

APPENDIX E

**OUTPUT OF THE PEAKFQ RUNS FOR OBSERVED REGULATED PEAK AND
ONE-DAY FLOWS IN THE SKAGIT RIVER NEAR CONCRETE**

Appendix E1 – Output of PEAKFQ Run for Observed Regulated Peak Flows at Skagit River near Concrete

U. S. GEOLOGICAL SURVEY
ANNUAL PEAK FLOW FREQUENCY ANALYSIS
Following Bulletin 17-B Guidelines
Program peakfq
(Version 4.1, February, 2002)

--- PROCESSING DATE/TIME ---
2005 OCT 14 15:01:28

--- PROCESSING OPTIONS ---
Plot option = None
Basin char output = None
Print option = Yes
Debug print = No
Input peaks listing = Long
Input peaks format = WATSTORE peak file

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U. S. GEOLOGICAL SURVEY
ANNUAL PEAK FLOW FREQUENCY ANALYSIS
Following Bulletin 17-B Guidelines
Program peakfq
(Version 4.1, February, 2002)

Station - 12194000 WY 1956-2004 Observed Annual Peak Flows
2005 OCT 14 15:01:28

I N P U T D A T A S U M M A R Y

Number of peaks in record	=	49
Peaks not used in analysis	=	0
Systematic peaks in analysis	=	49
Historic peaks in analysis	=	0
Years of historic record	=	49
Generalized skew	=	0.000
Standard error of generalized skew	=	0.550
Skew option	=	WEIGHTED
Gage base discharge	=	0.0
User supplied high outlier threshold	=	--
User supplied low outlier criterion	=	--
Plotting position parameter	=	0.00

***** NOTICE -- Preliminary machine computations. *****
***** User responsible for assessment and interpretation. *****

WCF134I-NO SYSTEMATIC PEAKS WERE BELOW GAGE BASE.	0.0
WCF195I-NO LOW OUTLIERS WERE DETECTED BELOW CRITERION.	22105.5
WCF163I-NO HIGH OUTLIERS OR HISTORIC PEAKS EXCEEDED HHBASE.	236025.4
**WCF164W-HISTORIC PERIOD IGNORED.	49.0
WCF002J-CALCS COMPLETED. RETURN CODE = 2	

Appendix E

Station - 12194000 WY 1956-2004 Observed Annual Peak Flows
2005 OCT 14 15:01:28

ANNUAL FREQUENCY CURVE PARAMETERS -- LOG-PEARSON TYPE III

	FLOOD BASE		LOGARITHMIC		
	DISCHARGE	EXCEEDANCE PROBABILITY	MEAN	STANDARD DEVIATION	SKEW
SYSTEMATIC RECORD	0.0	1.0000	4.8587	0.1863	0.055
BULL.17B ESTIMATE	0.0	1.0000	4.8587	0.1863	0.041

ANNUAL FREQUENCY CURVE -- DISCHARGES AT SELECTED EXCEEDANCE PROBABILITIES

ANNUAL LIMITS EXCEEDANCE ESTIMATES PROBABILITY	BULL.17B ESTIMATE	SYSTEMATIC RECORD	'EXPECTED	95-PCT CONFIDENCE	
			PROBABILITY'	FOR BULL. 17B LOWER	UPPER
0.9950	24320.0	24460.0	23010.0	19020.0	29190.0
0.9900	26970.0	27100.0	25820.0	21490.0	31970.0
0.9500	35850.0	35910.0	35100.0	29980.0	41160.0
0.9000	41760.0	41790.0	41210.0	35760.0	47250.0
0.8000	50300.0	50290.0	49960.0	44150.0	56110.0
0.5000	72020.0	71950.0	72020.0	65010.0	79770.0
0.2000	103600.0	103500.0	104300.0	92830.0	117900.0
0.1000	125400.0	125500.0	127100.0	110800.0	146500.0
0.0400	154000.0	154300.0	157900.0	133300.0	185800.0
0.0200	176000.0	176600.0	182300.0	150100.0	217200.0
0.0100	198500.0	199400.0	208000.0	166900.0	250300.0
0.0050	221700.0	223000.0	235400.0	184000.0	285100.0
0.0020	253600.0	255600.0	274500.0	206900.0	334400.0
0.6667	59917.7	(1.50-year flood)			
0.4292	77733.8	(2.33-year flood)			

