Bruce

CANADA

MANUAL OF HYDROMETRIC DATA REVIEW PROCEDURES

PREPARED BY: D.W. KIRK
DATA REVIEW ENGINEER
APPROVED BY: W.J. OZGA
HEAD, DATA CONTROL SECTION
APPLIED HYDROLOGY DIVISION

DEPARTMENT OF THE ENVIRONMENT
WATER RESOURCES BRANCH – WATER SURVEY OF CANADA
OTTAWA, ONTARIO – DECEMBER 1, 1972

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INTRODUCTION

This Manual has been prepared to provide a uniform set of standards and procedures for use in the review of historical hydrometric survey data. It is a new edition of the former Manual of Hydrometric Data Review Procedures dated May 1, 1971; all former standards and procedures are replaced by those given herein.

The systematic review of hydrometric survey data was initiated in 1960 by the Water Resources Branch, although prior to that date, data for individual gauging stations had been reviewed from time to time for various purposes.

In 1971 it was decided to place high priority on the establishment of a data review program in each District, with a deadline for completion by March 31, 1976, or earlier if possible. This program involves the review of all streamflow data to 1970 within the criteria listed below. It is considered a final review program in that future reviewing should be a part of the current office computations and not a separate activity.

(a) Only streamflow stations with five or more years of records will be included.

(b) Stations where data are contributed will not be included.

(c) Canal stations will not be included.

The primary purpose of the hydrometric survey data review which is now being undertaken is to discover and correct, as far as possible, significant errors in the existing records. The review also serves broadly to assess the reliability of the records produced, and also serves as a means for recommending future improvements where possible. On completion of the review for the various drainage basins, the users will be notified of the revisions in the appropriate publications.

CONDUCT OF HYDROMETRIC SURVEY DATA REVIEW

1. To be effective, the review procedure must be as uniform as possible. To achieve this uniformity the review operation will be conducted under the general supervision of the Data Control Section in Ottawa. Regular contact will be maintained between Ottawa and the District Offices by monthly reporting forms (R302) being sent to the Data Control Section by the District Data Review Engineer at the end of each month.

2. As the Hydrometric Survey Data Review Program now is established, review work will be done by review staffs in each District, as well as by the Data Control Section. The Ottawa review staff will conduct approximately one third of the entire review program, providing assistance in the review operations in each District.

3. Staff, whose primary function is review work, should be engaged as continuously as possible on this program, but must also be available for field work in times of flood or other emergencies, and should be given every opportunity to keep up with the latest field and office techniques.

4. All review work will be done in accordance with the procedures outlined in this Manual. Exceptions to this rule will be made only with the approval of the Data Control Section, Ottawa.

5. After completion of the review of a group of stations, a report will be prepared covering the results of the review for each station in the group. Joint approval is required by the District Office concerned and Ottawa before the results of the review can be released to users.

GENERAL REVIEW PROCEDURES

1. The instructions outlined in this manual are designed as a guide for the systematic review of streamflow data in the various District Offices. It is essential that the review be conducted with care and in sufficient detail so that another review of the same data will not be necessary at a later date. However, since time and staff are limiting factors it will not be possible to check each figure or minor interpretation; therefore, short-cut methods will have to be used with spot checks being made of the routine computations.

2. The review involves the examination of the base data available to the District Office staff at the time the original computations were made and pertinent data acquired subsequently, as well as the checking of the records for errors in interpretation and/or computation. The review also involves the examination of material pertaining to the magnetic tape files FLOW and PEAKS; this examination will reveal typographical errors and errors made in the computation of monthly summary figures. Data previously published in the Surface Water Data publications will also be examined and the errors noted. Whether or not revisions are made will depend on the criteria outlined herein and upon the judgment of the reviewer in their application.

3. In reviewing past records, inconsistencies may be noted in the methods of computation; for example, some of the monthly total discharges in ac-ft have been computed from the monthly mean discharge in cfs while others have been computed from the total cfs-days for the month. It will be noted also that the number of significant figures used in the original computations may not be consistent throughout the period of record. All these inconsistencies in past records were removed when the magnetic tape file FLOW was created. However, when revisions are indicated as a result of the review, all necessary hand computations must be carried out in conformity with present standards. The "cfsm" and "depth in inches" will not be re-computed.

4. The determination or check of drainage areas will not be part of the review program but will remain the responsibility of the District Office, with assistance being provided as required from Head Office.

5. Since the calendar year has been adopted as the basis for publication of Surface Water Data, review work will also be performed on that basis. The updating to 1970 of all previous data review reports will be based on the calendar year.

6. Experience gained in the review may result in suggestions for revision in some of the procedures outlined in this Manual. Such suggestions should be forwarded to the Data Control Section, Ottawa, for consideration and approval prior to implementation. Any suggestions adopted will be covered by addendum sheets to this instruction Manual. New editions of the Manual will be published when considered necessary.

CRITERIA FOR REVISING STREAMFLOW DATA

1. As a general rule revison will be made when the indicated change of:

   (a) a daily discharge is 50% or more;

   (b) an annual extreme, either maximum instantaneous, or maximum or minumum daily discharge is 15% or more;

   (c) a monthly mean discharge is 10% or more.

These criteria will be waived in the circumstances detailed in the following paragraphs.

2. (a) Computation errors in daily discharge figures, such as those resulting from the misapplication of a stage-discharge table or from the use of incorrect gauge heights usually will be corrected only as required by the criterion at 1 (a). Although the indicated changes to the daily discharge figures in a particular month may be within this criterion, the monthly mean should always be roughly re-computed to check that criterion 1 (c) is not exceeded. Typographical errors in daily discharge figures which do not involve a revision of associated data usually will be corrected wherever found, regardless of the criterion, recorded in the Review Report and corrected on the FLOW file.

2. (b) Typographical errors in monthly summary figures will also be corrected wherever found, regardless of the criterion at 1 (c). However, computation errors in monthly summary figures need only be listed as revisions if the indicated change exceeds 1%. (By "computation error" is meant an error in the addition of the daily discharges and division and multiplication of the total to obtain the mean and acre-feet).

3. If a revision is made to satisfy one of the above criteria, all the affected data must be revised. For example, if a maximum instantaneous discharge is revised by 18% because of a revision to the stage-discharge curve, all the daily discharges, monthly totals, means and acre-feet affected must be re-computed for <u>all</u> years in which the curve was used, regardless of the percentage criteria.

4. Application of any of the criteria should be made with discretion. Instances will be encountered where the criteria should either be relaxed or be made more stringent. Poor definition of the stage-discharge relation through lack of adequate discharge measurements in the high or low water range may warrant an increase in the percentage given in criterion 1 (b) to 20 per cent or more. In other cases, criterion 1 (c) may have to be relaxed for certain periods where changes in excess of 10 per cent are indicated, such as during a shift in the stage-discharge relation. Strict application of the percentages given in the criteria may not be justified where discharges are very small, for example, a change in a monthly mean discharge from 0.5 cfs to 0.4 cfs may be indicated but it is doubtful if such a revision would be worthwhile. Special consideration should be given to the appropriateness of the criteria in high and low flow periods especially when either the maximum or minimum for the period of record is involved. In these instances revisions may be desirable even if the indicated revision is less than the tolerance suggested. It is probable that other instances will be encountered when a strict application of the criteria will not be practical.

SYMBOLS

1. Symbols will be used when necessary to explain a particular condition. The symbols described in the latest edition of the Manual of Hydrometric Office Procedures, such as the following symbols, should be used where applicable:

A - Manual Gauge

B - Ice Conditions

E - Estimated

F - Water level from floodmark

G - Water level from graph of observed readings

2. *-Revised

Enter an asterisk to the right of the figure or notation that has been revised or corrected during the review. This also applies to typographical or computation errors but it does not apply where a figure has been changed to comply with the rule for significant figures.

3. Use the same symbol, capitalized, for the same purpose throughout the review in so far as possible. Every symbol must be accompanied by an appropriate reference in a footnote.

PROCEDURE FOR REVIEWING STREAMFLOW DATA

1. Assemble all the available data for the station under review. These will include the original discharge measurement notes and level checks, the list of discharge measurements, the gauge observation books, recorder charts, stage-discharge curves and tables, original forms R79 or equivalent, hydrographs, winter discharge computations, published records, letter file, station description, gauge history, station analysis, etc.

2. Use "Review Progress", form R256, for each station, checking the spaces provided as each step in the review is completed, even if there is no data to be checked.

3. Prepare the "Station History" on form R257. Enter the drainage area in the space provided. This may aid in interpreting the significance of rapid fluctuations in the annual discharge hydrograph and may also provide a guide to the significance of a discharge measurement not plotting on the hydrograph. Additional data are to be entered under the following headings, which are not printed on form R257 as notes under each will vary in length:

(a) Period of record. Although the data will be reviewed only to the cut-off date, indicate whether the station was active on the date the Station History was prepared, e.g., "May 1913 to date". Also list any changes in the name of the station.

