged from less than 0.1 to 86 milligrams per liter and nitrite-nitrogen concentrations in the samples ranged from less than 0.02 to 0.85 milligram per liter. Some of the largest nitrate-nitrogen concentrations were found in water from wells completed in the aquifer near animal pens.

The largest concentrations of trace elements generally were in water from wells completed in the aquifer near landfills and tailings areas. The largest measured concentrations were: cadmium, 200 micrograms per liter; mercury, 0.1 microgram per liter; lead, 46 micrograms per liter; iron, 37,000 micrograms per liter; and arsenic, 360 micrograms per liter.

Synthetic organic chemicals were found in water from several wells completed in the aquifer near landfills. The largest measured concentration were: benzene, 400 micrograms per liter; phenol, 660 micrograms per liter; 1,1 dichloroethane, 20 micrograms per liter; trichloroethylene, 8 micrograms per liter; and chloroethylene, 11 micrograms per liter.

A report on the characteristics of suspended sediment in the San Juan River near Bluff, Utah, analyzed the sediment records for 1930-80 (Thompson, 1982). The mean suspended-sediment load at this site was about 25,410,000 tons per year ranging from an annual load of 3,234,000 tons in 1978 to 112,400,000 tons in 1941. The relationship between annual suspended sediment load and annual stream discharge changed between water years 1941-44 and 1972-73. Possible causes for these changes are the use of new suspended-sediment sampling equipment, a change in laboratory procedures, and unusually high runoff that occurred in 1941 and 1972. Other unknown or unidentified factors may have been involved.

The use of annual stream discharge to predict annual suspended-sediment load will produce inadequate results for the site studied. The large size and diversity of geology and the precipitation patterns in the San Juan River basin present too many variables to form a constant relationship between suspended-sediment load and stream discharge.

Ground Water

Principal areas of ground-water withdrawal by wells in Utah, and those that are most extensively developed, are shown in figure 7 and listed in table 3. The estimated total withdrawal of water from wells in the State during 1982 was about 790,000 acre-feet, which is about 53,000 acre-feet less than during 1981, and 36,000 acre-feet less than the 1972-81 average annual withdrawal (table 4). The decrease in withdrawal primarily was due to a decrease in withdrawals for irrigation. Total withdrawal for irrigation during 1982 was about 504,000 acre-feet, which is 44,000 acre-feet less than during 1981. Withdrawal for public supply was 144,000 acre-feet during 1982, which was 7,000 acre-feet less than during 1981. Withdrawals for industry and domestic and stock during 1982 were about the same as during 1981.

The quantity of water withdrawn from wells is related to local climatic conditions. Precipitation during 1982 was greater than average in almost all of Utah (National Oceanic and Atmospheric Administration, 1983). Of 33 representative weather stations, only 2 reported less than average precipitation. A result of the greater than average precipitation was greater than average surface-water supplies, and, therefore, less withdrawal of water from wells for irrigation.

The greater than average precipitation in most of the State during 1982 resulted in increased recharge to the ground-water reservoirs. This increased recharge, together with decreased withdrawal, resulted in rises in ground-water levels in most of the State from 1982 to 1983 (Appel and others, 1983). Continued large withdrawals for irrigation, however, resulted in general declines in the Milford and Beryl-Enterprise areas of Escalante Valley.

Water levels rose in most parts of the basins along the Wasatch Front (between Brigham City and Nephi in north-central Utah). In Cache Valley, levels rose by as much as 9 feet and locally declined less than 1 foot. In the East Shore area, levels rose by as much as 18 feet, and they declined as much as 4 feet southwest of Ogden and between Farmington and Centerville. In Salt Lake Valley, levels rose by as much as 12 feet, whereas the only declines were less than 1 foot in three wells on the west and northwest sides of the valley. In Utah Valley, water levels rose by as much as 22 feet and no declines were recorded. In southwestern Goshen Valley, however, declines of less than 1 foot were measured in wells completed in the water-table aquifer. In Juab Valley, rises were as much as 8 feet with no declines recorded.

Outside of the basins of the Wasatch Front, water levels also generally rose in the upper and central Sevier Valleys, upper Fremont River valley, Cedar and Sanpete Valleys, and the Sevier Desert. Levels in 22 of 28 selected observation wells in the upper and central Sevier Valleys and upper Fremont River valley rose from 1982 to 1983, with the largest rise being 3.1 feet, whereas the largest decline was 0.8 foot. No water-level declines were recorded in Cedar or Sanpete Valleys where rises of as much as 6 and 15 feet, respectively, occurred. In the Sevier Desert, levels rose by as much as 9 feet, except in one well in which the level declined less than 1 foot.

In most of the basins elsewhere in Utah, water levels generally rose, but more extensive and larger water-level declines also occurred. Water levels generally rose in Curlew Valley, with the largest rise being nearly 6 feet. Levels declined, however, by as much as 4 feet in the northeastern corner of Curlew Valley. Levels rose by as much as 7 feet in about two-thirds of Tooele Valley, but declined by as much as 5 feet in the southeastern part of the valley. Levels in most of Pavant Valley rose, with the largest rise being nearly 6 feet. Declines of as much as 3 feet occurred in the northern, western, and southeastern parts of Pavant Valley. In Cedar City Valley, water levels generally rose, with the largest rise being nearly 7 feet, whereas declines were as much as 2 feet in its northeastern part. Levels in most wells in Parowan Valley rose, with the largest rises being as much as 2 feet, although levels declined by as much as 3 feet north of Paragonah. In the Milford area of Escalante Valley, levels mostly declined by as much as 4 feet, whereas rises were as much as 1 foot at the northern and southern ends of the valley. In more than one-half of the Beryl-Enterprise area of Escalante Valley, levels declined, with the largest decline being 12 feet north of Enterprise. Water levels rose as much as 17 feet at Enterprise.

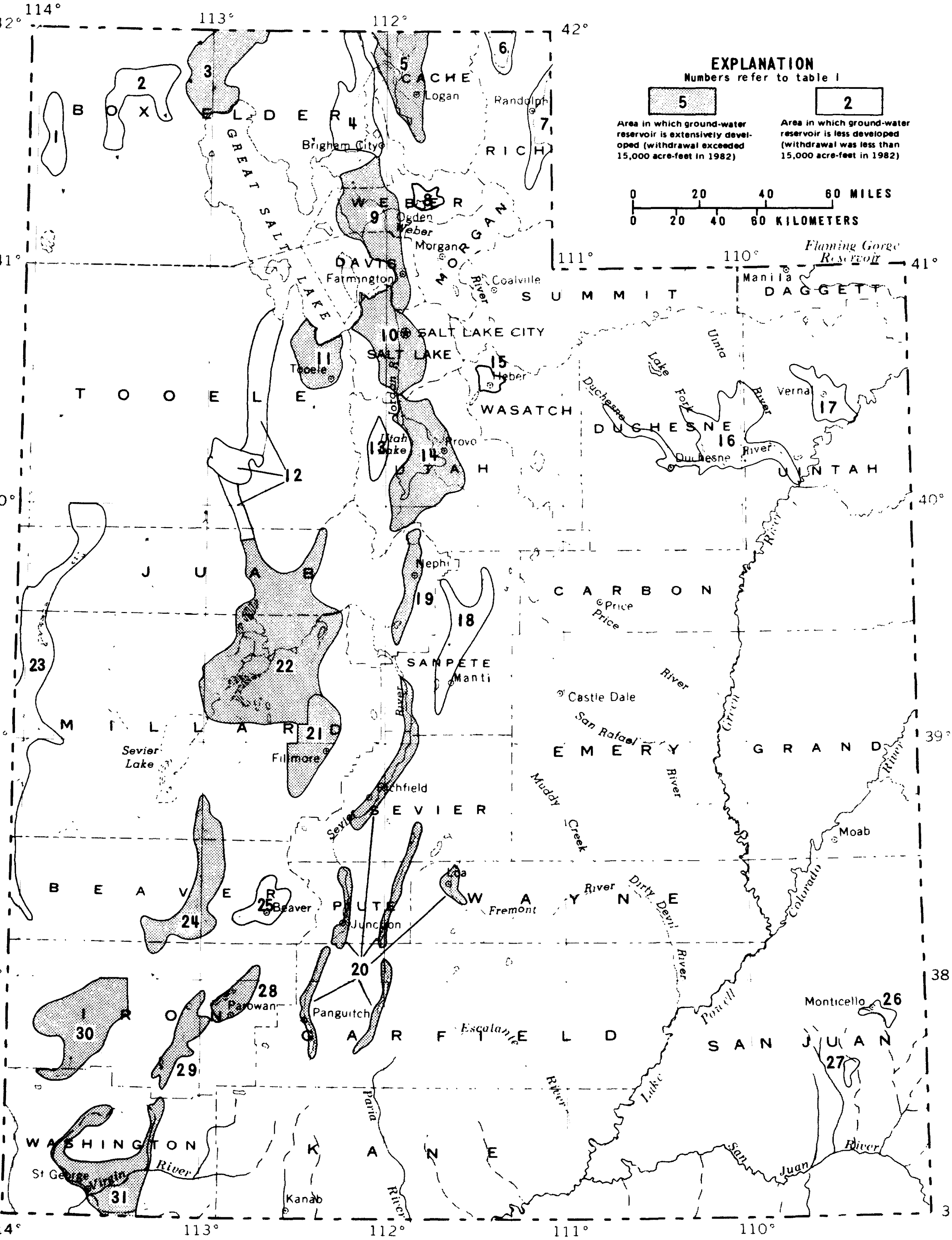


Figure 7.—Areas of ground-water development specifically referred to in this report.

Table 3.--Areas of ground-water development in Utah
(from Appel and others, 1983, table 1)

Number in figure 7	Area	Principal type of water-yielding rocks
1	Grouse Creek valley	Unconsolidated
2	Park Valley	Do.
3	Curlew Valley	Unconsolidated and consolidated
4	Malad-lower Bear River valley	Unconsolidated
5	Cache Valley	Do.
6	Bear Lake valley	Do.
7	Upper Bear River valley	Do.
8	Ogden Valley	Do.
9	East Shore area	Do.
10	Salt Lake Valley	Do.
11	Tooele Valley	Do.
12	Dugway area	Do.
	Skull Valley	Do.
	Old River Bed	Do.
13	Cedar Valley	Do.
14	Utah and Goshen Valleys	Do.
15	Heber Valley	Do.
16	Duchesne River area	Unconsolidated and consolidated
17	Vernal area	Do.
18	Sanpete Valley	Unconsolidated
19	Juab Valley	Do.
20	Central Sevier Valley	Do.
	Upper Sevier Valleys	Do.
	Upper Fremont River valley	Unconsolidated and consolidated
21	Pavant Valley	Do.
22	Sevier Desert	Unconsolidated
23	Snake Valley	Do.
24	Milford area	Do.
25	Beaver Valley	Do.
26	Monticello area	Consolidated
27	Blanding area	Unconsolidated
28	Parowan Valley	Unconsolidated and consolidated
29	Cedar City Valley	Unconsolidated
30	Beryl-Enterprise area	Do.
31	Central Virgin River area	Unconsolidated and consolidated

Table 4.--Withdrawal of water from wells in Utah
[Data from Appel and others, 1983, table 2 except where revised. Estimated 1981 total withdrawals from wells is from Holmes and others, 1982, table 2.]