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Station - 12194000 WY 1956-2004 Observed Annual Peak Flows
2005 OCT 14 15:01:28

I N P U T D A T A L I S T I N G

WATER YEAR	DISCHARGE	CODES	WATER YEAR	DISCHARGE	CODES
1956	106000.0		1981	148700.0	
1957	61000.0		1982	51700.0	
1958	41400.0		1983	101000.0	
1959	90700.0		1984	109000.0	
1960	89300.0		1985	46100.0	
1961	79000.0		1986	93400.0	

1962	56000.0	1987	83500.0
1963	114000.0	1988	39600.0
1964	73800.0	1989	74100.0
1965	52600.0	1990	119000.0
1966	36800.0	1991	149000.0
1967	72300.0	1992	53300.0
1968	84200.0	1993	39300.0
1969	49500.0	1994	36500.0
1970	38400.0	1995	59800.0
1971	62200.0	1996	160000.0
1972	91900.0	1997	91400.0
1973	49500.0	1998	76700.0
1974	79900.0	1999	61400.0
1975	57500.0	2000	103000.0
1976	122000.0	2001	30900.0
1977	58400.0	2002	94300.0
1978	70300.0	2003	65500.0
1979	46000.0	2004	166000.0
1980	135800.0		

Explanation of peak discharge qualification codes

PEAKFQ CODE	WATSTORE CODE	DEFINITION
D	3	Dam failure, non-recurrent flow anomaly
G	8	Discharge greater than stated value
X	3+8	Both of the above
L	4	Discharge less than stated value
K	6 OR C	Known effect of regulation or urbanization
H	7	Historic peak

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Station - 12194000 WY 1956-2004 Observed Annual Peak Flows
2005 OCT 14 15:01:28

EMPIRICAL FREQUENCY CURVES -- WEIBULL PLOTTING POSITIONS

WATER YEAR	RANKED DISCHARGE	SYSTEMATIC RECORD	BULL.17B ESTIMATE
2004	166000.0	0.0200	0.0200
1996	160000.0	0.0400	0.0400
1991	149000.0	0.0600	0.0600
1981	148700.0	0.0800	0.0800
1980	135800.0	0.1000	0.1000
1976	122000.0	0.1200	0.1200
1990	119000.0	0.1400	0.1400
1963	114000.0	0.1600	0.1600
1984	109000.0	0.1800	0.1800
1956	106000.0	0.2000	0.2000

2000	103000.0	0.2200	0.2200
1983	101000.0	0.2400	0.2400
2002	94300.0	0.2600	0.2600
1986	93400.0	0.2800	0.2800
1972	91900.0	0.3000	0.3000
1997	91400.0	0.3200	0.3200
1959	90700.0	0.3400	0.3400
1960	89300.0	0.3600	0.3600
1968	84200.0	0.3800	0.3800
1987	83500.0	0.4000	0.4000
1974	79900.0	0.4200	0.4200
1961	79000.0	0.4400	0.4400
1998	76700.0	0.4600	0.4600
1989	74100.0	0.4800	0.4800
1964	73800.0	0.5000	0.5000
1967	72300.0	0.5200	0.5200
1978	70300.0	0.5400	0.5400
2003	65500.0	0.5600	0.5600
1971	62200.0	0.5800	0.5800
1999	61400.0	0.6000	0.6000
1957	61000.0	0.6200	0.6200
1995	59800.0	0.6400	0.6400
1977	58400.0	0.6600	0.6600
1975	57500.0	0.6800	0.6800
1962	56000.0	0.7000	0.7000
1992	53300.0	0.7200	0.7200
1965	52600.0	0.7400	0.7400
1982	51700.0	0.7600	0.7600
1969	49500.0	0.7800	0.7800
1973	49500.0	0.8000	0.8000
1985	46100.0	0.8200	0.8200
1979	46000.0	0.8400	0.8400
1958	41400.0	0.8600	0.8600
1988	39600.0	0.8800	0.8800
1993	39300.0	0.9000	0.9000
1970	38400.0	0.9200	0.9200
1966	36800.0	0.9400	0.9400
1994	36500.0	0.9600	0.9600
2001	30900.0	0.9800	0.9800

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U. S. GEOLOGICAL SURVEY
 ANNUAL PEAK FLOW FREQUENCY ANALYSIS
 Following Bulletin 17-B Guidelines
 Program peakfq
 (Version 4.1, February, 2002)

