



November 8, 2005

John Field  
 Field Geology Services, Inc.  
 PO Box 985  
 Farmington, ME 04938

**Subject: Conceptual Hydraulic Analysis of Connecticut River Upstream of Wyoming Dam**

Dear Mr. Field:

This report presents methods and results applied by Woodlot Alternatives, Inc. (Woodlot) as part of a conceptual hydraulic analysis of changes in water surface elevations upstream of the former Wyoming Dam site on the Connecticut River near Guildhall, Vermont. This work was performed by Woodlot on behalf of Field Geology Services, Inc. (FGS). The results of the hydraulic analysis suggest that following the failure of the dam, upstream water surface elevations in the Connecticut River have decreased through the entire study reach for the evaluated hydrologic events.

**Hydrologic Analysis**

Project flows were developed for the 2, 5, and 100-year return interval events. Peak flows associated with these events was determined using peak flow data obtained from United States Geological Survey (USGS) stream gaging stations located on the Connecticut River upstream and downstream of the Wyoming Dam site. Peak flows for the evaluated return interval events at each gaging station were calculated using the USGS PEAKFQ software system. Peak flows on the Connecticut River at the Wyoming Dam site were subsequently determined using calculated peak flows at the upstream and downstream USGS gaging station based on linear interpolation of peak flows and drainage areas. The results of this analysis are presented in Table 1.

**Table 1: Hydrologic Analysis Results**

USGS Station Number	Location	Drainage Area (square miles)	Return Interval Peak Flow (cubic-feet-per-second)		
			2-Year	5-Year	100-Year
01129500	CT River, North Stratford, NH	799	13,940	18,350	30,870
01131500	CT River Near Dalton, NH	1514	21,890	28,850	47,500
-	Wyoming Dam	1192	18,837	24,811	41,289

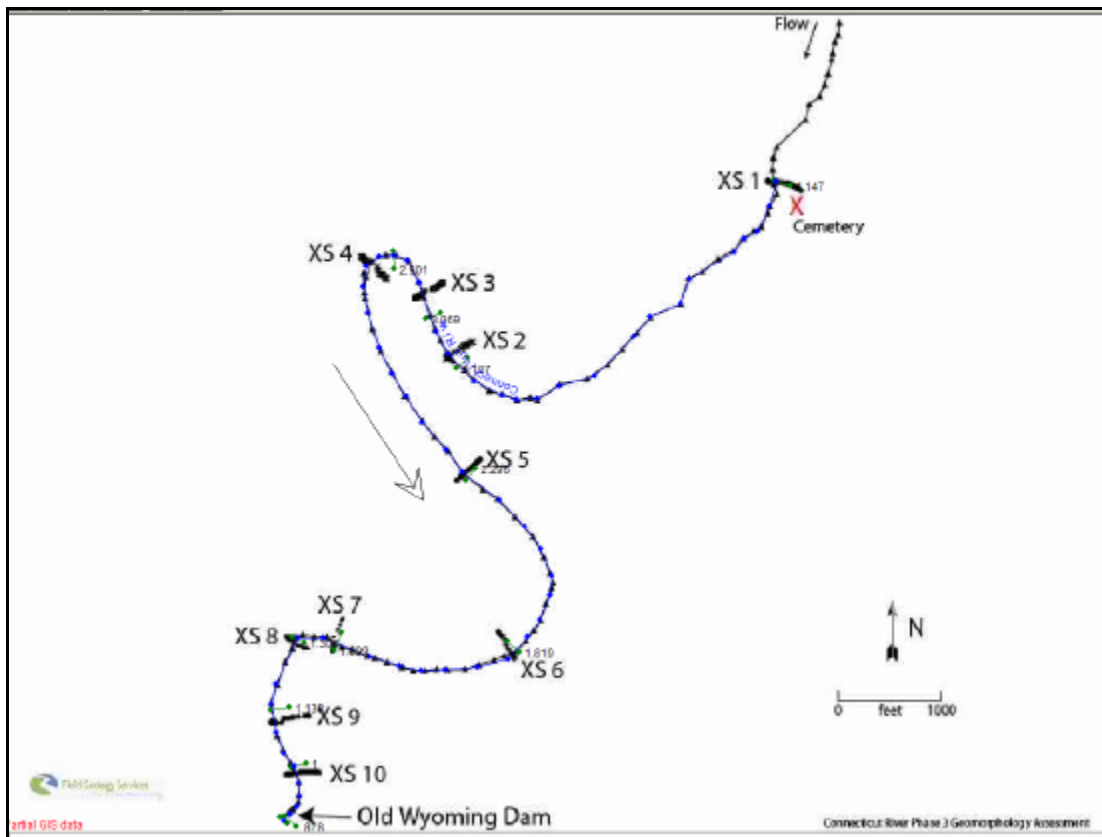
**Hydraulic Analysis**

A hydraulic analysis was performed to evaluate water surface elevations upstream of the Wyoming Dam site during the 2, 5, and 100-year return interval events. The hydraulic analysis was performed using the United States Army Corps of Engineers (Corps) HEC-RAS software system.

Geometry data for the hydraulic model was provided to Woodlot by FGS and the New Hampshire Department of Environmental Services (NHDES). Data provided by FGS included channel cross sections at ten locations from the dam extending upstream approximately three miles, and reference elevations at the Wyoming Dam site. Data provided by the NHDES included the Phase 1 dam inspection report for the Wyoming Dam (I.D. No 182.01) prepared by the Corps in February 1979. Information obtained in this report included approximate dimensions of the dam and spillway capacity calculations. Different arbitrary vertical datum were used by FGS and the USACE. Vertical data presented in the Corps report was rectified to the vertical datum used by FGS based on the assumption that the elevation described as “Elevation of top of spillway gate = 44.11” is the same as the “top of dam” elevations at the left and right abutments of 100.00-foot (ft) in the Corps report. This correction was checked against reported thalweg elevations and appeared to be reasonable. All analyses performed by Woodlot were subsequently performed using the arbitrary vertical datum established by FGS.

The locations of cross sections provided by FGS was checked by plotting the locations overlying the HEC-RAS model on a planform map of the Connecticut River developed by FGS showing the survey locations (**FIGURE 1**). This check suggests that the reach lengths provided by FGS are reasonably accurate. The numbered reach locations shown on the model locations are in river miles, with Cross Section No. 10 (“XS 10”) set at river mile “1”.

**Figure 1: Schematic Layout of Study Reach**



The width of the channel through the breach in the Wyoming Dam was set at 220-ft based on observations of water surface elevations provided by FGS. To account for the increased channel width immediately upstream of the dam site, the first upstream cross section (SX 10) was duplicated at a point 50-ft upstream of the dam. Interpolated cross sections were also set at a maximum interval of 100-ft within the balance of the hydraulic model to “smooth” the calculated water surface elevations.

The evaluation of existing (“dam-out”) and past (“dam-in”) water surface elevations in the project reach was performed through the application of applicable downstream boundary conditions in the hydraulic model.

For the dam-out (i.e., existing conditions) scenario, the downstream boundary condition was set using a normal depth slope of 0.005. The results of this analysis were checked using daily average flow data obtained from the USGS gaging station on the Connecticut River at North Stratford, NH (USGS Station No. 01129500) for July 26, 2005, and the water surface elevation recorded by FGS at XS 1 on that date. The recorded and calculated water surface elevations were within 0.2-ft, which was deemed expectable by Woodlot for this study. For the dam-in scenario, the downstream boundary condition was set using stage-discharge data at the Wyoming Dam presented in the Corps study.

All of the hydraulic calculations were performed with the assumption that supercritical flow would not occur in all areas of the study reach for the evaluated events. Calculated hydraulic parameters at the upper end of the model reach (XS 1) are presented in **TABLE 1**.

**Table 2: Results of Hydraulic Analysis at XS 1 (Sta. 4.147)**

Event	Scenario	WSEL (ft)	Difference in WSEL (ft)	Channel Velocity (fps)	Top Width (ft)
2-Year	Dam-In	55.23	3.97	2.9	368.29
2-Year	Dam-Out	51.26		3.66	363.73
5-Year	Dam-In	57.6	3.78	3.39	371.02
5-Year	Dam-Out	53.82		4.12	366.67
100-Year	Dam-In	63.59	3.96	4.4	377.92
100-Year	Dam-Out	59.63		5.15	373.36

Figures 2 through 4 (below) provide a graphical presentation changes in water surface elevations within the study reach for the evaluated hydrologic events.