Area	Number in figure 7	Estimated withdrawals from wells (acre-feet)						
		1982					1981 total	1972-81 average annual
		Irrigation	Industry	Public supply	Domestic and stock	Total (rounded)		
Curlew Valley	3	25,600	0	50	50	26,000	40,000	27,000
Cache Valley	5	11,900	9,100	3,600	1,800	26,000	33,000	27,000
East Shore area	9	[1]9,000	[2]6,900	[2]22,000	--	[2]38,000	36,000	41,000
Salt Lake Valley	10	1,900	[2]31,700	[2]61,400	30,000	[2]125,000	[2]136,000	128,000
Tooele Valley	11	19,800	500	5,100	150	26,000	30,000	30,000
Utah and Goshen Valleys	14	47,700	10,200	15,600	12,800	86,000	10,000	102,000
Juab Valley	19	15,000	50	750	200	16,000	21,000	24,000
Sevier Desert	22	13,200	1,500	860	270	16,000	18,000	31,000
Upper and central Sevier Valleys and upper Fremont River valley	20	16,000	200	5,000	6,300	28,000	25,000	23,000
Pavant Valley	21	68,600	100	100	300	69,000	80,000	91,000
Cedar City Valley	29	[3]23,700	900	[2]2,500	[2]400	[2]28,000	29,000	33,000
Parowan Valley	28	[3,4]24,100	300	200	200	25,000	27,000	29,000
Escalante Valley								
Milford area	24	53,700	0	1,000	300	55,000	69,000	61,000
Beryl-Enterprise area	30	[3]79,600	18,200	320	750	99,000	93,000	80,000
Other areas[5]		93,800	3,700	25,200	4,000	127,000	105,000	99,000
Totals (rounded)		504,000	[2]83,000	[2]144,000	[2]58,000	[2]790,000	[2]843,000	826,000

1 Includes some domestic and stock use.
2 Includes some previously unpublished revisions.
3 Data from reports of local water commissioners to the Utah Department of Natural Resources, Division of Water Rights.
4 Includes some use for stock.
5 Withdrawals are estimated minimums.

REFERENCES CITED

Appel, C. L., and others, 1983, Ground-water conditions in Utah, spring of 1983: Utah Division of Water Resources Cooperative Investigations Report 23, 97 p.

Christensen, R. C., Stephens, D. W., Pyper, G. E., McCormack, H. F., and Weigel, J. F., 1984, Quality and quantity of runoff and atmospheric deposition in urban areas of Salt Lake County, Utah: U.S. Geological Survey Water-Resources Investigations Report 84-4011, 215 p.

Holmes, W. F., and others, 1982, Ground-water conditions in Utah, spring of 1982: Utah Division of Water Resources Cooperative Investigations Report 22, 85 p.

National Oceanic and Atmospheric Administration, 1983, Climatological data (annual summary, 1982): Asheville, N. C., Environmental Data and Information Service, v. 84, no. 13.

Seiler, R. L., and Waddell, K. M., 1983, Reconnaissance of the shallow-unconfined aquifer in Salt Lake Valley, Utah: U.S. Geological Survey Water-Resources Investigations Report 83-4272, 33 p.

Thompson, K. R., 1982, Characteristics of suspended sediment in the San Juan River near Bluff, Utah: U.S. Geological Survey Water-Resources Investigations Report 82-4104, 21 p.

_____ 1983, Sanitary quality of the Jordan River in Salt Lake County, Utah: U.S. Geological Survey Water-Resources Investigations Report 83-4252, 40 p.

Weigel, J. F., 1984, Turbidity and suspended sediment in the Jordan River, Salt Lake County, Utah: U.S. Geological Survey Water-Resources Investigations Report 84-4019, 17 p.

Ward, J. A., Skoubye, C. M., and Ward, G. A., 1957, Flow characteristics and chemical quality of the Jordan River, Salt Lake County, Utah, for the year 1957: Utah State Water Pollution Control Board, 72 p.

WATER-RELATED REPORTS FOR NEVADA COMPLETED BY THE GEOLOGICAL SURVEY DURING 1981

<u>Carson City area, west-central Nevada</u>: "Flood and related debris flow hazards, Carson City quadrangle," by Terry Katzer and C. V. Schroer; Nevada Bureau of Mines and Geology Urban Map 1A1.

<u>Cold Spring Valley, Washoe Co.</u>: "Water resources of Cold Spring Valley, a growing urban area northwest of Reno, Nevada," by A. S. Van Denburgh; U.S. Geological Survey Open-File Report 80-1287, 77 p.

<u>Cottonwood Cove, Clark Co.</u>: "Potential flood and debris hazards et Cottonwood Cove, Lake Mead National Recreation Area, Clark County, Nevada," by Otto Moosburner; U.S. Geological Survey Open-File Report 80-1216, 11 p.

<u>Fallon area, Churchill Co.</u>: "Evaluation of the Pallmann [temperature-measurement] technique in two geothermal areas of west-central Nevada," by F. H. Olmsted, Irving Friedman, and D. R. Norton; part II of U.S. Geological Survey Professional Paper 1203, p. 13-21.

<u>Fallon area, Churchill Co.</u>: "Geohydrology of the basalt and unconsolidated sedimentary aquifers in the Fallon area, Churchill County, Nevada," by P. A. Glancy; U.S. Geological Survey Open-File Report 80-2042, 93 p.

<u>Grass Valley, Pershing Co.</u>: "The hydrothermal system in southern Grass Valley, Pershing County, Nevada," by A. H. Welch, M. L. Sorey, and F. H. Olmsted; U.S. Geological Survey Open-File Report 81-915, 193 p.

<u>Incline Village area, Lake Tahoe</u>: "Streamflow, sediment transport, and nutrient transport at Incline Village, Lake Tahoe, Nevada, 1970-73," by P. A. Glancy; U.S. Geological Survey Open-File Report 80-2045, 89 p.

<u>Las Vegas area, Clark Co.</u>: "Flood and related debris flow hazards, Las Vegas SE quadrangle," by Terry Katzer; Nevada Bureau of Mines and Geology Urban Map 3A1.

<u>Lemmon Valley, Washoe Co.</u>: "Geophysical reconnaissance of Lemmon Valley, Washoe County, Nevada," by D. H. Schaefer and D. K. Meurer; U.S. Geological Survey Water-Resources Investigations Open-File Report 80-1123, 29 p.

<u>Nevada Test Site, Nye Co.</u>: "Radioactive waste disposal in thick unsaturated zones," by I. J. Winograd; Science Magazine, v. 212, no. 4502, p. 1457-1464.

<u>Schurz area, west-central Nevada</u>: "Water resources of the Walker River Indian Reservation, west-central Nevada," by D. H. Schaefer; U.S. Geological Survey Open-File Report 80-427, 61 p.

<u>Yucca Mountain, Nye Co.</u>: "Interpretation of geophysical well-log measurements in drill holes UE25a-4, -5, -6, and -7, Yucca Mountain, Nevada Test Site," by J. J. Daniels; U.S. Geological Survey Open-File Report 81-615, 29 p.

Example 4.--List of discontinued gaging stations

The following continuous-record streamflow or stage stations in Minnesota have been discontinued or converted to partial-record stations. Daily streamflow or stage records were collected and published for the period of record shown for each station

Station number	Station name	Drainage area (mi^2)	Period of record
	Upper Mississippi River basin		
05210000	Mississippi River near Deer River, MN	a3,190	1945-50
*05213000	Prairie River near Grand Rapids, MN	485	1909†, 1925-49
05216800	O'Brien Creek near Pengilly, MN	-	1963-68
05217000	Swan River near Warba, MN	254	1954-69
05217500	Swan River near Swan River, MN	a290	1929
05218000	Mississippi River above Sandy River near Libby (above Sandy River), MN	4,560	1895-1915, 1925-29
05221000	Willow River near Palisade, MN	442	1929
05226200	Ripple (Mud) River near Wealthwood, MN	-	1937-39
05232000	Pelican Brook (Long Lake) near Pequot Lakes, MN	-	1938-42, 1943-47
05241500	Rabbit River near Crosby, MN	8.38	1945-63
05242700	Little Sand Lake outlet (Sand Lake outlet) near Dorset, MN	a74	1930-41
*05244000	Crow Wing River at Nimrod, MN	a1010	1910-14, 1930-81
05244500	Crow Wing River at Motley, MN	a2,140	1909†, 1913-17, 1930-31
05244980	Diversion from Long Prairie River near Osakis, MN	-	1939-47
05245000	Long Prairie River near Osakis, MN	-	1949-54
05245500	Long Prairie River near Motley, MN	973	1909-17, 1930-31
05246000	Crow Wing River at Pillager	a3,230	1903†, 1909-13, 1925-50
*05261000	Mississippi River near Fort Ripley, MN	a11,010	1906, 1909-10, 1929
05261500	Nokasippi River near Fort Ripley, MN	210	1929
*05268000	Platte (Platt) River at Royalton, MN	338	1929-36
05269000	Mississippi River near Sauk Rapids, MN	a12,400	1903-06
05270000	Mississippi River at Sartell, MN	a12,450	1929, 1943-47†
05270500	Sauk River near St. Cloud, MN	925	1909-12, 1913, 1929, 1930, 1931, 1932, 1933, 1934-81
05273500	Clearwater River at Clearwater, MN	-	1937, 1940-42
05274500	Elk River above St. Francis River near Big Lake, MN	384	1929
05274700	St. Francis River at Santiago, MN	-	1965-70, 1980-81
05274900	St. Francis River near Big Lake, MN	-	1965-70
05275500	Mississippi River at Elk River, MN	a14,500	1915-56
05276000	North Fork Crow River near Regal, MN	215	1943-54
05277000	Middle Fork Crow River at New London, MN	-	1939-42, 1943-47

"See footnotes at end of table."

Example 5.--List of discontinued surface-water-quality stations

DISCONTINUED WATER-QUALITY STATIONS

The following water-quality stations have been discontinued in Iowa. Continuous daily records of water temperature or sediment and monthly or periodic samples of chemical quality were collected and published for the period of record shown for each station. An asterisk (*) in the type of record column indicates that periodic data is available for that parameter subsequent to the period of daily record.

Discontinued water-quality stations

Station name	Station number	Drainage area (sq mi)	Type of Record	Period of record
Paint Creek at Waterville, Iowa.	05388500	42.8	Temp.	1952-56
			Sed.	1952-57
Turkey River at Garber, Iowa.	05412500	1,545	Temp., Sed.*	1957-62
Mississippi River at Dubuque, Iowa.	05414700	1,600	Chem.	1969-73
Maquoketa River near Maquoketa, Iowa.	05418500	1,553	Chem., Temp., Sed.	1978-82
Wapsipinicon River at Independence, Iowa.	05421000	1,048	Chem.*	1968-70
			Temp.*, Sed.*	1967-70
Crow Creek at Bettendorf, Iowa.	05422470	17.8	Chem., Temp., Sed.	1978-82
Iowa River near Rowan, Iowa.	05449500	429	Temp.*, Sed.*	1957-62
Cedar River at Cedar Falls, Iowa.	05463050	4,734	Chem.	1975-79
Cedar River near Gilbertville, Iowa.	05464020	5,234	Chem.	1971; 1975-81
Fourmile Creek near Lincoln, Iowa.	05464130	13.78	Chem., Temp., Sed.	1969-74
Half Mile Creek near Gladbrook, Iowa.	05464133	1.33	Chem., Temp., Sed.	1969-74
Fourmile Creek near Traer, Iowa.	05464137	19.51	Chem., Temp., Sed.	1969-74
Cedar River near Palo, Iowa.	05464450	6,380	Chem.	1975-79
Cedar River at Cedar Rapids, Iowa.	05464500	6,540	Chem.*	1906-07; 1944-54
			Temp.*	1944-54
			Sed.	1943-54
Cedar River near Bertram, Iowa.	05464760	6,955	Chem.	1975-81
Mississippi River at Burlington, Iowa.	05469720	4,000	Chem.	1969-73
Des Moines River at Fort Dodge, Iowa.	05480500	4,190	Chem.	1972-73
Des Moines River at Des Moines, Iowa.	05482000	6,245	Chem.	1954-55
			Temp., Sed.	1954-61
E. Fork Hardin Creek near Churdan, Iowa.	05483000	24.0	Temp.*,Sed.*	1952-57
Raccoon River at Van Meter, Iowa.	05484500	3,441	Chem.	1969-73; 1974-79
Raccoon River at Des Moines, Iowa.	05485000	3,590	Chem., Temp.	1945-47
Des Moines River below Raccoon River at Des Moines, Iowa.	05485500	9,770	Chem.*	1944-45
			Temp.*, Sed.	1944-47
Des Moines River below Des Moines, Iowa.	05485520	9,901	Chem.	1971; 1975-81
Middle River near Indianola, Iowa.	05486490	503	Temp.*, Sed.	1962-67
White Breast Creek near Dallas, Iowa.	05487980	342	Chem.	1968-73
			Temp., Sed.	1967-73
Big Sioux River at Sioux City, Iowa.	06485950	9,410	Chem.	1969-73
Floyd River at James, Iowa.	06600500	882	Temp., Sed.	1968-73
Floyd River at Sioux City, Iowa.	06600520	921	Chem.	1969-73
Missouri River at Decatur, Nebr.	06601200	316,160	Chem.	1974-81
Little Sioux River at Correctionville, Iowa.	06606600	2,500	Chem.*	1954-55
			Temp.*	1951-62
			Sed.	1950-62
Little Sioux River near Kennebec, Iowa.	06606700	2,738	Temp.	1950-55
			Sed.	1950-57
Little Sioux River at River Sioux, Iowa.	06607513	3,600	Chem.	1969-73
Soldier River near Mondamin, Iowa.	06608505	440	Chem.	1970-73
Steer Creek near Magnolia, Iowa.	06609200	9.26	Temp., Sed.	1963-69
Thompson Creek near Woodbine, Iowa.	06609590	6.97	Temp., Sed.	1963-69
Willow Creek near Logan, Iowa.	06609600	129	Chem., Temp.	1972-75
			Sed.	1971-75
Missouri River at Nebraska City, Nebraska.	06807000	410,000	Chem., Temp.	1951-77
			Sed.	1971-76
Mule Creek near Malvern, Iowa.	06808000	10.6	Temp.	1958-69
			Sed.	1954-69
Davids Creek near Hamlin, Iowa.	06809000	26.0	Temp.*	1952-53; 1965-68
East Nishnabotna River at Red Oak, Iowa.	06809500	894	Temp., Sed.	1962-73
Platte River near Diagonal, Iowa.	06818750	217	Chem.	1969-73
Thompson River at Davis City, Iowa.	06898000	701	Chem.	1967-73
			Temp., Sed.	1960-73
Weldon River near Leon, Iowa.	06898400	104	Chem.	1968-73
Chariton River near Chariton, Iowa.	06903400	182	Temp., Sed.	1969-73
Honey Creek near Russell, Iowa.	06903500	13.2	Sed.	1952-62
Chariton River near Rathbun, Iowa.	06903900	551	Temp.*, Sed.*	1962-69

