



# COMPUTING FLOOD FREQUENCIES USING USGS PeakFQ

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# PeakFQ

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USGS has implemented the Bulletin 17B procedures for flood frequency analysis of streamflow records in the **Peak** flow **FreQ**uency analysis program. This program has recently been updated and enhanced.

# Features in PeakFQ

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- **New interfaces**
  - PKFQWin – Windows (VB)
  - PKFQBat – batch-style, command line
- **Input formats**
  - WATSTORE text format
  - Watershed Data Management (.wdm) file
  - New Program Specification file (.psf)
- **New features**
  - Confidence limits on plots
  - Documentation in Windows Help format

# PKFQWin: opening screen

- Identify input file by selecting File / Open

PKFQWin

File Help

Use File menu to Open PEAKFQ data or PKFQWin spec file.  
Update Station and Output specifications as desired.  
Click Run PEAKFQ button to generate results.

PEAKFQ Data File:

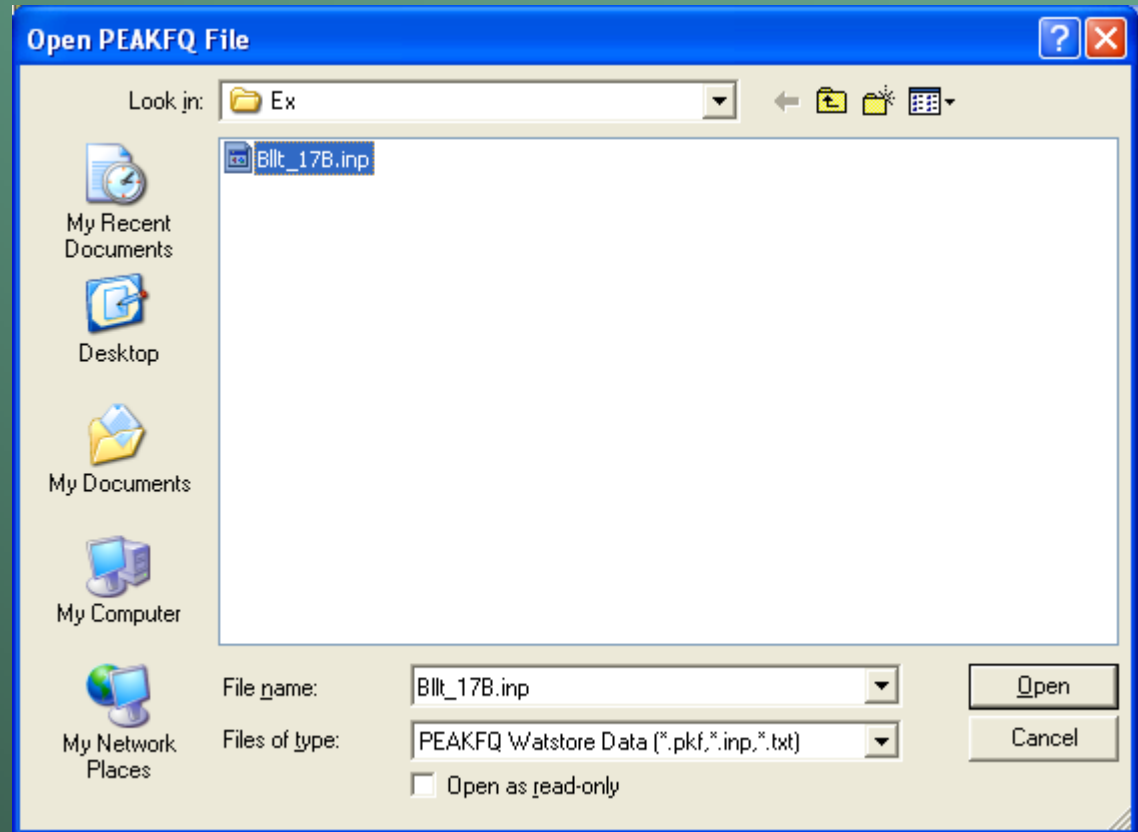
PKFQWin Spec File:

Station Specifications						Output Options						Results					
Station ID	Include in Analysis?	Beginning Year	Ending Year	Historic Period	Skew Option	Generalized Skew	Gen Skew Std Error	Mean Sqr Err	Low Hist Peak	Lo-Outlier Threshold	High Sys Peak	Hi-Outlier Threshold	Gage Base Discharge	Urban/Reg Peaks	Latitude	Longitude	