Figure 2: Plotted Water Surface Profiles for 2-Year Event

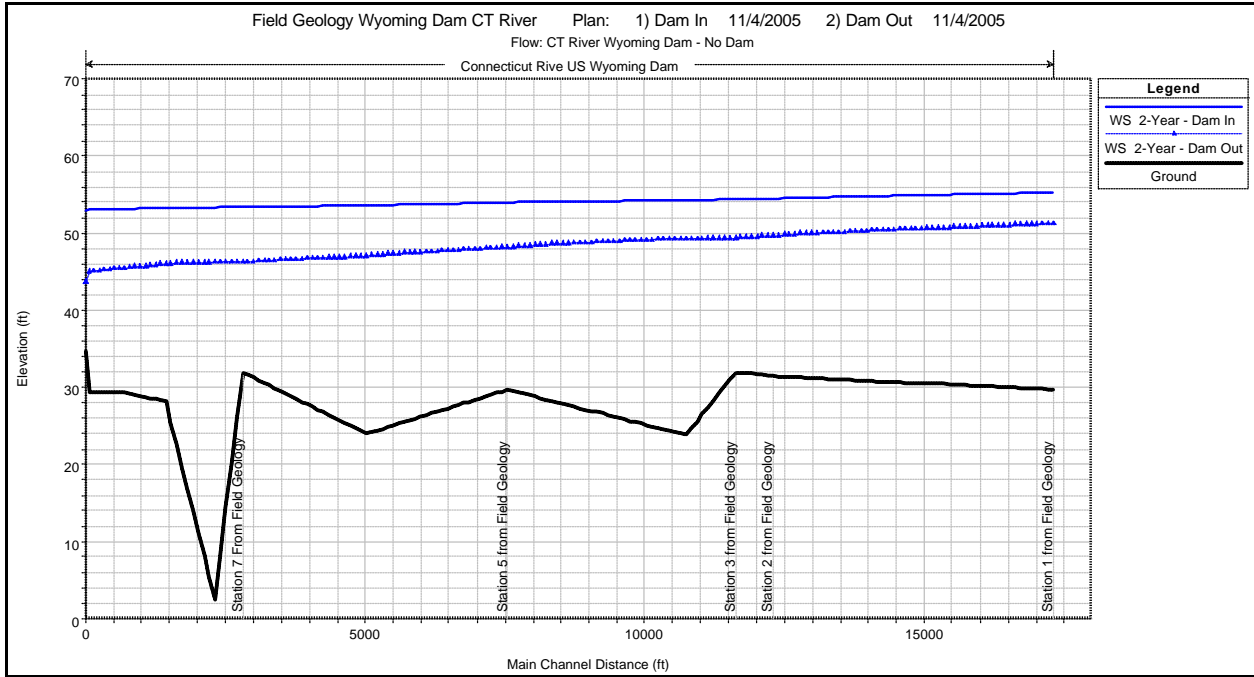
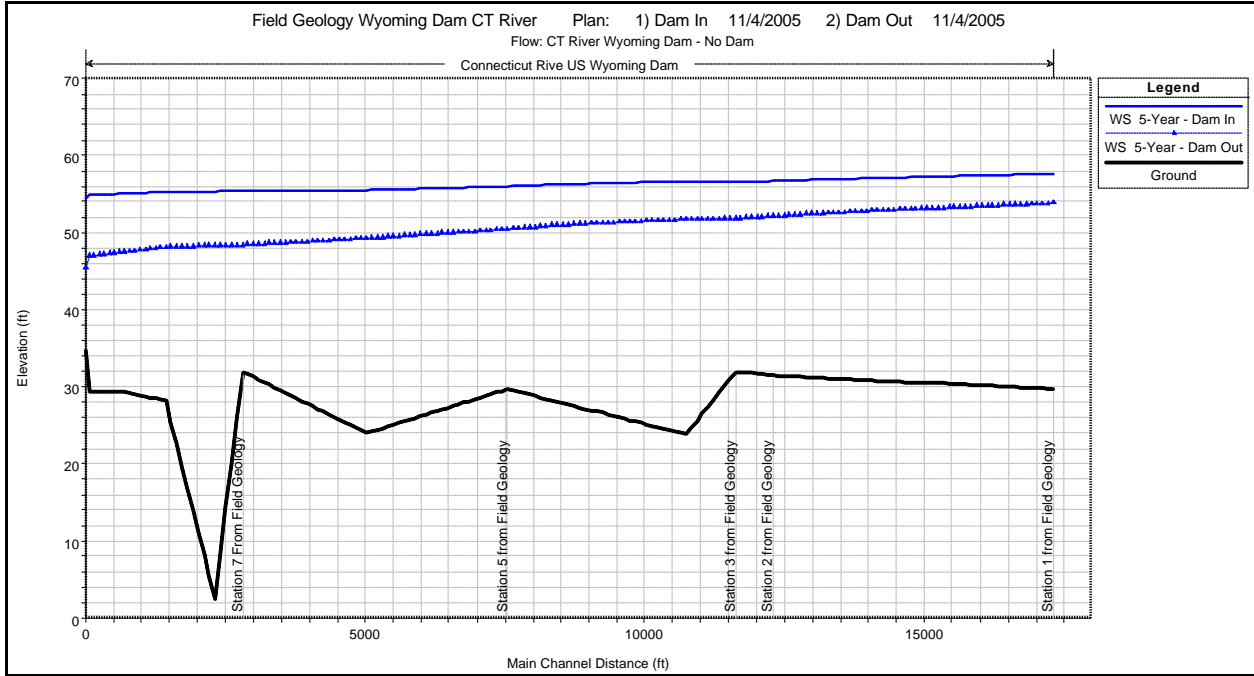
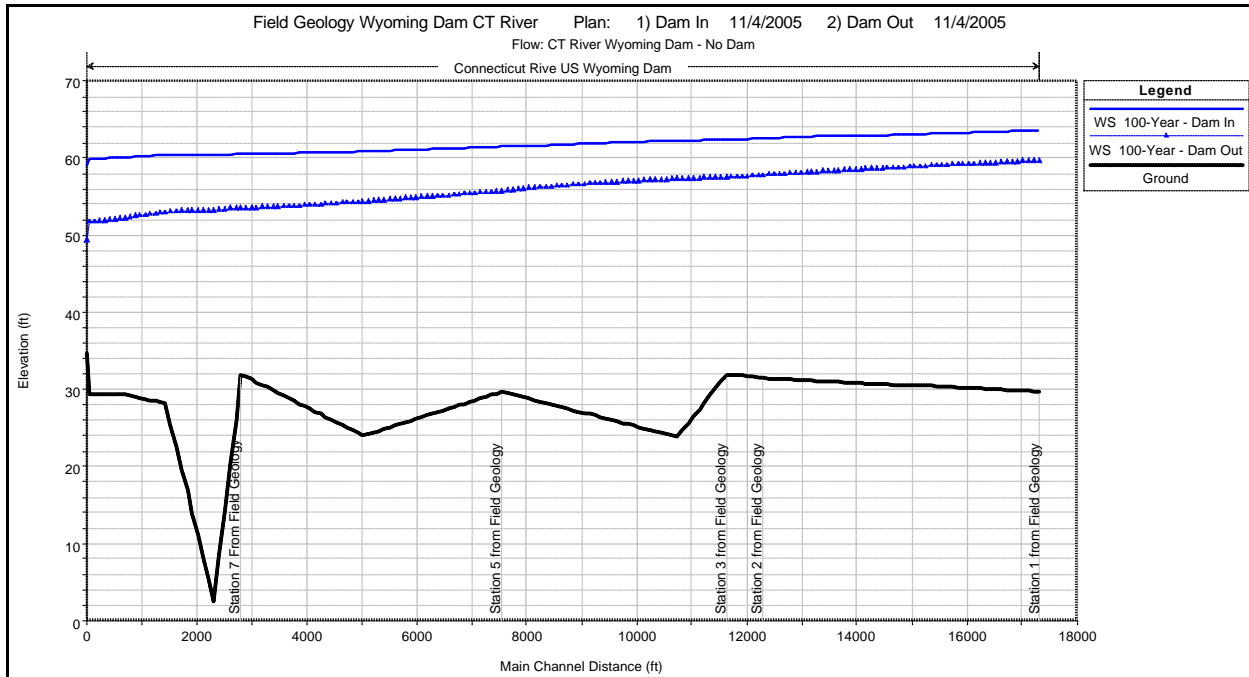


Figure 3: Plotted Water Surface Profiles for 5-Year Event



**Figure 4: Plotted Water Surface Profiles for 100-Year Event**



**Discussion of Results**

The results of the hydraulic analysis suggest that following the failure of the dam, upstream water surface elevations in the Connecticut River have decreased through the entire study reach for each of the evaluated hydrologic events. It is of note that the calculated extent of the backwater influence from the Wyoming Dam extended upstream beyond the upper limit of the study reach. This condition is apparent in that the calculated water surface elevations depicted in Figures 2 – 4 are higher for the “dam-in” scenario.

For all of the six evaluated scenarios (i.e., dam-in and dam-out scenarios with three hydrologic events each) the water surface elevations exceeded the maximum elevations of the surveyed cross sections at one or both streambanks. This condition may have affected the results of the hydraulic modeling performed as part of this study. The use of “full width” cross sections would likely have resulted in lower water surface elevations for all of the evaluated scenarios. In general, the use of full-width cross sections (i.e., including the entire floodplain) would result in lower calculated water surface elevations for the dam-in scenario and larger hydrologic events due to increased conveyance in floodplain areas. The effect of full-width cross sections would likely decrease if peak flows are contained within a given cross-section, particularly if this occurred in a more downstream section of the evaluated reach.

Please contact our office if you have any questions relating to the information presented in this report, or if we can be of further assistance.

Sincerely,  
Woodlot Alternatives, Inc.