Type of record: Chem. (chemical quality); Temp. (water temperature); Sed. (sediment).

Example 6.--Computer-generated 5-year hydrographs for four representative gaging stations

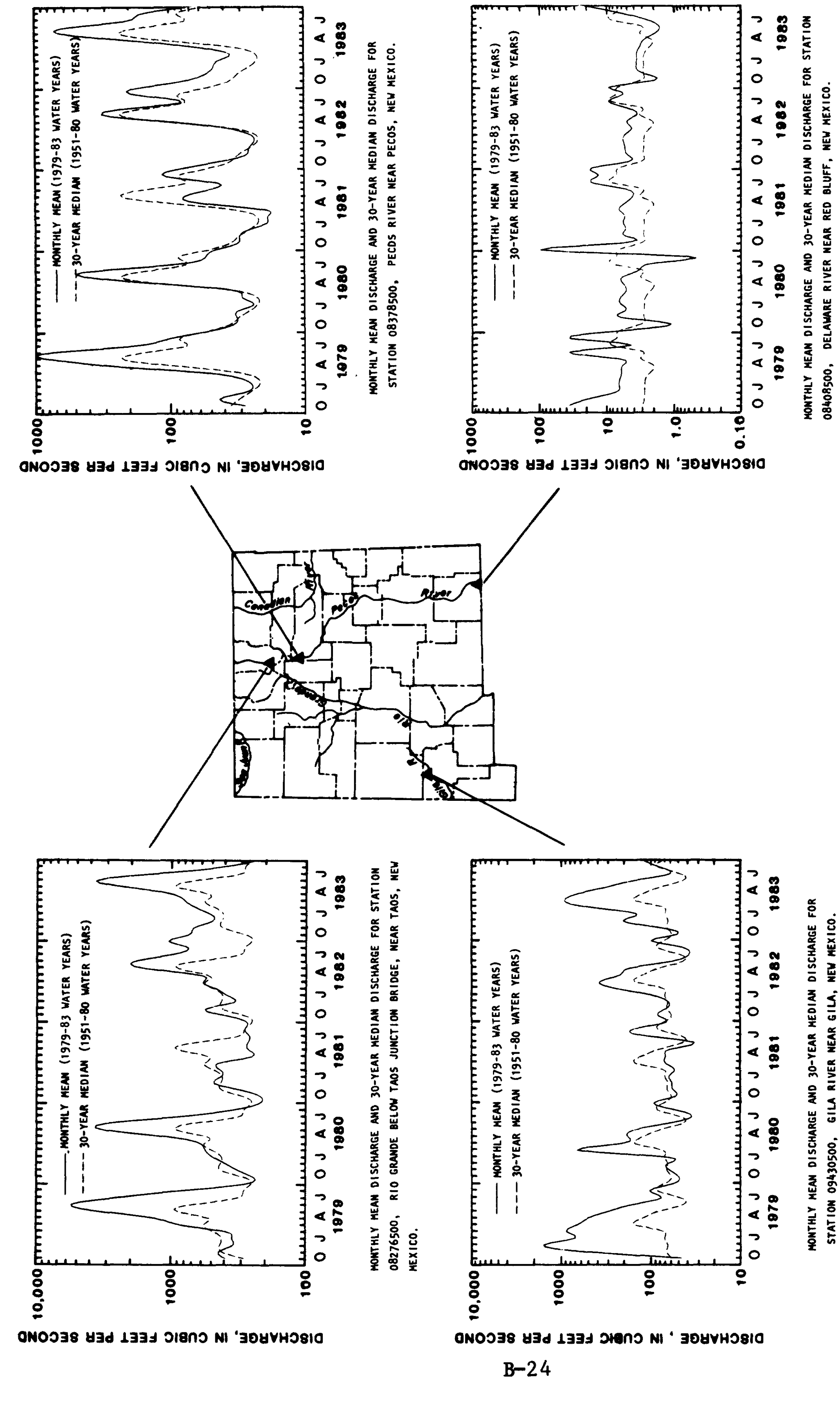


Figure 1.--Comparison of monthly mean discharges (1979-83 water years) to 30-year median (1951-80 water years).

Example 7.--Hydrographs for four wells showing long-term ground-water-level trends

5

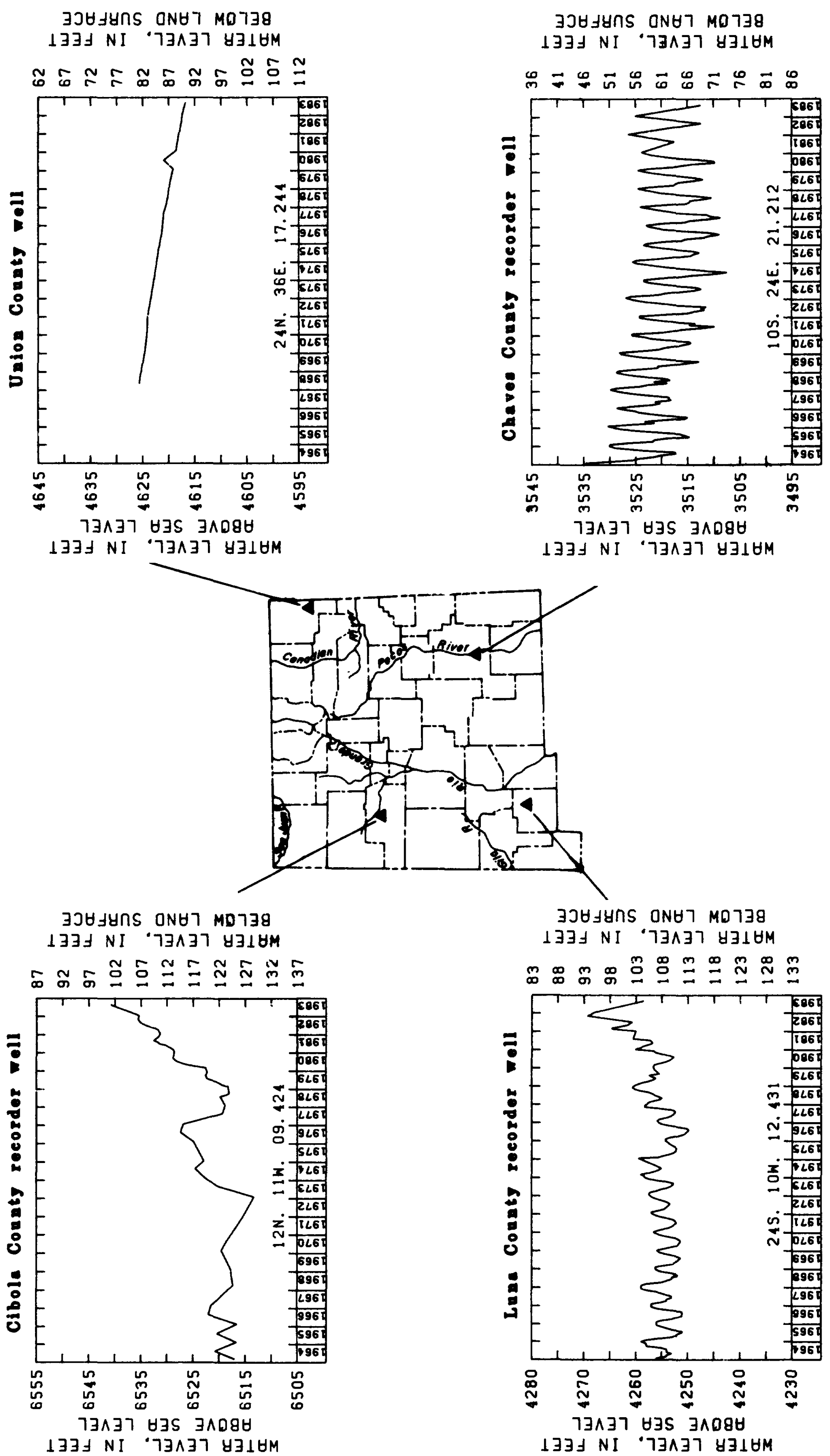


Figure 2.--Ground-water-level trends for last 20 years or period of record.

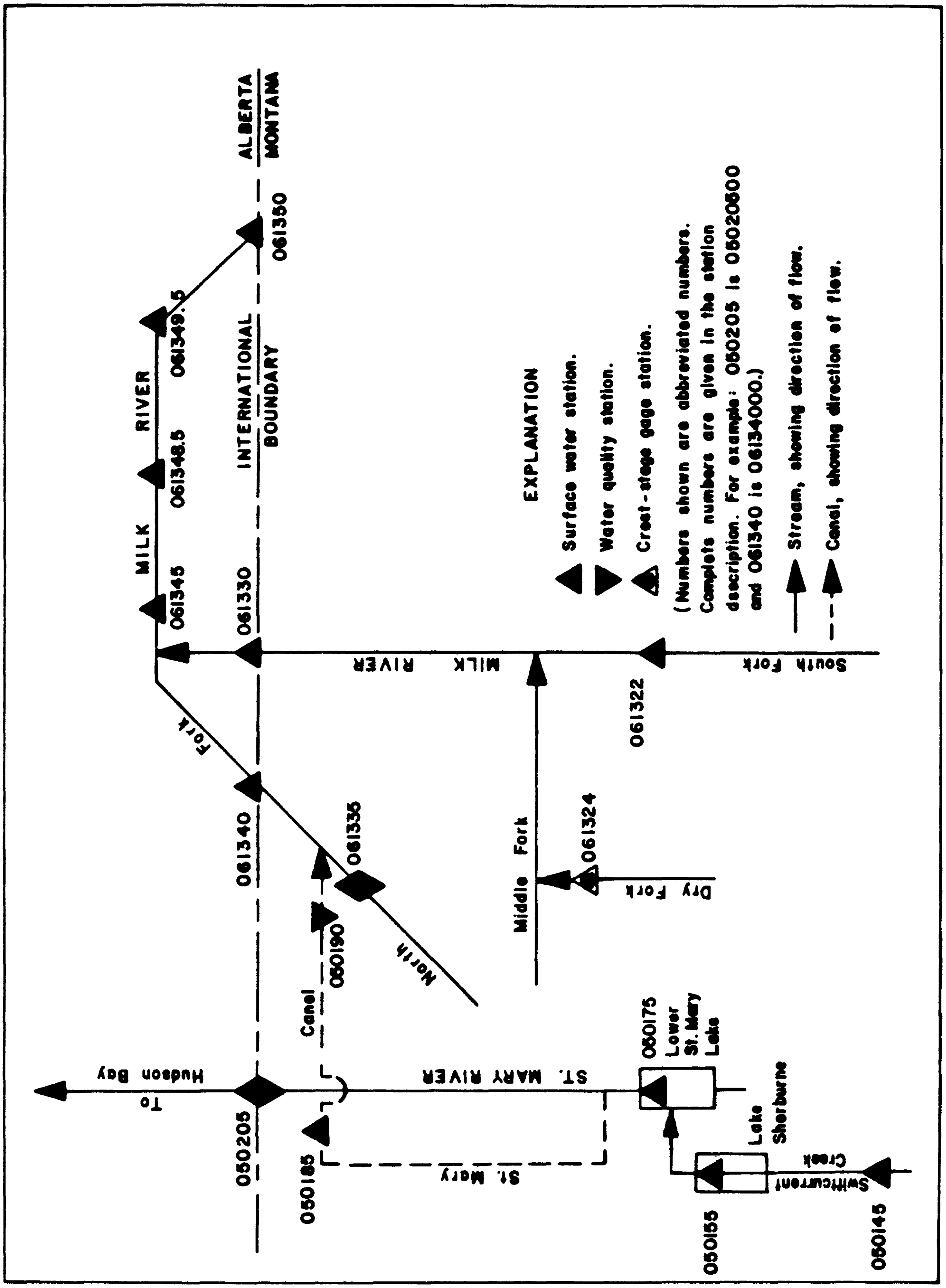


Figure 7. Schematic diagram showing diversion from St. Mary River in Part 5 to Milk River in Part 6.