(b) Purpose. State the purpose for which the station was originally established, any changes in purpose, the requesting agency (quote reference file and letter), co-operation with other organizations, known users of the data, and reason (s) for discontinuing or re-establishing the station.

(c) Location. Describe the original location and changes, if any, and reasons for changes. In some cases where there has been a change it may be more desirable to show headings 3 (d) to 3 (g) separately for each location.

(d) Discharge measurements. Indicate whether the measurements were made by wading, from cableway, etc., and give the location of the measuring section in relation to the gauge. A general note will suffice in cases where the location of the section varies.

(e) Types of gauges. List the types of gauges and period of use. Indicate the types of manual and recording gauges that were used, e.g., "0-9 ft staff", "chain", "wire weight", "reference point on bridge", "continuous (or weekly) recorder", "recorder (pencil)", etc. In some cases it may not be possible to give the length of the staff gauge or the type of recorder; however, it is desirable to note if recorder charts were produced in pencil.

(f) Elevation of gauge datum. Give the elevation of gauge datum and changes, if any.

(g) Bench marks. Write a description of the bench marks, give the date of installation and the bench mark from which elevations were run, and the elevation and changes, if any. It is not necessary to list temporary bench marks.

4. Obtain discharge hydrographs from the Data Control Section, Ottawa. These hydrographs are produced by computer methods, and may be ordered by Drainage Basin as indicated on the Monthly Reporting Sheet, form R302, and are available upon 4 to 6 weeks notice. Plot the discharge measurements on these hydrographs. The hydrograph will assist in revealing periods of questionable record which should be checked. For example, a sharp drop for a period of one or two days and perhaps followed by an equally rapid recovery may be the result of a one to two foot error in transferring the gauge readings from the observer's book to a form R79. Hydrographs are useful also in making comparisons between stations on the same stream or on adjacent streams having similar characteristics. Hydrographs may not be required for stations on streams subject to extensive regulation.

5. Plot all the stage-discharge curves used during the period of record on an arithmetic curve sheet, preferably form R239A, using one scale for the entire range of application. Label the curves as required for convenience of reference. It may be desirable to separate the curves into groups coinciding with changes in gauge

datum or location, significant changes in the control, etc. If the number of curves makes it impractical to draw them all on one sheet, two or more sheets should be used, using the same scale on each sheet. Each curve should only be plotted to the maximum discharge for which the curve was used. The extreme high and low water discharge measurements should be plotted to verify the delineation of the curves. Individual curves that are inconsistent with the general pattern will be exposed on this composite curve sheet. List the stage-discharge curves and their period of use in the space provided on form R239A. In some cases it may be found necessary to plot the discharge measurements on a logarithmic curve sheet (form R240), to verify extensions of stage-discharge curves.

6. Review each year of record and accept it or revise it if possible according to the adopted criteria in the following general order, checking off the steps in the review on form R256 as they are completed:

(a) Review the gauge corrections and their distribution. It should not be necessary to check or review in detail all original level notes except to verify correction applications.

(b) Spot check the list of discharge measurements, form R56, from the original notes, with particular emphasis on the gauge heights and discharges, and spot check the plotting of these measurements on the original curve sheets.

(c) Spot check the daily gauge height computations.

(d) Compare the stage-discharge curves for the year under review with those for the period of record on the composite curve sheet.

(e) Spot check the daily discharge computations.

(f) Inspect periods of questionable record on the discharge hydrographs and if possible compare them with hydrographs for stations on the same or adjacent streams. The combined hydrographs discussed on page 10 should be used for this purpose.

7. Check and enter the "Extremes of Discharge" on form R258; if this information has been published in the "Historical Streamflow Summary to 1970" publication, then the annual extremes of discharge should be checked and a copy of the page (instead of the R258) enclosed in the Review Report. Values which are in error in the publication should be indicated and the revisions copied on form R258. The completion of form R258 is almost self-explanatory. Any revised discharges should be marked with an asterisk, and any particular conditions should be identified with a symbol, capitalized. Follow the rules for symbols as shown on page 5. The maximum instantaneous discharge for the year will not be available for some stations, particularily those equipped with manual gauges only. However, if enough readings are available, a graph should be drawn through these readings to produce a maximum instantaneous discharge (Estimated). If an extreme is the result of some unusual condition it should be referenced by a footnote.

8. Use the "Summary of Revisions", form R259, to explain errors found and revisions made using a heading for each year in which the errors occur. Show the percentage change in daily values and the percentage change in affected monthly means. In some cases a revison may be indicated by applying the adopted criteria, but will not be made because it is considered unwarranted or it cannot be reasonably substantiated. For example, there may be some question regarding the accuracy of the daily gauge heights, the discharge measurements, level checks, stage-discharge curve, etc. In these cases, explain why a revision was not made. It is not necessary to explain why revisions were not made if indicated changes are within the limits of the criteria, although a statement that the discrepancies were noticed may be useful for future reference. The extent of the explanation as to why revisons were not made will be left to the discretion of the reviewer.

9. Check the Surface Water Data publications to see that the monthly means in cfs and total monthly discharge in ac-ft agree with the values shown on the form R79, or equivalent, in District Office files. Since these monthly summary figures on the R79's have already been checked against those obtained from the magnetic tape file FLOW, the reviewer can readily distinguish between:

BASIN REVIEW

As well as reviewing the records for each individual station in the review program, a comparison of records for stations within a basin, or in an adjacent basin, could reveal major errors or confirm the records. Two aids for comparing discharge data are available from Ottawa; (a) combined hydrographs and (b) regional analysis printouts. An explanation follows of how to select, request and use these hydrographs and printouts.

1. For each drainage basin prepare a separate book which will contain data for comparing the streams. This book will be used as a work file for review purposes and will not be included as part of a Review Report. Upon completion of the review program, the books may be retained in the general review file.

2. A copy of the list of stations being reviewed in the basin will be included in this book.

3. One or more schematic diagrams should be drawn showing the stations to be compared. This will be a sketch showing the rivers with gauging stations indicated and numbered, and may include stations not on the review program, e.g., contributed data which will be compared to Water Survey of Canada data.

4. The period of record (showing seasonal or continuous) and the drainage area should be indicated on one of these pages. A useful way of showing the period of record, particularly when making the selection of what combined hydrographs to request, is to use a horizontal bar graph.

5. To request combined hydrographs, use the schematic diagram and the bar graph to select the stations and periods of record which are to be compared. Check that the data requested are on magnetic tape (FLOW file). Copy this information on form R301 "Request for Combined Hydrographs", as explained on page 10, and send the form to Ottawa for plotting the hydrographs. The combined hydrographs will be sent to the Districts in about 4 weeks, and may be filed in the drainage basin book, or separately, depending on the number of hydrographs.

6. Printouts giving monthly mean and annual mean runoff in "inches per square mile" or "cfs per square mile" are available as an alternative method for comparing the records from stations within a drainage basin. Again, the schematic diagram and bar graph will assist in selecting the stations to be compared. Send a list of the stations selected to Ottawa and the printouts will be supplied in about 4 weeks. One printout page will contain all the summary information for a station giving the monthly mean runoff in the units requested for each month with complete data. It should be noted that in computing these data only the current value of the drainage area is used, so care must be taken if a station has been moved significantly within its period of use, or if diversions, etc. affect the drainage area. Insert these printouts in the drainage basin book.

7. The combined hydrographs and the regional analysis printouts are to be used as a quick method to recognize periods where the data could be in error and require further investigation. A convenient time to inspect the data for questionable periods is just prior to, or following, step 6 on page 7.

8. The combined hydrographs and regional analysis printouts should be ordered a month prior to the review of a drainage basin. The requests could be submitted with the monthly report. This means that the drainage basin book should be started six weeks before the beginning of the review of that particular basin. This would also be a good time to check the list of stations in the basin, making sure that the list is complete, and ordering additional annual hydrographs if necessary.

REQUEST FOR COMBINED HYDROGRAPHS FORM R301

Explanation of Combined Hydrographs

1. Combined hydrographs can be plotted to show each individual station on the same graph, stations summed or subtracted with the totals plotted, or a combination of these arrangements. A maximum of 5 stations and 5 plots is permitted.

2. When discharge data for stations are being summed (or subtracted), a plot will be produced only if data are available for all the stations involved.

3. The hydrographs are plotted on CALCOMP Plot Paper, drawn to the same scale as form R187A (3 cycle semi-log). The grid is not shown on the plots but, the plots may be overlayed on form R187A if the daily values are required. In selecting the numerical values for the cycles, the program searches for the maximum discharge to be plotted for the entire period. This discharge is assigned to the upper cycle, and the numerical values of the three cycles are automatically computed. The combined hydrographs are then plotted on the 3 cycle scale, provided that all the daily values are within this range. The computer searches for the minimum value to be plotted, and if the minimum to maximum exceeds three cycles, then the lower portion of the bottom cycle is converted to arithmetic scale going to zero flow, so that all daily values may be plotted. Negative flows can be plotted and are flagged by an arrow.

4. Any length of record may be requested. The program will automatically produce the plots in 5-year sections for convenience in handling the completed plot and accuracy in plotting.