Run PEAKFQ Save Specs Exit

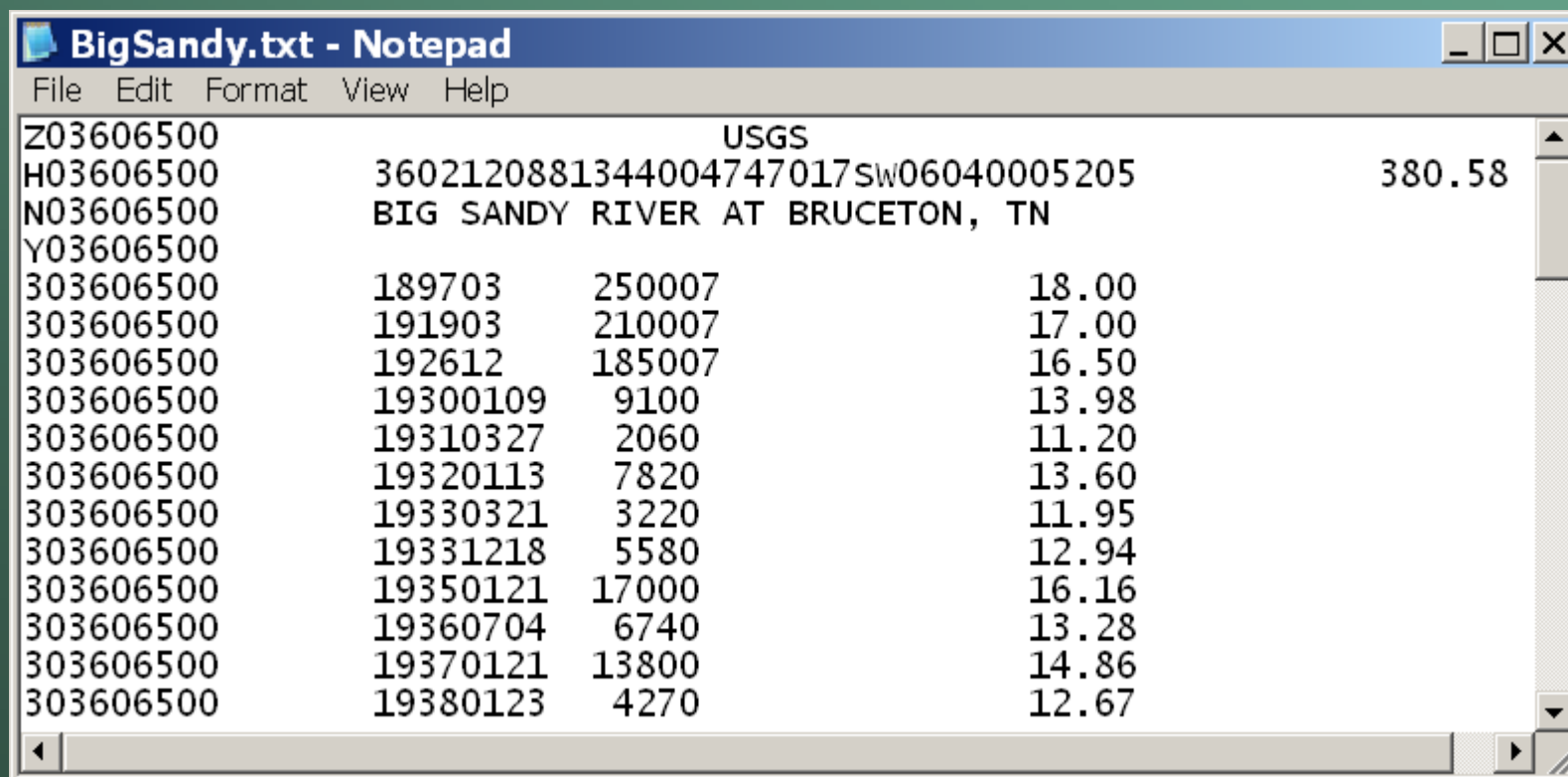
# Open PeakFQ File window

- Standard Windows open
- Recognizes predefined file suffixes (pkf, inp, txt, wdm, psf)
- Not restricted to predefined suffixes



# PKFQWin: Input file

- WATSTORE standard format from NWISWeb



Z03606500	USGS			
H03606500	3602120881344004747017SW06040005205			380.58
N03606500	BIG SANDY RIVER AT BRUCETON, TN			
Y03606500				
303606500	189703	250007		18.00
303606500	191903	210007		17.00
303606500	192612	185007		16.50
303606500	19300109	9100		13.98
303606500	19310327	2060		11.20
303606500	19320113	7820		13.60
303606500	19330321	3220		11.95
303606500	19331218	5580		12.94
303606500	19350121	17000		16.16
303606500	19360704	6740		13.28
303606500	19370121	13800		14.86
303606500	19380123	4270		12.67

# PKFQWin: Station Specifications tab

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- Populated with data from the input file
- Parameters filled from .psf file, I-records in a WATSTORE file, WDM attributes, or defaults
- Shaded fields are informational
- Non-shaded fields can be modified
- Multiple versions of same station are permitted

# PKFQWin: Station Specifications tab

PKFQWin

File Help

Use File menu to Open PEAKFQ data or PKFQWin spec file.  
Update Station and Output specifications as desired.  
Click Run PEAKFQ button to generate results.