*Michael Chelminski*

Michael Chelminski  
Director, Ecological Restoration Division

## Appendix

### Appendix Materials

- Phase 1 Inspection Report (from NHDES)
- USGS Peak Flow Data for USGS Station No. 01129500 (CT River, North Stratford, NH)
- PEAKFQ Output for USGS Station No. 01129500 (CT River, North Stratford, NH)
- USGS Peak Flow Data for USGS Station No. 01131500 (CT River Near Dalton, NH)
- PEAKFQ Output for USGS Station No. 01131500 (CT River Near Dalton, NH)
- Spreadsheet presentation of PEAKFQ Output for USGS Station No. 01129500 (CT River, North Stratford, NH)
- Spreadsheet presentation of PEAKFQ Output for USGS Station No. 01131500 (CT River Near Dalton, NH)
- Spreadsheet of hydrologic interpolation to Wyoming Dam on Connecticut River
- Spreadsheet of (1) cross section reach stationing, (2) spillway capacity, and (3) spillway rating curve. (2) and (3) from Phase 1 Inspection Report
- HEC-RAS output

57  
Stern.

CONNECTICUT RIVER BASIN  
NORTHUMBERLAND NEW HAMPSHIRE

CONNECTICUT GROVETON DAM  
N.H. 00147

RECEIVED

JUN 20 1979

NEW HAMPSHIRE  
WATER RESOURCES BOARD

File → 182.01

PHASE I INSPECTION REPORT  
NATIONAL DAM INSPECTION PROGRAM



DEPARTMENT OF THE ARMY  
NEW ENGLAND DIVISION, CORPS OF ENGINEERS  
WALTHAM, MASS. 02154

FEBRUARY 1979

The recent inspection of November 16, 1978 found the dam to be in the same apparent configuration as in 1975. The reader is referred to Section 3 for a detailed description of that inspection.

1. Normal Operating Procedures

There are no operating procedures evident or reported for this dam.

1.3 Pertinent Data

a. Drainage Area

The drainage area above the Connecticut Groveton Dam consists of 1194 square miles in New Hampshire, Vermont and Canada. The relatively large area includes a wide range of terrain and the soils are predominantly glacial till with shallow hardpan or bedrock.

b. Discharge at Dam Site

(1) Spillway

The log crib spillway is 180 feet long with a maximum capacity of 29,700 CFS with the water elevation at the top of the left abutment (elevation 100.0). The gates at both abutments are open but because of the possibility of clogging they were not used to calculate hydraulic capacity.

(2) Bypass Spillway and Channel

The 30-foot wide bypass channel in the right abutment has undergone extensive deterioration and erosion. A relatively small rise in river elevation causes water to flow over the remains of the spillway weir and into the bypass channel. The capacity of the bypass spillway and channel has been estimated at 3,400 CFS with the water surface at the top of the left abutment (elevation 100.0).

(3) Maximum Known Flood at Dam Site

According to the records at the Dalton, New Hampshire gauge, located approximately 22 miles downstream, the maximum known flood occurred on March 20, 1936 of 48,600 CFS. Using the hydrologic ratio between Dalton and Groveton, the resultant flood at Groveton is estimated at 40,800 CFS.

(4) Test Flood

The combined spillway bypass channel capacity of 33,100 CFS, at elevation 100.0, is 79.8 percent of the test flood of 41,500 CFS. The test flood would result in a water surface elevation of 102.2 which is 2.2 feet above the left abutment, but 1.8 feet below the approximate top of the river banks at elevation 104.0.

c. Elevations

(Based on an assumed elevation of 100.0 at the top of the concrete platform of the New Hampshire power house. See plan sheet for TBM location.)

(1) Top of Dam

Left abutment - 100.0  
Right abutment - 100.0  
River banks - 104+

(2) Maximum Pool

104+

(3) Full Flood Control Pool

104+

(4) Recreation Pool

87.2

(5) Spillway Crest

87.2

(6) Upstream Portal Invert

Not applicable.

(7) Streambed at Centerline of Dam

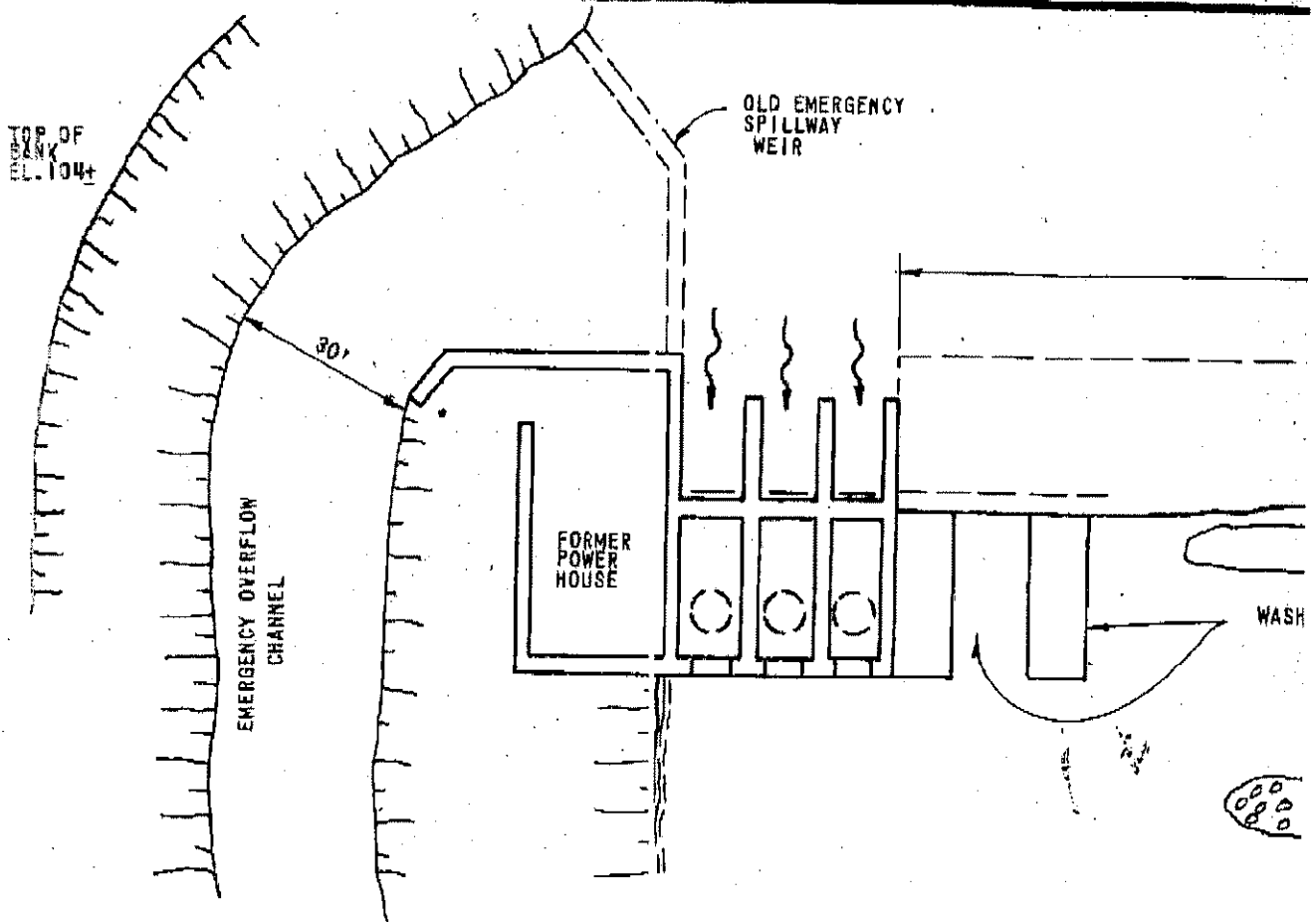
76.2

(8) Maximum Tailwater

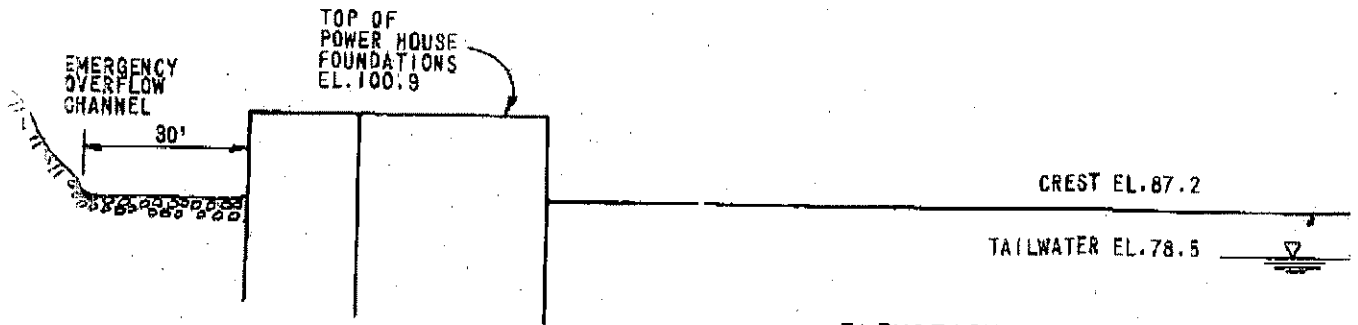
Not known.