5. Each hydrograph is plotted with a different coloured pen, so the various plots can be distinguished. The plots are identified to the right of the combined hydrographs by whatever identification is desired.

Instructions for completing Form R301

1. Period of record required: Enter the entire period for which combined hydrographs are required. For example, if data are available for the years 1908-12, 1931-36, 1948-68 and hydrographs are required for the entire period of record, then request the period 1908-1968. Hydrographs will be produced only for the years containing data.

2. Stations involved: List the stations in numeric order. Each station number is given successively an identification number from 1 to 5. The identification numbers will be used when identifying the hydrographs to be plotted. The District number should be filled in for each station number.

3. Plot identification: Under the heading "Plot Identification Number" fill in the identification numbers of the hydrograph to be plotted in the appropriate column; one plot per row. If two or more stations are to be added (or subtracted), the signs should also be indicated. Show the "Identification Desired on Hydrograph" for each plot. A maximum of 60 characters is allowed.

DEPARTMENT OF THE ENVIRONMENT — WATER RESOURCES BRANCH

REQUEST FOR COMBINED HYDROGRAPHS

PERIOD OF RECORD REQUIRED

1967-1968

STATIONS INVOLVED

LIST STATION NUMBERS IN NUMERIC ORDER

IDENT. NO	STATION NUMBER	DIST. NO
1	05MH001	4
2	05MH005	4
3	05NG001	4
4		
5		

DISTRICT NUMBERS

1.	4. Winnipeg	7. Halifax
2. Vancouver	5. Guelph	8. Regina
3. Calgary	6. Montreal	9.

PLOT IDENTIFICATION

PLOT IDENTIFICATION NUMBER	IDENTIFICATION DESIRED ON HYDROGRAPH (MAXIMUM OF 60 CHARACTERS)	PLOT COLOUR
1	DATA RIVER BELOW REVIEW CREEK DRAINAGE AREA 61,300	Black
2	DATA RIVER ABOVE REVIEW CREEK DRAINAGE AREA 35,600	Red
3	REVIEW CREEK AT THE MOUTH DRAINAGE AREA 23,800	Green
		Blue
		Black (.4 mm)

DECK SET-UP FOR COMPUTER RUN

1. Period of Record; 1 card ; KP col. 1-9
2. Stations involved; Max. 5 cards; col. 1 Ident. No.; col. 2 blank; col. 3-9 Sta. No.; col. 10 blank; col. 11 Dist. No.
3. Plot Code ; 1 card ; col. 1 code (8) if "individual plots" or code 9 for "summed" plots or combination of both
4. Plot Ident. ; Max. 5 cards; col. 1-10 Plot Ident. Nos.; col. 11-70 Identification
5. End ; 1 card ; 999 cols. 1-3

R301 (Oct. 72) Prepared by J. W. Rogers Date Oct. 15, 1972

DEPARTMENT OF THE ENVIRONMENT — WATER RESOURCES BRANCH

REQUEST FOR COMBINED HYDROGRAPHS

PERIOD OF RECORD REQUIRED

1967-1968

STATIONS INVOLVED

LIST STATION NUMBERS IN NUMERIC ORDER

DISTRICT NUMBERS

1. 4. Winnipeg 7. Halifax
2. Vancouver 5. Guelph 8. Regina
3. Calgary 6. Montreal 9.

PLOT IDENTIFICATION

PLOT IDENTIFICATION NUMBER	IDENTIFICATION DESIRED ON HYDROGRAPH (MAXIMUM OF 60 CHARACTERS)	PLOT COLOUR
1	DATA RIVER BELOW REVIEW CREEK D.A. 61,300	Black
2+3	DATA RIVER ABOVE REVIEW CREEK PLUS REVIEW CREEK D.A. 59,400	Red
		Green
		Blue
		Black (.4 mm)

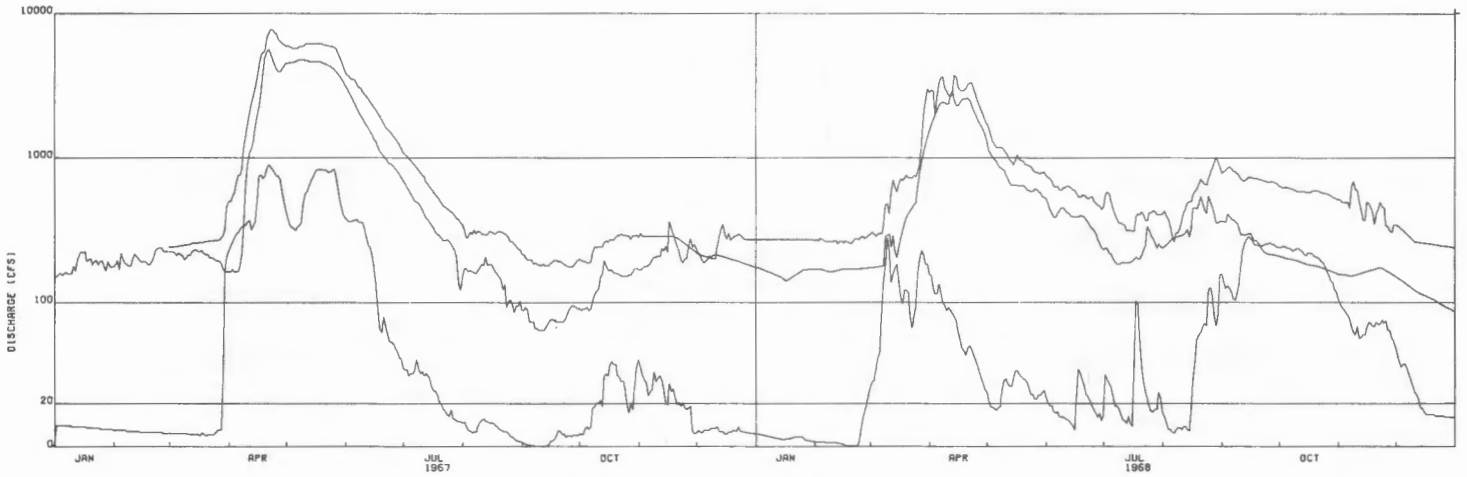
DECK SET-UP FOR COMPUTER RUN

1. Period of Record; 1 card ; KP col. 1-9
2. Stations involved; Max. 5 cards; col. 1 Ident. No.; col. 2 blank; col. 3-9 Sta. No.; col. 10 blank; col. 11 Dist. No.
3. Plot Code ; 1 card ; col. 1 code 8 if "individual plots" or code 9 for "summed" plots or combination of both
4. Plot Ident. ; Max. 5 cards; col. 1-10 Plot Ident. Nos.; col. 11-70 Identification
5. End ; 1 card ; 999 cols. 1-3

R301 (Oct. 72) Prepared by J. W. Rogers Date Oct. 15, 1972

SAMPLES OF COMBINED HYDROGRAPHS

INDIVIDUAL PLOTS

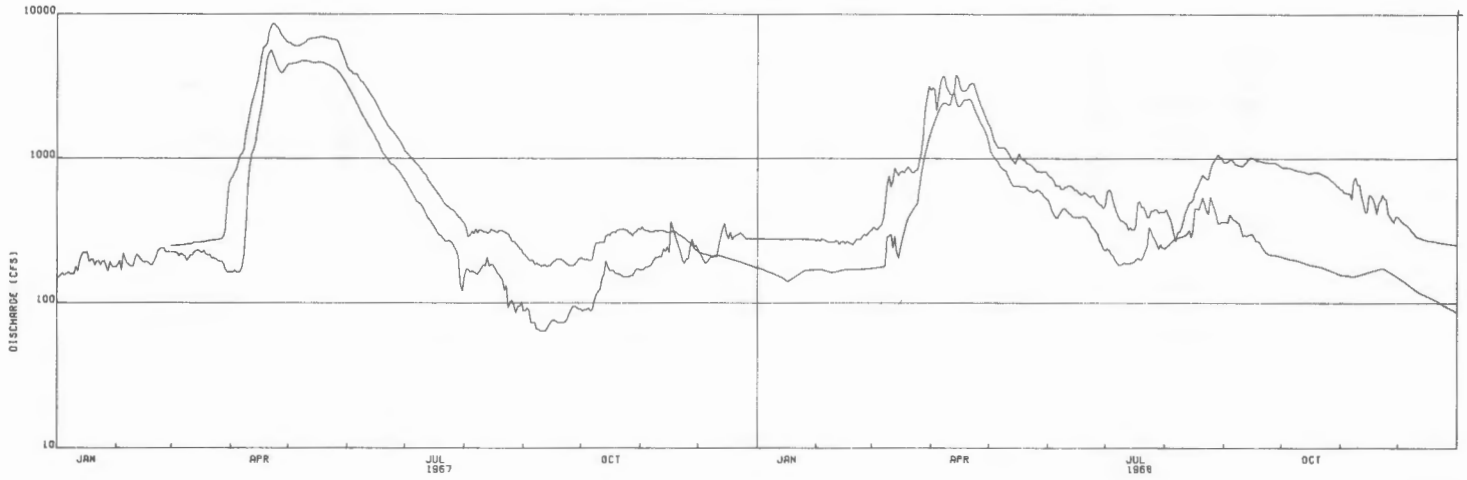


DATA RIVER BELOW REVIEW CREEK DRAINAGE AREA 61.300

DATA RIVER ABOVE REVIEW CREEK DRAINAGE AREA 35.600

REVIEW CREEK AT THE MOUTH DRAINAGE AREA 23.800

INDIVIDUAL AND SUMMED PLOTS



DATA RIVER BELOW REVIEW CREEK D.A. 61.300

DATA RIVER ABOVE REVIEW CREEK PLUS REVIEW CREEK D.A. 59.400

NOTE:
ACTUAL PLOTS WILL BE IN THE COLOURS SHOWN ON FORM R30(

INSTRUCTIONS FOR REVISING OR EXTENDING STREAMFLOW RECORDS

1. Follow the criteria as outlined herein to aid in deciding when revisions are required. Records should not be revised unless documentary substantiation is available on which to base the revision. No revision should ever be made merely on the basis of a different interpretation or opinion.