PEAKFQ Data File: BLT\_17B.INP

PKFQWin Spec File:

**Low outlier threshold**

Station Specifications					Output Options								Results				
Include in Analysis?	Beginning Year	Ending Year	Historic Period	Skew Option	Generalized Skew	Gen Skew Std Error	Mean Sqr Err	Low Hist Peak	Lo-Outlier Threshold	High Sys Peak	Hi-Outlier Threshold	Gage Base Discharge	Urban/Reg Peaks	Latitude	Longitude	Peak	
Yes	1897	1973	0	Weighted	-0.5	0.55	0.3025	18500	0	17000	0	0	No	36.0386	88.2283	03	
Yes	1897	1973	77	Generalized	-0.5	0.55	0.3025	18500	0	17000	0	0	No	36.0386	88.2283	03	
Yes	1882	1968	0	Weighted	0.6	0.55	0.3025	4400	0	8800	0	0	No	41.5111	73.9486	01	
Yes	1935	1973	0	Weighted	-0.2	0.55	0.3025	0	0	71500	0	0	No	42.5767	96.3119	06	
Yes	1935	1973	82	Weighted	-0.2	0.55	0.3025	0	0	71500	70000	0	No	42.5767	96.3119	06	
Yes	1929	1973	0	Weighted	0.2	0.55	0.3025	0	0	22400	0	0	No	39.5119	78.0375	01	
Yes	1932	1973	0	Weighted	0.2	0.55	0.3025	0	0	10200	0	0	No	37.3169	121.128	11	
Yes	1932	1973	0	Generalized	0.2	0.55	0.3025	0	0	10200	0	0	No	37.3169	121.128	11	

