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FLOOD OF SEPTEMBER 18-19, 2004 IN THE UPPER DELAWARE RIVER BASIN, NEW YORK

Open-File Report 2005-1166

U.S. Department of the Interior
U.S. Geological Survey

Cover photo: “Delaware River near Hankins, NY” taken November 17, 2004, by Gary D. Firda, U.S. Geological Survey, Troy, New York.

Flood of September 18-19, 2004 in the Upper Delaware River Basin, New York

By Lloyd T. Brooks

In cooperation with the
Federal Emergency Management Agency

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U.S. Department of the Interior
U.S. Geological Survey

U.S. Department of the Interior
Gale A. Norton, Secretary

U.S. Geological Survey
Charles G. Groat, Director

U.S. Geological Survey, Reston, Virginia: 2005

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Contents

Figures

Tables

CONVERSION FACTORS AND DATUM

Multiply	By	To obtain
	Length	
inch (in.)	2.54	centimeter (cm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
	Area	
acre	0.4047	hectare (ha)
acre	0.004047	square kilometer (km^2)
square foot (ft^2)	0.09290	square meter (m^2)
square mile (mi^2)	259.0	hectare (ha)
square mile (mi^2)	2.590	square kilometer (km^2)
	Volume	
cubic foot (ft^3)	0.02832	cubic meter (m^3)
acre-foot (acre-ft)	1,233	cubic meter (m^3)
	Flow rate	
acre-foot per day (acre-ft/d)	0.01427	cubic meter per second (m^3/s)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
cubic foot per second per square mile [$(ft^3/s)/mi^2$]	0.01093	cubic meter per second per square kilometer [$(m^3/s)/km^2$]
million gallons per day (Mgal/d)	0.04381	cubic meter per second (m^3/s)

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as follows:

$$°F=(1.8×°C)+32$$

Temperature in degrees Fahrenheit (°F) may be converted to degrees Celsius (°C) as follows:

$$°C=(°F-32)/1.8$$

Vertical coordinate information is referenced to National Geodetic Vertical Datum of 1929 (NGVD 1929).

Flood of September 18-19, 2004, in the Upper Delaware River Basin, New York

By Lloyd T. Brooks

Abstract

The interaction between the remnants of tropical depression Ivan and a frontal boundary in the upper Delaware River basin on September 18-19, 2004, produced 4 to more than 6 inches of rainfall over a 5-county area within a 24-hour period. Significant flooding occurred on the East Branch Delaware River and its tributaries, and the main stem of the Delaware River. The resultant flooding damaged more than 100 homes and displaced more than 1,000 people. All of the counties within the basin were declared Federal disaster areas, but flood damage in New York was most pronounced in Delaware, Orange, and Sullivan Counties. Flood damage totaled more than $10 million. Peak water-surface elevations at some study sites in the basin exceeded the 500-year flood elevation as documented in flood-insurance studies by the Federal Emergency Management Agency. Flood peaks at some long-term U.S. Geological Survey (USGS) streamflow-gaging stations were the highest ever recorded.

Introduction

Heavy rain associated with the remnants of tropical depression Ivan produced widespread flooding in the upper Delaware River basin during September 18-19, 2004 (fig. 1). From 4 to more than 6 inches of rain fell over the 24-hour period, and the runoff flooded many parts the basin. More than 100 homes were damaged and more than 1,000 people were evacuated. Delaware, Orange, and Sullivan Counties in New York were declared Federal disaster ares.

This report documents the rainfall and flood water-surface elevations within the upper Delaware River basin during September 18-19, 2004. Study sites were identified by Federal Emergency Management Agency (FEMA) personnel. Sites included in this study were located along the East Branch Delaware River and its tributaries, and the main stem of the Delaware River. Peak water-surface elevations were surveyed, described, and photographed by U.S. Geological Survey (USGS) personnel. Descriptions and maps of individual sites are presented in the Appendix. Peak water-surface elevations at some study sites on the East Branch Delaware River exceeded the 500-year flood elevation as documented in FEMA flood-insurance studies. Record peak discharges were set at several USGS streamflow-gaging stations. Pepacton and Cannonsville Reservoirs were nearly full before the storm, but provided some attenuation of peak flows.

Rainfall

The interaction of the remnants of tropical depression Ivan with a frontal boundary in southeastern New York during September 17-18, 2004, (fig. 1), caused widespread rainfalls of 4 to more than 6 inches that inundated the upper Delaware River basin.

This rainfall followed 1 to 2 inches of rain left by the remnants of Hurricane Frances 10 days earlier. The maximum recorded rainfall within the upper Delaware River basin associated with tropical depression Ivan in New York was 6.90 inches at Roscoe, Sullivan County (fig. 1), and the minimum recorded was 3.59 inches at Stamford, Delaware County. Rainfall amounts recorded at 53 sites in New York, New Jersey and Pennsylvania are listed in table 1.

Selected rainfall depths with respect to frequency and duration at Roscoe, N.Y., which is centrally located in the upper Delaware River basin (fig. 1), are listed in table 2.

The rainfall intensity was very high, with a 50-to-100-year recurrence interval for a 24-hour storm. Recurrence intervals basinwide were generally 10 to 50 years. Most of the rain fell between 8:00 a.m. on Friday, September 17, and 8:00 a.m. on Saturday, September 18 (National Weather Service, 2004). A plot of cumulative rainfall at the National Weather Service Office at Binghamton, N.Y. (fig. 2) indicates a fairly uniform rainfall rate throughout the storm, and that the storm duration was about 24 hours (National Oceanic and Atmospheric Administration, National Climatic Data Center, 2004).

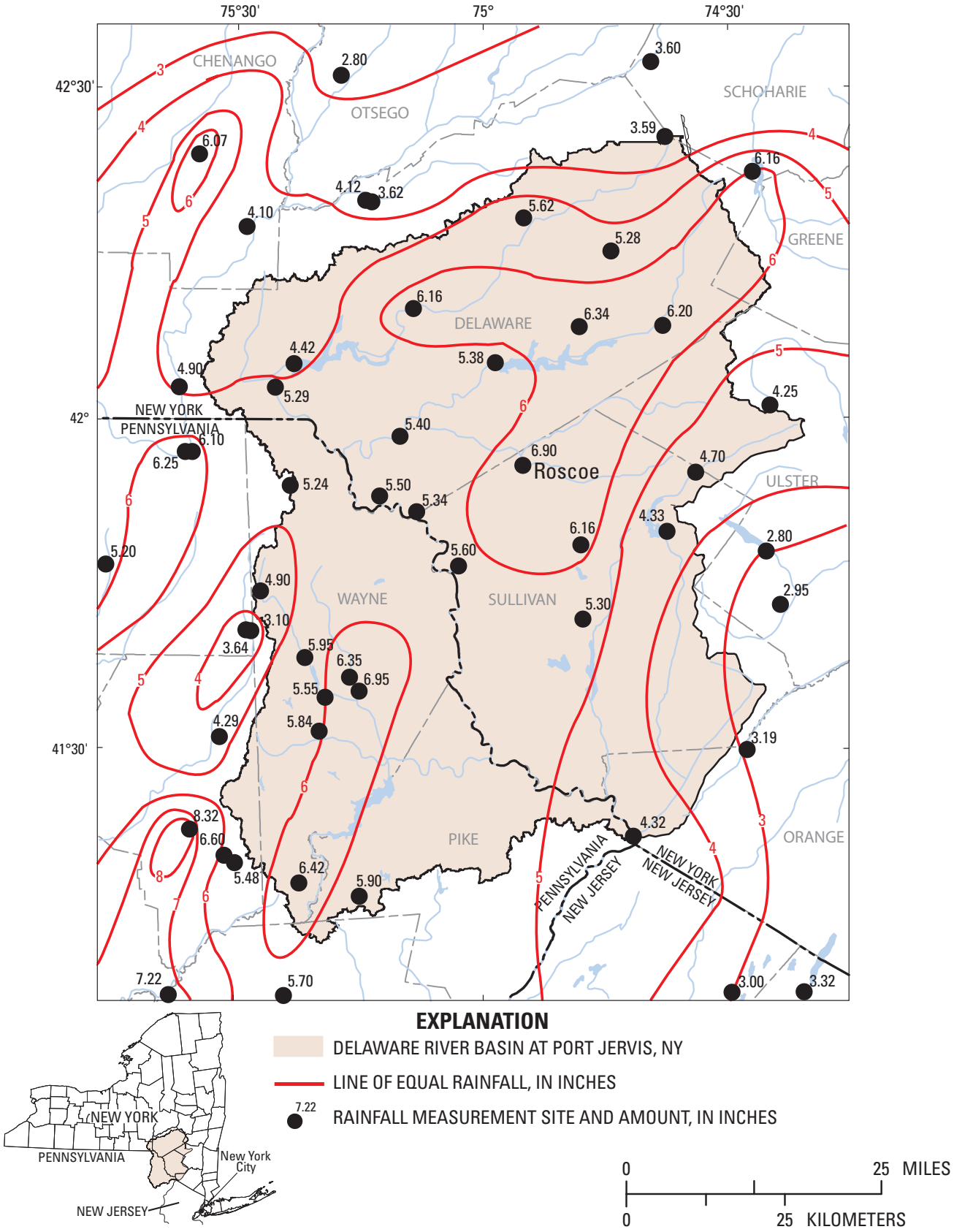


Figure 1. Pertinent geographic features of southeastern New York and rainfall from the storm of September 17-18, 2004 (Data provided by National Oceanic and Atmospheric Administration).

Table 1. Total storm rainfall for September 17-18, 2004 at selected locations within the upper Delaware River Basin and adjacent area.

[Data provided by National Oceanic and Atmospheric Administration and New York City Department of Environmental Protection; selected data shown on fig. 1.]