2. In some cases the base data may be so doubtful and incomplete as to render effective revision impossible for the entire record, but this decision should not be made without careful consideration and thorough investigation. A complete explanation must be given in the "Summary of Revisions" if any records cannot be revised through lack of data, even though revision appears necessary. Do not destroy such records, but make an appropriate notation on the original records. If previously published records have been reviewed and found unreliable, this must be indicated in the Surface Water Data Reference Index by submitting a revised form R285 to Data Control Section, Ottawa. The "Period of Record" should be revised, withdrawing the unreliable period(s), and an appropriate notation made at "Remarks". For example, "Records for the period May 1910 to August 1915 have been found unreliable and should not be used".

3. If feasible, streamflow records should be extended to complete a partial month or a partial year. This is especially desirable if the incomplete period is short in comparison with the entire period of record. Records may be extended by correlation, comparison with discharge hydrographs for nearby stations, use of meteorological records, etc. Where appropriate, revised forms R285 must be submitted to Data Control Section, Ottawa.

4. Revised or extended records will be computed in accordance with instructions and standards laid down in the latest edition of the Manual of Hydrometric Office Procedures. Wherever possible, use the d-mac Pencil Follower for computing data.

5. When revisions or extensions are made to any part of the daily discharge records for a calendar year, discretion must be used as to the advisability of including a new form R79 in the report. As a guide, if those revisions or extensions apply to one or more complete months, a new R79 should be included. Only the month or months affected need be shown on this R79 and the monthly summary figures should be computed manually to the latest standards. Upon approval of the report the FLOW file will be updated and printouts obtained which should be verified. All summary figures on these printouts, monthly and annual, are produced by computer methods and are to the latest standards.

6. When a revision is made to any part of a year, make the necessary corrections on the original records if this can be done legibly, then initial and date. Otherwise, include a copy of the R79 mentioned at 5. above in the original records and mark the original month(s) as "Obsolete, see Revision". Additional explanatory notes may be added as required, e.g., "Daily discharges for the period June 15 to 18, 1915 were revised".

7. No original data or work sheets are to be destroyed, even if they have been made obsolete in the review. Work sheets involved in the review of each station will be filed in a "Review of Hydrometric Survey Data to ..." file as set up in each District Office.

8. Prepare the "Summary of Revisions" on form R259. Enter the period of record reviewed and the years which were revised. Explain the type of revision that was made, i.e., stage-discharge curve revision, computation error, gauge correction error, error in transfer of gauge observation, etc.; also describe the data that were revised and the percentage revision involved (based on the original figure). Explain if any records were extended or considered unreliable. Also explain revisions which were made in previous reviews, if any, and give the publication name or No. in which these data were published, e.g., "Mean discharge for April 1936 corrected by the Calgary District Office in 1947 and published in WRP 117". Drainage area revisions will not be noted or explained but it will remain the responsiblity of the District Office to see that they are recorded in their files.

INTERNATIONAL GAUGING STATIONS

On waters adjacent to the International Boundary, certain gauging stations are maintained by Canada (or the United States) under agreement with the United States (or Canada) and the records are collected and complied in a manner equally acceptable to both countries. These stations are designated as "International Gauging Stations".

The following procedures should be used as a guide for reviewing International Gauging Stations. They follow the framework outlined in the "Procedural Guide for Operation of International Gauging Stations dated November 4, 1969".

1. Review only stations for which the original calculations were done by the Water Survey of Canada, following the same procedure as outlined in the preceding sections. Some of the discharge measurements and level checks may have been made by U.S.G.S. personnel and should be treated as if done by District staff.

2. After completion of the review, joint approval of the review report is to be made by the two appropriate District Engineers or their representatives, and the Head of the Data Control Section, Ottawa, prior to making any changes to published data.

3. Completed Review Reports will be signed on the Cover Sheet by the two appropriate District Engineers or by their representatives, by the Data Review Engineer, Ottawa, and overall approval given by the signature of the Head of the Data Control Section, Ottawa. The "Revised Data" form R260, will be signed by the two appropriate District Engineers or by their representatives, and by the Data Review Engineer, Ottawa.

4. Following the joint approval, copies of the completed Review Reports will be provided to the appropriate District Offices, and to the Data Control Section, Ottawa. The revisions will be edited for publication according to the standards of the agency publishing them. Similarily, the data stored on magnetic tape may be processed according to the standards of either country.

PUBLICATION INSTRUCTIONS

1. The source data for the summary of monthly means will be the new magnetic tape file, TOTALS. Since this file is created from the FLOW file all approved revisions to daily discharges must be incorporated thereon. Therefore, when a Review Report is submitted to Data Control Section, Ottawa, a completed form R296, FLOW or LEVELS FILE UPDATING should be prepared where necessary, for each station reviewed. If there are many revisions to be made to the FLOW or LEVELS files, copies of the "Revised Data" form R260 may be prepared, rather then recopying all the revisions onto form R296. The corrections will be made by the Data Control Section, Ottawa, and the printouts will be sent to the District Offices for checking.

2. A summary of monthly means and annual extremes for the entire period of record of the station will be published every 5 years, starting with the 1970 Historical Streamflow Summary publication. Revisions to the monthly means and the annual extremes will not be identified in this publication, but the user will be informed in the Introduction that stations which have been reviewed are identified in the Surface Water Data Reference Index and the annual Surface Water Data publications, and that the revisions are available upon application to the respective District Engineer.

3. Starting with the 1971 Reference Index, each station where a review has been completed will be identified. The fact that data have been reviewed will be conveyed to the user by a footnote in the Surface Water Data Reference Index. A revised Gauging Station Inventory form R285 should be submitted with each Review Report, indicating in items 83 and 84 that data have been reviewed to a specified date. As mentioned on page 13, any data which are considered unreliable during a certain period must be indicated on the R285 at item 70, "Remarks", and the period of record, items 36 to 45 amended accordingly.

4. Revised annual extremes will be published in the five-year Historical Steamflow Summary publication. Where appropriate, a form R295 PEAKS FILE UPDATING, should be submitted with the Review Report.

5. It is not intended that forms R285, R295 and R296 be a permanent part of a Review Report; they are included only for the use of the Data Control Section in preparing the various publications and magnetic tape files. There is nc need to list them in the table of contents, but the dates on which they have been prepared should be indicated on the form R256, Review Progress.

PREPARATION OF THE REVIEW REPORT

1. A Review Report and at least one copy will be required for each station reviewed; the original report will be filed in the District Office, and a copy at Head Office. Additional copies may also be required for outside agencies. The extent of the Review Report will depend largely on the changes required in the existing records. Where a station record is reviewed and virtually no change is found necessary, the report would be very short; where the changes were extensive the report will of necessity be considerably larger to cover them adequately. The copy for Head Office will be made in Ottawa where the hydrographs can be reduced to 8 1/2 x 11 sheets.

2. The Review Report will consist of:

(a) The signed "Cover Sheet".

(b) The "Contents Sheet".

(c) The "Summary" of Review.

(d) "Station History", form R257.

(e) "Extremes of Discharge", form R258.

(f) "Summary of Revisions", form R259.

(g) Composite curve sheets.

(h) Special studies, such as logarithmic stage-discharge curves, plots of observers' readings from manual gauges to estimate instantaneous maxima, etc.

(i) Revised stage-discharge curves and tables where appropriate.

(j) "Revised Data", form R260.

(k) Revised forms R79 where needed.

(l) Annual hydrographs with discharge measurements plotted. These hydrographs should also show revised or extended data where appropriate.

(m) "Progress Check", form R256.

3. Signing Procedure. Completed Review Reports will be signed on the Cover Sheet by the Engineer in charge of review work in the District Office, by the Data Review Engineer, Ottawa, and overall approval given by the signature of the Head of the Data Control Section, Ottawa. The "Revised Data", form R260, will be signed by the Engineer in charge of review in the District Office and by the Data Review Engineer, Ottawa.