(9) Test Flood Surcharge

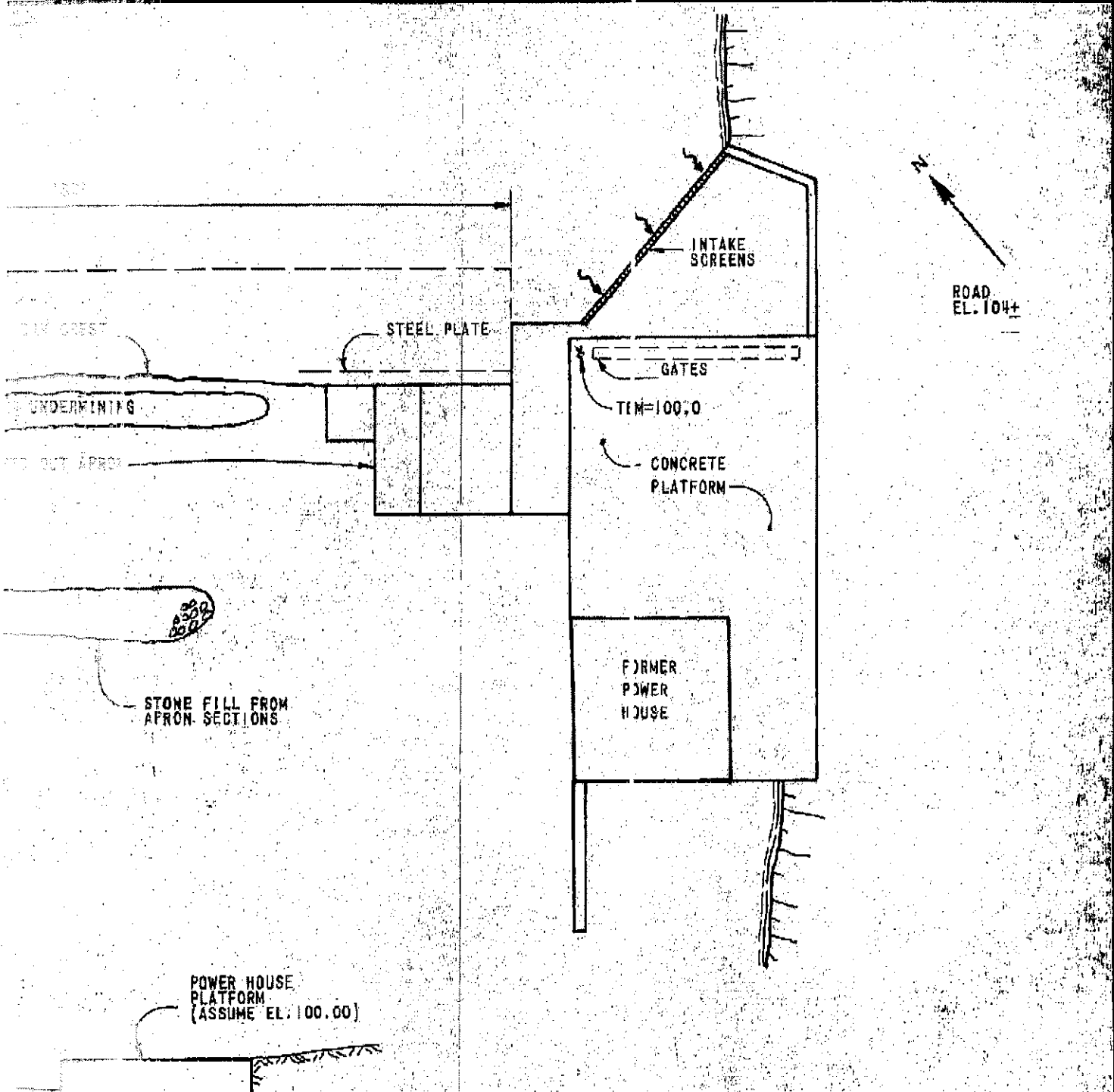
102.2



PLAN



ELEVATION



DUFRESNE-HENRY ENGINEERING CORP. ARCHITECT-ENGINEER		U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS CONNECTICUT GROVETON DAM PLAN - ELEVATION			
GROVETON		NEW HAMPSHIRE	
CLIENT NO.	04-0082	SCALE	N.T.S.
ENGR.	JAD	DATE	1-22-79

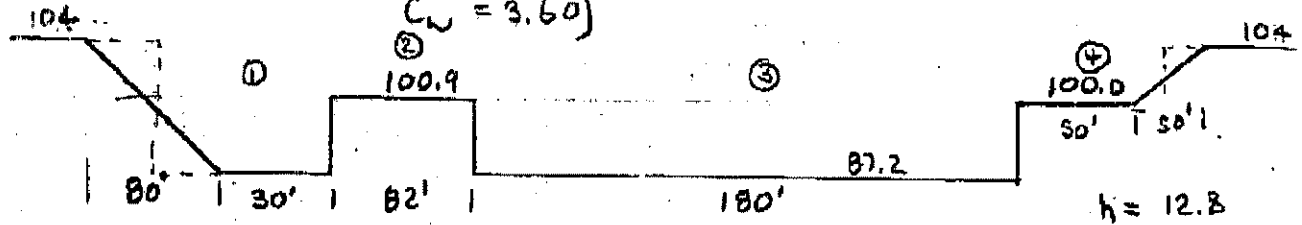
### DUFRESNE-HENRY ENGINEERING CORPORATION

BY J. DOHRMAN  
DATE 2-20-79

SUBJECT CONNECT CUT GROVEDN DAM  
H.Y.D. CALCULATION

SHEET NO. 3 OF 6  
JOB NO. \_\_\_\_\_

SPILLWAY CAPACITY (EXISTING CREST IS VERY IRREGULAR WITH MOST OF APRON WASHED AWAY ASSUME  $C_w = 3.60$ )



MAIN SPILLWAY

$$Q = CLH^{3/2} = (3.6)(180)(45.8) = 29,674 \text{ SAY } \underline{29,700 \text{ CF}}$$