Example 9.--Transmittal letter to U.S. Government Printing Office (GPO)[1]

United States Department of the Interior

GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
Post Office Box 1350
Albany, New York 12201
FTS 562-3107

NEW YORK DISTRICT

April 9, 1985

U.S. Government Printing Office
201 Varick Street
New York, New York 10014
ATTN: Israel Cargin

REGISTERED MAIL

Gentlemen:

Enclosed is camera copy for a 232-page book (i-viii, 1-224) for high quality direct-image printing (Itek or equivalent quality). The title is "Water Resources Data--New York, Water Year 1984, Volume 3, Western New York." We would like 400 copies printed and delivered to this office. Please inform us of the bid cost as soon as it is known.

Most of the report is to be printed by the direct image process (without intermediate negatives). No other process will be accepted. However, covers 1-4 and p. 18-21 require lithographic-quality printing; print these parts of the report by offset (using the negatives furnished) and collate with the direct-image copy. All positive copies will need reduction as specified on the attached "Printer's Instructions."

Please refer all questions to Margaret Evans at the above address.

Sincerely yours,

Lawrence A. Martens
District Chief

Enclosures:

Camera copy
Printing & Binding Requisition (2)
Printer's Instructions
Sample of previous volume (note that this year's
cover ink will be Pantone Purple U on white stock)

---

[1] Modified from transmittal letter to GPO from New York District. Edit to meet District needs.

Example 10.--Printing and binding requisition (SF-1)[1]
(Uncompleted, numerically coded form)

SF 1 PRINTING AND BINDING REQUISITION
To the PUBLIC PRINTER Please furnish the following:

JACKET NO (Assigned at GPO) | ☐ Red ☐ Black | REQUISITION NO (1)

FROM (Department or Government Establishment) (2) | Bureau or Office (3) | DATE (4)

APPROPRIATION CHARGEABLE/APPLICABLE LAW (5) | BILLING ADDRESS CODE (BAC) (6) | AUTHORIZED BY (7)

TITLE (8) | QUALITY LEVEL (9) | FORM NO.

QUANTITY (Units of finished products) (10) | FINISHED PRODUCT (Check One) ☐ Books or Pamphlets ☐ Blank Forms (Sheets) ☐ Sets ☐ Pads or Tablets ☐ Other (Specify) (11) | CLASSIFICATION

THIS ORDER RIDES (Department) | (Requisition No.) | (Jacket No.) | STRAP WITH REQUISITION NO.

PAPER STOCK AND INK

	FIRST CHOICE (Grade, color, and basis weight)	SECOND CHOICE (If any)	COLOR(S) OF INK
Text	(12)		(13)
Cover	(14)		(15)
OTHER (Specify) (16)	(17)		(18)

COMPOSITION

FURNISHED (Magnetic tape) ☐ Direct Drive ☐ Other (19) | (Negatives) | (Camera Copy) | (Manuscript) | (Shoot printed copy) | PREVIOUS JACKET/REQ. (If reprint)

TEXT TYPE (Point, Face, Leaded/Solid) | DISPLAY TYPE (Face) | MARGINS (After trim) Picas/inches: Back/Left, Top, Other | FOL. LIT. | FORMS MUST REGISTER | TYPEWRITER SPACING

TYPE PAGE WIDTH (Picas) | No. of Cols. | Col. Width | TYPE PAGE DEPTH (Include running head but not bottom folio) | ILLUSTRATIONS (Total) | PICK UP FROM: Jacket No. | Req. No. | RESTORE TO ORIGINAL JACKET | HOLD REPRODUCIBLES (Specify) (Negs., type, mag. tape) Weeks

PRESS AND BINDERY

PRINT ONE SIDE ONLY | HEAD TO HEAD (20) | HEAD TO FOOT | OTHER | COVER PRINTS 1 2 3 4 | EMBOSS | RULING (Print or Bindery) | PERFORATE | SCORE | Position | NUMBER (Inclusive) TO | Color of ink

SIZE FLAT (Inches) FORMS, SETS, PADS (21) x | FOLD TO (Inches) (22) x | SIZE TRIMMED PAGE (Inches) BOOKS/PAMPHLETS (23) x | PAGES (24) | FOLDINS/INSERTS (25) | PAPER COVERS (Self) (Separate) (26)

WIRE STITCH (Side) (Saddle) (27) (No.) | PASTE ON FOLD | LOOSELEAF (28) | ADHESIVE BOUND (29) | SEW | CASE BOUND | (Material and Color) | STAMP TITLE (Bindery) Cover | Spine | Gold | Im. Gold | Ink (color)

PAD/SETS (Gum) | (Stitch) | (Pos.) | (Sheets in Pad) | (Sets in Pad) | (Sheets in Set) | PUNCH/DRILL | (Shape) | (No. of holes) | (Diam.) | (Inches Center to Center) | (Pos.) | ROUND CORNERS (No.) | (Position)

GATHER (Explain) | CARBON INTERLEAVE | INDEX (Cut) | (Tab) | (Bleed) | LIP DIVIDERS (Height of Lip) | Width of cut ½ etc.) | (Pos.)

PROOFS AND DELIVERY

REQUESTED PROOF DATE (30) | PROOF SETS (Galley) (Page) | DEPT. HOLD (Workdays) (Galley) (Pages) | PROOFS TO

REQUESTED DELIVERY DATE (31) | KRAFT WRAP | SHRINK FILM | BAND IN SETS | SUITABLE (32) | OTHER PACKAGING (Specify) | QUANTITY IN PACKAGE | PACK IN CARTONS (33) | B/L FURNISHED

DELIVER TO (34)

ADDITIONAL INFORMATION

(35)

FOR ADDITIONAL INFORMATION CONTACT (Name and Telephone Number)
(36)

BILLING ADDRESS (If BAC has not been assigned)
(37)

I certify that this work is authorized by law and necessary to the conduct of the business of the above-mentioned government establishment.

STANDARD FORM 1 (Rev. July 1979)
Prescribed by GPO
Title 44 of the U.S. Code 1-111

(Authorizing Signature) | (Title)

NSN 7540-00-543-7077 PREVIOUS EDITION NOT USABLE

[1]See WRD Publications Guide, p. 353-357, for instructions on filling out form SF-1.

Example 11.--Printing and binding requisition (SF-1)[1]
(Sample completed form)

Sample: Circled items indicate information to be entered.

Information for these items is to be obtained from Publications Planning Unit before requisition is prepared.

SF 1 PRINTING AND BINDING REQUISITION
To the PUBLIC PRINTER Please furnish the following:

- From (Department or Government Establishment): DEPARTMENT OF THE INTERIOR
- Bureau or Office: U.S. Geological Survey
- Requisition no.: S-04020-I-GS
- Date: April 9, 1985
- Appropriation: 4-4062-02900 ID - 1450804
- Title: Water Resources Data--New York WY 1984 v. 3, Western NY
- Quality level: 4
- Quantity: 400
- Finished product: XX Books or Pamphlets

Paper stock and ink

	First choice	Second choice	Colors of ink
Text	White, offset book, Sub 50		Black
Cover	Vellum finish, white Sub 65		*Pantone Purple U
Other (Specify)			

Composition

- Camera copy: XX

Press and bindery

- Print: Head to head XX
- Size trimmed page (inches), books/pamphlets: **8 1/2" x 11"
- Pages: 232
- Paper covers: XX
- Adhesive bound: XX

Proofs and delivery

- Requested proof date: May 20, 1985
- Requested delivery date: May 27, 1985
- Deliver to: U.S. Geological Survey, Water Resources Division, Publications Unit, 341 U.S. Post Office & Courthouse, Albany, NY 12201

Additional information

*Print 100 percent solid (no screening).
**Trim size must be correct.
***Pack in even cartons.

Please call for approval before awarding bid. The direct-image process (Itek or equivalent quality) must be used for the bulk of this document using camera copy furnished. No other process will be accepted except for covers 1-4 and pages 18-21, which require lithographic-quality printing; print these parts of the report by lithography (using negatives furnished) and collate with the direct-image copy. Send two sample books (two complete, unbound, collated books) for approval before binding job. After approval, return camera copy and negatives to agency. See "Printer's Instructions" for additional information. Send copy of invoice to agency.

For additional information contact: Margaret Evans FTS 562-3017 or (508) 472-3107

Billing address:

(Authorizing Signature) (Title)

STANDARD FORM 1 (Rev. July 1978) Prescribed by GPO Title 44 of the U.S. Code

PREVIOUS EDITION NOT USABLE

[1]Modified from SF-1 sent to GPO by New York District - Edit to meet District needs.

PRINTER'S INSTRUCTIONS[1]

Title: "Water Resources Data--New York, Water Year 1984, Volume 3, Western New York" (Sample of previous volume is enclosed. See SF-1 for color of ink for this year's cover.)

<u>COVER</u> - Print by offset

Cover 1, 4: Negative furnished for covers 1 and 4 plus spine. It may be be necessary to cut & splice spine to fit thickness of book. See sample. Opaque as needed. Print with Pantone Purple U ink.

Cover 2 (calendar), cover 3 (metric conversion table): Negative is furnished, place at optical center. (See sample) Opaque as needed. Print with black ink.