PROCEDURE FOR UPDATING PREVIOUS REVIEW REPORTS

1. For stations which had been previously reviewed and Review Reports written, it will be necessary to update the reports for the years remaining to 1970. The extent of the updated Review Report will vary with each station depending on what changes may have occurred since the last review. For example, at one station the same gauge, bench marks, and stage-discharge curve that was described in the previous report may still be in use, while at another station the gauge may have been moved to an entirely new location, requiring a new Station History and Composite Curve Sheet. The arrangement of the updated review reports will be left to the discretion of the reviewer, provided that the report does not intermingle with the original Review Report, and that they are both bound together in the same book. The following steps give a suggested method for updating the review reports with a minimum of duplication of work.

2. Review Reports for stations which have been previously reviewed will be in the form of two separate reports, bound together in the same book but separated by dividers. The previous Review Report will be retained in its entirety and will become "Report A" in the book. The updated Review Report will be worked up for the years being reviewed, and will contain the same forms as any original review. It will become "Report B" in the review book.

3. The reports will be preceded by a Front Sheet, which will explain the two reports, and a Contents Sheet covering both reports. These sheets will also be separated from the reports by a divider. The complete 1970 Review Report will therefore be in three sections, as follows:

a) Front Sheet and Contents Sheet

b) Report B - "Report on Review of Hydrometric Survey Data to 1970"

c) Report A - "Report on Review of Hydrometric Survey Data to ... "

4. It is desirable that the composite curve sheet in the updated Review Report contain all the curves used during the period of record. However, to avoid duplication of work and if it is convenient, the curves for the updated period may be plotted on a copy of the original curve sheet from Report A. This sheet should then be labelled "Updated for 1970 Data Review Program", and included in the updated Review Report. The original composite curve sheets will remain with Report A. If a new curve sheet is used, it should be drawn to the same scale as the original sheet so the sheets can be overlayed for comparison.

5. The "Station History" will be rewritten for the Report B. Most of the information can be obtained from the previous Review Report which will be retyped making the necessary additions.

6. The Remarks and Conclusions from Report A should be considered when writing up the "Summary" for the 1970 Review Report. If necessary, the comments in Report A can be referred to.

Report on Review of

Hydrometric Survey Data to 1970

for

Bear Creek near Bull River

Station No. 07KB002

This Report was completed in two stages and consists of the following two reports:

Report A - Report on Review of Hydrometric Survey Data to 1960. Dated September 3, 1966.

Report B - Report on Review of Hydrometric Survey Data to 1970. Dated December 1, 1972.

Contents

Report B

Report on Review of Hydrometric Survey Data to 1970

Report A

Report on Review of Hydrometric Survey Data to 1960

Report on Review of

Hydrometric Survey Data to 1970

for

Bear Creek near Bull River

Station No. 07KB002

Prepared in accordance with "Manual of Hydrometric Data Review Procedures", dated December 1, 1972, by:

J.W. Rogers
August 15, 1972.

Approved by R.A. Brown for District Office. Date Nov 2, 1972

Approved by D.W. Forrest for Data Control Section. Date Nov. 28, 1972

BEAR CREEK NEAR BULL RIVER

STATION NO. 07KB002

SUMMARY

Remarks:

Records prior to 1959 were published under the title "Bear Creek above confluence of Bull River".

The observer's books for the period October 1, 1962 to September 1963 were missing from District Files and daily gauge height computations for that period have been accepted as correct.

Presence of ice affects the stage-discharge relationship in some years. The average duration of ice effect is about 3 months in those years and is defined on the average by about 2 discharge measurements per winter.

Since 1953 discharges at this station have been affected by upstream diversions for irrigation. For details of these diversions see "Bear Creek Diversion near Bull River", Station No. 07KB005.

Extent of Revisions:

Various kinds of errors were found which resulted in revisions to:

Errors in daily values	Errors in monthly values
83 daily revisions affecting 17 months in 5 years	2 monthly revisions in 2 years

7 Maximum Instantaneous Discharges were revised or calculated.
The major revision resulted from a two month period in 1965 which had been worked up using the wrong stage-discharge table.

Conclusions:

With the exception of the period June 1956 to May 1957, the stage-discharge relationship has been fairly stable and well defined over the range of application. The stage-discharge curve used during the aforementioned period was accepted by the review staff since a better curve could not be substantiated.

Discharges should be reliable throughout the open water period, but those obtained during periods of ice effect should be used with caution.

The area draining to this station is fairly small, 12.3 square miles, and is in part responsible for the large diurnal fluctuations in stage and discharge. A manual gauge read once daily does not give a true estimate of mean daily stage or discharge.

An automatic recorder would improve the quality of the open water discharge records at this station.

CLEAR RIVER AT SANDSTONE

STATION NO. 07KD004

SUMMARY

Remarks:

According to a letter from the Provincial Department of Lands and Forests, the Treeland Lumber Company maintained a dam at the outlet of Clear Lake for lumbering operations for a number of years prior to 1960. In the spring of 1960, this dam was destroyed by high water and has not been rebuilt to date (November 17, 1968). The period when the dam was in operation or the amount of storage involved was not given. However, apparently there is now no regulation in the Clear River basin upstream from the gauging station.

Stage-discharge tables prior to 1949 were not available and were reconstructed for review purposes.

Extent of Revisions:

Major revisions to daily values resulted from a revision to the upper end of two stage-discharge curves (42 days), and three periods of missing data which were estimated (26 days). An additional 10 days were revised due to typing errors and missing symbols.

Errors in daily values

78 daily revisions affecting
15 months in 8 years

3 Maximum Instantaneous Discharges were revised.

Conclusions:

The stage-discharge relation is not stable and is subject to extensive shifting caused mainly by beaver dams or high water. The stage-discharge relation is not defined by measurements above 3,000 cfs. This flow was greatly exceeded in 1953 when an estimate of 10,000 cfs for the maximum instantaneous discharge was made. This estimate was accepted in the review since another interpretation of the stage-discharge curve can not be substantiated. However, the records for 1953 should be reviewed again when discharge measurements are obtained in the extreme high water range.

STATION HISTORY

for Prairie Creek near Sandstorm Station No. 07KC003

Drainage Area 123 Square Miles

Period of Record:

Mainly open water 1947 to date.

Purpose:

The station was initiated by the PFRA for irrigation purposes.

Location:

Lat. 51°29', Long. 107°04', Saskatchewan, on the Canadian National Railways bridge on Highway No. 15 about one mile west of Outlook.

Discharge Measurements:

From bridge. No discharge measurements were obtained during ice-affected periods.

Types of Gauges:

Chain gauge from July 7, 1947 to date.

Elevation of Gauge Datum:

1611.80 feet (G.S.C. datum).

Bench Mark:

Bench mark established July 7, 1947, one-inch vertical bolt on top of the east concrete abutment, on the upstream side, marked with a hacksaw cut on top of the bolt, elevation 1642.67 feet as referred to GSC BM No. Z-83, elevation 1777.356 feet, Publication No. 22, 1952 Edition.

Prepared by E. D. Smiley
Date Oct. 12/72

STATION HISTORY

for Clear River at Sandstone Station No. 07KD004

Drainage Area 654 Square Miles

Period of Record:

February 1945 to December 1949 and April 1950 to date. Data were obtained at two different locations.

Purpose:

Established by Water Resources Branch for runoff purposes.

A. From February 1945 to December 1949:

Location:

In SE. ¼, sec. 24, tp 6, rge 2, W. 5th Mer., at traffic bridge about 500 feet above confluence with Beaver Mines Creek.

Discharge Measurements:

From cableway about 1,000 feet downstream from traffic bridge, which included the flow in Beaver Mines Creek, or by wading within 500 feet upstream from the traffic bridge which did not include the flow in Beaver Mines Creek.

Types of Gauges:

Chain or wire weight.

Elevation of Gauge Datum:

90.40 feet (assumed datum).

Bench Mark:

Bench mark established May 13, 1945, black paint mark on ledge on right bank directly under bridge, elevation 100.00 feet (assumed).

Drainage Area:

660 square miles.

B. From April 1950 to date:

Location:

Latitude 49°29'20", longitude 114°08'40", Alberta, in NW24-6-2-W5 about one-half mile upstream from former location at traffic bridge.

Prepared by R. H. Fournier
Date Oct. 11, 1972.

R257 (Oct 72)

STATION HISTORY

for Clear River at Sandstone Station No. 07KD004

Drainage Area 654 Square Miles

Discharge Measurements:

Low Water - by wading within 500 feet of the gauge.
Medium and high water - from cableway 200 feet downstream of the recording gauge.

Types of Gauges:

Recording gauge (A35) from April 17, 1950 to date. Staff gauges during periods when the recorder was out of operation.

Elevation of Gauge Datum:

0.00 feet (Assumed datum) from April 1950 to September 1952. 90.57 feet (Assumed datum) from October 1952 to June 8, 1957. 4,184.42 feet (G.S.C. datum) from June 9, 1957 to date. Corresponding changes were made to bench mark elevations, therefore there was no change in the gauge datum even though the elevations were changed, i.e., water levels were expressed as gauge heights and referred to the same gauge datum for April 1950 to date.