End PEAKFQ analysis.
 Stations processed : 1
 Number of errors : 0
 Stations skipped : 0
 Station years : 49

Appendix E2 – Output of PEAKFQ Run for Observed Regulated One-Day Flows at Skagit River near Concrete

U. S. GEOLOGICAL SURVEY
ANNUAL PEAK FLOW FREQUENCY ANALYSIS
Following Bulletin 17-B Guidelines
Program peakfq
(Version 4.1, February, 2002)

--- PROCESSING DATE/TIME ---

2005 OCT 14 15:06:31

--- PROCESSING OPTIONS ---

Plot option = None
Basin char output = None
Print option = Yes
Debug print = No
Input peaks listing = Long
Input peaks format = WATSTORE peak file

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U. S. GEOLOGICAL SURVEY
ANNUAL PEAK FLOW FREQUENCY ANALYSIS
Following Bulletin 17-B Guidelines
Program peakfq
(Version 4.1, February, 2002)

Station - 12194000 WY 1956-2004 Observed 1-Day Flows
2005 OCT 14 15:06:31

I N P U T D A T A S U M M A R Y

Number of peaks in record	=	49
Peaks not used in analysis	=	0
Systematic peaks in analysis	=	49
Historic peaks in analysis	=	0
Years of historic record	=	49
Generalized skew	=	-0.040
Standard error of generalized skew	=	0.550
Skew option	=	WEIGHTED
Gage base discharge	=	0.0
User supplied high outlier threshold	=	--
User supplied low outlier criterion	=	--
Plotting position parameter	=	0.00

***** NOTICE -- Preliminary machine computations. *****
***** User responsible for assessment and interpretation. *****

WCF134I-NO SYSTEMATIC PEAKS WERE BELOW GAGE BASE.	0.0
WCF195I-NO LOW OUTLIERS WERE DETECTED BELOW CRITERION.	15899.5
WCF163I-NO HIGH OUTLIERS OR HISTORIC PEAKS EXCEEDED HHBASE.	193718.4
**WCF164W-HISTORIC PERIOD IGNORED.	49.0
WCF002J-CALCS COMPLETED. RETURN CODE = 2	

Appendix E

Station - 12194000 WY 1956-2004 Observed 1-Day Flows
2005 OCT 14 15:06:31

ANNUAL FREQUENCY CURVE PARAMETERS -- LOG-PEARSON TYPE III

	FLOOD BASE		LOGARITHMIC		
	DISCHARGE	EXCEEDANCE PROBABILITY	MEAN	STANDARD DEVIATION	SKEW
SYSTEMATIC RECORD	0.0	1.0000	4.7443	0.1967	0.056
BULL.17B ESTIMATE	0.0	1.0000	4.7443	0.1967	0.031

ANNUAL FREQUENCY CURVE -- DISCHARGES AT SELECTED EXCEEDANCE PROBABILITIES

ANNUAL LIMITS EXCEEDANCE ESTIMATES PROBABILITY	BULL.17B ESTIMATE	SYSTEMATIC RECORD	'EXPECTED	95-PCT CONFIDENCE	
			PROBABILITY'	FOR BULL. 17B	LOWER
0.9950	17510.0	17700.0	16500.0	13500.0	21240.0
0.9900	19550.0	19720.0	18660.0	15370.0	23400.0
0.9500	26450.0	26540.0	25870.0	21900.0	30610.0
0.9000	31110.0	31150.0	30670.0	26400.0	35440.0
0.8000	37880.0	37860.0	37610.0	33010.0	42520.0
0.5000	55370.0	55260.0	55370.0	49700.0	61680.0
0.2000	81190.0	81150.0	81790.0	72350.0	93160.0
0.1000	99310.0	99430.0	100800.0	87150.0	117100.0
0.0400	123200.0	123700.0	126500.0	105900.0	150200.0
0.0200	141700.0	142600.0	147100.0	119900.0	176900.0
0.0100	160800.0	162200.0	168900.0	134000.0	205300.0
0.0050	180600.0	182500.0	192200.0	148300.0	235300.0
0.0020	207800.0	210800.0	225700.0	167800.0	278000.0
0.6667	45587.0	(1.50-year flood)			
0.4292	60017.5	(2.33-year flood)			

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Station - 12194000 WY 1956-2004 Observed 1-Day Flows
2005 OCT 14 15:06:31