BY-PASS CHANNEL

$$Q = CLH^{3/2} = (2.5)(30)(45.8) = 3435 \text{ } \underline{3,400 \text{ CF}}$$

$$\text{TOTAL CAPACITY} = \underline{33,100 \text{ CF}}$$

MAX. CAPACITY @ 104 h = 16.8

$$A = 1176 + 254 + 3024 + 300 = 4754 \text{ FT}^2$$

$$Q = (2.5)(4754)(4.10) = \underline{48,728 \text{ CF}}$$



DUFRESNE-HENRY ENGINEERING CORPORATION

BY J DOHRMAN

SUBJECT CONNECT CWT GROVEDD

SHEET NO. 4 OF

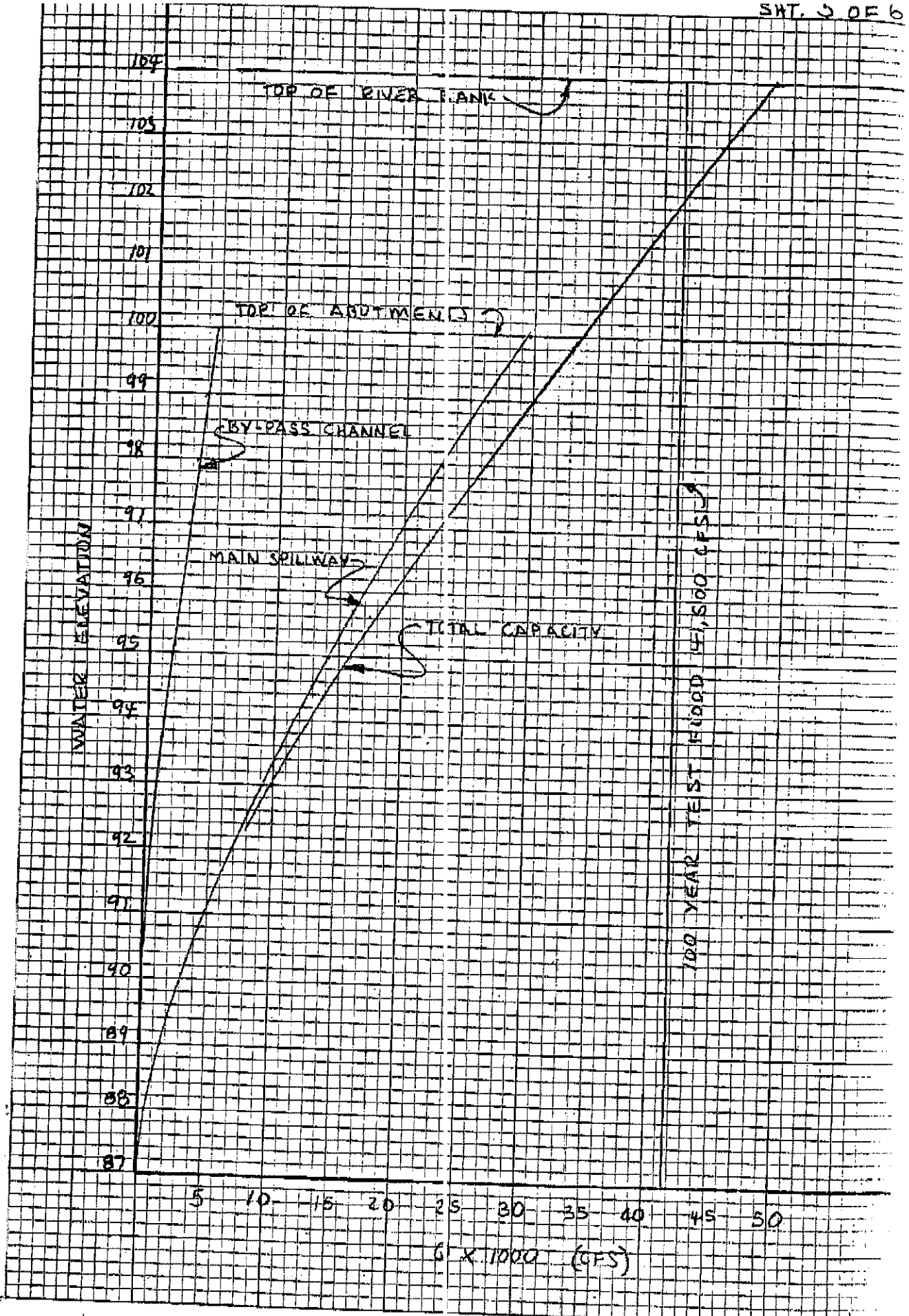
DATE 2-2-79

HYD. CALCULATIONS

JOB NO. 04-0082

FLOOD STAGE CALCULATION

ELEVATION	MAIN SPILLWAY FLOW		CYPASS CHANNEL FLOW		TOTAL FLOW (CF)
	h	Q	h	Q	
88	.8	464	0	0	464
89	1.8	1565	.8	54	1619
90	2.8	3036	1.8	190	3226
91	3.8	4800	2.8	387	5187
92	4.8	6814	3.8	638	7452
93	5.8	9051	4.8	946	9997
94	6.8	11,490	5.8	1309	12799
95	7.8	14,116	6.8	1729	15,845
96	8.8	16,916	7.8	2206	19,122
97	9.8	19,879	8.8	2741	22,620
98	10.8	22,949	9.8	3336	26,335
99	11.8	26,266	10.8	3993	30,256
100	12.8	29,674	11.8	4712	34,386
101					36,141
102					40,238
103					44,500
104					48,728



## nstrat.dat

Z01129500			
H01129500		USGS	
N01129500	4444590713754003333007	SW01080101799.00	880.17
Y01129500	CONNECTICUT RIVER AT NORTH STRATFORD,	NH	
301129500	19310412	128006	9.62
301129500	19320410	102006	8.84
301129500	19330418	215006	12.39
301129500	19340425	217006	12.73
301129500	19350428	110006	9.13
301129500	19360319	284006	14.64
301129500	19370430	137006	10.10
301129500	19380922	128006	9.81
301129500	19390508	137006	10.13
301129500	19400503	195006	12.00
301129500	19410416	122006	9.59
301129500	19420426	153006	10.63
301129500	19430616	287006	14.67
301129500	19440505	115006	9.34
301129500	19450329	164006	10.97
301129500	19451002	98206	8.69
301129500	19470413	135006	10.00
301129500	19480328	104006	8.93
301129500	19490328	111006	9.21
301129500	19500421	149006	10.46
301129500	19501126	115006	9.32
301129500	19520420	117006	9.41
301129500	19530327	168006	11.10
301129500	19540423	204006	12.27
301129500	19550415	187006	11.74
301129500	19560501	106006	8.99
301129500	19570421	95506	8.58
301129500	19580423	161006	10.88
301129500	19590419	76806	7.74
301129500	19600419	197006	12.07
301129500	19610510	101006	8.81
301129500	19620430	129006	9.80
301129500	19630422	150006	10.49
301129500	19640415	182006	11.57
301129500	19650925	65306	7.19
301129500	19660422	104006	8.91
301129500	19670403	93806	8.49
301129500	19680324	87006	9.15
301129500	19690520	167006	11.06
301129500	19700425	160006	10.83
301129500	19710505	104006	8.91
301129500	19720505	203006	12.25
301129500	19730630	158006	10.76
301129500	19740424	187006	11.73
301129500	19750420	113006	9.27
301129500	19760402	147006	10.40
301129500	19770401	125006	9.66
301129500	19780510	114006	9.30
301129500	19790326	122006	9.56
301129500	19800411	80306	7.90
301129500	19810221	1700026	16.40
301129500	19820427	153006	10.61
301129500	19830504	119006	9.42
301129500	19840531	162006	10.94
301129500	19850417	91306	8.36
301129500	19860331	158006	10.80
301129500	19870401	200006	13.17
301129500	19880405	111006	9.12
301129500	19890406	126006	9.70

			nstrat.dat
301129500	19900318	191006	11.87
301129500	19910410	139006	10.16
301129500	19920423	188006	11.79
301129500	19930417	126006	9.69
301129500	19940417	185006	11.69
301129500	19950117	86506	8.17
301129500	19960424	204006	12.28
301129500	19961202	124006	9.62
301129500	19980331	323006	15.63
301129500	19990917	125006	9.64
301129500	20000511	192006	11.89
301129500	20010425	200006	12.15
301129500	20020404	211006	12.50
301129500	20030330	146006	10.39
301129500	20031111	120006	9.48

NSTRAT.OUT

1

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 23 11:51:00

--- 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

1

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

Station - 01129500 CONNECTICUT RIVER AT NORTH STRATFORD, NH  
2005 OCT 23 11:51:00

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

Number of peaks in record = 74  
Peaks not used in analysis = 0  
Systematic peaks in analysis = 74  
Historic peaks in analysis = 0  
Years of historic record = 0  
Generalized skew = 0.255  
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. 5565.9  
WCF163I-NO HIGH OUTLIERS OR HISTORIC PEAKS EXCEEDED HHBASE. 35608.4

1

Station - 01129500 CONNECTICUT RIVER AT NORTH STRATFORD, NH  
2005 OCT 23 11:51:00

NSTRAT.OUT

ANNUAL FREQUENCY CURVE PARAMETERS -- LOG-PEARSON TYPE III

	FLOOD BASE		LOGARITHMIC		
	DISCHARGE	EXCEEDANCE PROBABILITY	MEAN	STANDARD DEVIATION	SKEW
SYSTEMATIC RECORD	0.0	1.0000	4.1485	0.1384	0.170
BULL.17B ESTIMATE	0.0	1.0000	4.1485	0.1384	0.188

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	6554.0	6520.0	6404.0	5715.0	7303.0
0.9900	7012.0	6983.0	6882.0	6171.0	7761.0
0.9500	8483.0	8469.0	8403.0	7653.0	9225.0
0.9000	9423.0	9417.0	9367.0	8607.0	10160.0
0.8000	10740.0	10740.0	10710.0	9942.0	11480.0
0.5000	13940.0	13950.0	13940.0	13100.0	14820.0
0.2000	18350.0	18350.0	18410.0	17160.0	19810.0
0.1000	21300.0	21290.0	21460.0	19740.0	23360.0
0.0400	25090.0	25050.0	25430.0	22930.0	28070.0
0.0200	27960.0	27880.0	28500.0	25290.0	31720.0
0.0100	30870.0	30740.0	31660.0	27650.0	35500.0
0.0050	33840.0	33660.0	34970.0	30020.0	39430.0
0.0020	37890.0	37640.0	39590.0	33210.0	44880.0
0.6667	12179.5	( 1.50-year flood )			
0.4292	14746.6	( 2.33-year flood )			

1

Station - 01129500 CONNECTICUT RIVER AT NORTH STRATFORD, NH  
2005 OCT 23 11:51:00

INPUT DATA LISTING

WATER YEAR	DISCHARGE	CODES	WATER YEAR	DISCHARGE	CODES
1931	12800.0	K	1968	8700.0	K
1932	10200.0	K	1969	16700.0	K
1933	21500.0	K	1970	16000.0	K
1934	21700.0	K	1971	10400.0	K
1935	11000.0	K	1972	20300.0	K
1936	28400.0	K	1973	15800.0	K
1937	13700.0	K	1974	18700.0	K
1938	12800.0	K	1975	11300.0	K
1939	13700.0	K	1976	14700.0	K
1940	19500.0	K	1977	12500.0	K
1941	12200.0	K	1978	11400.0	K
1942	15300.0	K	1979	12200.0	K
1943	28700.0	K	1980	8030.0	K
1944	11500.0	K	1981	17000.0	K
1945	16400.0	K	1982	15300.0	K
1946	9820.0	K	1983	11900.0	K