**Historic Period**

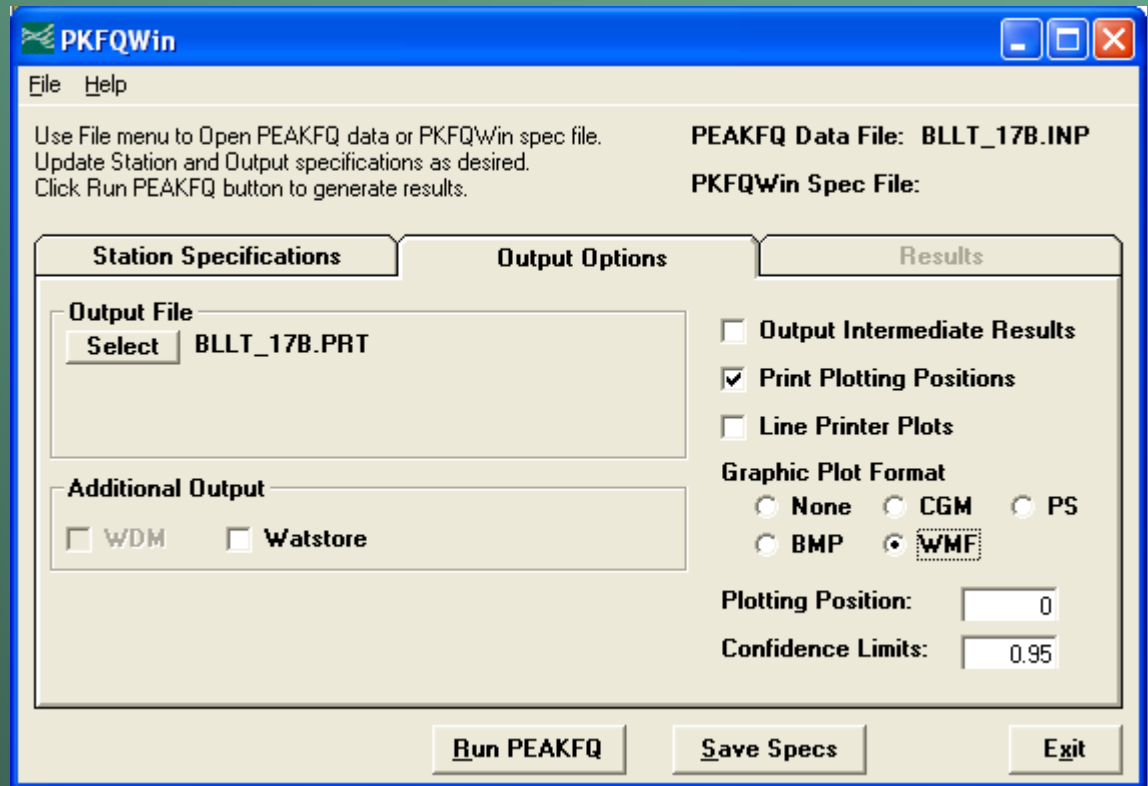
**High outlier threshold**

Run PEAKFQ Save Specs Exit



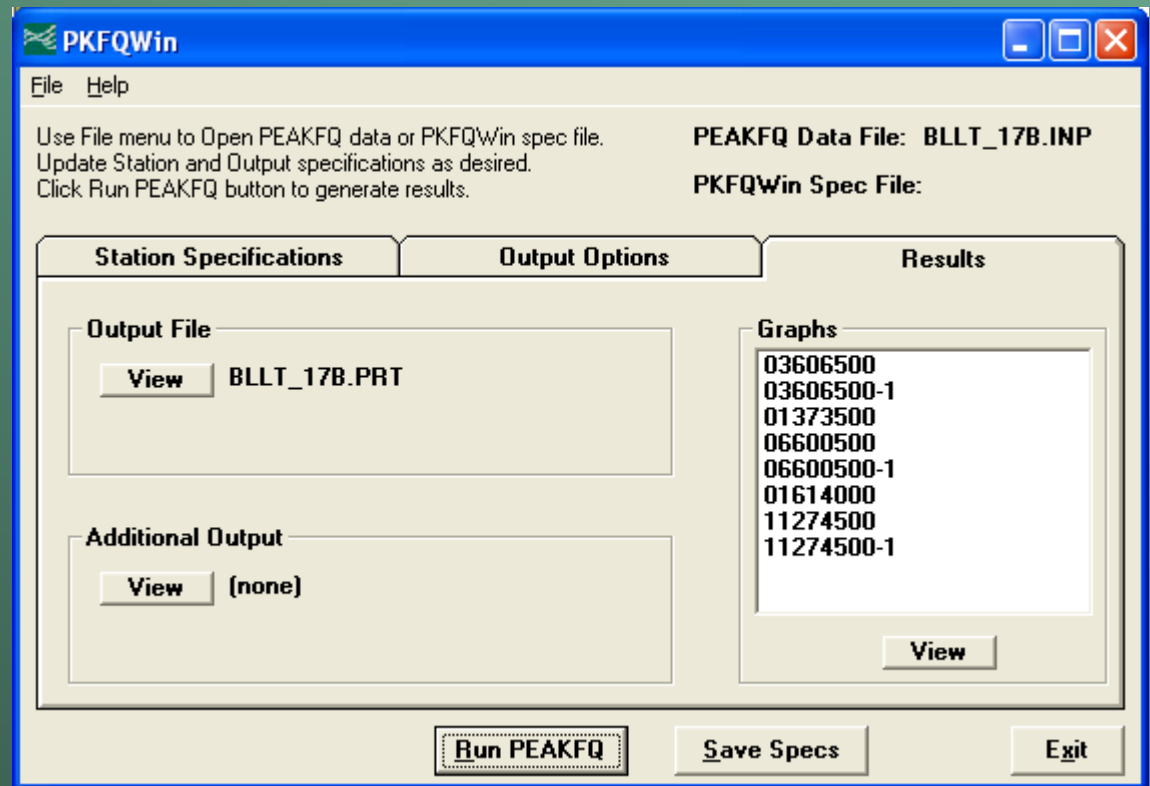
# PKFQWin: Output Options tab

- Output Options tab is available after input file has been opened
- By default, output files are named based on the name of the input file
- Four graphic plot formats
- Line printer plots ;o)
- Click on Run PEAKFQ to start the analysis



# PKFQWin: Results tab

- Results tab is available after Run PEAKFQ has been selected
- Text output may be viewed using the system default viewer for text files
- Graphs may be viewed



# PKFQWin: View Output File

- Uses default text file viewer
- For Notepad
  - Scrollable
  - Find, select, copy, ...
  - Format - font, size, and style

BLLT\_17B.PRT - Notepad

File Edit Format View Help

Program PeakFq U. S. GEOLOGICAL SURVEY Seq.002.002  
 Ver. 5.0 Beta 8 Annual peak flow frequency analysis Run Date / Time  
 05/06/2005 following Bulletin 17-B Guidelines 06/10/2005 13:42