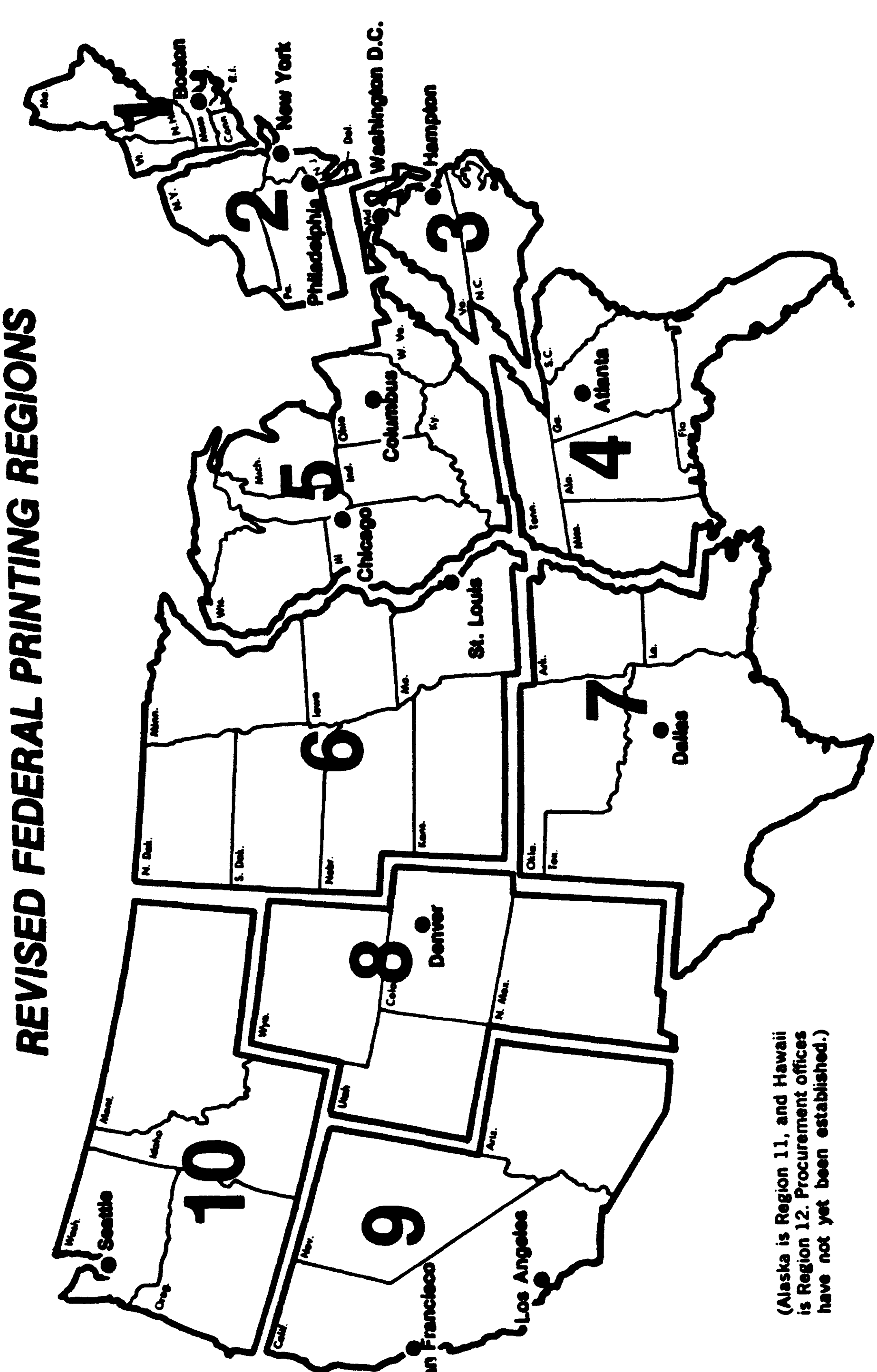
<u>TEXT</u>

Print by direct-image process. Reduce copy and position as indicated below:

Page	Reduction	Margins	
i-ii (Title page and Back of title page)	Print at 100% of original size.	---Position copy at optical center---	
iii (Preface)	Reduce to 90% of original size.	---Position copy at optical center---	
iv (OP. Form 272)	Reduce to 85% of original size.	Top margin 3/4 inch.	Outside margin 6/10 inch.
v	Reduce to 70% of original size.	Top margin 1 inch.	"
vi-viii	Reduce to 70% of original size.	Top margin 6/10 inch.	"
1	Reduce to 70% of original size.	Top margin 1 inch.	"
2-17	Reduce to 70% of original size.	Top margin 6/10 inch.	"
18-21	Negative enclosed (Print by lithography and collate).	Top margin 6/10 inch.	"
22-218	Reduce to 60% of original size.	Top margin 6/10 inch.	"
219	Reduce to 60% of original size.	Top margin 1 inch.	"
220-223	Reduce to 60% of original size.	Top margin 6/10 inch.	"
224	Blank		

[1]Modified from printer's instructions to GPO from New York District. Edit to meet District needs.

Example 13.--Map of Federal printing regions



GOVERNMENT PRINTING OFFICE REGIONAL PRINTING PROCURMENT OFFICES

REGION 1
U.S. Government Printing Office
Regional Printing Procurement Office
John W. McCormick Post Office & Court House
Room 1400, Post Office Square
Boston, Massachusetts 02109
Telephone: 617-223-7566

REGION 2 (I)
U.S. Government Printing Office
Regional Printing Procurement Office
8001 Roosevelt Blvd.
Suite 306, Third Floor
Philadelphia, Pennsylvania 19152
Telephone: 215-951-5441 FTS: 486-5441

REGION 2 (II)
U.S. Government Printing Office
Regional Printing Procurement Office
201 Varick Street, Room 752
New York, New York 10014
Telephone: 212-620-3321 FTS: 660-3321

REGION 3 (I)
U.S. Government Printing Office
Regional Printing Procurement Office
1st and N Streets, S.E.
Washington, D.C. 20403
Telephone: 202-775-9845

REGION 3 (II)
U.S. Government Printing Office
Regional Printing Procurement Office
Building 720-B
Langley A.F.B., Virginia 23665
Telephone: 804-827-2553 FTS: 928-2553

REGION 4
U.S. Government Printing Office
Regional Printing Procurement Office
R. B. Russell FOB, Room 788
75 Spring St., SW
Atlanta, Georgia 30303
Telephone: 404-221-5198 FTS: 242-5198

REGION 5 (I)
U.S. Government Printing Office
Regional Printing Procurement Office
610 South Canal St., Room 1051
Chicago, Illinois 60607
Telephone: 312-353-3916

REGION 5 (II)
U.S. Government Printing Office
Regional Printing Procurement Office
200 North High Street
Federal Building, Room 34
Columbus, Ohio 43215
Telephone: 614-469-6884 FTS: 943-6884

REGION 6
U.S. Government Printing Office
Regional Printing Procurement Office
210 N. Tucker Blvd., Room 1466
St. Louis, Missouri 63101
Telephone: 314-425-4371 FTS: 279-4371

REGION 7
U.S. Government Printing Office
Regional Printing Procurement Office
U.S. Courthouse & Federal Office Building
Room 3B7, 1100 Commerce Street
Dallas, Texas 75242
Telephone: 214-767-0451 FTS: 729-0451

REGION 8
U.S. Government Printing Office
Regional Printing Procurement Office
Denver Federal Center
Building 53, Room H-1004
Denver, Colorado 80225
Telephone: 303-234-2139

REGION 9 (I)
U.S. Government Printing Office
Regional Printing Procurement Office
Room 2E26, Federal Office Building
15000 Aviation Boulevard
Lawndale, California 90261
Telephone: 213-536-6650 FTS: 966-6650

REGION 9 (II)
U.S. Government Printing Office
Regional Printing Procurement Office
608 Folsom Street
San Francisco, California 94107
Telephone: 415-556-5356

REGION 10
U.S. Government Printing Office
Regional Printing Procurement Office
4735 East Marginal Way, South
Seattle, Washington 98134
Telephone: 206-764-3726 FTS: 399-3726

FIELD PRINTING OFFICES

CHICAGO FIELD PRINTING OFFICE
433 West Van Buren St., Room 300A
Chicago, Illinois 60607
Telephone: 312-353-2940 FTS: 353-2940

DENVER FIELD PRINTING OFFICE
Denver Federal Center
Building 53, Rm. D1010, P.O. Box 25347
Denver, Colorado 80225
Telephone: 303-234-2811 FTS: 234-2811

NEW YORK FIELD PRINTING OFFICE
201 Varick Street, Rm. 752, 7th Floor
New York, New York 10014
Telephone: 212-620-3327 FTS: 660-3327

SAN FRANCISCO FIELD PRINTING OFFICE
608 Folsom Street
San Francisco, California 94107
Telephone: 415-556-5356 FTS: 556-5356

SEATTLE FIELD PRINTING OFFICE
4735 East Marginal Way, South
Seattle, Washington 98134
Telephone: 206-764-3726 FTS: 339-3726

WASHINGTON, D.C. DEPARTMENTAL SERVICE OFFICE
Navy Yard
Washington, D.C. 20403
Telephone: 202-755-9871

Example 15.--Annual questionnaire for State data reports

QUESTIONNAIRE--1984 STATE DATA REPORTS

Publications Planning Unit
Water Resources Division
U.S. Geological Survey
418 National Center
Reston, Virginia 22092

From: District Chief________________________________

1. How many volumes are planned for publication? __________

2. To which volume does this form apply?____________
(Fill out separate questionnaire for each volume.)

3. How many pages will be in this volume?____________
(About 600 pages is the maximum for a volume.)

4. When will this volume be sent to the printer?________________

5. How many copies of this volume will be ordered?__________

6. How many copies of this volume will be distributed on your automatic mailing list?______________

7. Is volume subtitle (if any) on the 1983 volume correct?_________
If not, give correct subtitle:

8. Is cooperation statement on front cover (cover 1) of the 1983 volume correct?______________
If not, give correct statement:

9. Is return address on the back cover (cover 4) of the 1983 volume correct?_____________
If not, give correct address:

10. How many copies of the 1983 volumes do you have on hand?__________

11. Will the authorship remain the same for the 1984 volume?
Yes______, No_______
If not give the new listing below:

__________________, ________________, ______________________, and __________________

____

Signature of District Chief   Date

Example 16.--Revision of daily discharge (one month of record)[1]

02011800 JACKSON RIVER BELOW GATHRIGHT DAM, NEAR HOT SPRINGS, VA

LOCATION.--Lat 37°56'54", long 79°56'58", Alleghany County, Hydrologic Unit 02080201, on right bank 0.4 mi (0.6 km) upstream from Cedar Creek, 0.5 mi (0.8 km) downstream from Gathright Dam and Moomaw Lake, and 7.3 mi (11.7 km) southwest of Hot Springs.

DRAINAGE AREA.--345 mi² (894 km²).

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1973 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,400.00 ft (426.720 m) National Geodetic Vertical Datum of 1929 (Corps of Engineers bench mark). Prior to Dec. 20, 1973, nonrecording gage at same site and datum.

REMARKS.--Records good. Flow regulated since December 1979 by Moomaw Lake (station 02011795).

AVERAGE DISCHARGE.--8 years, 452 ft³/s (12.80 m³/s), 17.79 in/yr (452 mm/yr), unadjusted.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 29,000 ft³/s (821 m³/s) Dec. 26, 1973, result of cofferdam failure during construction of Gathright Dam, gage height, 18.77 ft (5.721 m), from rating curve extended above 4,400 ft³/s (120 m³/s) on basis of slope-area measurement of peak flow; minimum, 3.0 ft³/s (0.085 m³/s) July 12, 1979, result of gate closure at Gathright Dam, gage height, 7.78 ft (2.371 m); minimum daily, 47 ft³/s (1.33 m³/s) Sept. 2, 1981.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of June 21, 1972, reached a stage of 17.20 ft (5.243 m), from floodmark.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,980 ft³/s (84.4 m³/s) June 3, gage height, 12.20 ft (3.719 m); minimum, 5.6 ft³/s (0.16 m³/s) Apr. 6, gage height, 7.83 ft (2.387 m); minimum daily, 47 ft³/s (1.33 m³/s) Sept. 2.

REVISIONS.--The minimum daily discharge for water year 1980 has been revised to 55 ft³/s (1.56 m³/s) May 14-20. Revised daily discharges, in cubic feet per second, for June 1980, are given below. These figures supersede those published in the report for 1980.

June 1	899	June 9	242	June 17	66	June 25	66
2	1210	10	155	18	65	26	61
3	804	11	66	19	65	27	58
4	398	12	63	20	65	28	58
5	311	13	63	21	65	29	58
6	250	14	63	22	65	30	58
7	257	15	63	23	65		
8	260	16	66	24	66		

MONTH	TOTAL	MEAN	MAX	MIN	MEAN♦	CFSM♦	IN♦
June 1980	6051	202	1210	58	196	.57	.63
Wtr Yr 1980	193866	530	3860	55	584	1.69	23.05

♦ Adjusted for change in contents in Moomaw Lake.

[1]Reprinted as originally published in WDR: VA-81-1. Daily-discharge table for the 1981 water year (page 134) has been omitted.

Example 17.--Revision of peak discharges and daily discharges[1] for high-water periods during a water year

04087220 ROOT RIVER NEAR FRANKLIN, WI

LOCATION.--Lat 42°52'25", long 87°59'45", in SE 1/4 sec.22, T.5 N., R.21 E., Milwaukee County, Hydrologic Unit 04040002, on right bank 400 ft upstream from State Highway 100, 2.1 mi upstream from Root River Canal, 2.4 mi southeast of Franklin, 5.5 mi southeast of Hales Corners, and about 24 mi upstream from mouth.