NSTRAT.OUT					
1947	13500.0	K	1984	16200.0	K
1948	10400.0	K	1985	9130.0	K
1949	11100.0	K	1986	15800.0	K
1950	14900.0	K	1987	20000.0	K
1951	11500.0	K	1988	11100.0	K
1952	11700.0	K	1989	12600.0	K
1953	16800.0	K	1990	19100.0	K
1954	20400.0	K	1991	13900.0	K
1955	18700.0	K	1992	18800.0	K
1956	10600.0	K	1993	12600.0	K
1957	9550.0	K	1994	18500.0	K
1958	16100.0	K	1995	8650.0	K
1959	7680.0	K	1996	20400.0	K
1960	19700.0	K	1997	12400.0	K
1961	10100.0	K	1998	32300.0	K
1962	12900.0	K	1999	12500.0	K
1963	15000.0	K	2000	19200.0	K
1964	18200.0	K	2001	20000.0	K
1965	6530.0	K	2002	21100.0	K
1966	10400.0	K	2003	14600.0	K
1967	9380.0	K	2004	12000.0	K

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

1

Station - 01129500 CONNECTICUT RIVER AT NORTH STRATFORD, NH  
2005 OCT 23 11:51:00

EMPIRICAL FREQUENCY CURVES -- WEIBULL PLOTTING POSITIONS

WATER YEAR	RANKED DISCHARGE	SYSTEMATIC RECORD	BULL.17B ESTIMATE
1998	32300.0	0.0133	0.0133
1943	28700.0	0.0267	0.0267
1936	28400.0	0.0400	0.0400
1934	21700.0	0.0533	0.0533
1933	21500.0	0.0667	0.0667
2002	21100.0	0.0800	0.0800
1954	20400.0	0.0933	0.0933
1996	20400.0	0.1067	0.1067
1972	20300.0	0.1200	0.1200
1987	20000.0	0.1333	0.1333
2001	20000.0	0.1467	0.1467
1960	19700.0	0.1600	0.1600
1940	19500.0	0.1733	0.1733
2000	19200.0	0.1867	0.1867

		NSTRAT.OUT	
1990	19100.0	0.2000	0.2000
1992	18800.0	0.2133	0.2133
1955	18700.0	0.2267	0.2267
1974	18700.0	0.2400	0.2400
1994	18500.0	0.2533	0.2533
1964	18200.0	0.2667	0.2667
1981	17000.0	0.2800	0.2800
1953	16800.0	0.2933	0.2933
1969	16700.0	0.3067	0.3067
1945	16400.0	0.3200	0.3200
1984	16200.0	0.3333	0.3333
1958	16100.0	0.3467	0.3467
1970	16000.0	0.3600	0.3600
1973	15800.0	0.3733	0.3733
1986	15800.0	0.3867	0.3867
1942	15300.0	0.4000	0.4000
1982	15300.0	0.4133	0.4133
1963	15000.0	0.4267	0.4267
1950	14900.0	0.4400	0.4400
1976	14700.0	0.4533	0.4533
2003	14600.0	0.4667	0.4667
1991	13900.0	0.4800	0.4800
1937	13700.0	0.4933	0.4933
1939	13700.0	0.5067	0.5067
1947	13500.0	0.5200	0.5200
1962	12900.0	0.5333	0.5333
1931	12800.0	0.5467	0.5467
1938	12800.0	0.5600	0.5600
1989	12600.0	0.5733	0.5733
1993	12600.0	0.5867	0.5867
1977	12500.0	0.6000	0.6000
1999	12500.0	0.6133	0.6133
1997	12400.0	0.6267	0.6267
1941	12200.0	0.6400	0.6400
1979	12200.0	0.6533	0.6533
2004	12000.0	0.6667	0.6667
1983	11900.0	0.6800	0.6800
1952	11700.0	0.6933	0.6933
1944	11500.0	0.7067	0.7067
1951	11500.0	0.7200	0.7200
1978	11400.0	0.7333	0.7333
1975	11300.0	0.7467	0.7467
1949	11100.0	0.7600	0.7600
1988	11100.0	0.7733	0.7733
1935	11000.0	0.7867	0.7867
1956	10600.0	0.8000	0.8000
1948	10400.0	0.8133	0.8133
1966	10400.0	0.8267	0.8267
1971	10400.0	0.8400	0.8400
1932	10200.0	0.8533	0.8533
1961	10100.0	0.8667	0.8667
1946	9820.0	0.8800	0.8800
1957	9550.0	0.8933	0.8933
1967	9380.0	0.9067	0.9067
1985	9130.0	0.9200	0.9200
1968	8700.0	0.9333	0.9333
1995	8650.0	0.9467	0.9467
1980	8030.0	0.9600	0.9600
1959	7680.0	0.9733	0.9733
1965	6530.0	0.9867	0.9867

NSTRAT.OUT  
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 : 74

## dalton.dat

Z01131500			
H01131500		USGS	
N01131500	4424360714316003333007	sw010801011514.00	799.89
Y01131500	CONNECTICUT RIVER NEAR DALTON, NH		
301131500	19280409	443006	
301131500	19290410	282006	
301131500	19300409	171006	
301131500	19310413	159006	
301131500	19320413	202006	
301131500	19330420	358006	
301131500	19340426	315006	
301131500	19350430	225006	
301131500	19360320	483006	25.60
301131500	19370501	196006	17.30
301131500	19380922	196006	17.53
301131500	19390423	236006	18.82
301131500	19400504	313006	21.10
301131500	19410417	193006	17.45
301131500	19420427	231006	18.64
301131500	19430618	214006	18.05
301131500	19440507	204006	17.96
301131500	19450331	249006	19.79
301131500	19451002	141006	15.87
301131500	19470604	218006	18.45
301131500	19480403	168006	16.64
301131500	19490329	160006	16.33
301131500	19500422	213006	18.27
301131500	19501126	184006	17.24
301131500	19520422	183006	17.22
301131500	19530328	346006	22.38
301131500	19540424	341006	22.25
301131500	19550417	271006	20.19
301131500	19560501	180006	17.11
301131500	19570422	138006	15.50
301131500	19580423	286006	20.63
301131500	19590407	147006	15.85
301131500	19600420	274006	20.26
301131500	19610425	183006	17.21
301131500	19620410	207006	18.08
301131500	19630423	211006	18.21
301131500	19640416	244006	19.31
301131500	19650423	85706	13.19
301131500	19660424	146006	15.81
301131500	19670405	154006	16.12
301131500	19680325	153006	16.09
301131500	19690419	294006	20.58
301131500	19700427	240006	19.02
301131500	19710505	172006	16.81
301131500	19720506	322006	21.34
301131500	19730702	208006	18.04
301131500	19740425	266006	19.78
301131500	19750421	162006	16.45
301131500	19760401	226006	18.59
301131500	19770402	188006	17.35
301131500	19780511	188006	17.35
301131500	19790327	197006	17.67
301131500	19800412	114106	14.59
301131500	19810224	207006	18.00
301131500	19820420	2500026	
301131500	19830505	175006	16.93
301131500	19840601	284006	20.30
301131500	19850425	121006	14.88
301131500	19860331	254006	19.46

dalton.dat			
301131500	19870402	292006	20.54
301131500	19880407	170006	16.75
301131500	19890407	279006	20.16
301131500	19900319	387006	23.22
301131500	19910411	216006	18.30
301131500	19920424	266006	19.79
301131500	19930418	173006	16.87
301131500	19940418	275006	20.06
301131500	19950117	299006	20.73
301131500	19960425	304006	20.86
301131500	19970408	151006	16.22
301131500	19980401	420006	23.70
301131500	19990918	163006	16.51
301131500	20000512	241006	19.09
301131500	20010425	323006	21.38
301131500	20020416	324006	21.40
301131500	20030331	199006	17.17
301131500	20031030	163006	16.52

DALTON.OUT

1

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 23 11:47:23

--- 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

1

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

Station - 01131500 CONNECTICUT RIVER NEAR DALTON, NH  
2005 OCT 23 11:47:23

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

Number of peaks in record	=	77
Peaks not used in analysis	=	0
Systematic peaks in analysis	=	77
Historic peaks in analysis	=	0
Years of historic record	=	0
Generalized skew	=	0.300
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.	8469.5
WCF163I-NO HIGH OUTLIERS OR HISTORIC PEAKS EXCEEDED HHBASE.	56935.9

1

Station - 01131500 CONNECTICUT RIVER NEAR DALTON, NH  
2005 OCT 23 11:47:23

DALTON.OUT

ANNUAL FREQUENCY CURVE PARAMETERS -- LOG-PEARSON TYPE III

	FLOOD BASE		LOGARITHMIC		
	DISCHARGE	EXCEEDANCE PROBABILITY	MEAN	STANDARD DEVIATION	SKEW
SYSTEMATIC RECORD	0.0	1.0000	4.3416	0.1414	0.005
BULL.17B ESTIMATE	0.0	1.0000	4.3416	0.1414	0.060

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	9670.0	9510.0	9423.0	8389.0	10820.0
0.9900	10450.0	10310.0	10230.0	9158.0	11600.0
0.9500	12930.0	12860.0	12800.0	11650.0	14080.0
0.9000	14500.0	14470.0	14410.0	13240.0	15650.0
0.8000	16680.0	16700.0	16630.0	15450.0	17840.0
0.5000	21890.0	21950.0	21890.0	20580.0	23280.0
0.2000	28850.0	28880.0	28950.0	26980.0	31160.0
0.1000	33390.0	33330.0	33620.0	30940.0	36590.0
0.0400	39080.0	38850.0	39560.0	35750.0	43630.0
0.0200	43300.0	42890.0	44040.0	39230.0	48970.0
0.0100	47500.0	46880.0	48590.0	42650.0	54390.0
0.0050	51720.0	50860.0	53240.0	46050.0	59930.0
0.0020	57380.0	56150.0	59610.0	50540.0	67450.0
0.6667	19040.7	( 1.50-year flood )			
0.4292	23192.7	( 2.33-year flood )			