Station - 03606500 BIG SANDY / BRUCETON - CHNG 2 SYS PKS + HIST

ANNUAL FREQUENCY CURVE PARAMETERS -- LOG-PEARSON TYPE III

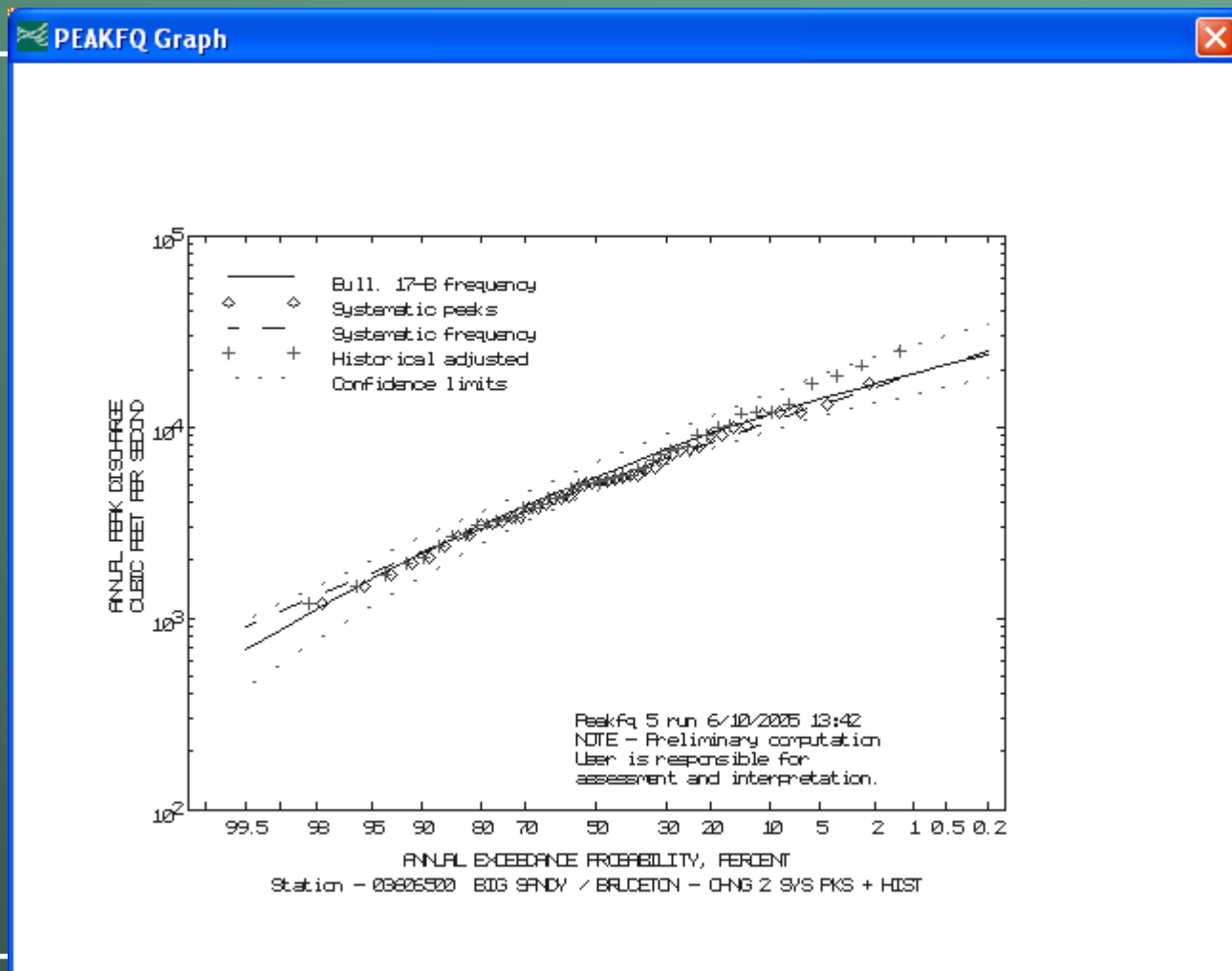
	FLOOD BASE		LOGARITHMIC		
	DISCHARGE	EXCEEDANCE PROBABILITY	MEAN	STANDARD DEVIATION	SKEW
SYSTEMATIC RECORD	0.0	1.0000	3.6901	0.2667	-0.199
BULL.17B ESTIMATE	0.0	1.0000	3.7150	0.2886	-0.500

ANNUAL FREQUENCY CURVE -- DISCHARGES AT SELECTED EXCEEDANCE PROBABILITIES

ANNUAL EXCEEDANCE PROBABILITY	BULL.17B ESTIMATE	SYSTEMATIC RECORD	'EXPECTED PROBABILITY' ESTIMATE	95-PCT CONFIDENCE LIMITS FOR BULL. 17B ESTIMATES	
				LOWER	UPPER
0.9950	687.7	898.3	594.3	429.0	966.7
0.9900	870.8	1074.0	779.8	569.2	1186.0
0.9500	1596.0	1725.0	1522.0	1169.0	2018.0
0.9000	2154.0	2204.0	2094.0	1659.0	2640.0
0.8000	3032.0	2942.0	2991.0	2453.0	3618.0
0.6667	4089.0	3825.0	4068.0	3413.0	4824.0
0.5000	5482.0	4999.0	5482.0	4643.0	6495.0
0.4292	6152.0	5573.0	6163.0	5217.0	7335.0