Locality and State	Total storm rainfall (inches)
SCRUB OAK, PA	8.32
STODDARTSVILLE, PA	7.22
HONESDALE, PA	6.95
ROSCOE, NY	6.90
MOSCOW, PA	6.60
DREHER, PA	6.42
HONESDALE, PA	6.35
ANDES, NY	6.34
SUSQUEHANNA DEPOT, PA	6.25
ARKVILLE, NY	6.20
LIBERTY, NY	6.16
WALTON, NY	6.16
SCHOHARIE RESERVOIR, NY	6.16
SUSQUEHANNA DEPOT, PA	6.10
OXFORD, NY	6.07
ALDENVILLE, PA	5.95
GREENTOWN, PA	5.90
REINING POND, PA	5.84
TOBYHANNA, PA	5.70
DELHI, NY	5.62
CALLICOON, NY	5.60
PROMPTON, PA	5.55
LORDVILLE, NY	5.50
MOSCOW, PA	5.48
FISHS EDDY, NY	5.40
PEPACTON RESERVOIR, NY	5.38
LONG EDDY, NY	5.34
MONTICELLO, NY	5.30
DEPOSIT, NY	5.29
BOVINA, NY	5.28
SHEHAWKEN, PA	5.24
HOP BOTTOM, PA	5.20
WINDSOR, NY	4.90
PLEASANT MOUNT, PA	4.90
CLARYVILLE, NY	4.70
CANNONSVILLE RESERVOIR, NY	4.42
NEVERSINK, NY	4.33
MATAMORAS, PA	4.32
AYLESWORTH, PA	4.29
SLIDE MOUNTAIN, NY	4.25
EAST SIDNEY, NY	4.12
BAINBRIDGE, NY	4.10
STILLWATER, PA	3.64
EAST SIDNEY, NY	3.62
CHARLOTTEVILLE, NY	3.60
STAMFORD, NY	3.59
WEST MILFORD, NJ	3.32
BLOOMINGBURG, NY	3.19
STILLWATER, PA	3.10
CANISTER, NJ	3.00
ELLENVILLE, NY	2.95
MORRIS, NY	2.80
RONDOUT RESERVOIR, NY	2.80

Table 2. Rainfall-frequency relations for storms of 3-, 6-, 12-, and 24-hour duration at Roscoe, N.Y.

[Data from U.S. Weather Bureau, 1961. Location is shown in fig. 1.]

Recurrence interval (years)	Rainfall, in inches for selected duration			
	3 hours	6 hours	12 hours	24 hours
2	1.8	2.3	2.8	3.0
5	2.4	2.8	3.5	4.0
10	2.7	3.4	4.2	5.0
25	3.2	4.0	5.0	5.9
50	3.5	4.5	5.5	6.5
100	3.8	4.9	6.0	7.4

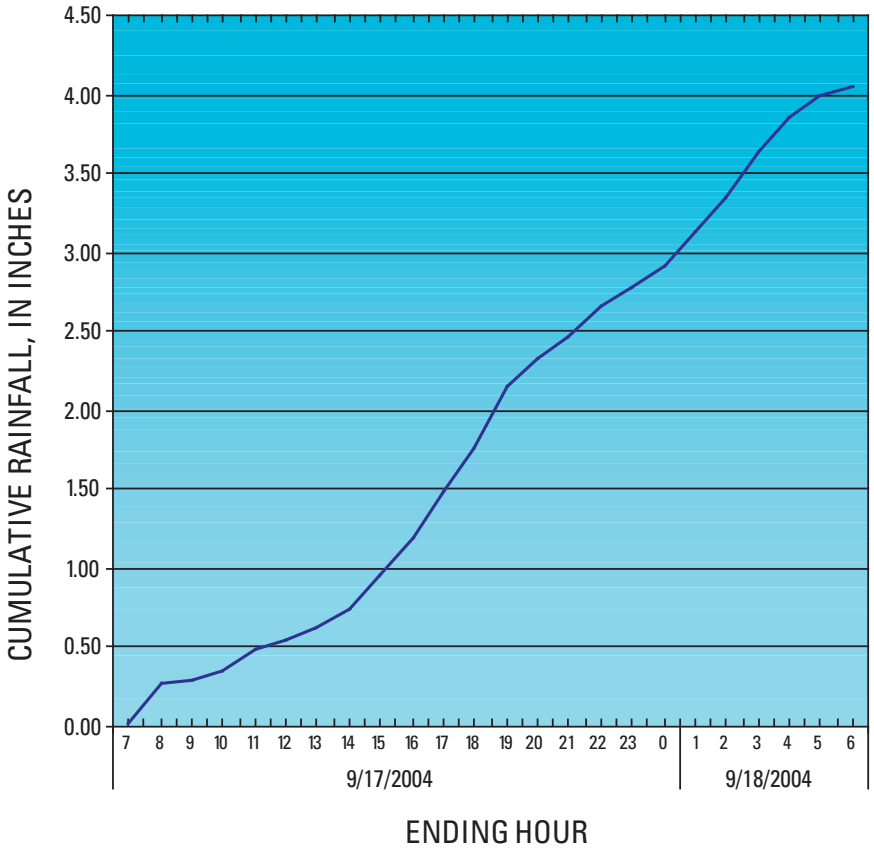


Figure 2. Cumulative rainfall during September 17-18, 2004 recorded at National Weather Service Office, Binghamton, N.Y.

Flood Discharge and Frequency

Locations of the 33 USGS streamflow-gaging stations in the upper Delaware River basin are presented in figure 3, and historical flood peaks and the peak discharges for the flood of September 18-19, 2004, at those stations are presented in table 3.

Discharge hydrographs for five USGS streamflow-gaging stations (two unregulated reaches of two streams and three regulated reaches) in the East Branch Delaware River basin during the storm are presented in figure 4.

Flows at stations on the unregulated streams peaked in the late morning on September 18, whereas peaks at stations on regulated streams were a few hours later (fig. 4).

Streamflow peaks at stations on unregulated reaches in the basin generally remained below a 50-year recurrence interval except at two stations - Beaver Kill at Cooks Falls (01420500) and Oquaga Creek at Deposit (01426000). The flood peaks at those stations had 90-year and 60-year recurrence intervals, respectively. Peak discharges at stations in the Neversink River basin remained below the 15-year recurrence interval.

Peak discharges at stations on the regulated reaches of the East Branch Delaware River at Downsville (01417000), Harvard (01417500) and above Read Creek at Fishs Eddy (01420980) (fig. 4) equaled or exceeded a 100-year recurrence interval. These stations are downstream from Pepacton Reservoir. Computation of recurrence intervals used the period since the current degree of regulation (1955 to present). The storm brought new peaks-of-record for the period of regulation at these stations. Except for the station on Oquaga Creek, peak discharges at stations in the West Branch Delaware River basin had recurrence intervals of less than 40 years.

Three stations on the Delaware River below the confluence of the East and West Branch Delaware Rivers recorded new maximum discharges (since 1955) with recurrence intervals of 80 to 90 years. Peak discharges at selected sites in the upper Delaware River basin are plotted as a function of drainage area in figure 5 with previous peak-of-record discharges.

Effects of Reservoirs on Downstream Flooding

Daily inflow and outflow hydrographs, diversions, and water-surface elevations in the Pepacton and Cannonsville Reservoirs during September 16-23, 2004, are presented in figures 6A and 6B, respectively. Reservoir elevations are referenced to the National Geodetic Vertical Datum of 1929 (sea level). The maximum computed daily mean inflow to the Pepacton Reservoir was 17,300 ft^3/s on September 18 (fig. 6A).

The USGS streamflow-gaging station East Branch Delaware River at Margaretville (01413500) (fig. 3) recorded an instantaneous peak discharge of 13,900 ft^3/s at 1145 hrs on September 18 (table 3). The drainage area above the gaging station represents 44 percent of the total contributing area of the Pepacton Reservoir. The peak discharges recorded at four stations within the Pepacton drainage basin - East Branch Delaware River at Margaretville, Platte Kill near Dunraven (01414000), Mill Brook near Dunraven (01414500), and Tremper Kill near Andes (01415000) (fig. 3) occurred between 0930 and 1030 hours on September 18 (table 3). Combining the peak discharges at these stations and dividing by the combined drainage areas yields a peak runoff of 101 (ft^3/s)/ mi2. Applying that average peak runoff to the entire Pepacton drainage yields an estimated peak inflow of 37,500 ft^3/s to the reservoir on September 18.

Pepaction Reservoir content was at 99.2 percent of capacity on September 17, before the storm. The reservoir water-surface elevation was 1,279.42 ft above sea level (0.6 ft below the spillway elevation of 1,280.0 ft) on that day (fig. 6A). The maximum daily mean elevation of 1,282.66 ft occurred on September 19. The combined flow through the release valves and over the spillway reached a maximum daily of 14,100 ft^3/s on September 18. The USGS streamflow-gaging station just downstream from the confluence of the spillway and release channel (East Branch Delaware River at Downsville (01417000) (fig. 4)) recorded an instantaneous peak discharge of 18,000 ft^3/s on September 18. The reservoir was nearly at full capacity but nevertheless attenuated the flood peak.

Streamflow-gaging stations on the two major tributaries to the Cannonsville Reservoir - West Branch Delaware River at Walton (01423000) and Trout Creek near Trout Creek (0142400103) (fig. 3) account for 78 percent of the drainage area; their recorded peak runoff rates during the storm were 45.8 $(ft^3/s)/mi^2$ and 110.9 $(ft^3/s)/mi^2$, respectively (table 3). Weighting these two peak runoff values by drainage area yields an estimated peak runoff of 49.5 $ft^3/s/mi^2$ for the Cannonsville drainage basin and an estimated peak inflow to the reservoir of 22,600 ft^3/s. The reservoir content was at 99.6 percent of capacity, and the daily mean water-surface elevation was at 1,149.73 ft above sea level on September 17, before the storm (fig. 6B). The spillway elevation is 1,150.00 ft above sea level. The maximum daily reservoir elevation was 1,155.23 ft above sea level on September 19. The maximum instantaneous discharge recorded at the gage West Branch Delaware River at Stilesville (01425000), just downstream from the reservoir, was 11,400 ft^3/s on September 19. Although the Cannonsville Reservoir was nearly at full capacity, the reservoir had a significant attenuating effect the flood peak.