1

Station - 01131500 CONNECTICUT RIVER NEAR DALTON, NH  
2005 OCT 23 11:47:23

INPUT DATA LISTING

WATER YEAR	DISCHARGE	CODES	WATER YEAR	DISCHARGE	CODES
1928	44300.0	K	1967	15400.0	K
1929	28200.0	K	1968	15300.0	K
1930	17100.0	K	1969	29400.0	K
1931	15900.0	K	1970	24000.0	K
1932	20200.0	K	1971	17200.0	K
1933	35800.0	K	1972	32200.0	K
1934	31500.0	K	1973	20800.0	K
1935	22500.0	K	1974	26600.0	K
1936	48300.0	K	1975	16200.0	K
1937	19600.0	K	1976	22600.0	K
1938	19600.0	K	1977	18800.0	K
1939	23600.0	K	1978	18800.0	K
1940	31300.0	K	1979	19700.0	K
1941	19300.0	K	1980	11410.0	K
1942	23100.0	K	1981	20700.0	K
1943	21400.0	K	1982	25000.0	K

		DALTON.OUT			
1944	20400.0	K	1983	17500.0	K
1945	24900.0	K	1984	28400.0	K
1946	14100.0	K	1985	12100.0	K
1947	21800.0	K	1986	25400.0	K
1948	16800.0	K	1987	29200.0	K
1949	16000.0	K	1988	17000.0	K
1950	21300.0	K	1989	27900.0	K
1951	18400.0	K	1990	38700.0	K
1952	18300.0	K	1991	21600.0	K
1953	34600.0	K	1992	26600.0	K
1954	34100.0	K	1993	17300.0	K
1955	27100.0	K	1994	27500.0	K
1956	18000.0	K	1995	29900.0	K
1957	13800.0	K	1996	30400.0	K
1958	28600.0	K	1997	15100.0	K
1959	14700.0	K	1998	42000.0	K
1960	27400.0	K	1999	16300.0	K
1961	18300.0	K	2000	24100.0	K
1962	20700.0	K	2001	32300.0	K
1963	21100.0	K	2002	32400.0	K
1964	24400.0	K	2003	19900.0	K
1965	8570.0	K	2004	16300.0	K
1966	14600.0	K			

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

1

Station - 01131500 CONNECTICUT RIVER NEAR DALTON, NH  
2005 OCT 23 11:47:23

EMPIRICAL FREQUENCY CURVES -- WEIBULL PLOTTING POSITIONS

WATER YEAR	RANKED DISCHARGE	SYSTEMATIC RECORD	BULL.17B ESTIMATE
1936	48300.0	0.0128	0.0128
1928	44300.0	0.0256	0.0256
1998	42000.0	0.0385	0.0385
1990	38700.0	0.0513	0.0513
1933	35800.0	0.0641	0.0641
1953	34600.0	0.0769	0.0769
1954	34100.0	0.0897	0.0897
2002	32400.0	0.1026	0.1026
2001	32300.0	0.1154	0.1154
1972	32200.0	0.1282	0.1282
1934	31500.0	0.1410	0.1410
1940	31300.0	0.1538	0.1538

## DALTON.OUT

1996	30400.0	0.1667	0.1667
1995	29900.0	0.1795	0.1795
1969	29400.0	0.1923	0.1923
1987	29200.0	0.2051	0.2051
1958	28600.0	0.2179	0.2179
1984	28400.0	0.2308	0.2308
1929	28200.0	0.2436	0.2436
1989	27900.0	0.2564	0.2564
1994	27500.0	0.2692	0.2692
1960	27400.0	0.2821	0.2821
1955	27100.0	0.2949	0.2949
1974	26600.0	0.3077	0.3077
1992	26600.0	0.3205	0.3205
1986	25400.0	0.3333	0.3333
1982	25000.0	0.3462	0.3462
1945	24900.0	0.3590	0.3590
1964	24400.0	0.3718	0.3718
2000	24100.0	0.3846	0.3846
1970	24000.0	0.3974	0.3974
1939	23600.0	0.4103	0.4103
1942	23100.0	0.4231	0.4231
1976	22600.0	0.4359	0.4359
1935	22500.0	0.4487	0.4487
1947	21800.0	0.4615	0.4615
1991	21600.0	0.4744	0.4744
1943	21400.0	0.4872	0.4872
1950	21300.0	0.5000	0.5000
1963	21100.0	0.5128	0.5128
1973	20800.0	0.5256	0.5256
1962	20700.0	0.5385	0.5385
1981	20700.0	0.5513	0.5513
1944	20400.0	0.5641	0.5641
1932	20200.0	0.5769	0.5769
2003	19900.0	0.5897	0.5897
1979	19700.0	0.6026	0.6026
1937	19600.0	0.6154	0.6154
1938	19600.0	0.6282	0.6282
1941	19300.0	0.6410	0.6410
1977	18800.0	0.6538	0.6538
1978	18800.0	0.6667	0.6667
1951	18400.0	0.6795	0.6795
1952	18300.0	0.6923	0.6923
1961	18300.0	0.7051	0.7051
1956	18000.0	0.7179	0.7179
1983	17500.0	0.7308	0.7308
1993	17300.0	0.7436	0.7436
1971	17200.0	0.7564	0.7564
1930	17100.0	0.7692	0.7692
1988	17000.0	0.7821	0.7821
1948	16800.0	0.7949	0.7949
1999	16300.0	0.8077	0.8077
2004	16300.0	0.8205	0.8205
1975	16200.0	0.8333	0.8333
1949	16000.0	0.8462	0.8462
1931	15900.0	0.8590	0.8590
1967	15400.0	0.8718	0.8718
1968	15300.0	0.8846	0.8846
1997	15100.0	0.8974	0.8974
1959	14700.0	0.9103	0.9103
1966	14600.0	0.9231	0.9231
1946	14100.0	0.9359	0.9359
1957	13800.0	0.9487	0.9487
1985	12100.0	0.9615	0.9615

			DALTON.OUT	
	1980	11410.0	0.9744	0.9744
1	1965	8570.0	0.9872	0.9872

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 : 77

**Woodlot Alternatives, Inc. PN 105168**

**PEAKFQ Results for North Stratford USGS Station (USGS No. 01129500)**

Return Interval	ANNUAL EXCEEDANCE PROBABILITY	BULL.17B ESTIMATE	SYSTEMATIC RECORD	'EXPECTED PROBABILITY' ESTIMATE	95-PCT CON FOR BULL. LOWER	FIDENCE LIMITS 17B ESTIMATES UPPER
1.005	0.995	6554	6520	6404	5715	7303
1.010	0.99	7012	6983	6882	6171	7761
1.053	0.95	8483	8469	8403	7653	9225
1.111	0.9	9423	9417	9367	8607	10160
1.25	0.8	10740	10740	10710	9942	11480
<b>2</b>	<b>0.5</b>	<b>13940</b>	<b>13950</b>	<b>13940</b>	<b>13100</b>	<b>14820</b>
<b>5</b>	<b>0.2</b>	<b>18350</b>	<b>18350</b>	<b>18410</b>	<b>17160</b>	<b>19810</b>
10	0.1	21300	21290	21460	19740	23360
25	0.04	25090	25050	25430	22930	28070
50	0.02	27960	27880	28500	25290	31720
<b>100</b>	<b>0.01</b>	<b>30870</b>	<b>30740</b>	<b>31660</b>	<b>27650</b>	<b>35500</b>
200	0.005	33840	33660	34970	30020	39430
500	0.002	37890	37640	39590	33210	44880
1.50	0.6667	12179.5	1.50-year			
2.33	0.4292	14746.6	2.33-year			

**Bold - Return-Interval Events Requested for Hydraulic Analysis**

**Woodlot Alternatives, Inc. PN 105168**

**PEAKFQ Results for Dalton USGS Station (USGS No. 01131500)**

Return Interval	ANNUAL EXCEEDANCE PROBABILITY	BULL.17B ESTIMATE	SYSTEMATIC RECORD	'EXPECTED PROBABILITY' ESTIMATE	95-PCT CON FOR BULL. LOWER	FIDENCE LIMITS 17B ESTIMATES UPPER
1.005	0.995	9670	9510	9423	8389	10820
1.010	0.99	10450	10310	10230	9158	11600
1.053	0.95	12930	12860	12800	11650	14080
1.111	0.9	14500	14470	14410	13240	15650
1.25	0.8	16680	16700	16630	15450	17840
<b>2</b>	<b>0.5</b>	<b>21890</b>	<b>21950</b>	<b>21890</b>	<b>20580</b>	<b>23280</b>
<b>5</b>	<b>0.2</b>	<b>28850</b>	<b>28880</b>	<b>28950</b>	<b>26980</b>	<b>31160</b>
10	0.1	33390	33330	33620	30940	36590
25	0.04	39080	38850	39560	35750	43630
50	0.02	43300	42890	44040	39230	48970
<b>100</b>	<b>0.01</b>	<b>47500</b>	<b>46880</b>	<b>48590</b>	<b>42650</b>	<b>54390</b>
200	0.005	51720	50860	53240	46050	59930
500	0.002	57380	56150	59610	50540	67450
1.50	0.6667	19040.7	1.50-year			
2.33	0.4292	23192.7	2.33-year			