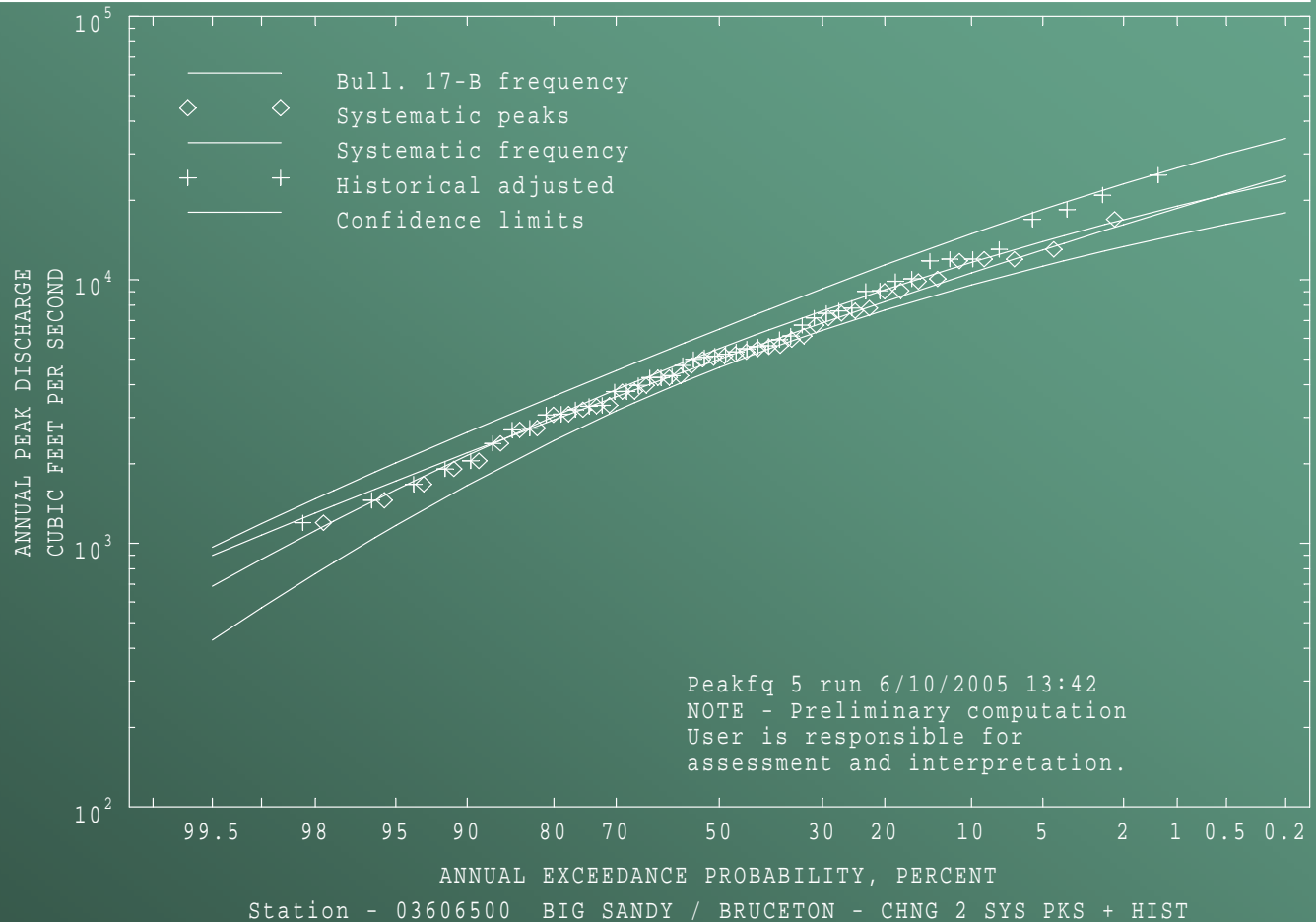
# PKFQWin: View Graphs

- If graphical output was selected on the Output tab, graphs will be available
- A .bmp file is displayed
- No editing



# PKFQWin: .wmf Graph Format

- Image can be imported into word, powerpoint, etc.
- Image can be edited



# PKFQBat

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- Provides a batch-style interface to PeakFQ
- Run from a command line
- Run from a script
- Same input and output options as PKFQWin
- Use .psf file and I records for parameters

# PeakFQ

- *Current version*
- *Release date*
- *Documentation*
- *Contact*

PeakFQ - Flood-Frequency Analysis - Windows Internet Explorer
http://water.usgs.gov/software/PeakFQ/
USGS Water Resourc...
PeakFQ - Flood-Fre...
Live Search
Page
Tools

science for a changing world
Water Resources of the United States
Home Data Maps Software Publications Programs Contact

## PeakFQ

### Flood Frequency Analysis Based on Bulletin 17B

Program PeakFQ provides estimates of instantaneous annual-maximum peak flows for a range of recurrence intervals, including 1.5, 2, 2.33, 5, 10, 25, 50, 100, 200, and 500 years (annual-Exceedance probabilities of 0.6667, 0.50, 0.4292, 0.20, 0.10, 0.04, 0.02, 0.01, 0.005, and 0.002, respectively). The Pearson Type III frequency distribution is fit to the logarithms of instantaneous annual peak flows following Bulletin 17B guidelines of the Interagency Advisory Committee on Water Data. The parameters of the Pearson Type III frequency curve are estimated by the logarithmic sample moments (mean, standard deviation, and coefficient of skewness) with adjustments for low outliers, high outliers, historic peaks, and generalized skew.

PeakFQ reads annual peaks in the WATSTORE standard format and in the [Watershed Data Managaement \(WDM\)](#) format. Annual peak flows are available from [NWISWeb](#) (<http://nwis.waterdata.usgs.gov/usa/nwis/peak>). (Retrieve data in the WATSTORE standard format, not the Tab-separated format.)

Current Version:	5.2
Release Date:	November 1, 2007
Documentation:	NOTE: Electronic and/or print versions of many U.S. Geological Survey reports can be found at the <a href="#">Publications Warehouse</a> ( <a href="http://infotrek.er.usgs.gov/pubs/">http://infotrek.er.usgs.gov/pubs/</a> )
	Version History ( <a href="#">RELEASE.TXT</a> )
	Flynn, K.M., Kirby, W.H., and Hummel, P.R., 2006, User's manual for program PeakFQ, Annual Flood Frequency Analysis Using Bulletin 17B Guidelines: U.S. Geological Survey Techniques and Methods Book 4, Chapter B4, 42 pgs. [ <a href="#">On-line</a>   <a href="#">PDF</a>   <a href="#">chm</a> ]
	Flynn, K.M., Kirby, W.H., Mason, R.R., Cohn, T.A., 2006, Estimating magnitude and frequency of floods using the PeakFQ program: U.S. Geological Survey Fact Sheet 2006-3143, 2 pgs. [ <a href="#">On-line</a>   <a href="#">PDF</a> ]
	Interagency Advisory Committee on Water Data, 1982, Guidelines for determining flood-flow frequency: Bulletin 17B of the Hydrology Subcommittee, Office of Water Data Coordination, U.S. Geological Survey, Reston, Va., 183 p., <a href="http://water.usgs.gov/osw/bulletin17b/bulletin_17b.html">http://water.usgs.gov/osw/bulletin17b/bulletin_17b.html</a>
Contact:	U.S.Geological Survey Office of Surface Water 415 National Center Reston, VA 20192 <a href="mailto:h2osoft@usgs.gov">h2osoft@usgs.gov</a>