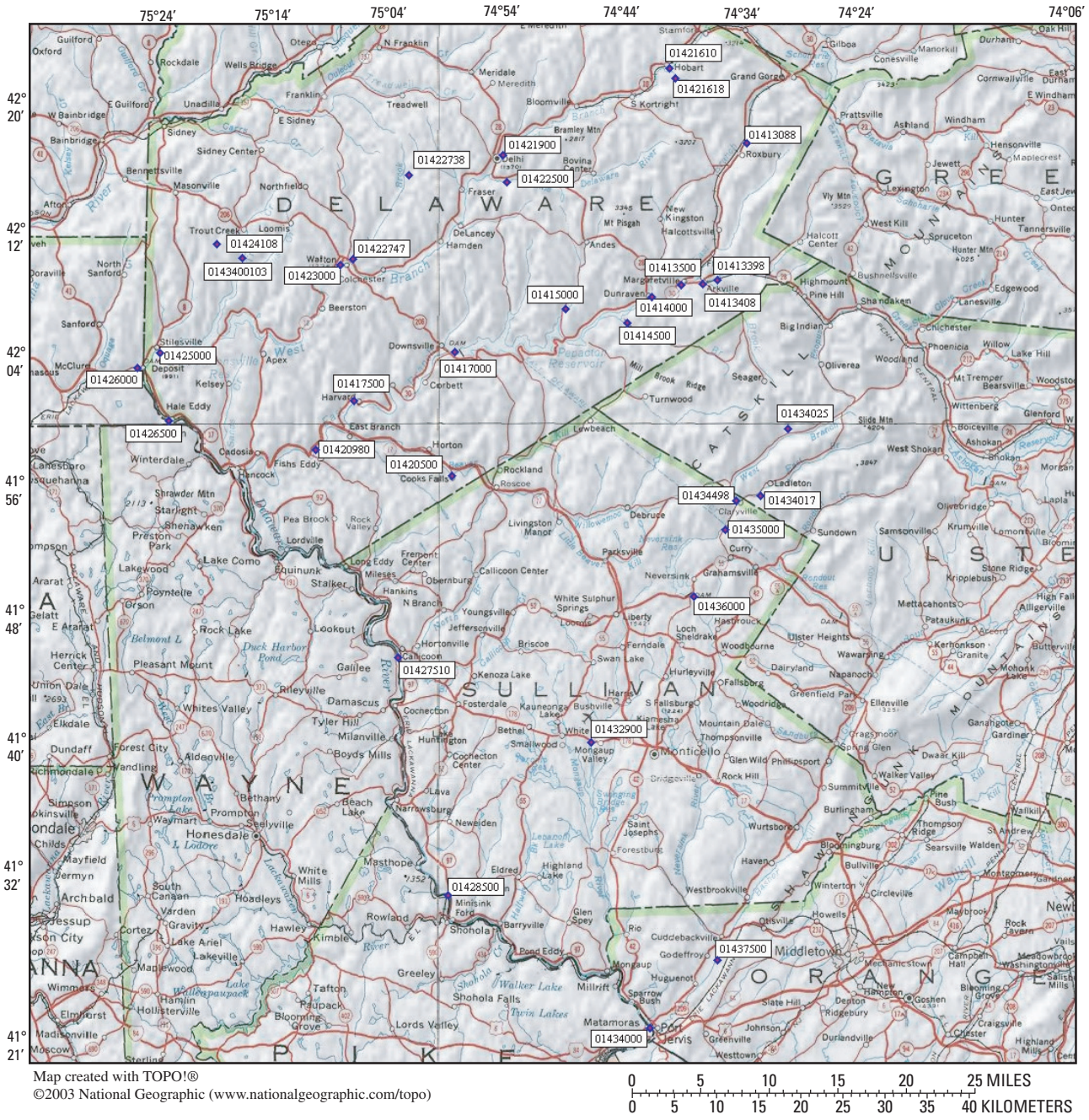


Figure 3. Locations of selected U.S. Geological Survey streamflow-gaging stations in the upper Delaware River Basin, New York. See Table 3 for station names and flood-related data.

Table 3. Historical flood peaks and peaks during the flood of September 18-19, 2004 at selected U.S. Geological Survey streamflow-gaging stations in the upper Delaware River basin.

[mi^2, square miles; ft, feet; ft^3/s, cubic feet per second; $ft^3/s/mi^2$, cubic feet per second per square mile; EST, Eastern Standard Time; --, not available; Site locations shown on fig. 3]

				Previous maximum of record			Flood of September 18-19, 2004					
USGS station number	**Station name	Drainage area (mi^2)	Period of record	Date of peak	Peak stage (ft)	Peak discharge (ft^3/s)	Date of peak	Time (EST) of peak (hr)	Peak stage (ft)	Peak discharge (ft^3/s)	Peak discharge ($ft^3/s/mi^2$)	**Recurrence interval (years)
01413088	EAST BR DELAWARE R AT ROXBURY NY	13.50	2000-04	04/13/01	5.98	316	09/18/04	1515	6.44	469	34.7	--
01413398	BUSHKILL NEAR ARKVILLE NY	46.70	1997-04	01/19/96	--	7,600	09/18/04	1100	10.05	3,910	83.7	--
01413408	DRY BROOK AT ARKVILLE NY	82.20	1996-04	01/19/96	a15.50	b12,000	09/18/04	1015	12.39	9,420	114.6	--
01413500	EAST BR DELAWARE R AT MARGARETVILLE NY	163.00	1937-04	01/19/96	14.88	25,800	09/18/04	1145	12.66	13,900	85.3	15
01414000	PLATTE KILL AT DUNRAVEN NY	34.90	1941-62,96-04	01/19/96	9.60	5,690	09/18/04	0945	8.23	4,170	119.5	30
01414500	MILL BROOK NEAR DUNRAVEN NY	25.20	1937-04	01/19/96	12.56	5,380	09/18/04	0900	a11.3	4,000	158.7	25
01415000	TREMPER KILL NEAR ANDES NY	33.20	1937-04	01/19/96	7.69	5,000	09/18/04	1030	6.94	3,740	112.7	30
01417000	EAST BRANCH DELAWARE RIVER AT DOWNSVILLE NY	372.00	c1955-04	05/30/84	8.91	c9,820	09/18/04	1645	12.09	18,000	48.4	1.02 x 100
01417500	EAST BR DELAWARE RIVER AT HARVARD NY	458.00	c1955-04	05/30/84	11.78	c11,100	09/18/04	2045	16.07	21,000	45.9	100
01420500	BEAVER KILL AT COOKS FALLS NY	241.00	1913-04	01/19/96	17.79	42,900	09/18/04	1100	17.67	42,100	174.7	90
01420980	EAST BR DELAWARE R ABV READ CR AT FISHS EDDY NY	766.00	c1955-04	01/19/96	d16.88	c53,000	09/18/04	1215	21.4	56,300	73.5	1.01 x 100
01421610	WEST BR DELAWARE R AT HOBART NY	15.50	2000-04	04/09/01	2.41	488	09/18/04	1030	2.84	738	47.6	--
01421618	TOWN BR SE OF HOBART NY	14.30	1998-04	07/04/99	7.54	4,400	09/18/04	0945	5.34	1,840	128.7	--
01421900	W BR DELAWARE RIVER UPSTREAM FROM DELHI NY	134.00	1937-70,96-04	01/19/96	d9.80	b13,000	09/18/04	1830	9.81	5,280	39.4	5
01422500	LITTLE DELAWARE RIVER NEAR DELHI NY	49.80	1937-70,96-04	01/19/96	8.51	6,100	09/18/04	1115	6.66	3,210	64.5	6
01422738	WOLF CREEK AT MUNDALE NY	0.61	1998-04	09/04/03	2.51	47	09/18/04	0700	2.6	59	96.7	--
01422747	EAST BROOK EAST OF WALTON NY	24.70	1998-04	01/18/99	4.89	1,130	09/18/04	0915	6.71	2,830	114.6	--
01423000	WEST BRANCH DELAWARE RIVER AT WALTON NY	332.00	1950-04	01/19/96	16.36	25,000	09/18/04	1800	13.41	15,200	45.8	7
0142400103	TROUT CREEK NEAR TROUT CREEK NY	20.20	1952-67,96-04	01/19/96	7.24	2,800	09/18/04	0515	6.46	2,240	110.9	35
01424108	SHERRUCK BROOK TRIB NR TROUT CREEK NY	1.26	1997-04	06/13/03	2.35	89	09/18/04	0945	2.46	104	82.5	--
01425000	W BR DELAWARE RIVER AT STILESVILLE NY	456.00	c1964-04	03/16/86	13.07	17,800	09/19/04	0815	11.83	11,400	25.0	10
01426000	OQUAGA CREEK AT DEPOSIT NY	67.60	1941-73,04	07/04/70	d8.98	7,170	09/18/04	0915	8.44	6,870	101.6	60
01426500	WEST BRANCH DELAWARE RIVER AT HALE EDDY NY	595.00	c1964-04	03/15/86	13.63	c18,700	09/18/04	1115	12.83	17,400	29.2	30
01427510	DELAWARE RIVER AT CALLICOON NY	1820.00	1975-04	01/19/96	16.31	95,600	09/18/04	1645	17.35	107,000	58.8	80
01428500	DELAWARE R ABOVE LACKAWAXEN R NR BARRYVILLE NY	2020.00	c1964-04	01/20/96	22.18	c98,300	09/18/04	1515	24.09	112,000	55.4	90
01432900	MONGAUP R AT MONGAUP VALLEY NY	76.60	2002-04	09/23/03	6.73	1,680	09/18/04	1300	11.94	5,720	74.7	--
01434000	DELAWARE RIVER AT PORT JERVIS NY	3070.00	c1964-04	01/20/96	18.37	c134,000	09/18/04	1645	19.52	151,000	49.2	90
01434017	EAST BR NEVERSINK RIVER NR CLARYVILLE NY	22.90	1991-04	01/19/96	11.25	3,240	09/18/04	1015	9.76	1,880	82.1	<2
01434025	BISCUIT BK ABOVE PIGEON BK AT FROST VALLEY NY	3.72	1983-04	04/04/87	4.37	815	09/18/04	0800	3.31	305	82.0	<2
01434498	WEST BRANCH NEVERSINK R AT CLARYVILLE NY	33.80	1991-04	12/17/00	12.38	9,500	09/18/04	0945	10.96	5,980	176.9	4
01435000	NEVERSINK RIVER NEAR CLARYVILLE NY	66.60	1937-04	11/25/50	a15.00	23,400	09/18/04	1030	11.55	6,960	104.5	3
01436000	NEVERSINK RIVER AT NEVERSINK NY	92.60	c1954-04	06/23/72	8.20	c6,130	09/18/04	1545	6.64	4,020	43.4	15
01437500	NEVERSINK RIVER AT GODEFFROY, N. Y.	307.00	c1954-04	08/19/55	12.49	c33,000	09/18/04	2100	8.22	6,870	22.4	4