**Bold - Return-Interval Events Requested for Hydraulic Analysis**

Woodlot Alternatives, Inc. PN 105168  
 Interpolation of PEAKFQ Results  
 Wyoming Dam HEC-RAS on Connecticut River

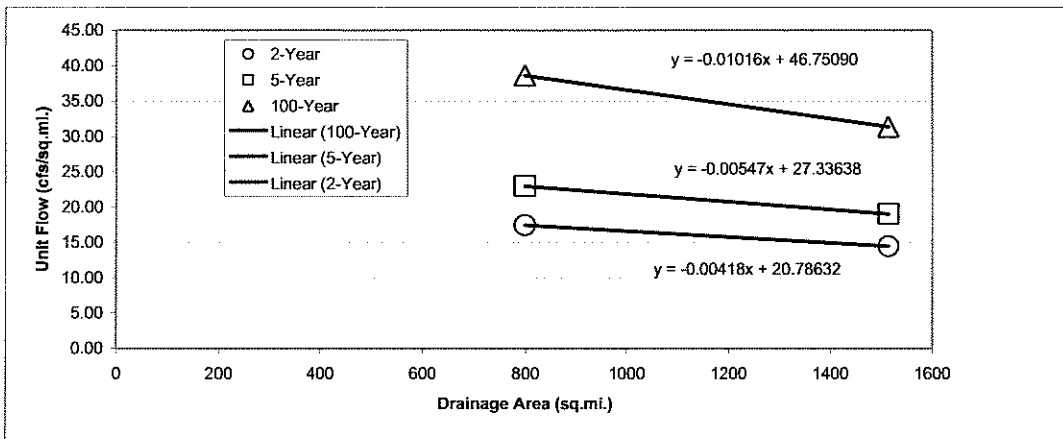
D.A. at former Wyoming Dam (from Field Geology email dated 10/20/05): 1191.9 DA (sq.mi.)

USGS Station Data			Return Interval Q (cfs)			Unit Return Interval Q (cfs/sq.mi.)		
Station No.	Location	DA (sq.mi.)	2	5	100	2	5	100
1129500	CT River, North Stratford, NH	799	13940	18350	30870	17.45	22.97	38.64
1131500	CT River Near Dalton, NH	1514	21890	28850	47500	14.46	19.06	31.37

Check of Interpolation Functions:		Slope*	-0.00418	-0.00547	-0.01016
		Intercept*	20.78632	27.33638	46.7509
CT River, North Stratford, NH	799		17.45	22.97	38.63
CT River Near Dalton, NH	1514		14.46	19.05	31.37

Application of Functions to Wyoming Dam:			15.804	20.817	34.641
Unit Q (cfs/sq.mi.)	1191.9		18,837	24,811	41,289
Q (cfs)					

\*Note - Slope and intercept data from linear interpolation of data on chart.



Sheet Added By Woodlot to Calculate HEC-RAS "Reach Lengths"  
 Data From Field Geology - Note that XS 2 and XS 3 as presented by Field Geology showed XS 3 upstream of XS 2. Woodlot  
 put the stations in this order in the HEC-RAS model but switched to cross section names (not data) to preserved a logical  
 numerical ordering of the cross sections.

Xsec #/Location Upstream end	Corresponding LP pt #	Distance	Distance from		Thalweg (ft)	Reach No. (mi.)	Woodlot Data	
			Cum Distance (ft)	downstream end (ft)			delta	cum data in ft
1	1514	0	0	19367	30.03			
3	1565	2054	2054	17313	37.58	4.147	5019	17313
2	1569	5019	7074	12293	37.10	3.197	671	12293
4	1596	671	7745	11622	37.02	3.069	887	11622
5	1610	887	8632	10735	36.90	2.901	3195	10735
6	1641	3195	11827	7540	36.61	2.296	2521	7540
7	1675	2521	14348	5019	36.14	1.819	2217	5019
8	1679	2217	16565	2802	35.91	1.399	492	2802
9	1683	492	17057	2310	35.99	1.306	884	2310
10	1687	884	17941	1426	35.92	1.138	730	1426
		730	18671	696	35.85	1.000	696	696
WAI Xsec US of Dam			19367	50	35.49	0.878		
Old Wyoming Dam*	1694			0	34.70	0.868		0

Assumed Spillway Capacity	2-Year	5-Year	100-Year	NHDES Test Flood
Q (cfs)	18,837	24,811	41,289	41,500
Length	180			
Spillway Elevation (ft)	44.11			
Spillway Coefficient	2.8			
Head Over Spillway (ft):		13.43	18.86	18.93
Q from Weir Equation	18,837	24,811	41,289	41,500
Goal Seek = 0	0	(0)	0	(0)
				8,746
Q Check (cfs):	18,837	24,811	41,289	41,500
Head Over Spillway (ft):	11.18	13.43	18.86	18.93
				12.00
Spillway Elev (ft):	87.2	100.63	106.06	106.13
				99.20

Adjust these values for Goal Seek

Flood Stage Calcs: Stage (NHDES)	Stage (Field Geolog Q (NHDES))	Interp Q	Interp Stage	Event
95	51.91	15845		
96	52.91	19122	18,837	2-Year
97	53.91	22620		
98	54.91	26335	24,811	5-Year
99	55.91	30562		
100	56.91	34386		
101	57.91	36141		
102	58.91	40238		
103	59.91	44500	41,289	100-Year
104	60.91	48728		



<b>XSec Name</b>	<b>Station</b>	<b>Event</b>	<b>Scenario</b>	<b>WSEL (ft)</b>	<b>Difference in WSEL (ft)</b>	<b>Channel Velocity (fps)</b>	<b>Top Width (ft)</b>	<b>E.G. Slope</b>
XS 7	1.399	2-Year	Dam-In	53.42		2.18	461.73	0.000079
XS 7	1.399	2-Year	Dam-Out	46.28	7.14	3.41	451.52	0.000347
XS 7	1.399	5-Year	Dam-In	55.33		2.62	461.73	0.000102
XS 7	1.399	5-Year	Dam-Out	48.4	6.93	3.86	461.73	0.000363
XS 7	1.399	100-Year	Dam-In	60.57		3.52	461.73	0.000138
XS 7	1.399	100-Year	Dam-Out	53.42	7.15	4.78	461.73	0.000382
XS 8	1.306	2-Year	Dam-In	53.37		2.43	295.96	0.000048
XS 8	1.306	2-Year	Dam-Out	46.2	7.17	3.11	264.21	0.000104
XS 8	1.306	5-Year	Dam-In	55.26		3.02	297.86	0.000069
XS 8	1.306	5-Year	Dam-Out	48.28	6.98	3.8	275.86	0.000142
XS 8	1.306	100-Year	Dam-In	60.41		4.34	298.45	0.000121
XS 8	1.306	100-Year	Dam-Out	53.18	7.23	5.36	295.77	0.000235
XS 9	1.138	2-Year	Dam-In	53.32		2.26	456.6	0.000088
XS 9	1.138	2-Year	Dam-Out	45.98	7.34	3.64	449.43	0.000424
XS 9	1.138	5-Year	Dam-In	55.2		2.71	456.6	0.000112
XS 9	1.138	5-Year	Dam-Out	48.04	7.16	4.09	456.6	0.000437
XS 9	1.138	100-Year	Dam-In	60.34		3.63	456.6	0.000152
XS 9	1.138	100-Year	Dam-Out	52.92	7.42	5.05	456.6	0.000452
XS 10	1.000	2-Year	Dam-In	53.19		2.91	355.94	0.000131
XS 10	1.000	2-Year	Dam-Out	45.47	7.72	4.71	340.48	0.000617
XS 10	1.000	5-Year	Dam-In	55.02		3.52	355.94	0.000171
XS 10	1.000	5-Year	Dam-Out	47.46	7.56	5.36	355.94	0.000669
XS 10	1.000	100-Year	Dam-In	60.05		4.77	355.94	0.000243
XS 10	1.000	100-Year	Dam-Out	52.2	7.85	6.71	355.94	0.000740
Dam Site	0.868	2-Year	Dam-In	52.82		4.73	220	0.000527
Dam Site	0.868	2-Year	Dam-Out	43.66	9.16	9.56	220	0.005004
Dam Site	0.868	5-Year	Dam-In	54.5		5.7	220	0.000693
Dam Site	0.868	5-Year	Dam-Out	45.33	9.17	10.61	220	0.005000
Dam Site	0.868	100-Year	Dam-In	59.16		7.67	220	0.000994
Dam Site	0.868	100-Year	Dam-Out	49.31	9.85	12.84	220	0.005000