I N P U T D A T A L I S T I N G

WATER YEAR	DISCHARGE	CODES	WATER YEAR	DISCHARGE	CODES
1956	94100.0		1981	104900.0	
1957	49700.0		1982	49000.0	
1958	34600.0		1983	61500.0	
1959	58200.0		1984	79600.0	
1960	77500.0		1985	23900.0	
1961	60300.0		1986	70100.0	

1962	48900.0	1987	60300.0
1963	81700.0	1988	29000.0
1964	58600.0	1989	55900.0
1965	49500.0	1990	86100.0
1966	29000.0	1991	135000.0
1967	53900.0	1992	35300.0
1968	60200.0	1993	25300.0
1969	44100.0	1994	31400.0
1970	29000.0	1995	51800.0
1971	54700.0	1996	131000.0
1972	40400.0	1997	63000.0
1973	43100.0	1998	61400.0
1974	73400.0	1999	45100.0
1975	42500.0	2000	86000.0
1976	108200.0	2001	22800.0
1977	45800.0	2002	79700.0
1978	57800.0	2003	43200.0
1979	35300.0	2004	131000.0
1980	113700.0		

Explanation of peak discharge qualification codes

PEAKFQ CODE	WATSTORE CODE	DEFINITION
D	3	Dam failure, non-recurrent flow anomaly
G	8	Discharge greater than stated value
X	3+8	Both of the above
L	4	Discharge less than stated value
K	6 OR C	Known effect of regulation or urbanization
H	7	Historic peak

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Station - 12194000 WY 1956-2004 Observed 1-Day Flows
2005 OCT 14 15:06:31

EMPIRICAL FREQUENCY CURVES -- WEIBULL PLOTTING POSITIONS

WATER YEAR	RANKED DISCHARGE	SYSTEMATIC RECORD	BULL.17B ESTIMATE
1991	135000.0	0.0200	0.0200
1996	131000.0	0.0400	0.0400
2004	131000.0	0.0600	0.0600
1980	113700.0	0.0800	0.0800
1976	108200.0	0.1000	0.1000
1981	104900.0	0.1200	0.1200
1956	94100.0	0.1400	0.1400
1990	86100.0	0.1600	0.1600
2000	86000.0	0.1800	0.1800
1963	81700.0	0.2000	0.2000

2002	79700.0	0.2200	0.2200
1984	79600.0	0.2400	0.2400
1960	77500.0	0.2600	0.2600
1974	73400.0	0.2800	0.2800
1986	70100.0	0.3000	0.3000
1997	63000.0	0.3200	0.3200
1983	61500.0	0.3400	0.3400
1998	61400.0	0.3600	0.3600
1961	60300.0	0.3800	0.3800
1987	60300.0	0.4000	0.4000
1968	60200.0	0.4200	0.4200
1964	58600.0	0.4400	0.4400
1959	58200.0	0.4600	0.4600
1978	57800.0	0.4800	0.4800
1989	55900.0	0.5000	0.5000
1971	54700.0	0.5200	0.5200
1967	53900.0	0.5400	0.5400
1995	51800.0	0.5600	0.5600
1957	49700.0	0.5800	0.5800
1965	49500.0	0.6000	0.6000
1982	49000.0	0.6200	0.6200
1962	48900.0	0.6400	0.6400
1977	45800.0	0.6600	0.6600
1999	45100.0	0.6800	0.6800
1969	44100.0	0.7000	0.7000
2003	43200.0	0.7200	0.7200
1973	43100.0	0.7400	0.7400
1975	42500.0	0.7600	0.7600
1972	40400.0	0.7800	0.7800
1979	35300.0	0.8000	0.8000
1992	35300.0	0.8200	0.8200
1958	34600.0	0.8400	0.8400
1994	31400.0	0.8600	0.8600
1966	29000.0	0.8800	0.8800
1970	29000.0	0.9000	0.9000
1988	29000.0	0.9200	0.9200
1993	25300.0	0.9400	0.9400
1985	23900.0	0.9600	0.9600
2001	22800.0	0.9800	0.9800

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 ANNUAL PEAK FLOW FREQUENCY ANALYSIS
 Following Bulletin 17-B Guidelines
 Program peakfq
 (Version 4.1, February, 2002)

End PEAKFQ analysis.
 Stations processed : 1
 Number of errors : 0
 Stations skipped : 0
 Station years : 49