** Sites in pink indicate significant regulation. Recurrence intervals at these sites were calculated from statistical analyses of annual peak discharges during the regulated period. No adjustments were made for the amount of available storage in the reservoirs before or during floods, or for changes in regulation procedures during the period of regulation. Other studies, such as flood-insurance studies, and other procedures, can be investigated for alternate methods of determining discharge recurrence intervals at these sites.

a From floodmarks
b About
c Since existing degree of regulation
d At former site

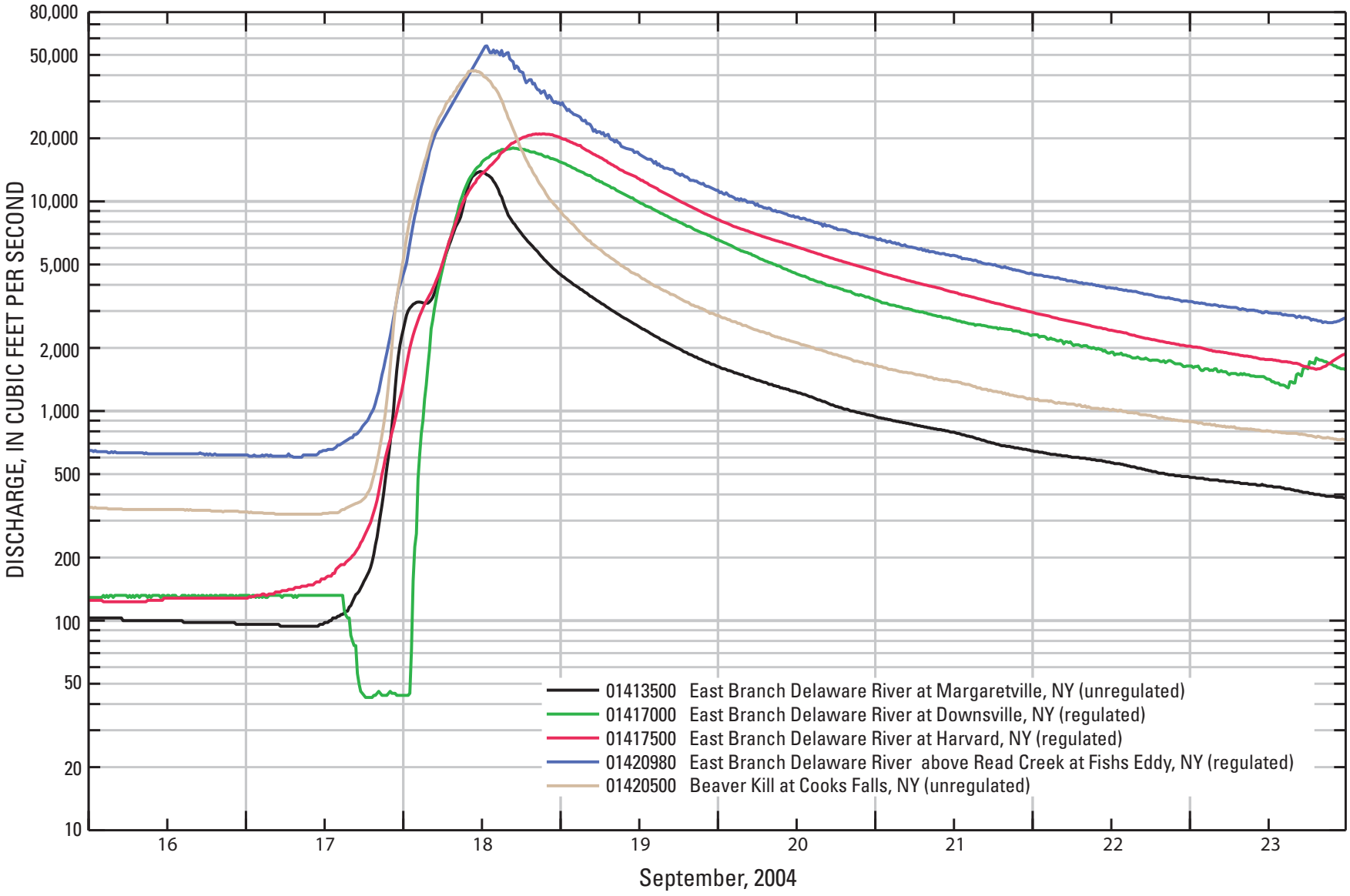


Figure 4. Discharge hydrographs for selected streamflow-gaging stations in the East Branch Delaware River basin, September 16-23, 2004. (Locations are shown in fig. 3.)

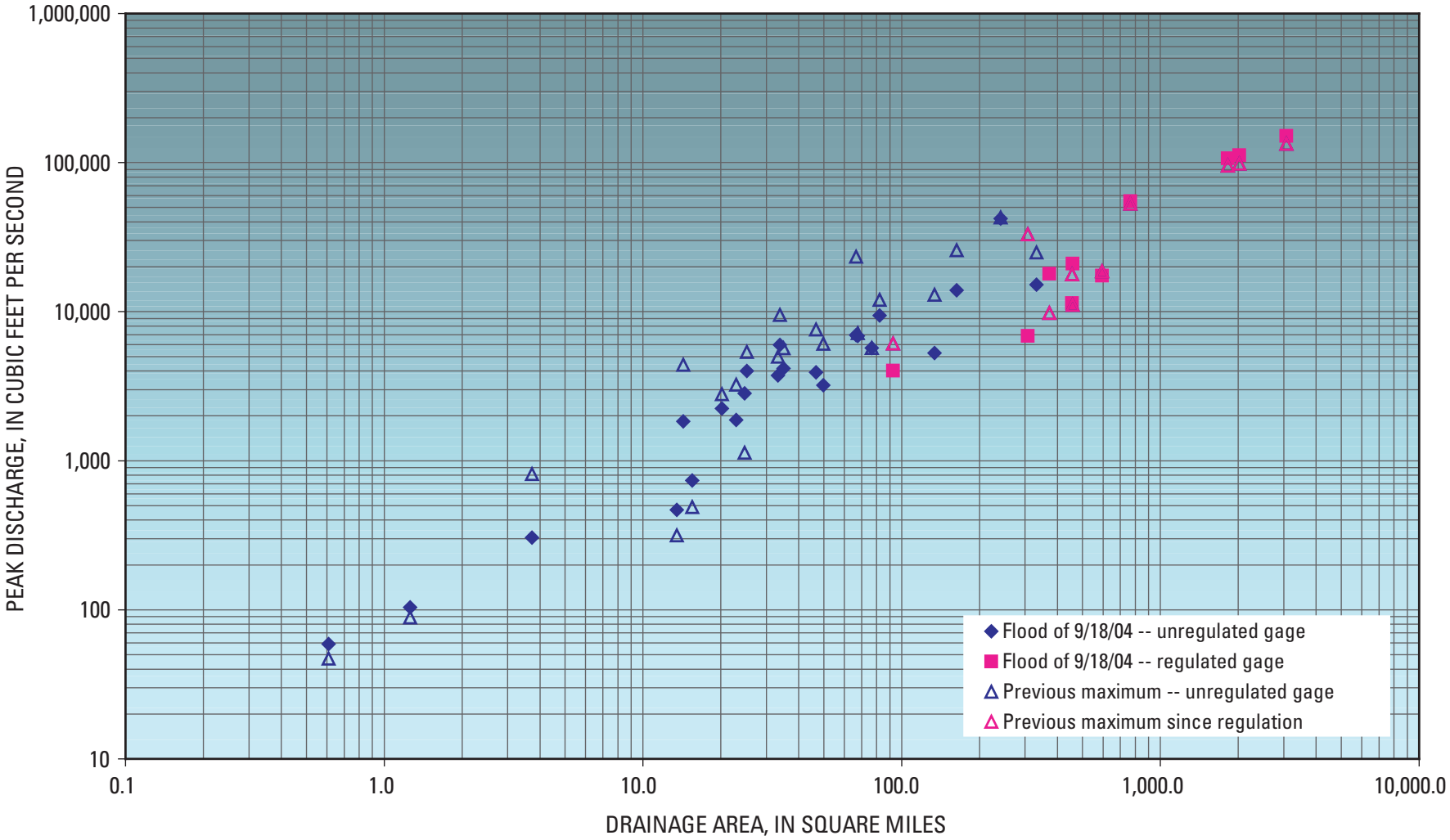
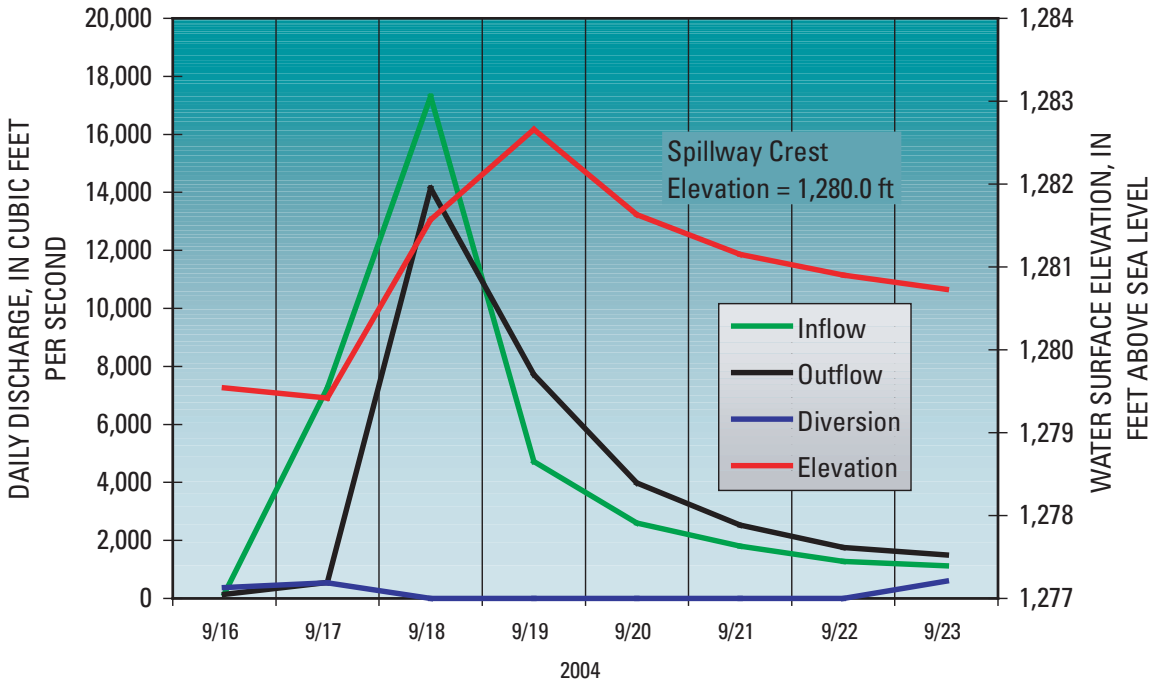
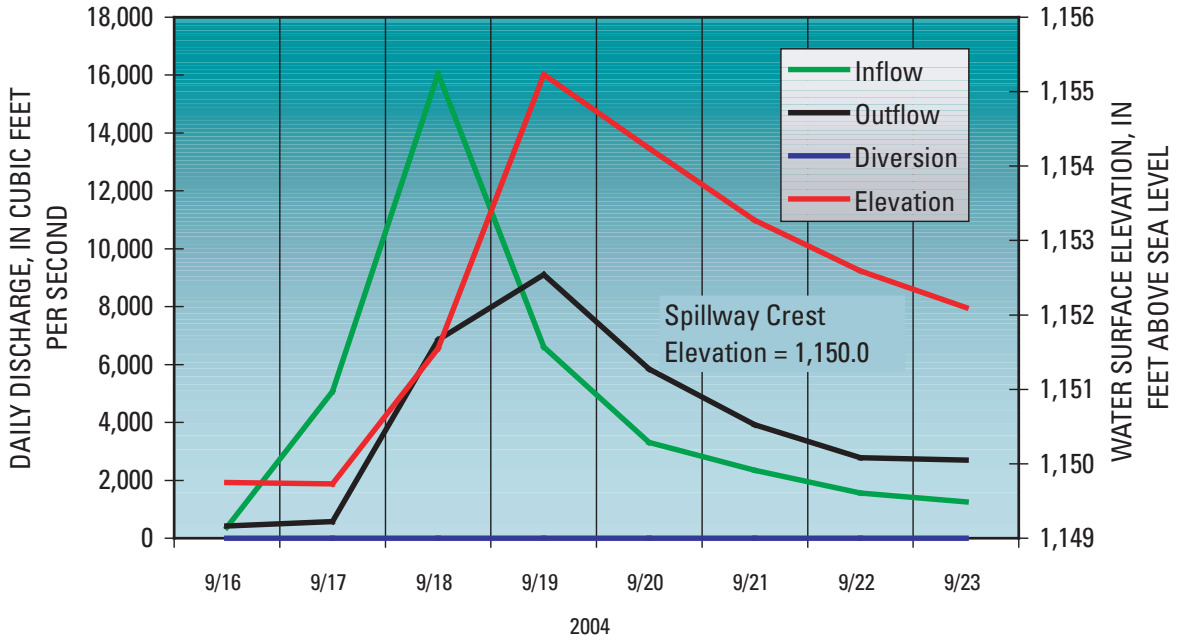