Bench Marks:

Bench mark set on April 17, 1950, spike driven into tree stump four feet downstream from gauge, elevation 9.43 feet from April 1950 to September 1952, 100.00 feet from October 1952 to June 8, 1957 and 4193.85 feet from June 9, 1957 to date.

SIBM was set on June 9, 1957, sixteen feet upstream from gauge, elevation 4194.69 feet.

These two bench marks are referenced to GSC BM No. 102-D, elevation 4207.987, Publication No. 23, 1950 Edition, but they are not "tied in" to the bench mark at the former location at the traffic bridge.

Drainage Area:

654 square miles.

Prepared by R. H. Fournier
Date Oct. 11, 1972.

EXTREMES OF DISCHARGE

for Mountain River near Avalanche Station No. 07KF006

Year	Maximum Instantaneous Discharge		Maximum Daily Discharge		Minimum Daily Discharge	
	Date and Time	cfs	Date	cfs	Date	cfs
1911	-	-	-	-	-	-
1912	-	-	July 10	74,100	March 25	1,060 B
1913	-	-	Aug. 15	32,600	April 9 days	1,210 B
1914	-	-	June 9	61,700	Dec. 24-26	650 B
1915	June 28 1430 MST	205,000 F	June 29	164,000*	Dec. 15	700 B
1916	June 22 0800 MST	61,600	June 22	58,800	March 4	950 B
1917	-	-	May 18	65,600	Feb. 22	1,100 B
1918	-	-	June 16	35,300	Various Times	960 B
1919	-	-	June 24	19,900	March 4	688 B
1920	-	-	May 10	57,200	Dec. 4	895 B
1941	-	-	June 28	26,700	Nov. 17	548
1942	-	-	July 14	42,300	Nov. 26	583
1943	-	-	April 12	44,000 B	Feb. 11-13	1,080 B
1944	June 16 1810 MST	126,000 G	June 16	122,000	Nov. 22	551
1945	-	-	June 1	24,300	Nov. 30	724 B
1946	-	-	June 24	44,700	Feb. 8	1,300 B
1947	-	-	June 13	28,600	Nov. 27	602
1948	-	-	May 25	65,400	Feb. 12	1,140 B
1949	-	-	July 22	32,700	Dec. 14	730 B
1950	June 17 1730 MST	53,700 G	June 17	50,300	Dec. 13	430 B
*	Revised					
B	Ice Conditions					
F	Water Level from floodmark					
G	Water Level from graph of observed readings					

Prepared by J. W. Rogers
Date Oct 22 1972

Checked by K. W. Winter
Date Oct 22/72

ANNUAL EXTREMES OF DISCHARGE IN CFS AND ANNUAL TOTAL DISCHARGE IN AC-FT

YEAR	MAXIMUM INSTANTANEOUS DISCHARGE	MAXIMUM DAILY DISCHARGE	MINIMUM DAILY DISCHARGE	YEAR	TOTAL DISCHARGE
1915	---	1160 CFS ON MAY 29	400 CFS ON MAR 23	1915	434000 AC-FT
1916	---	--- *	--- *	1916	---
1917	---	1140 CFS ON JUN 29	190 CFS ON NOV 24	1917	330000 AC-FT
1918	---	1100 CFS ON JUN 10	160 CFS ON MAR 6	1918	278000 AC-FT
1919	---	1200 CFS ON JUN 5	150 CFS ON JAN 7	1919	303000 AC-FT
1920	---	1100 CFS ON JUL 10	100 CFS ON APR 19	1920	201000 AC-FT
1921	---	2500 CFS ON JUN 10	105 CFS ON MAR 4	1921	412000 AC-FT
1922	---	950 CFS ON MAY 19	130 CFS ON SEP 19	1922	335000 AC-FT
1923	---	1150 CFS ON JUN 22	390 CFS ON DEC 2	1923	437000 AC-FT
1924	---	558 CFS ON FEB 2	53.0 CFS ON NOV 28	1924	178000 AC-FT
1925	---	1160 CFS ON MAY 20	45.0 CFS ON JAN 27	1925	205000 AC-FT
1926	---	705 CFS ON MAR 16	30.0 CFS ON OCT 1	1926	145000 AC-FT
1927	---	1030 CFS ON DEC 28	30.0 CFS ON JAN 3	1927	323000 AC-FT
1928	---	2680 CFS ON JUN 10	43.0 CFS ON DEC 28	1928	966000 AC-FT
1929	---	713 CFS ON MAY 31	8.1 CFS ON DEC 4	1929	83200 AC-FT
1930	---	402 CFS ON MAY 14	5.3 CFS ON JAN 31	1930	58600 AC-FT
1931	---	146 CFS ON MAY 7	4.6 CFS ON MAR 14	1931	36900 AC-FT
1932	---	970 CFS ON MAY 7	7.7 CFS ON JAN 9	1932	389000 AC-FT
1933	---	1300 CFS ON MAY 30	118 CFS ON FEB 25	1933	514000 AC-FT
1934	---	1160 CFS ON APR 24	208 CFS ON SEP 7	1934	470000 AC-FT
1935	---	1110 CFS ON MAY 24	457 CFS ON JAN 2	1935	545000 AC-FT
1936	1000 CFS ON JUN 18	1000 CFS ON JUN 18	178 CFS ON APR 13	1936	387000 AC-FT
1937	1080 CFS AT 1430 PST ON JUN 3	1040 CFS ON JUN 3	96.0 CFS ON JAN 5	1937	330000 AC-FT
1938	1270 CFS AT 0900 PST ON MAY 28	1240 CFS ON MAY 28	150 CFS ON DEC 30	1938	337000 AC-FT
1939	543 CFS AT 1500 PST ON MAY 8	532 CFS ON MAY 4	117 CFS ON FEB 18	1939	216000 AC-FT
1940	304 CFS AT 2000 PST ON JUN 11	263 CFS ON JUN 12	52.0 CFS ON FEB 24	1940	122000 AC-FT
1941	824 CFS AT 1300 PST ON DEC 23	798 CFS ON DEC 20	83.0 CFS ON MAY 27	1941	288000 AC-FT
1942	1310 CFS AT 1900 PST ON JUL 4	1280 CFS ON JUL 1	123 CFS ON MAR 29	1942	560000 AC-FT
1943	865 CFS AT 0900 PST ON MAY 9	798 CFS ON MAY 9	134 CFS ON OCT 19	1943	288000 AC-FT
1944	802 CFS AT 1300 PST ON JUN 4	795 CFS ON JUN 3	70.0 CFS ON MAY 4	1944	194000 AC-FT
1945	1250 CFS AT 1400 PST ON JUN 7	1240 CFS ON JUN 7	257 CFS ON SEP 14	1945	457000 AC-FT
1946	1360 CFS AT 1800 PST ON MAY 13	1360 CFS ON MAY 14	492 CFS ON FEB 16	1946	624000 AC-FT
1947	696 CFS AT 1130 PST ON JAN 1	689 CFS ON JAN 1	114 CFS ON MAR 1	1947	212000 AC-FT
1948	1550 CFS AT 1200 PST ON JUN 18	1530 CFS ON JUN 18	140 CFS ON MAR 21	1948	719000 AC-FT
1949	1350 CFS AT 1040 PST ON MAY 16	1330 CFS ON MAY 16	355 CFS ON DEC 22	1949	516000 AC-FT
1950	1310 CFS AT 1300 PST ON JUN 15	1300 CFS ON JUN 6	321 CFS ON JAN 30	1950	491000 AC-FT
1951	~~1440 CFS AT 1230 PST ON MAY 13~~ *	1440 CFS ON MAY 13	590 CFS ON JAN 31	1951	647000 AC-FT
1952	~~1410 CFS AT 1700 PST ON MAY 20~~ *	1410 CFS ON MAY 20	164 CFS ON NOV 29	1952	507000 AC-FT
1953	1040 CFS AT 1730 PST ON MAY 22	944 CFS ON MAY 23	152 CFS ON JAN 16	1953	331000 AC-FT
1954	---	1190 CFS ON JUL 11	45.0 CFS ON OCT 19	1954	528000 AC-FT
1955	---	1030 CFS ON JUN 10	276 CFS ON DEC 19	1955	473000 AC-FT
1956	1540 CFS AT 1015 PST ON JUL 15	1540 CFS ON JUL 15	282 CFS ON JAN 1	1956	537000 AC-FT
1957	1670 CFS AT 2130 PST ON AUG 27	1480 CFS ON AUG 28	223 CFS ON APR 13	1957	433000 AC-FT
1958	2790 CFS AT 0800 PST ON APR 25	2560 CFS ON APR 26	315 CFS ON OCT 3	1958	385000 AC-FT
1959	2150 CFS AT 0945 PST ON MAY 25	2120 CFS ON MAY 26	326 CFS ON JAN 13	1959	648000 AC-FT
1960	1160 CFS AT 0010 PST ON JAN 1	1150 CFS ON JAN 1	315 CFS ON JUN 4	1960	384000 AC-FT
1961	1970 CFS AT 1230 PST ON JUN 7	1790 CFS ON JUN 6	242 CFS ON FEB 15	1961	344000 AC-FT
1962	1310 CFS AT 1445 PST ON APR 30	1250 CFS ON APR 28	229 CFS ON JAN 28	1962	309000 AC-FT
1963	~~326 CFS AT 0815 PST ON SEP 23~~ *	348 CFS ON AUG 16	141 CFS ON MAY 15	1963	165000 AC-FT
1964	1380 CFS AT 0915 PST ON JUN 16	1360 CFS ON JUN 17	163 CFS ON JAN 1	1964	410000 AC-FT
1965	1640 CFS AT 0930 PST ON JUN 6	1620 CFS ON JUN 6	216 CFS ON NOV 9	1965	478000 AC-FT
1966	462 CFS AT 1500 PST ON APR 12	455 CFS ON APR 10	153 CFS ON OCT 18	1966	226000 AC-FT
1967	---	--- *	--- *	1967	---
1968	1760 CFS AT 1030 PST ON JUN 12			1968	---
1969	1680 CFS AT 1556 PST ON MAY 31	1660 CFS ON MAY 31	269 CFS ON DEC 12	1969	496000 AC-FT
1970	1030 CFS AT 0930 PST ON MAY 13	1020 CFS ON MAY 13	97.1 CFS ON DEC 13	1970	211000 AC-FT
	EXTREMES OF DISCHARGE FOR THE PERIOD OF RECORD			MEAN	375000 AC-FT