DRAINAGE AREA.--49.2 mi^2.

PERIOD OF RECORD.--October 1963 to current year.

REVISED RECORD.--WDR WI-81-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 674.5 ft National Geodetic Vertical Datum of 1929.

REMARKS.--Records good. Flow affected by urbanization in the drainage basin.

AVERAGE DISCHARGE.--20 years, 43.9 ft^3/s, 12.12 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,700 ft^3/s Apr. 21, 1973, gage height, 9.31 ft; minimum, 0.38 ft^3/s Aug. 10, 1971, gage height, 1.45 ft.

EXTREMES OUTSIDE OF PERIOD OF RECORD.--Flood of Mar. 30, 1960, reached a stage of 9.57 ft, discharge, 5,130 ft^3/s, from rating curve extended above 2,000 ft^3/s on basis of contracted-opening measurement of peak flow.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 350 ft^3/s and maximum (*):

DATE	TIME	DISCHARGE (ft^3/s)	GAGE HEIGHT (ft)	DATE	TIME	DISCHARGE (ft^3/s)	GAGE HEIGHT (ft)
Dec. 3	0330	970	*8.60	Apr. 3	0015	*1,080	8.54
Dec. 6	0015	436	6.96	Apr. 9	2300	471	7.12
				Aug. 17	2300	473	7.13

minimum daily discharge, 4.3 ft^3/s Aug. 7 and 9.

REVISIONS.--Revised maximum discharges for water year 1981, revised daily discharges, in cubic feet per second, for high-water periods during the year, revised monthly and yearly discharges are given below. These figures supersede those published in the report for 1981.

Peak discharges above base of 350 ft^3/s and maximum (*):

DATE	TIME	DISCHARGE (ft^3/s)	GAGE HEIGHT (ft)	DATE	TIME	DISCHARGE (ft^3/s)	GAGE HEIGHT (ft)
Dec. 7	2030	406	6.80	Apr. 11	1445	*474	*7.33
Feb. 18	0830	466	7.27	Apr. 14	1715	457	7.21
Feb. 23	0445	418	6.90	aSept.30	2330	459	7.22

a Not independent of peak of Oct. 1, 1981.

Daily discharges:

Dec. 7	353	Feb. 19	359	Apr. 9	265	Apr. 14	396
Dec. 8	301	Feb. 22	256	Apr. 11	423	Apr. 15	266
Feb. 18	447	Feb. 23	354	Apr. 12	289	Sept.30	377

MONTH	TOTAL	MEAN	MAX	MIN	CFSM	IN.
December 1980	1574.2	50.8	352	9.2	1.03	1.19
February 1981	2411.8	86.1	447	9.0	1.75	1.82
April 1981	2705	90.2	423	12	1.83	2.04
September 1981	1024.8	34.2	377	3.5	0.70	0.77
Cal Year 1980	12982.5	35.5	777	4.1	0.72	9.81
Wtr Year 1981	11601.9	31.8	447	2.0	0.65	8.77

[1]Reprinted as originally published in WDR: WI-83-1. Daily-discharge table for the 1983 water year (page 104) has been omitted.

05572000 SANGAMON RIVER AT MONTICELLO, IL

LOCATION.--Lat 40°01'51", long 88°35'20", in SW1/4 sec.12, T.18 N., R.5 E., Piatt County, Hydrologic Unit 07130006, near center of span on downstream side of highway bridge, 0.5 mi (0.8 km) west of Monticello and at mile 162.2 (261.0 km).

DRAINAGE AREA.--550 mi² (1,424 km²).

PERIOD OF RECORD.--February 1908 to December 1912, June 1914 to current year. Monthly discharge only for some periods, published in WSP 1308. Published as "near Monticello" 1910-12.

REVISED RECORDS.--WSP 525: 1920. WSP 1115: 1946-47. WSP 1208: 1915-16, 1918-20, 1927, 1929, 1939. WSP 1508: 1908(M), 1917, 1928(M).

GAGE.--Water-stage recorder. Datum of gage is 625.89 ft (190.771 m) National Geodetic Vertical Datum of 1929. Prior to Sept. 30, 1964, nonrecording gage at site 0.2 mi (0.3 km) downstream at same datum. Oct. 1, 1964, to Oct. 22, 1971, nonrecording gage at present site and datum.

REMARKS.--Records fair except those for winter periods, which are poor. Several observations of water temperature were made during the year and are published under MISCELLANEOUS TEMPERATURE MEASUREMENTS in this report.

AVERAGE DISCHARGE.--71 years, 401 ft³/s (11.36 m³/s), 9.90 in/yr (251 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 19,000 ft³/s (538 m³/s) Oct. 4, 1926, gage height, 18.50 ft (5.639 m), from graph based on gage readings, site then in use; maximum gage height, 18.55 ft (5.654 m) May 16, 1968; minimum discharge, 0.2 ft³/s (0.006 m³/s) Oct. 10, 1954.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 1,800 ft³/s (51 m³/s) and maximum (*):

Date	Time	Discharge (ft³/s)	Discharge (m³/s)	Gage height (ft)	Gage height (m)
Apr. 17	1500	1950	55.2	12.09	3.685
May 18	2315	3920	111	13.92	4.243
June 23	0900	2850	80.7	12.97	3.953
July 7	0230	1810	51.3	11.94	3.639
July 23	0315	2780	78.7	12.90	3.932
July 29	1530	*4110	116	*14.07	4.289
Aug. 8	Unknown	3780	107	13.81	4.209
Aug. 17	Unknown	2650	75.0	12.70	3.871
Aug. 28	1945	2340	66.3	12.46	3.798

Minimum daily discharge, 2.6 ft³/s (0.074 m³/s) Nov. 2.

REVISIONS.--The peak discharges above base of 2,100 ft³/s (59 m³/s) and annual maximum (*) for some water years have been revised as shown in the following table. They supersede figures published in WSP 265, 325, 405, 505, 525, 545, 565, 585, 605, 625, 645, 665, 685, 700, 715, 730, 785, 825, 855, 895, 925, 1005, 1055, 1085, 1308, and 1678.

Water Year	Date	Discharge (ft³/s)	Discharge (m³/s)	Gage height (ft)	Gage height (m)
1909	Feb. 25, 1909	3240	91.8	11.2	3.414
	Apr. 14, 1909	3120	88.4	11.1	3.383
	Apr. 22, 1909	2540	71.9	10.6	3.231
1912	Mar. 29, 1912	4530	128	12.2	3.719
	Apr. 30, 1912	4250	120	12.0	3.658
1915	Aug. 17, 1915	3380	95.7	11.9	3.627
	Aug. 21, 1915	4140	117	12.4	3.780
1920	Mar. 15, 1920	2440	69.1	11.2	3.414
1921	Sept. 4, 1921	*1860	52.7	10.5	3.200
1922	Apr. 13, 1922	*5880	167	13.45	4.100
1923	Mar. 16, 1923	*5840	165	13.42	4.090
	May 18, 1923	5620	159	13.3	4.054
1924	June 30, 1924	5620	159	13.3	4.054
	Aug. 21, 1924	*5820	165	13.41	4.087
1925	Mar. 19, 1925	*2160	61.2	10.90	3.322
1926	Feb. 27, 1926	2160	61.2	10.9	3.322
	Sept. 7, 1926	5620	159	13.3	4.054
	Sept. 28, 1926	4620	131	12.7	3.871
1927	Nov. 18, 1926	3230	91.5	11.8	3.597
	Feb. 3, 1927	3530	100	12.0	3.658
	May 21, 1927	3830	108	12.2	3.719
	May 27, 1927	2550	72.2	11.3	3.444
1928	Dec. 10, 1927	4200	119	12.6	3.840
1929	Jan. 23, 1929	*4800	136	12.9	3.932
	Mar. 18, 1929	2190	62.0	11.2	3.414
	Apr. 3, 1929	2190	62.0	11.2	3.414
	May 20, 1929	2410	68.3	11.4	3.475
1930	Jan. 4, 1930	*2650	75.0	11.6	3.536
	Jan. 15, 1930	*2650	75.0	11.6	3.536
	Feb. 26, 1930	2300	65.1	11.3	3.444
1931	Sept. 19, 1931	*1620	45.9	10.53	3.210
1932	Jan. 19, 1932	*1420	40.2	10.22	3.115
1935	Jan. 12, 1935	*3270	92.6	12.04	3.670
	May 12, 1935	*3360	95.2	12.1	3.688
1937	June 28, 1937	*3800	108	12.37	3.770
1938	Apr. 9, 1938	*4720	134	12.86	3.920
1940	Mar. 5, 1940	*2870	81.3	11.88	3.621
1941	June 15, 1941	*1640	46.4	10.89	3.319
1944	Apr. 25, 1944	6000	170	13.5	4.115
1946	Dec. 31, 1945	2110	59.8	11.4	3.475
	May 5, 1946	2240	63.4	11.5	3.505
1947	June 10, 1947	3480	98.6	12.3	3.749

[1]Reprinted as originally published in WDR: IL-81-2. The daily-discharge table for the 1981 water year (p. 322) has been omitted.

Example 19.--Format[1] for publishing records of water discharge for periods greater than 1 year

03198020 TRACE FORK AT RUTH, WV

LOCATION.--Lat 38°18'30", long 81°43'40", Kanawha County, Hydrologic Unit 05050008, on right bank 200 ft (61 m) upstream from Dryden Hollow at Ruth.

DRAINAGE AREA.--2.82 mi² (7.30 km²).

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--July 1980 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 700 ft (213 m), from topographic map.

REMARKS.--Water-discharge records for period July to September 1980 fair. Water-discharge records for water year 1981 good except those for January, February, and those below 0.2 ft³/s (0.006 m³/s), which are poor. Water-discharge records for water year 1982 good except those for January, June, July, August, September, and those below 0.2 ft³/s (0.006 m³/s), which are poor.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 260 ft³/s (7.36 m³/s) May 30, 1982, gage height, 10.70 ft (3.261 m); minimum daily, 0.02 ft³/s (<0.001 m³/s) Aug. 23, 1982; minimum gage height, 6.90 ft (2.103 m) July 8, 1980.

EXTREMES FOR CURRENT PERIOD.--July to September 1980: Maximum discharge during period, 223 ft³/s (6.32 m³/s) July 10, gage height, 10.21 ft (3.112 m); minimum, 0.04 ft³/s (0.001 m³/s) July 8, gage height, 6.90 ft (2.103 m).

Water year 1981: Maximum discharge, 108 ft³/s (3.06 m³/s) June 4, gage height, 8.97 ft (2.734 m); minimum daily, 0.04 ft³/s (0.001 m³/s) Aug. 25-27, Sept. 12, 13.

Water year 1982: Maximum discharge, 260 ft³/s (7.36 m³/s) May 30, gage height 10.70 ft (3.261 m); minimum daily, 0.02 ft³/s (<0.001 m³/s) Aug. 23; minimum gage height, 7.01 ft (2.137 m) Oct. 3, 4.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1979 TO SEPTEMBER 1980
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1										.24	.34	2.0
2										.23	.27	11
3										.31	.25	5.2
4										.47	.83	2.1
5										.20	.48	1.2
6										.10	.25	1.9
7										.05	.30	2.0
8										1.2	.30	1.1
9										1.9	.52	1.3
10										32	.38	6.9
11										8.6	.23	2.5
12										7.1	.18	1.5
13										28	.15	1.1
14										4.4	.13	.82
15										1.7	.53	.71
16										.91	4.2	.63
17										.61	.72	.57
18										.45	1.3	.49
19										.34	2.0	.42
20										.24	.80	.40
21										.21	4.9	.52
22										.19	23	1.5
23										.25	34	3.5
24										.17	7.5	1.6
25										.14	4.0	1.5
26										.13	2.6	.99
27										1.4	1.8	.71
28										8.2	1.4	.59
29										1.0	2.0	.51
30										.52	4.9	.50
31										.38	3.1	---
TOTAL										101.64	103.36	55.76
MEAN										3.28	3.33	1.86
MAX										32	34	11
MIN										.05	.13	.40
CFSM										1.16	1.18	.66
IN.										1.34	1.36	.74

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[1] Reprinted as originally published in WDR: WV-82-1, except that the daily-discharge tables for the 1981 and 1982 water years have been omitted.