Figure 5. Peak discharge at selected streamflow-gaging stations in the upper Delaware River basin, N.Y. as a function of drainage area during the flood of September 18-19, 2004 and previous maximum known discharges.



A.Pepacton Reservoir at Downsville, N.Y.



B.Cannonsville Reservoir at Stilesville, N.Y.

Figure 6. Daily mean inflow, outflow, diversion, and water-surface elevation at two reservoirs, September 16-23, 2004: A. Pepacton Reservoir near Downsville, N.Y. B. Cannonsville Reservoir at Stilesville, N.Y. [Data provided by New York City, Department of Environmental Protection, Board of Water Supply; gage readings at 0800 hours]

Peak Water-Surface Elevations at Flood Study Sites

A part of this study entailed measurement of peak water-surface elevations at 49 sites along five streams - Little Beaver Kill, Willowemoc Creek, Beaver Kill, East Branch Delaware River and the Delaware River in New York (fig. 7). Seven of these sites were USGS streamflow-gaging stations (fig. 3).

High-water marks at each site were surveyed to obtain peak water-surface elevations and were referenced to the National Geodetic Vertical Datum of 1929 (sea level). At sites associated with a bridge, high-water marks were obtained both upstream and downstream of the structure. The accuracy of high-water marks was rated subjectively by field personnel as "excellent," "good," "fair," or "poor," according to guidelines of Benson and Dalrymple (1967). "Excellent" means the reported high-water mark is within 0.02 ft of the true high-water elevation; "good" within 0.05 ft; "fair" within 0.10 ft; and "poor" implies less than "fair" accuracy. High-water mark description, photographs, location (latitude and longitude) and location with respect to a nearby bridge or other structure were documented and presented in the Appendix. High-water mark locations described as "left bank" or "right bank" are in relation to an observer facing downstream.

Peak water-surface elevations for the September 2004 flood were compared with (1) flood-profile elevations published in Federal Emergency Management Agency (FEMA) flood-insurance studies (Federal Emergency Management Agency, 1987a, 1987b, 1987c, 1987d, 1987e, 1990a, 1990b, 1993, 1999, 2001, 2002a, 2002b) and (2) water-surface elevations recorded at selected USGS streamflow-gaging stations. High-water mark elevations and published FEMA 10-, 50-, 100-, and 500-year water-surface flood elevations are tabulated in table 4.

Flood elevations at 10-, 50-, 100-, and 500-year recurrence intervals, and those during the flood of September 18-19, 2004 for the East Branch Delaware River and its tributaries, and the main stem Delaware River are plotted in figure 8.

Comparison of high-water mark elevations with FEMA flood-insurance studies indicated that most of the sites along Willowemoc Creek had peak water-surface elevations with recurrence intervals of 10 to 50 years (fig 7, table 4). Flood water-surface elevations on the Little Beaver Kill at Morsston were in the 10- to 50-year recurrence interval. Flooding in the Village of Livingston Manor was at the 50- to 100-year level and occurred mainly above the confluence of the Little Beaver Kill and Willowemoc Creek.

Published FEMA flood profiles indicate that recurrence intervals of flood water-surface elevations on the East Branch Delaware River ranged from more than 500 years in the Downsville area to less than 10 years at East Branch. Water-surface elevations on the East Branch Delaware River downstream from the confluence with the Beaver Kill were in the 10- to 50-year recurrence interval. Flooding was not evident in the West Branch Delaware River basin and therefore was not included in this study. Recurrence intervals of flood peaks on the upper Delaware River ranged from 10 to 50 years from Lordville to Hankins, from 50 to 100 years at Callicoon, from 100 to 500 years at Cochecton, 50 years at Skinners Falls, and from 10 to 50 years from Narrowsburg to Pond Eddy. The flood peak recurrence interval at the U.S. Routes 6 and 209 bridge at Port Jervis was between 50 and 100 years, and was between 100 and 500 years at the confluence of the Neversink and Delaware Rivers. The flood peaks on the Neversink River were within the 10- to 50-year recurrence interval. All water-surface elevation recurrence intervals noted above are based on published FEMA flood-insurance studies and associated profiles.

Flood Damage

About 1,000 people in the upper Delaware River basin were evacuated, and several hundred homes were flooded as a result of rainfall from the remnants of tropical depression Ivan (Times Herald Record, 2004a). More than 10 homes in Downsville were later condemned (The Daily Star, 2004). By early November, 2004, more than $1.2 million in federal disaster aid had been distributed to New Yorkers to assist with flood recovery (FEMA News Release 1565-027, November 12, 2004). Preliminary reports indicate the total damage cost in Sullivan County alone was more than $10 million (Times Herald Record, 2004b). Several bridges in the county required replacement, and road damage was widespread. Seasonal campgrounds along the Beaver Kill, East Branch Delaware, and Delaware Rivers were flooded, and reports of damage of camper trailers were common. Thirty-five camper vans were swept into the Delaware River near Hankins.

Summary

The remnants of tropical depression Ivan combined with a frontal boundary produced from 4 to more than 6 inches of rain in the upper Delaware River basin in New York. Rain that fell on soils already moist from a previous storm produced flood-peak elevations with recurrence intervals greater than 500 years, as indicated by elevations documented in FEMA flood-insurance studies. Pepacton and Cannonsville Reservoirs were at 99 percent capacity but attenuated peak discharges downstream. About 1,000 people were evacuated and more than 100 homes sustained flood damage, 10 of which were later condemned. All five of the counties in New York within the basin were declared Federal disaster areas, and aid totaling more than $1.2 million was distributed to homeowners. Flood damage was most pronounced along the East Branch Delaware River and its tributaries, and along