# PeakFQ

- PeakFQ program can be found at

*<http://water.usgs.gov/software/PeakFQ/>*

PeakFQ - Flood-Frequency Analysis - Windows Internet Explorer

<http://water.usgs.gov/software/PeakFQ/>

USGS Water Resourc... PeakFQ - Flood-Fre... x

Contact: 415 National Center  
Reston, VA 20192  
[h2osoft@usgs.gov](mailto:h2osoft@usgs.gov)

Distribution Files			
Version	Operating System	Download File	Description
<b>5.2</b> <b>01Nov2007</b>	Windows	<a href="#">README.TXT</a>	Installation and usage information
		<a href="#">PKFQWin_5.2.exe</a>	Self-installing executable, includes executable program, sample data, and documentation
<b>4.1</b> <b>25Feb2002</b>	MS-DOS	<a href="#">README.TXT</a>	Installation and usage information
		<a href="#">peakfq4_1.exe (2.51MB)</a>	Self-installing executable, includes executable program, test data, source code, and documentation
	Sun Solaris	<a href="#">README.TXT</a>	Installation and usage information
		<a href="#">peakfq4.1.Solaris.tar.gz (1.3MB)</a>	Compressed tar file, includes executable program, test data, source code, and documentation
	Unix	<a href="#">peakfq4.1.source.tar.gz (705K)</a>	Compressed tar file, includes source code, test data, and documentation



# Data

- USGS peak flow data can be retrieved in the WATSTORE text format at:

USGS Surface Water for USA: Peak Streamflow - Windows Internet Explorer

http://nwis.waterdata.usgs.gov/usa/nwis/peak

USGS Home  
Contact USGS  
Search USGS

**National Water Information System: Web Interface**

USGS Water Resources (USGS Access) Data Category: Surface Water Geographic Area: United States GO

News: [Recent changes](#)

## Peak Streamflow for the Nation

### Choose Site Selection Criteria

Found 27,273 sites in USA with peak streamflow data. Choose from the following criteria to constrain the number of sites selected.

Site -- Location --	Site -- Identifier --	Site -- Attribute --	Data -- Attribute --
<input type="checkbox"/> State/Territory	<input type="checkbox"/> Site Name	<input type="checkbox"/> Altitude	<input type="checkbox"/> Number of observations
<input type="checkbox"/> Hydrologic Region	<input checked="" type="checkbox"/> Site Number	<input type="checkbox"/> Drainage area	<input type="checkbox"/> Period of record
<input type="checkbox"/> Lat-Long box	<input type="checkbox"/> Multiple Site Numbers		
	<input type="checkbox"/> Agency Code		
	<input type="checkbox"/> File of Site Numbers		

Submit Reset

***nwis.waterdata.usgs.gov/usa/nwis/peak***

# Data

- Identify station(s)
  - Exact Match
  - Match From Start
  - Match Any Part

## Select sites which meet all of the following criteria:

Define one or more values for each of the following site-selection criteria: ---  
or select [new criteria](#)

☒ **Site Number** -- enter a full or partial site ID (*optional*)

☒ exact match

☐ match from the start

☐ match any part

## Choose Output Format

### Display Summary of Selected Sites

Choose one of the following options for displaying descriptions of the sites meeting the criteria above:

☐ ☒ Table of sites sorted by  grouped by

☐ ☒ Scroll list of sites -- allows selection of data for multiple sites

☐ ☒ Brief descriptions -- allows selection of data for multiple sites

☐ ☒ Site-description information displayed in

Agency  
Site identification number  
Site name  
Site type

<--Select fields to include in  
site-description output

☐ ☒ Save file of selected sites to local disk for future upload

☐ ☒ Raw NWISWeb sitefile review (*internal*)

## Retrieve Published peak streamflow data for Selected Sites

Choose one of the following options for displaying data for the sites meeting the criteria above:

☒ Retrieve data from:  to:  (YYYY-MM-DD -- **Blank = all data**)

☒ Retrieve sample time and time zone ☒ as stored ☐ in UTC

☐ ☒ Graphs of data

☐ ☒ Table of data

☐ ☒ Tab-separated data   \*



\* Save compressed files with a .gz file extension.

☒ ☒ peakfq (watstore) format  \*

\* Save compressed files with a .gz file extension.