Example 20.--Revision of daily discharge (8 water years)[1]

164 KANAWHA RIVER BASIN

03199400 LITTLE COAL RIVER AT JULIAN, WV

LOCATION.--Lat 38°09'17", long 81°51'10", Boone County, Hydrologic Unit 05050009, on left bank on downstream side of highway bridge on State Route 3 at Julian, 5.6 mi north of intersection of U.S. Highway 119 and State Route 3, and at mile 17.4.

DRAINAGE AREA.--318 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1974 to current year.

REVISED RECORDS.--WDR WV-82-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 634.13 ft National Geodetic Vertical Datum of 1929. Prior to Apr. 21, 1976, nonrecording gage at same site and datum.

REMARKS.--Water-discharge records fair except those for January, April, August, and September, which are poor.

AVERAGE DISCHARGE.--9 years, 495 ft³/s, 21.14 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 23,800 ft³/s (revised) Dec. 9, 1978, gage height, 28.86 ft (corrected), from rating curve extended above 1,300 ft³/s; minimum daily, 16 ft³/s July 20, 1977.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 6,350 ft³/s Apr. 25, gage height 15.62 ft, no other peak above base of 4,700 ft³/s; minimum daily, 23 ft³/s Sept. 12, 27-30.

REVISIONS.--Revised figures for discharge for water years 1975-1982, superseding those published in corresponding annual reports are given herein.

EXTREMES FOR WATER YEARS 1975-1982.--Peak discharges above base of 4,700 ft³/s and maximum (*):

Water year	Date	Time	Discharge (ft³/s)	Gage height (ft)
1975	Mar. 12, 1975	2300	5430	a14.40
	Mar. 14, 1975	1200	5780	a14.90
	Mar. 29, 1975	1900	6610	a15.95
	Mar. 30, 1975	1400	6650	a16.00
	Apr. 25, 1975	2200	*6830	a16.20
1976	Mar. 21, 1976	1900	*5850	15.00
1977	Oct. 9, 1976	1730	7800	17.25
	Apr. 5, 1977	0900	*18000	25.30
	Aug. 14, 1977	2230	14400	22.90
1978	Dec. 6, 1977	0015	4830	13.47
	Jan. 26, 1978	1130	*23400	28.65
	Apr. 27, 1978	0500	8210	17.66
1979	Dec. 9, 1978	1000	*23800	28.86
	Jan. 2, 1979	1200	5960	15.14
	Jan. 8, 1979	0500	6360	15.64
	Jan. 21, 1979	2400	7990	17.44
	Feb. 24, 1979	2300	5140	13.98
	May 28, 1979	1400	5210	14.08
	June 22, 1979	1200	13900	22.58
1980	Apr. 30, 1980	1800	*8450	17.90
	July 11, 1980	0300	8130	17.58
1981	June 5, 1981	----	b5430	b14.27
	June 7, 1981	0700	*5860	15.01
1982	Feb. 9, 1982	Unknown	*b9400	Unknown
	May 30, 1982	Unknown	b6440	Unknown
	June 5, 1982	Unknown	b6830	Unknown

a From graph based on gage readings.
b Estimated from runoff comparison with nearby stations.

Water year 1975: Minimum daily discharge, 46 ft³/s Aug. 30, Sept. 4, 5, 1975.

Water year 1976: Minimum daily discharge, 24 ft³/s Sept. 8, 9, 24, 1976.

Water year 1977: Minimum daily discharge, 16 ft³/s July 20, 1977.

Water year 1978: Minimum discharge, 23 ft³/s Sept. 27, 28, 29, 1978, gage height, 1.59 ft.

Water year 1979: Minimum daily discharge, 18 ft³/s Oct. 11, 25, 1978.

Water year 1980: Minimum daily discharge, 52 ft³/s July 2, 1980.

Water year 1981: Minimum daily discharge, 32 ft³/s Sept. 29, 30, 1981.

Water year 1982: Minimum daily discharge, 28 ft³/s Oct. 13, 16, 17, Nov. 17, 1981.

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[1]Reprinted as originally published in WDR: WV-83-1, except that the daily-discharge tables for 9 water years (8 revised) have been omitted.

Local well numbers

Wells and springs in California are assigned numbers according to their location on the rectangular system for the subdivision of public land. For example, in the number 005S/010E-22G01 M, the part of the number preceding the slash indicates the township (T.5 S.) and the number between the slash and hyphen indicates the range (R.10 E.); the digits following the hyphen indicate the section (sec.22); the letter following the section number indicates the 40-acre subdivision of the section. Within each 40-acre tract, the wells are numbered serially, as indicated by the final digit. The final letter, separated from the rest of the number by a space, indicates the base line and meridian. Base-line and meridian designations are as follows: H, Humboldt; M, Mount Diablo; S, San Bernardino. See figure 4.

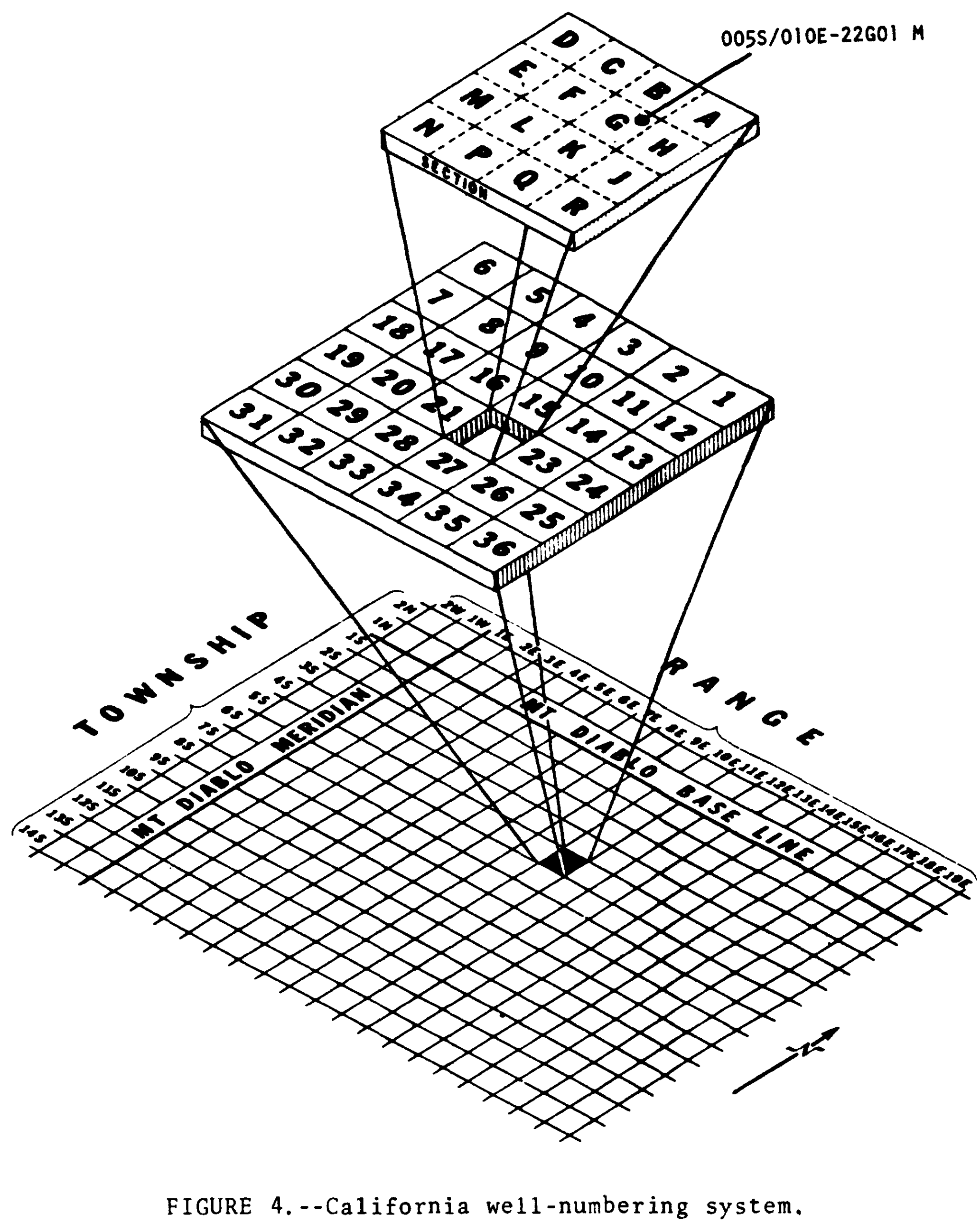

FIGURE 4.--California well-numbering system.

EXPLANATION OF GROUND-WATER LEVEL RECORDS

Collection of the data

Ground-water level data from a network of observation wells in Kentucky are published herein. These water-level measurements provide a sampling and historcal record of water-level changes in the state and nation's most important aquifers.

The water-level data are published by county in alphabetical order, then in ascending order of latitude within the county. Each well is identified by means of (1) a 15-digit number that is based on the grid system of latitude and longitude as shown in figure 4, (2) where applicable a local number that is provided for continuity with older reports and for other use as dictated by local needs, and (3) a map number for locating wells in each county. This is an arbitrary number, beginning with one at the bottom of the map (south) and increasing to the top (north). Location maps for ground-water level data precede the data.

Measurements are made in many types of wells under varying conditions, but the methods of measurement are standardized to the extent possible. Records of water levels are obtained from taped measurements, or from a water-level recorder that produces either a continuous graph of the fluctuations or a tape punched at selected time intervals. The equipment and measuring techniques used at each observation well insure that measurements at each well are of consistent accuracy and reliability.

Water-level measurements are reported in feet below land-surface datum. The altitude of land-surface datum at each well is National Geodetic Vertical Datum of 1929 (NGVD). Where altitude by precise leveling is not available, the NGVD land-surface datum is approximated from a topographic map and is thus noted in the well description. Water levels in wells equipped with recorders are reported for noon each day when available. A water-level hydrograph of data for the current year and two preceding years is included for all wells equipped with recorders.

Water levels are published to as many significant figures as can be justified by the local conditions. For example, in a measurement of a depth to water of several hundred feet, the error of determining the absolute value of the total depth to water may be a few tenths of a foot, whereas the error in determining the net change of water level between successive measurements may be only a hundredth or a few hundredths of a foot. For lesser depths to water, the accuracy is greater.

Low- and high-water levels included at bottom of tables are extremes for data in the table only. Extremes for period of record in the site descriptions are historical water levels that were recorded or measured manually at any time.

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[1]Reprinted as originally published in WDR: KY-83-1 and WDR: WI-82-1.

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EXPLANATION OF GROUND-WATER-LEVEL RECORDS

COLLECTION OF THE DATA

Ground-water-level data for 70 observation wells are published in this report. These wells are part of a network of 199 observation wells measured in Wisconsin. Of the 70 wells, 21 are measured by U.S. Geological Survey personnel, 39 by State or County personnel, and 10 by interested area residents.

These data represent water-table and artesian conditions in the principal aquifers of the State. Precipitation is the major climatic factor affecting ground-water levels. Spring and fall are the seasons when the water table is the highest.

An exception to these conditions is in the sandstone aquifer in southeastern Wisconsin where heavy municipal and industrial pumping is causing a continual decline in the water level. Water in this aquifer is under artesian pressure where confined by the overlying Maquoketa Shale.

Water levels in artesian wells in the State are sensitive to major earthquakes. Response to earthquakes worldwide is observed on graphs from water-stage recorders as an instantaneous rise and fall in water level and generally occur within an hour of the initial shock.

Water-level records for 58 wells are obtained from direct measurements with a steel tape; records for 13 are from the graph on a water-stage recorder. Water-level measurements in this report are referenced to the land-surface datum (lsd)--a datum plane approximately at land surface at each well. The altitude of the lsd above the National Geodetic Vertical Datum of 1929 and the height of the measuring point (MP) above or below the lsd is given in each well description. All taped measurements are listed. For wells with recorders, lows are listed for every fifth day and at the end of the month (eom). Normally, water levels are reported to a hundredth of a foot. The absolute value of the depth to water may be in error by a few tenths of a foot, but the error in determining the net change in water level between successive measurements is normally only a hundredth or a few hundredths of a foot.