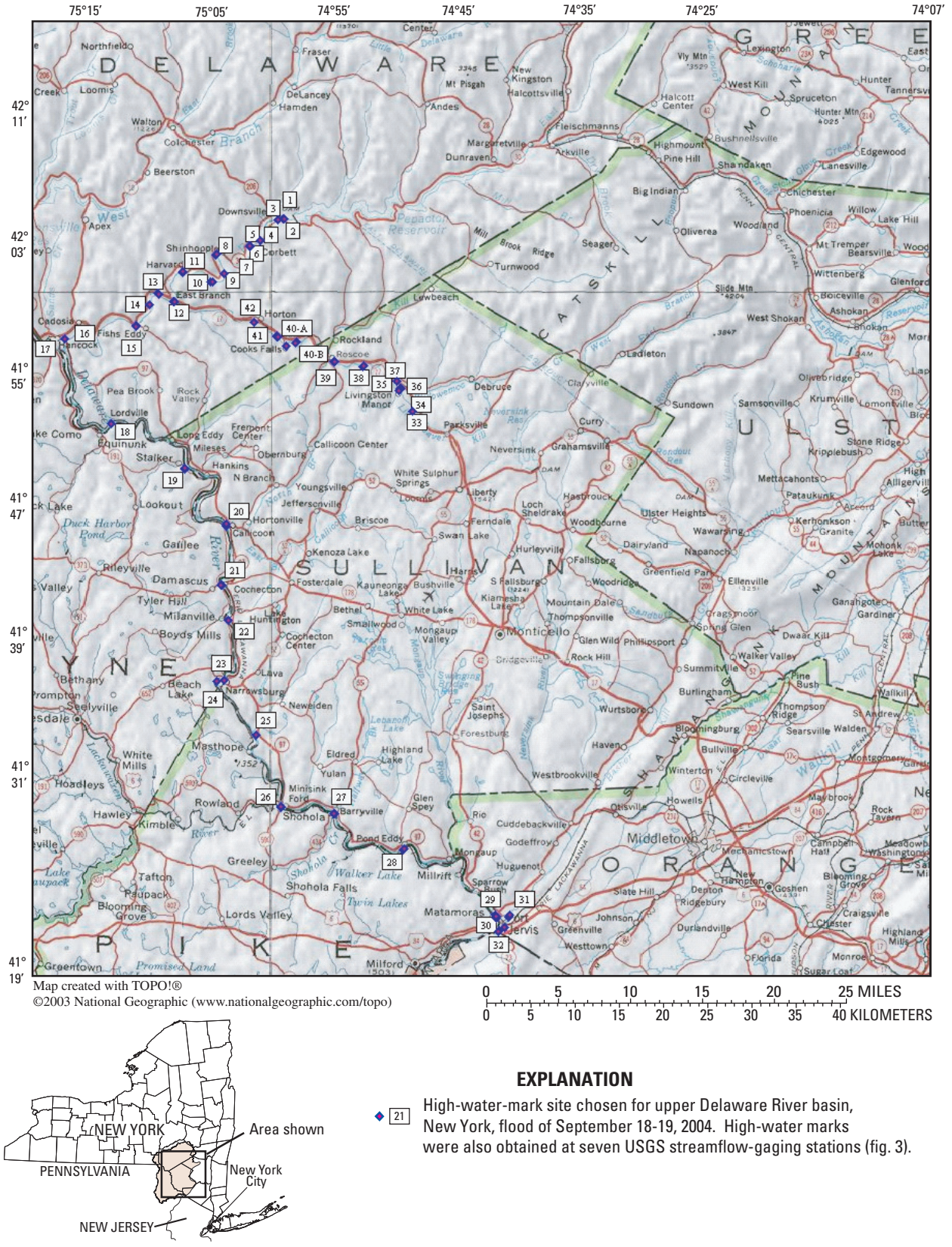


Figure 7. Locations of 42 high-water sites chosen for upper Delaware River basin, New York, flood of September 18-19, 2004.

Table 4. Peak flood elevations at 49 high-water-mark sites in the upper Delaware River basin, New York, during flood of September 18-19, 2004, and corresponding water-surface elevations for 10-, 50-, 100-, and 500-year flood-recurrence intervals.

[Water-surface elevations are in feet above NGVD 1929. Recurrence-interval elevations from Federal Emergency Management Agency (1987a,b,c,d,e; 1990a,b; 1993, 1999, 2001, 2002a,b). Dash (--) indicates no data available. Locations are shown in fig. 7. Site descriptions are found in the Appendix]

Site number or USGS gaging station number	Selected High-water mark	Site name or USGS gaging station name	Peak Flood elevation, in feet above sea level, September 18-19, 2004[1]	FEMA water-surface elevations, in feet above sea level			
				10-year flood	50-year flood	100-year flood	500-year flood
01417000		East Branch Delaware River at Downsville, N.Y.	1,107.01	1,101.4	1,103.1	1,103.5	1,104.3
1	1.4	East Branch Delaware River at State Route 30 at Downsville,	[a]1,105.38	1,100.9	1,102.3	1,102.9	1,103.5
	1.1	N.Y.	[b]1,105.44	1,100.8	1,102.2	1,102.8	1,103.4
2	2.1	East Branch Delaware River at Bridge Street at Downsville,	[a]1,103.12	1,099.9	1,101.2	1,101.7	1,102.5
	2.3	N.Y.	[b]1,102.93	1,099.6	1,100.9	1,101.4	1,102.1
3	3.1	East Branch Delaware River at River Road and Depot Street	[c]1,100.53	1,098.9	1,100.3	1,100.7	1,101.4
	3.2	at Downsville, N.Y.	[c]1,100.54	1,098.7	1,100.1	1,100.5	1,101.2
4	4.1	East Branch Delaware River at State Route 30 near Airport Road near Downsville, N.Y.	[d]1,088.12	1,085.8	1,087.3	1,088.0	1,089.0
5	5.1	East Branch Delaware River at Airport Road near Downsville, N.Y.	[d]1,088.10	1,083.5	1,084.8	1,085.2	1,086.1
6	6.2	East Branch Delaware River at Corbett Road at Corbett, N.Y.	[a]1,083.13	1,079.2	1,080.8	1,081.4	1,082.5
	6.3		[b]1,082.33	1,079.0	1,080.2	1,080.8	1,081.7
7	7.1	East Branch Delaware River at River Road at Shinhopple,	[a]1,059.11	--	--	--	--
	7.3	N.Y.	[b]1,057.36	--	--	--	--
8	8.2	East Branch Delaware River at Island Road at Shinhopple,	[d]1,048.72	--	--	--	--
	8.1	N.Y.	[d]1,048.00	--	--	--	--
9	9.1	East Branch Delaware River at Bronxville Road at Long Flat, N.Y.	[d]1,045.06	1,047.0	1,050.0	1,051.2	1,054.0
10	10.3	East Branch Delaware River at Long Flats Road at Long Flat,	[d]1,038.44	1,041.6	1,044.4	1,045.7	1,048.8
	10.1	N.Y.	[d]1,037.97	1,040.8	1,043.7	1,045.0	1,048.2
11	11.5	East Branch Delaware River at Harvard Road at Harvard,	[a]1,025.88	1,026.3	1,029.1	1,030.6	1,033.4
	11.4	N.Y.	[b]1,025.68	1,025.4	1,028.5	1,030.2	1,032.8
01417500		East Branch Delaware River at Harvard, N.Y.	1,023.48	1,022.6	1,025.6	1,027.0	1,030.1
12	12.4	East Branch Delaware River at Old State Route 17 and "new"	[a]1,009.03	1,011.2	1,015.3	1,016.8	1,020.9

1 a, upstream side of bridge; b, downstream side of bridge; c, in urban area; d, in rural area

Table 4. Peak flood elevations at 49 high-water-mark sites in the upper Delaware River basin, New York, during flood of September 18-19, 2004, and corresponding water-surface elevations for 10-, 50-, 100-, and 500-year flood-recurrence intervals.--Continued

[Water-surface elevations are in feet above NGVD 1929. Recurrence-interval elevations from Federal Emergency Management Agency (1987a,b,c,d,e; 1990a,b; 1993, 1999, 2001, 2002a,b). Dash (--) indicates no data available. Locations are shown in fig. 7. Site descriptions are found in the Appendix]

Site number or USGS gaging station number	Selected High-water mark	Site name or USGS gaging station name	Peak Flood elevation, in feet above sea level, September 18-19, 2004[1]	FEMA water-surface elevations, in feet above sea level			
				10-year flood	50-year flood	100-year flood	500-year flood
	12.3	State Route 17 at East Branch, N.Y.	[b]1,008.40	1,010.9	1,014.8	1,016.3	1,020.4
	12.1		[b]1,005.59	1,008.8	1,011.9	1,013.1	1,016.5
13	13.5	East Branch Delaware River at State Route 17, about 1.0 mile	[a]997.00	997.6	1,001.5	1,003.3	1,008.9
	13.1	downstream from East Branch, N.Y.	[b]995.01	997.5	1,001.4	1,003.2	1,007.2
14	14.1	East Branch Delaware River at State Route 17, about 2.0	[a]989.45	987.6	991.9	993.7	997.9
	14.3	miles downstream from East Branch, N.Y.	[b]988.50	986.9	990.0	991.7	995.4
01420980		East Branch Delaware River above Read Creek at Fishs Eddy, N.Y.	977.07	975.7	979.6	981.3	985.3
01421000		East Branch Delaware River at Fishs Eddy, N.Y.	974.06	973.6	977.6	979.5	983.5
15	15.1	East Branch Delaware River at County Route 28 at Fishs	[a]971.82	971.6	975.9	977.8	982.2
	15.3	Eddy, N.Y.	[b]971.11	971.6	975.8	977.5	981.7
16	16.6	East Branch Delaware River at State Route 97 at Hancock,	[a]906.08	904.1	908.7	910.6	915.8
	16.4	N.Y.	[b]905.88	903.9	908.5	910.4	914.7
17	17.5	East Branch Delaware River at Conrail Railroad at Hancock,	[a]905.35	903.7	908.3	910.2	914.4
	17.1	N.Y.	[b]904.93	903.6	908.1	910.0	914.3
18	18.5	Delaware River at Lordville Road at Lordville, N.Y.	[a]860.77	857.9	864.3	867.4	874.0
	18.13		[a]859.38	857.8	864.2	867.3	873.8
	18.1		[b]858.48	857.6	863.8	866.9	873.6
	18.7		[b]858.53	857.6	863.8	866.9	873.6
19	19.5	Delaware River at Kellams Bridge Road at Hankins, N.Y.	[a]811.57	808.2	813.8	816.2	824.8
	19.1		[b]811.43	808.1	813.5	815.9	823.1
20	20.1	Delaware River at Bridge Street at Callicoon, N.Y.	[a]755.98	751.5	755.2	757.0	761.9
	20.3		[b]755.61	751.1	754.9	756.8	761.6
01427510		Delaware River at Callicoon, N.Y.	752.21	749.3	753.1	755.1	759.9
21	21.6	Delaware River at State Route 371 at Cochecton, N.Y.	[a]736.10	727.8	732.0	734.1	739.9
	21.1		[b]735.92	727.6	731.9	733.9	739.8
22	22.5	Delaware River at Skinners Falls Road at Skinners Falls, N.Y.	[a]720.60	714.3	720.0	722.8	730.4
	22.1		[b]720.25	714.1	719.8	722.4	730.2

1 a, upstream side of bridge; b, downstream side of bridge; c, in urban area; d, in rural area

Table 4. Peak flood elevations at 49 high-water-mark sites in the upper Delaware River basin, New York, during flood of September 18-19, 2004, and corresponding water-surface elevations for 10-, 50-, 100-, and 500-year flood-recurrence intervals.--Continued

[Water-surface elevations are in feet above NGVD 1929. Recurrence-interval elevations from Federal Emergency Management Agency (1987a,b,c,d,e; 1990a,b; 1993, 1999, 2001, 2002a,b). Dash (--) indicates no data available. Locations are shown in fig. 7. Site descriptions are found in the Appendix]

