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Montana Department of Transportation

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Memorandum

To: Distribution

From: David J. Hedstrom, P.E., Hydraulics Engineer *DJH*

Date: July 21, 2016

Subject: Updated Regression Equations & Flood Frequencies
Montana StreamStats , USGS Scientific Investigations Report 2015-5019
Updates Through Water Year 2011 for Peak Flows and 2009 for Low Flows

The USGS recently published updated Regional Regression Equations and Flood Frequencies for Montana in a 7-chapter online report series called Montana StreamStats. Please take these methods into consideration when developing hydrology for MDT projects. Remember that this is only one tool in the hydrologic toolbox. We will continue to use the guidelines in Chapter 7—Hydrology for all hydrology studies.

The Montana StreamStats report, which is available at <https://pubs.er.usgs.gov/publication/sir20155019> has three sections.

1. Chapter A—StreamStats On-line Program
 - a. Discusses the online Montana StreamStats application and methodology.
2. Chapters B-E—Updated Flood Frequencies for Gaged Locations
 - a. Cover the gaged stations in Montana, and
 - b. Include updated Peak Flow analyses and Low Flow analyses.
3. Chapters F&G—Regional Regression Equations for Ungaged Locations
 - a. Cover the estimating flows for ungaged locations, and
 - b. Include Regression Equations for Peak Flows and Low Flows.

Please read and familiarize yourself with this publication. As with the 1998 version, there are some limitations and other cautions in using the methods contained in this publication. Also note that this report did not update the Channel Width Regression Equations.

Attached is a summary sheet to help navigate the publication.

Copies:

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Montana StreamStats SIR-2015-0519

StreamStats

Chapter A—StreamStats

Appendix 1. (Excel Spreadsheet)

- Table 1-1. Streamflow-gaging stations in or near MT for which streamflow characteristics and regulation status are reported.
- Table 1-2. Dams in MT that were used to classify regulation status for streamflow-gaging stations.
- Table 1-3. Information on major regulation structures affecting streamflow records.

Gaged Locations

Chapter B—Peak Flow Trends and Stationarity

(No Spreadsheet)

Chapter C—Peak Flow Frequency Analyses (Through 2011) (725 Gaging Stations)

Figure 1. Map showing locations of stream gaging stations used in the analysis

Appendix 1. (Excel Spreadsheet)

- Table 1-6 Peak-flow frequency results.

Chapter D—Adjusted Peak Flow Frequencies (Through 2011) (504 Gaging Stations)

Presents adjusted frequency estimates for selected streamflow-gaging stations

Figure 1. Map showing which gages were adjusted.

Appendix 1. (Excel Spreadsheet)

- Table 1-2. Peak flow frequency estimates for selected streamflow-gaging stations in or near Montana that were adjusted by *weighting with regional regression equations*.
- Table 1-5. Peak-flow frequency estimates for selected streamflow-gaging stations in or near Montana that were adjusted by *mixed-station record extension*.

Chapter E—Streamflow Characteristics (Low Flow Stats) (Through 2009) (408 Gaging Stations)

Figure 1. Map showing Gages with Low Flow Stats

Appendix 1. (Excel Spreadsheet)

- Table 1-1. Information on streamflow-gaging stations for which streamflow characteristics are reported through water year 2009.

Ungaged Locations

Chapter F—Peak-Flow Regression Equations (Data Through 2011)

Figure 1. Map showing gages and hydrologic regions used in regional regression analysis.

P. 12 Using equation on streams that cross hydrologic regions

P. 12 Table 3. Ranges of values of basin characteristics used to develop regression equation

P. 17 Envelope Curves

P. 19 Gage Transfer on Same Stream

P. 20 Example Problems

Appendix 1. (Excel Spreadsheet)

- Table 1-4 Peak-Flow Regression Equations

Chapter G—Low-Flow Regression Equations (Annual, Seasonal, Monthly) (Data through 2009)

Figure 1. Map showing hydrologic regional boundaries and selected gages

P. 13 Ranges of values used to develop equations & Gage Transfer on Same Stream

Appendix 1. (Excel Spreadsheet)

- Table 1-3 Low-Flow Regression Equations

Appendix 2. (Excel Spreadsheet)

- Table 2-1 Spreadsheet to calculate Low Flows using Regression Equations
- Table 2-2 Spreadsheet to calculate Low Flows using Drainage-Area Ratio Method