Example 23.--Summary of hydrologic conditions. ground-water-levels section (two States)[1]

Ground-Water Levels

Water-level changes that occurred during the 1982 water year were determined from a statewide network of observation wells measured by numerous Federal, State, and local agencies. The network consists of more than 3,200 wells measured annually, semiannually, or monthly and 65 wells equipped with continuous recorders. The observation wells used as examples in the following discussion are typical of those in the network having similar hydrologic characteristics. (See figure 2.)

The hydrograph of the well in Garden County shows the response of water levels to climate effects in an area where there is little development of ground- or surface-water resources. At the beginning of the water year the water level was slightly below the long-term average, with very little change from the previous year's level. Less-than-normal precipitation during the winter and early spring caused water levels to decline slightly and they remained less than average through the summer despite greater-than-normal rainfall.

The greater-than-normal rainfall during the growing season had a more significant effect on water levels in irrigated areas of the State. Water levels were higher in most areas prior to the irrigation season because the 1981 irrigation season had been shortened by late-summer rains. Most of the State received greater-than-normal rainfall during July and August of 1982, which decreased the need for ground water for irrigation, resulting in less seasonal drawdown of water levels.

The hydrograph of a recorder-equipped observation well in an irrigated area of Chase County illustrates these trends. Although the water level in this well had declined progressively since 1966, the level was higher prior to the irrigation season than in 1981, and the decline during the summer was less.

Rainfall was less than normal during July and August of 1982 only in the south-central part of the State, and the effect on water levels is shown by the hydrograph of a recorder-equipped well in Adams County. Before the 1982 irrigation season, the water level was higher than at the same time in 1981, reversing a downward trend that began about 1950. Large withdrawals for irrigation caused the water level to decline below last year's lowest level, and at the end of September the level was about 1 foot below the level of last year.

The key observation well in Saunders County represents a condition common in stream-valley aquifers in Nebraska where water levels reflect a balance maintained between pumpage from the aquifer and induced recharge from a nearby stream. Local precipitation affects the volume of pumpage from the aquifer, and stream stage affects the recharge. Although much below average during 1981, water levels rose through the fall and winter of 1982 and by January were above long-term average. Greater-than-normal rainfall and concomitant increases in streamflow during May raised water levels to several feet above average, and they remained well above average through the end of the water year.

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[1]Reprinted as originally published in WDR: NE-82-1 and WDR: WI-83-1.

Example 23.--Summary of hydrologic conditions, ground-water-levels section (two States)--Continued

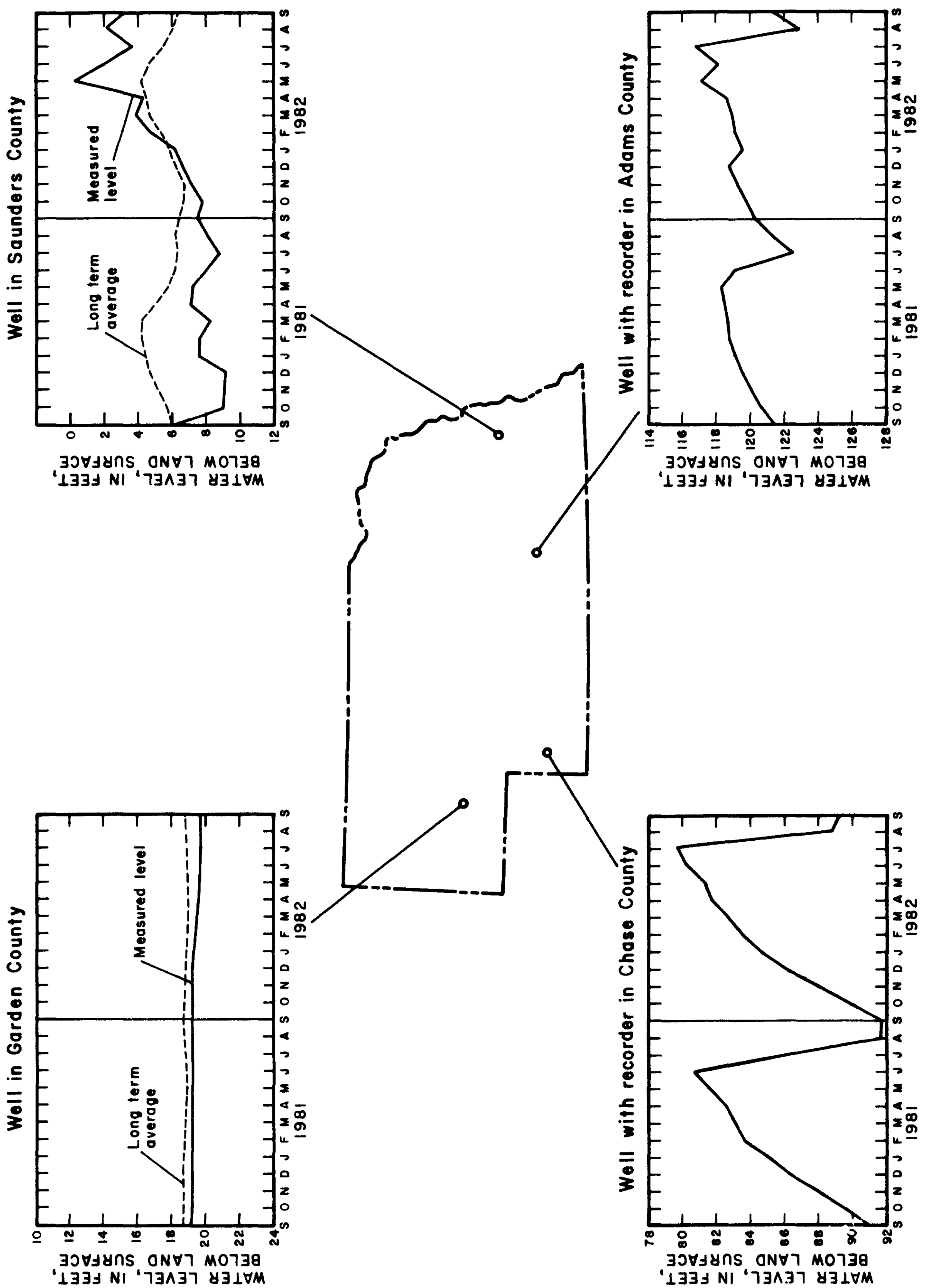

Figure 2.--Hydrographs of representative observation wells, 1981 and 1982.

GROUND-WATER LEVELS

The seasonal level of the water table reflects natural recharge and discharge, and indirectly reflects long-term precipitation trends. Changes in the water table are represented by seasonal averages of measurements made in 29 shallow-aquifer wells.

The relation of seasonal water-table levels during 1983 to the long-term means, or normals, is shown in figure 3. The normal water level is defined as being within one-half the standard deviation of the seasonal mean for the period of record. The months included in each season are grouped so that SPRING includes the months of March, April, and May when ground-water recharge is highest. The seasons are: WINTER, December to February; SPRING, March to May; SUMMER, June to August; and FALL, September to November.

During the last quarter of last year (September-November 1982), water levels in south-central and north-central Wisconsin were above normal and two areas on the east coast showed below normal levels. The first quarter of this year (WINTER), water levels were above normal throughout most of the State. Areas in central and southeast Wisconsin were normal, and below normal levels were measured in wells in Kewaunee and Kenosha Counties. In the SPRING, water levels continued to be above normal over the State. Water levels at four isolated wells were in the normal range, and levels at the Kewaunee and Kenosha wells remained below normal. During the SUMMER, water levels again fell into the normal range in central Wisconsin and a total of five wells in eastern Wisconsin had below normal levels. Still, the level of the water table over most of the State was above normal. In the FALL, the relation of the level of the water table to normal levels remained about the same as it was during the summer.

In summary, the water-table level in Wisconsin was above normal throughout most of the State during 1983. As indicated on figure 3, levels in many of the wells were more than one standard deviation above normal (none were more than one below normal). Seven of these (in Barron, Clark, Dane, Lafayette, Langlade, Taylor, and Trempealeau Counties) maintained levels more than one standard deviation above normal through all four quarters. Below-normal levels persisted in wells in Kewaunee and Kenosha Counties; probably the result of pumping from the deep-confined aquifer in the Green Bay and the southeast Wisconsin-northeast Illinois areas. Levels in the Kewaunee well were below normal all of 1982.

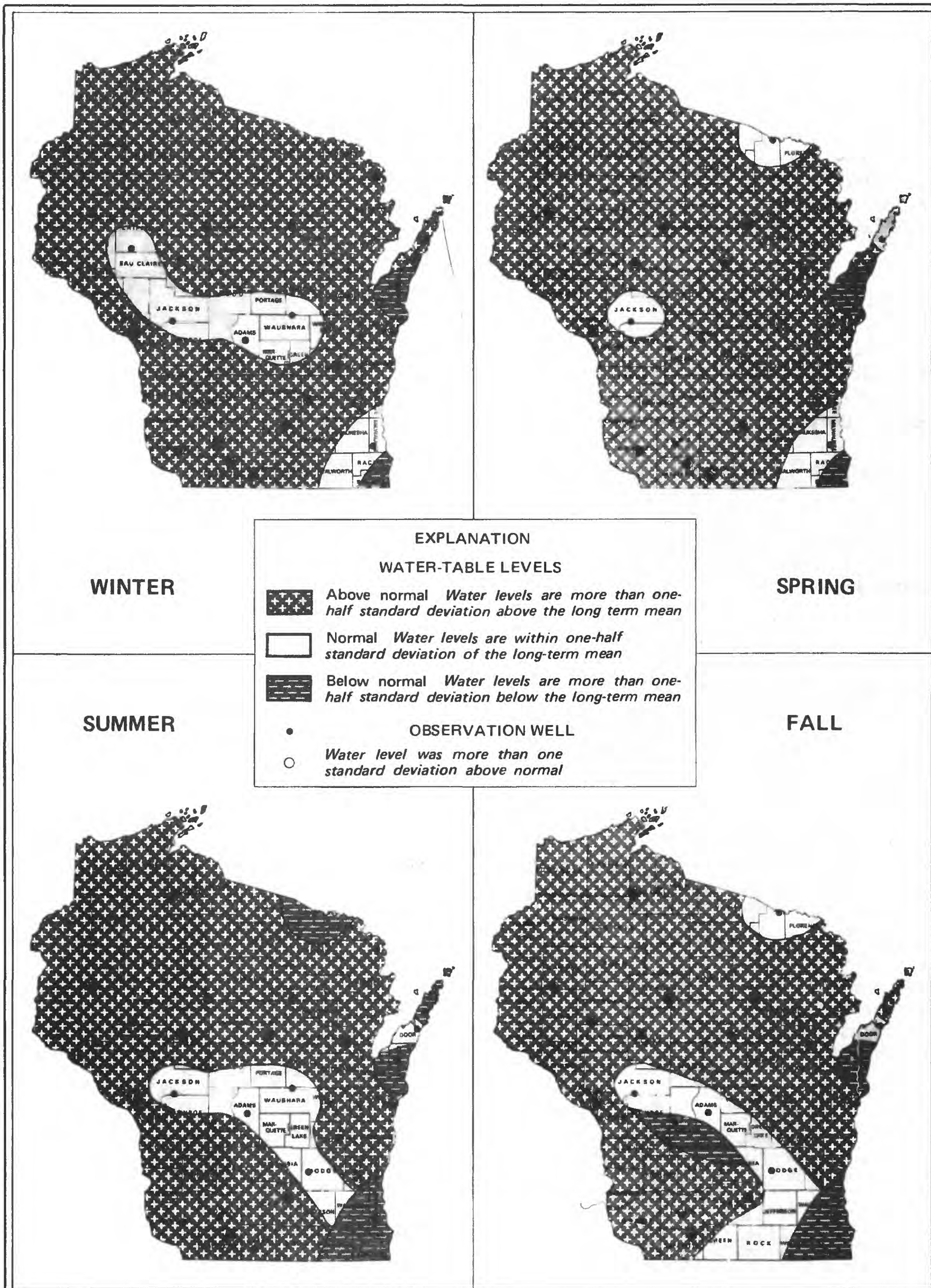

Figure 3. Relation of seasonal water-table levels to long-term means.

*U.S. GOVERNMENT PRINTING OFFICE:1987-181-407:40065