Site number or USGS gaging station number	Selected High-water mark	Site name or USGS gaging station name	Peak Flood elevation, in feet above sea level, September 18-19, 2004[1]	FEMA water-surface elevations, in feet above sea level			
				10-year flood	50-year flood	100-year flood	500-year flood
23	23.3	Delaware River at U.S. Route 652 at Narrowsburg, N.Y.	[a]695.91	690.2	696.1	698.9	707.0
	23.1		[b]693.54	690.1	696.0	698.8	706.9
24	24.1	Delaware River at 2nd Avenue and Delaware Drive at Narrowsburg, N.Y.	[c]694.57	689.4	695.3	697.8	706.1
	24.3		[c]693.44	689.1	695.1	697.5	705.9
	24.4		[c]693.52	689.1	695.0	697.3	705.9
	24.5		[c]692.26	688.2	694.1	696.8	705.4
	24.7		[c]689.53	687.0	693.0	695.6	704.8
	24.8		[c]688.27	686.0	692.1	694.8	704.1
25	25.3	Delaware River at Crawford Road at Tusten, N.Y.	[d]665.40	663.1	669.2	672.0	680.1
	25.7		[d]665.31	662.9	669.0	671.8	680.0
01428500		Delaware River above Lackawaxen River near Barryville, N.Y.	624.31	620.5	627.5	630.6	639.4
26	26.3	Delaware River at Minisink Road at Minisink Ford, N.Y.	[a]617.35	610.7	617.3	620.3	631.0
	26.2		[b]617.09	609.8	616.3	619.5	627.4
27	27.5	Delaware River at State Route 55 at Barryville, N.Y.	[a]586.24	580.0	586.3	589.5	597.9
	27.1	Delaware River at State Route 55 at Barryville, N.Y. (USGS Gaging Station 01432160)	[b]585.14	579.1	585.7	588.9	597.4
28	28.3	Delaware River at County Route 41 at Pond Eddy, N.Y.	[a]525.42	521.5	527.0	529.5	537.5
	28.4		[b]523.69	520.0	524.5	527.0	533.3
32	32.5	Delaware River at U.S. Routes 6 and 209 at Port Jervis, N.Y.	[a]436.46	430.8	435.1	437.4	442.3
01434000		Delaware River at Port Jervis, N.Y.	434.87	429.3	433.4	435.4	440.7
32	32.2	Delaware River at U.S. Routes 6 and 209 at Port Jervis, N.Y.	[b]435.51	429.1	433.1	435.3	440.6
29	29.1	Confluence of Delaware and Neversink Rivers at Interstate Route 84 at Port Jervis, N.Y.	[a]428.30	419.8	424.0	426.6	431.6
	29.4		[b]428.18	419.6	423.8	426.3	431.6
31	31.4	Neversink River at Rivers Edge Road at Port Jervis, N.Y.	[c]429.08	427.4	435.5	439.0	451.0
	31.1		[c]429.01	427.1	435.3	438.8	450.8
30	30.7	Neversink River at State Route 6 (Main Street) at Port Jervis,	[a]428.57	424.7	429.7	432.4	438.4

1 a, upstream side of bridge; b, downstream side of bridge; c, in urban area; d, in rural area

Table 4. Peak flood elevations at 49 high-water-mark sites in the upper Delaware River basin, New York, during flood of September 18-19, 2004, and corresponding water-surface elevations for 10-, 50-, 100-, and 500-year flood-recurrence intervals.--Continued

[Water-surface elevations are in feet above NGVD 1929. Recurrence-interval elevations from Federal Emergency Management Agency (1987a,b,c,d,e; 1990a,b; 1993, 1999, 2001, 2002a,b). Dash (--) indicates no data available. Locations are shown in fig. 7. Site descriptions are found in the Appendix]

Site number or USGS gaging station number	Selected High-water mark	Site name or USGS gaging station name	Peak Flood elevation, in feet above sea level, September 18-19, 2004[1]	FEMA water-surface elevations, in feet above sea level			
				10-year flood	50-year flood	100-year flood	500-year flood
	30.1	N.Y.	[b]428.37	424.0	428.7	430.5	434.5
33	33.1	Little Beaver Kill at County Route 146 at Morsston, N.Y.	[a]1,465.23	1,462.2	1,466.0	1,466.8	1,468.0
	33.6		[a]1,466.22	1,461.9	1,465.9	1,466.7	1,467.9
	33.5		[a]1,465.83	1,461.6	1,465.9	1,466.6	1,467.8
	33.10		[b]1,462.70	1,460.8	1,462.7	1,463.4	1,464.8
	33.8		[b]1,459.66	1,459.5	1,460.9	1,461.9	1,463.0
34	34.2	Confluence of Willowemoc Creek and Little Beaver Kill at	[b]1,423.53	1,419.8	1,422.0	1,423.1	1,425.8
	34.1	Main Street at Livingston Manor, N.Y.	[b]1,420.45	1,417.3	1,420.3	1,421.5	1,423.2
35	35.1	Willowemoc Creek at County Route 178 (Old State Route 17)	[a]1,426.34	1,424.4	1,427.7	1,430.4	1,431.9
	35.3	at Livingston Manor, N.Y.	[b]1,423.20	1,423.8	1,427.1	1,429.0	1,430.8
36	36.1	Little Beaver Kill at Pearl Street at Livingston Manor, N.Y.	[c]1,424.60	1,421.2	1,424.0	1,425.8	1,426.1
37	37.4	Willowemoc Creek at State Route 17 at Livingston Manor,	[a]1,404.14	1,402.0	1,404.4	1,405.8	1,408.7
	37.1	N.Y.	[b]1,402.42	1,401.4	1,403.3	1,404.4	1,405.7
38	38.5	Willowemoc Creek at Hazel Road at Hazel, N.Y.	[a]1,338.06	1,337.1	1,340.3	1,342.1	1,347.0
	38.1		[b]1,337.43	1,336.4	1,338.8	1,339.9	1,344.9
39	39.6	Willowemoc Creek at Stewart Avenue at Roscoe, N.Y.	[a]1,284.35	1,283.3	1,286.8	1,288.1	1,291.0
	39.5		[a]1,284.33	1,282.3	1,286.0	1,287.7	1,290.6
	39.4		[a]1,283.20	1,282.2	1,286.0	1,287.4	1,290.4
	39.1		[b]1,282.24	1,282.2	1,285.4	1,286.9	1,290.1
40-B	40-B.7	Beaver Kill at State Route 17 near Cooks Falls, N.Y.	[a]1,196.04	--	--	--	--
	40-B.5		[b]1,194.89	--	--	--	--
40-A	40-A.2	Beaver Kill at Cooks Brook Road at Cooks Falls, N.Y.	[a]1,173.67	--	--	--	--
	40-A.1	Beaver Kill at Cooks Brook Road at Cooks Falls, N.Y. (USGS Gaging Station 01420500)	[b]1,169.61	--	--	--	--
41	41.1	Beaver Kill at Cooks Falls Road at Butternut Grove, N.Y.	[d]1,154.76	--	--	--	--
	41.5		[d]1,153.12	--	--	--	--
	41.3		[d]1,152.87	--	--	--	--
42	42.1	Beaver Kill at State Route 17 at Horton, N.Y.	[a]1,120.49	--	--	--	--

1 a, upstream side of bridge; b, downstream side of bridge; c, in urban area; d, in rural area

Table 4. Peak flood elevations at 49 high-water-mark sites in the upper Delaware River basin, New York, during flood of September 18-19, 2004, and corresponding water-surface elevations for 10-, 50-, 100-, and 500-year flood-recurrence intervals.--Continued

[Water-surface elevations are in feet above NGVD 1929. Recurrence-interval elevations from Federal Emergency Management Agency (1987a,b,c,d,e; 1990a,b; 1993, 1999, 2001, 2002a,b). Dash (--) indicates no data available. Locations are shown in fig. 7. Site descriptions are found in the Appendix]

Site number or USGS gaging station number	Selected High-water mark	Site name or USGS gaging station name	Peak Flood elevation, in feet above sea level, September 18-19, 2004[1]	FEMA water-surface elevations, in feet above sea level			
				10-year flood	50-year flood	100-year flood	500-year flood
	42.7		[b]1,118.42	--	--	--	--

1 a, upstream side of bridge; b, downstream side of bridge; c, in urban area; d, in rural area