# Data

## ■ Match from Start



USGS Home  
Contact USGS  
Search USGS

National Water Information System: Web Interface

USGS Water Resources (USGS Access)

Data Category: Surface Water

Geographic Area: United States

GO

News: [Recent changes](#)

Peak Streamflow for the Nation

Site Selection

Select sites which meet all of the following criteria: ---- or select [new criteria](#)

Initial Site Selection Results -- 54 sites match criteria

Site number contains string 036

Minimum number of observations = 1

Check one or more boxes to select sites for further display--below

☐ **USGS 03600000 RUTHERFORD CREEK NR CARTERS CREEK, TN**  
Maury County, Tennessee  
Hydrologic Unit Code 06040003  
Latitude 35°40'23.89", Longitude 86°58'41.53" NAD27  
Drainage area 68.8 square miles  

Period of record		
Begin Date	End Date	Peaks
1954-01-21	1977-11-29	25

☐ **USGS 03605880 CANE CREEK AT STEWART, TN**  
Houston County, Tennessee  
Hydrologic Unit Code 06040005  
Latitude 36°19'09", Longitude 87°50'21" NAD27  
Drainage area 4.12 square miles  

Period of record		
Begin Date	End Date	Peaks
1984-05-08	2003-05-05	20

☒ **USGS 03606500 BIG SANDY RIVER AT BRUCETON, TN**  
Carroll County, Tennessee  
Hydrologic Unit Code 06040005  
Latitude 36°02'12.92", Longitude 88°13'44.68" NAD27  
Drainage area 205 square miles  
Gage datum  
380.58 feet above sea level NGVD29  

Period of record		
Begin Date	End Date	Peaks
1897-03	2007-01-07	67

☐ **USGS 03607000 BIG SANDY R AT BIG SANDY TENN**

# Data

- Select time period
- **peakfq** format
- Display in browser or Save to file
- Submit request

## ☐ USGS 03614000 HESS BAYOU TRIBUTARY NEAR MOUND CITY, IL

Pulaski County, Illinois  
Hydrologic Unit Code 05140206  
Latitude 37°08'11", Longitude  
89°08'31" NAD27  
Drainage area 1.95 square miles

### Period of record

Begin Date	End Date	Peaks
1959-01-21	1972-04-15	14

## Choose Output Format

### Display Summary of Selected Sites

Choose one of the following options for displaying descriptions of the sites meeting the criteria above:

- ☐ Table of sites sorted by  grouped by
- ☐ Scroll list of sites -- allows selection of data for multiple sites
- ☐ Brief descriptions -- allows selection of data for multiple sites
- ☐ Site-description information displayed in 
  - Agency
  - Site identification number
  - Site name
  - Site type<--Select fields to include in site-description output
- ☐ Save file of selected sites to local disk for future upload
- ☐ Raw NWISWeb sitefile review (internal)

### Retrieve Published peak streamflow data for Selected Sites

Choose one of the following options for displaying data for the sites meeting the criteria above:

- ☒ Retrieve data from  to:  (YYYY-MM-DD -- Blank = all data)
  - ☒ Retrieve sample time and time zone ☒ as stored ☐ in UTC
  - ☐ Graphs of data
  - ☐ Table of data
  - ☐ Tab-separated data   \*
- \* Save compressed files with a .gz file extension.
- ☒ peakfq (watstore) format

\* Save compressed files with a .gz file extension.

Submit

Reset

Help

# Data

- From the File Menu, select Save As
- Identify folder
- Name the file

http://nwis.waterdata.usgs.gov/nwis/peak?search\_site\_no=03606500&search\_site\_no=03606500

http://nwis.waterdata.usgs.gov/nwis/peak? Live Search

http://n... x Google

Page Tools

USGS			
Z03606500			
H03606500	3602120881344004747017SW06040005205		380.58
N03606500	BIG SANDY RIVER AT BRUCETON, TN		
Y03606500			
303606500	189703	250007B	18.00
303606500	191903	210007B	17.00
303606500	192612	185007B	16.50
303606500	19300109	9100	13.98
303606500	19310327	2060	11.20
303606500	19320113	7820	13.60
303606500	19330321	3220	11.95
303606500	19331218	5580	12.94
303606500	19350121	17000	16.16
303606500	19360704	6740	13.28
303606500	19370121	13800	14.86
303606500	19380123	4270	12.67
303606500	19390204	5940	13.23
303606500	19400319	1680	10.91
303606500	19410802	1200	10.00
303606500	19420410	10100	14.52
303606500	19430320	3780	12.45
303606500	19440218	5340	13.07
303606500	19450102	5630	13.13
303606500	19460109	12000	14.92
303606500	19470104	3980	12.53
303606500	19480317	6130	13.31
303606500	19481120	4740	12.83
303606500	19491213	9880	14.37
303606500	19510104	5230	13.01
303606500	19511216	4260	12.70
303606500	19530519	5000	12.95
303606500	19540122	3320	12.32
303606500	19550322	5480	13.11

Done Internet 100%

# Peak Flow Data

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- peakfq-formatted peak flow data can be written to a .wdm file using the IOWDM program found at:

*[water.usgs.gov/software/iowdm.html](http://water.usgs.gov/software/iowdm.html)*

# Example Session . . .

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