MAX. INST. DISCHARGE IS 2790 CFS ON APR 25 1958 AT 0800 PST
MAX. DAILY DISCHARGE IS 2680 CFS ON JUN 10 1928
MIN. DAILY DISCHARGE IS 4.6 CFS ON MAR 14 1931

* Revised - see form R258

EXTREMES OF DISCHARGE

5

for Okanagan River at Okanagan Falls Station No. 08NM002

Revised values

Year	Maximum Instantaneous Discharge		Maximum Daily Discharge		Minimum Daily Discharge	
	Date and Time	cfs	Date	cfs	Date	cfs
1916			July 2	1300		
1951	May 13 1230 PST	1450				
1952	May 20 1700 PST	1430				
1963	Aug 16 1830 PST	365				
1968			June 12	1730	March 21	82.5

Prepared by P. I. Thompson Checked by J. F. Moore
Date Oct. 7, 1972 Date Oct 8, 1972

R258 (Oct 72)

SUMMARY OF REVISIONS

for Rising River at Long Lake Station No. 02KG007

Period of Record Reviewed:

August 1910 to September 1926; mainly open water 1932 to 1953; and continuous March 1954 to December 1970.

Revisions or Extensions:

1912, 1917-20, 1925, 1950, 1954-55, 1957-60.

Comments:

General:

The elevation of gauge datum is 0.00 feet (assumed datum) throughout the period of record. Because there are no field notes on level surveys except for the survey of October 5, 1951, it is impossible to accurately trace the datum. An examination of the computed discharges and the notes on the R79A forms would indicate that the datum was preserved. The gauge heights entered on the R79A forms are being accepted by the reviewer.

After analyzing the stage discharge curves and discharge measurements for the period 1910 to 1926 (shown on Curve Sheet No. 1), it became apparent that one composite curve could have been used for this entire period. There was a great deal of scatter in all the measurements through all stages, especially around 1000 cfs, however, there was no suggestion of a major control change. It appears that the method used in drawing the curves was to favour the latest measurements over previous measurements. Had a composite curve been drawn for this period, averaging all measurements, the indicated changes would be less than the review criterion of 15% for annual extremes, or less than the 10% criterion for monthly means. Therefore the stage-discharge curves used for the period 1910 to 1926 were found acceptable.

1912

An estimate of the flow for the period October 30 to December 31 was made to complete the discharge records. This estimate was based on a comparison with the discharge hydrograph for the North Capitchewan River at Edmont.

1917, 1918, 1919 and 1920

The daily discharges for the ice periods for January 1 to February 28, and December 14 to 31, 1917; December 25 to 31, 1918; January 1 to February 28, and December 11 to 31, 1919; and January 1 to March 23, 1920, were computed but bracketted as means. The daily values will be compiled on the FLOW file.

1924

Records were revised by the District Office prior to this review and revisions were published in WRP 52.

Prepared by M. A. Snow
Date Oct. 22, 1972

SUMMARY OF REVISIONS

for Rising River at Long Lake Station No. 02KG007

Comments: (continued)

1925

There was no gauge reading for October 31. The mean discharge for October was computed from daily discharges for 30 days, and was 94 cfs. An estimate was made by the review staff for October 31 as 275 E cfs. This resulted in a revision of the mean discharge for October from 94 cfs to 100 cfs.

1932

The discharge for June 27 is in error by -30% because of a one-foot error in transferring the gauge height from the observer's book. However, this indicated revision was not made because it is within the 50% criterion for daily discharges.

1942

From the available base data, it was impossible to verify the method used in computing the gauge height and discharge (4.47 feet and 3600 cfs) for June 20, which is the maximum daily discharge for the year.

1950

The discharge for April 2 was computed as 197 cfs. On April 1 and 3 the discharges were 1420 cfs and 1230 cfs, respectively. From the observer's book, the gauge reading on April 2 was 1.32 feet on the staff gauge. This reading could be interpreted as 3.12 feet, showing a discharge of 1390 cfs. A check with Carrot Creek near Garden shows that this would be a fair estimate, therefore April 2 was revised to 1390 E cfs. The mean discharge for April was revised from 357 cfs to 397 cfs.

1954

The following daily discharges were previously computed but not published:

July 2	69 E
July 3	65 E
July 10	48 E
July 17	49 E
August 1	42 E
August 22	39 E

These discharges will be included on the FLOW file.

1955

The discharges for August 1, 1955 to September 30, 1955, were not previously published. Since these are found acceptable by the reviewer, the discharges found on the original R79B form will be included on the FLOW file.

SUMMARY OF REVISIONS

for Rising River at Long Lake Station No. 02KG007

Comments: (continued)

1956

Using the "subdivided day" method to compute the mean discharge for April 4, a 38% difference occurred when compared with the original computation. Since the change was less than the 50% review criterion for a daily discharge, the original discharge was not changed.

1957

The original stage-discharge curve (October 1, 1956 to April 14, 1958) was revised above 3,210 cfs to agree with high water discharge measurements made in 1959 and 1960; it was originally not defined in this range by discharge measurements. Daily discharges for the period March 22 to April 2 were revised. The maximum daily discharge for the year was revised by +15% to 4,620 cfs; the mean discharge for March was revised by +5% to 3,400 cfs and for the year by +2% to 1,040 cfs.

1958, 1959 and 1960

Daily discharges for the period April 15, 1958 to November 30, 1960 were revised mainly because of a revision of the stage-discharge curve. The original curve was not defined by discharge measurements in the high water range, above about 3,000 cfs, and was originally drawn too far to the right, while in the low water range this curve was defined by a discharge measurement made on October 24, 1959 which was incorrect because of an error in transferring the discharge figure from the original discharge measurement notes to the "list of measurements". The "area" figure was entered instead of the "discharge" figure with a correction from 395 to 498 cfs or +21%. In addition, the daily discharges during the 1958-59 winter period were based upon a discharge measurement of 74 cfs made on January 21, 1959 which is of questionable reliability since it was determined using a weir formula with a single observation of the depth of water over a 1,365 foot weir, and with no allowance for the velocity of approach. The use of this measurement produced results which are incompatible with those for stations on near-by streams.

Discharges were revised as follows, with the percentage change from the original figure shown in parenthesis:

	1958	1959	1960
January Mean	-	400 cfs (+70%)	550 cfs (+25%)
February Mean	-	200 cfs (+54%)	370 cfs (+37%)
March Mean	-	420 cfs (+35%)	480 cfs (+21%)
April Mean	1,850 cfs (- 2%)	1,880 cfs (-14%)	2,030 cfs (-15%)
May Mean	1,380 cfs (- 7%)	1,070 cfs (- 5%)	1,150 cfs (- 6%)
June Mean	2,900 cfs (-22%)	2,700 cfs (-18%)	2,950 cfs (-20%)
July Mean	3,500 cfs (-26%)	3,700 cfs (-26%)	5,160 cfs (-29%)
August Mean	2,100 cfs (-15%)	2,300 cfs (-16%)	3,200 cfs (-22%)
September Mean	1,700 cfs (-12%)	2,060 cfs (-15%)	1,880 cfs (-14%)
October Mean	1,520 cfs (-10%)	1,740 cfs (-12%)	1,490 cfs (-10%)
November Mean	810 cfs (- 1%)	790 cfs (+0.4%)	910 cfs (- 4%)
December Mean	630 cfs (+15%)	700 cfs (+5%)	-
Annual Mean	1,320 cfs (- 9%)	1,280 cfs (- 1%)	1,580 cfs (-11%)
Maximum Daily	4,200 cfs (-28%)	4,900 cfs (-29%)	5,520 cfs (-30%)

R259 (Oct 72) Prepared by M. A. Snow
Date Oct. 22, 1972

REVISED DATA

for Rapid River at Rapid Falls Station No. 02YC003

Revisions:

Data to 1970 inclusive have been reviewed and no revisions were found necessary.

OR

Data from October 1960 to December 1970 inclusive have been reviewed and the revisions found necessary are included herein.

Year		1962	1962	1962	1964	1964	1964	1965
Month		Oct.	Nov.	Dec.	Feb.	July	Aug.	June
Day	1		5250 E	3100 E				
	2		5200 E	3150 E				
	3		5250 E	3150 E				
	4		5250 E	3100 E				
	5		5100 E	3050 E				
	6		4600 E	3050 E				
	7		4500 E	3000 E				
	8		4550 E	3000 E				
	9		4780 E	2950 E				
	10		4630 E	2950 E				
	11		4500 E	2900 E				
	12		4380 E	2900 E				
	13		4030 E	2850 E				
	14		3800 E	2850 E				
	15		3620 E	2800 E				
	16		3480 E	2800 E				
	17		3350 E	2750 E				
	18		3170 E	2700 E				
	19		3150 E	2650 E				
	20		3150 E	2600 E				
	21		3200 E	2550 E				
	22		3230 E	2500 E				
	23		3200 E	2450 E		17,200		32,100
	24		3170 E	2400 E				84,800
	25		3170 E	2350 E				125,000
	26		3170 E	2300 E				84,500
	27		3170 E	2250 E				59,100
	28		3150 E	2200 E				50,300
	29		3150 E	2150 E				44,200
	30	5300 E	3150 E	2100 E				39,800
	31	5300 E		2050 E			15,100	
Total			117,500	83,600				
Mean		7,730	3,920	2,700	1,030	23,000	19,500	25,100
Acre-Feet			233,000	166,000				

1967 - Maximum Instantaneous Discharge - 23,700 cfs at 2300 NST on April 22.

Prepared by D.B. Smith Approved by R.A. Brown Date Nov 2, 1972

Checked by W.A. Pine Approved by D.W. Forrest Date Nov. 24, 1972

R260 (Oct 72)

DEPARTMENT OF THE ENVIRONMENT – WATER RESOURCES BRANCH

REVIEW PROGRESS

for Eagle Creek near Birdie Station No. 07KB001

Year	Gauge Corr.	R56	Disch. Hydro-Graph	Stage Disch. Curve	Daily Discharge Computations				R258 Completed	Publ. Errors Noted	FLOW File Errors Noted
					Shift Corr.	Open Water Period	B.W. Corr.	Ice Period			
1915	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–
1916	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–
1917	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–
1918	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–
1919	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	✓
1920	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–
1921	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–
1922	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1923	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–
1924	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–
1925	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	✓
1926	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	✓
	✓										
1945	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–
1946	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1947	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1948	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1949	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–
1950	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–
1951	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	✓
1952	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	✓
1953	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	✓
1954	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	✓
1955	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	✓
1956	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–
1957	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–
1958	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–
1959	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1960	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1961	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1962	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1963	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–
1964	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–
1965	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–
1966	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	–
1967	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	–
1968	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	✓
1969	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	✓
1970	✓	✓	✓	✓	✓	✓	✓	✓	✓	–	✓

Remarks :

R285 Updated on Nov. 15, 1972
R295 Completed on Nov. 14, 1972
R296 Completed on Nov. 14, 1972
Time Spent on Review 33 Man-days

Prepared by W. J. Ford
Date Nov. 12, 1972

R256 (Oct 72)

REPORTING PROCEDURE

1. Regular contact will be maintained between Ottawa and the District Offices by monthly reporting forms (R302) being sent to the Data Control Section by the District Data Review Engineer at the end of each month. This Reporting Sheet will keep Ottawa informed of the data review progress in the Districts, the Drainage Basins which have been reviewed, those which are under review, and those which will be reviewed next, and the personnel and time spent on data review. It will also be used to indicate when Annual Hydrographs or Combined Hydrographs are required, and the changes to the list of stations in the Drainage Basins or to the Review Schedule.

2. The Reporting Sheets (R302) from the Districts will be used to complete form R303, the Data Review Monthly Report for all of Canada. This form will be completed monthly by the Data Control Section, and sent to the Districts semi-annually. The form shows the total 1970 Hydrometric Data Review Program for each District, the number of stations and station years reviewed, and the number of man-days spent on review, and the percentage completed. The form shows the amount of the review done by the District Staff and by the Ottawa Data Review Staff.

3. Upon completion of the review of all stations within a Drainage Basin (as shown on the 1970 Review Program lists), the approved review reports will be sent to Ottawa for their approval, as mentioned on page 2.

4. Update forms R295, and R296 will be retained in Ottawa and used to update the magnetic tape files at the end of each year. Corrected printouts will be sent to the Districts for a final check.

DEPARTMENT OF THE ENVIRONMENT-WATER RESOURCES BRANCH

REPORTING SHEET

1970 HYDROMETRIC DATA REVIEW PROGRAM

District Guelph Month November 1972

SUMMARY OF PROGRESS TO DATE

1970 Review Program	Number of Stations	Station - Years	Percentage of Total Sta - Yrs.
Total Program	206	2,628	
Completed - To Last Month	11	150	
- This Month	1	7	
- Total to Date	12	157	6
Rate of Progress to Date	$\frac{157}{215}$ $\frac{\text{Total Sta.-Yrs. Completed}}{\text{Total No. of Man - Days}}$ x 200 =		146 $\frac{\text{Sta. - Yrs}}{\text{Man - Year}}$

DATA REVIEW PROGRESS THIS MONTH

	Drainage Basins	Stations	Sta.-Yrs
Completed	Hudson Bay - James Bay	1	7
Under Review	Hudson Bay - James Bay	11	169
	Lake Superior	8	145

DATA REVIEW STAFF THIS MONTH

Name	No. of Days
H.A. Parker	16
F.C. Craig	2
R.J. Thompson	2
B.W. Brown	10
Total this Month	30
Total to Last Month	185
Total to Date	215

NEXT BASINS TO BE REVIEWED

Drainage Basins	Indicate if Hydrographs Required
Lake Huron - North Channel	Yes

	Attached
Requests for Combined Hydrographs - Form R301	Yes
1 Copy of the Completed Drainage Basin (s) Indicating Changes	-
1 Copy of the Review Schedule, if there are changes	-

R302 (Oct. 72) Prepared by B.W. Brown Date Nov. 30/72

DEPARTMENT OF THE ENVIRONMENT-WATER RESOURCES BRANCH

MONTHLY REPORT FOR November **19** 72

1970 HYDROMETRIC DATA REVIEW PROGRAM

District		Total Program		Completed							Man-Days		
				To Last Month		This Month		To Date			To Last Month	This Month	To Date
		Sta.	Sta-Yrs	Sta.	Sta.-Yrs	Sta.	Sta - Yrs	Sta.	Sta - Yrs.	%			
Vancouver	O			12	50	-	-	12	50		53	-	53
	V	441	6,590	3	43	2	15	5	58		25	21	46
	T			15	93	2	15	17	108	2	78	21	99
Calgary	O			-	-	-	-	-	-		-	-	-
	C	285	3,729	14	205	6	55	20	260		183	35	218
	T			14	205	6	55	20	260	7	183	35	218
Regina	O			-	-	-	-	-	-		-	12	12
	R	128	1,301	26	240	3	30	29	270		125	95	220
	T			26	240	3	30	29	270	21	125	107	232
Winnipeg	O			7	106	-	-	7	106		103	24	127
	W	201	1,974	30	298	4	40	34	338		139	19	158
	T			37	404	4	40	41	444	22	242	43	285
Guelph	O			-	-	-	-	-	-		11	13	24
	G	206	2,628	11	150	1	7	12	157		185	30	215
	T			11	150	1	7	12	157	6	196	43	239
Halifax	O			-	-	-	-	-	-		-	-	-
	H	115	2,146	1	63	1	49	2	112		23	10	33
	T			1	63	1	49	2	112	5	23	10	33
Montreal	O			-	-	-	-	-	-		-	-	-
	M	5	77	1	13	-	-	1	13		8	-	8
	T			1	13	-	-	1	13	17	8	-	8
Overall		1,390	18,445	105	1,168	17	196	122	1,364	7	855	259	1,114

Overall Rate of Review = $\frac{1364}{1114}$ Total Sta.- Yrs. Comp. / Total No. of Man - Days × 200 = 245 Sta.-Yrs. / Man - Year

R303 (Oct. 72)

Prepared by J. W. Rogers Date Dec. 10, 1972

GB
707
.C36
K57

Kirk, D.W.

Manual of hydrometric data review procedures.