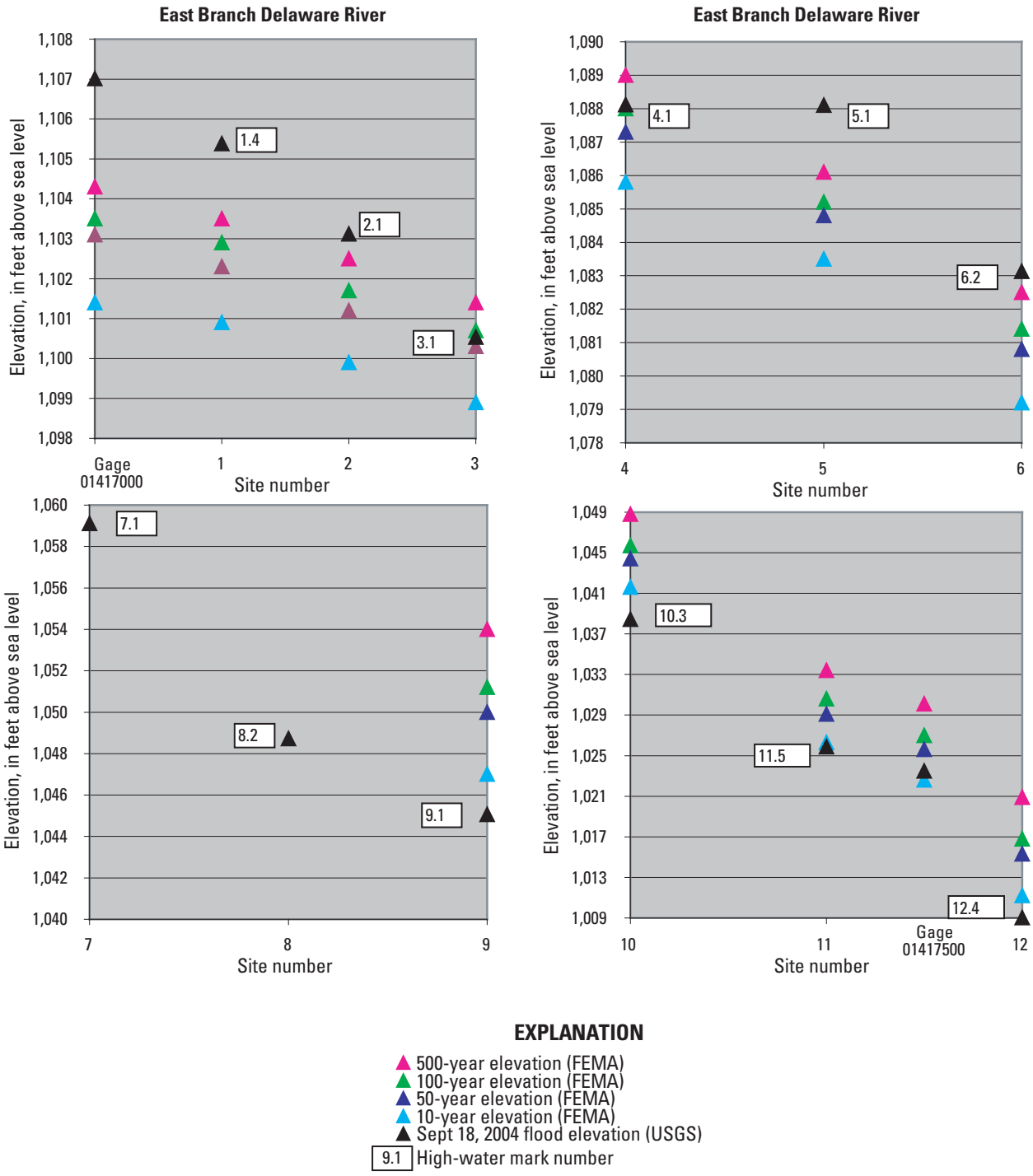
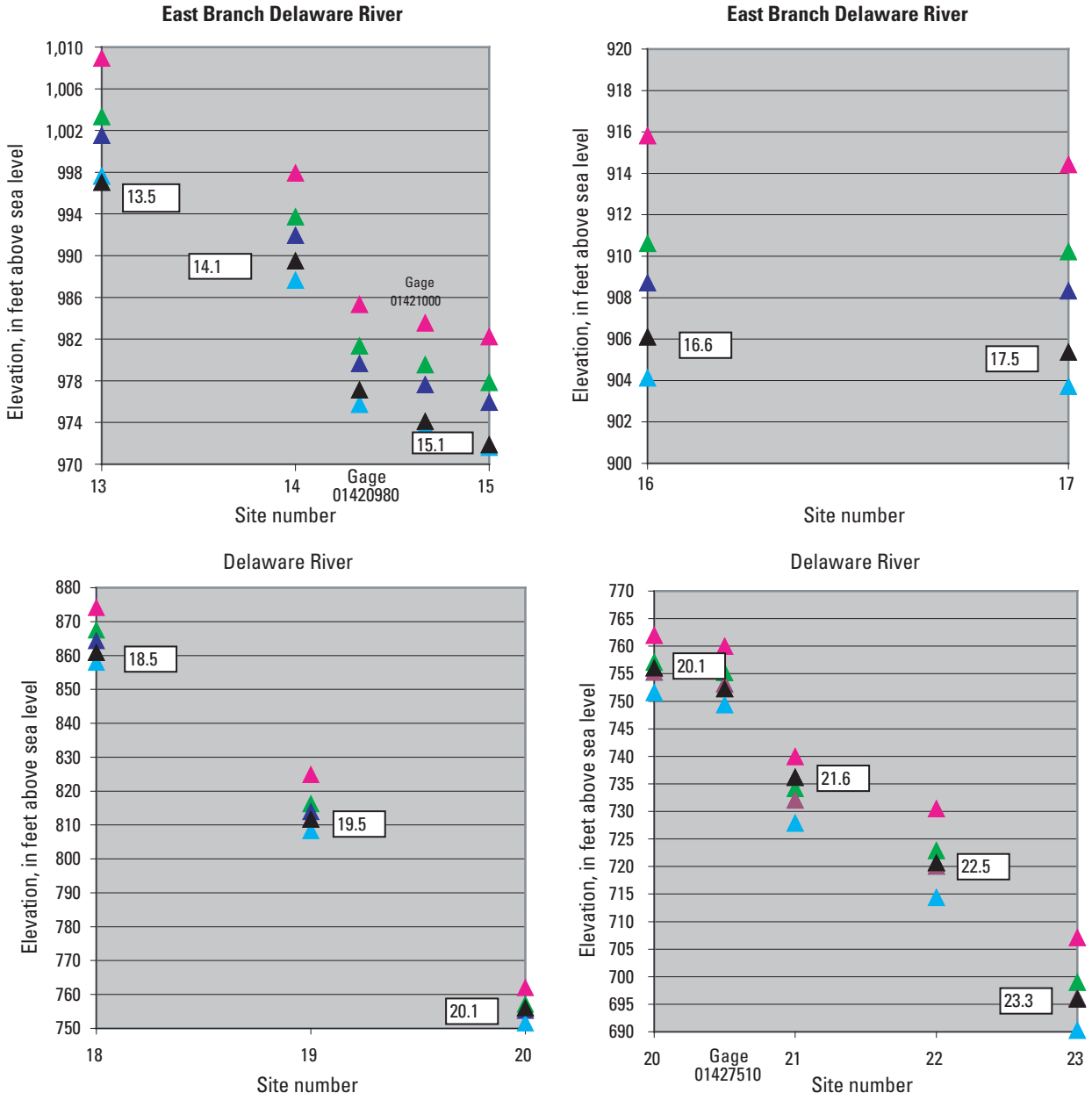


Figure 8. Peak water-surface elevations at selected sites in the upper Delaware River basin during September 18-19, 2004 and for flood recurrence values from FEMA flood-insurance studies. (Site names and locations are given in table 4.)


East Branch Delaware River
Elevation, in feet above sea level
1,010
1,006
1,002
998
994
990
986
982
978
974
970
13.5
14.1
Gage
01421000
15.1
13
14
Gage
01420980
15
Site number
East Branch Delaware River
Elevation, in feet above sea level
920
918
916
914
912
910
908
906
904
902
900
16.6
17.5
16
17
Site number
Delaware River
Elevation, in feet above sea level
880
870
860
850
840
830
820
810
800
790
780
770
760
750
18.5
19.5
20.1
18
19
20
Site number
Delaware River
Elevation, in feet above sea level
770
765
760
755
750
745
740
735
730
725
720
715
710
705
700
695
690
20.1
21.6
22.5
23.3
20
Gage
01427510
21
22
23
Site number
EXPLANATION
500-year elevation (FEMA)
100-year elevation (FEMA)
50-year elevation (FEMA)
10-year elevation (FEMA)
Sept 18, 2004 flood elevation (USGS)
20.1 High-water mark number

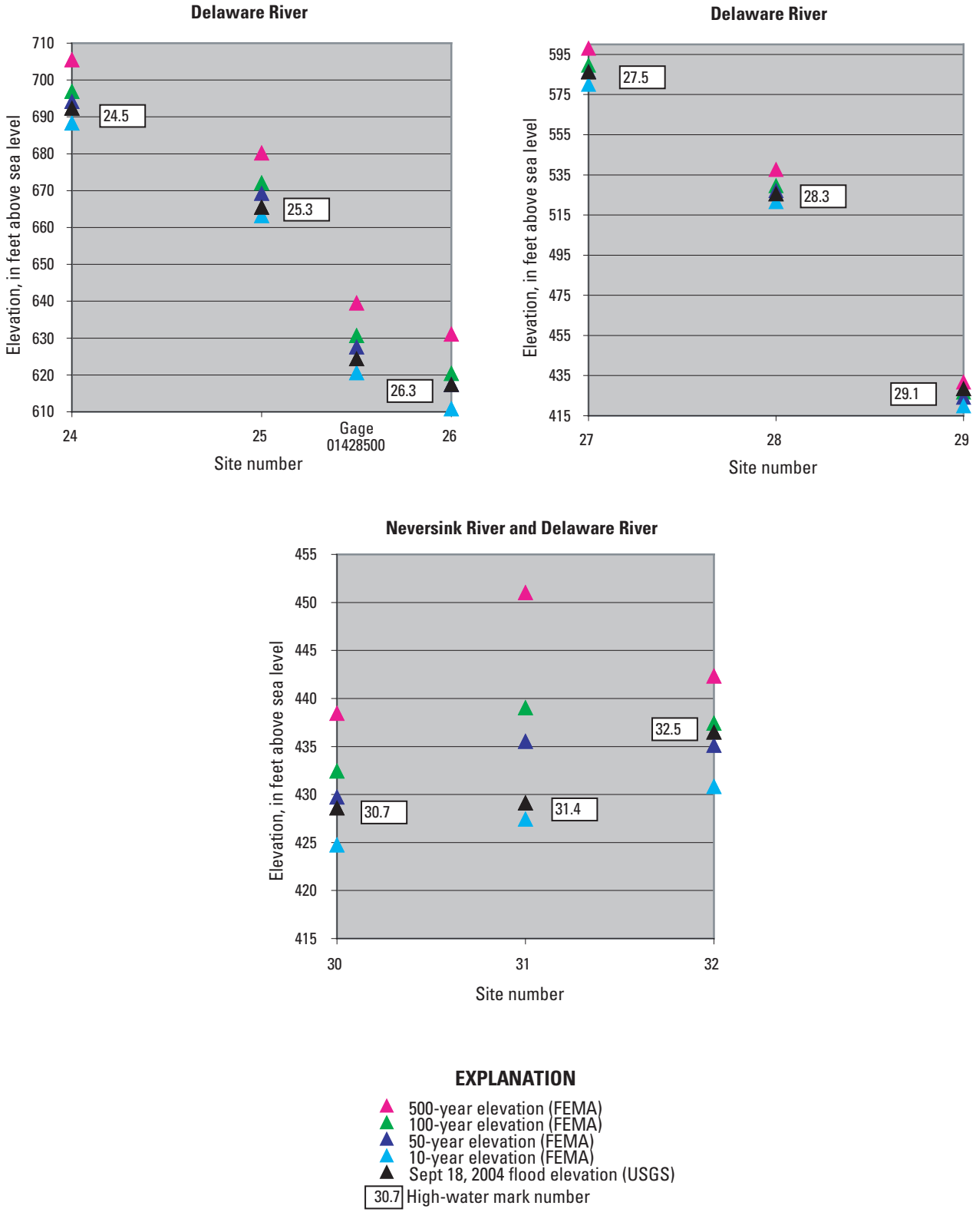
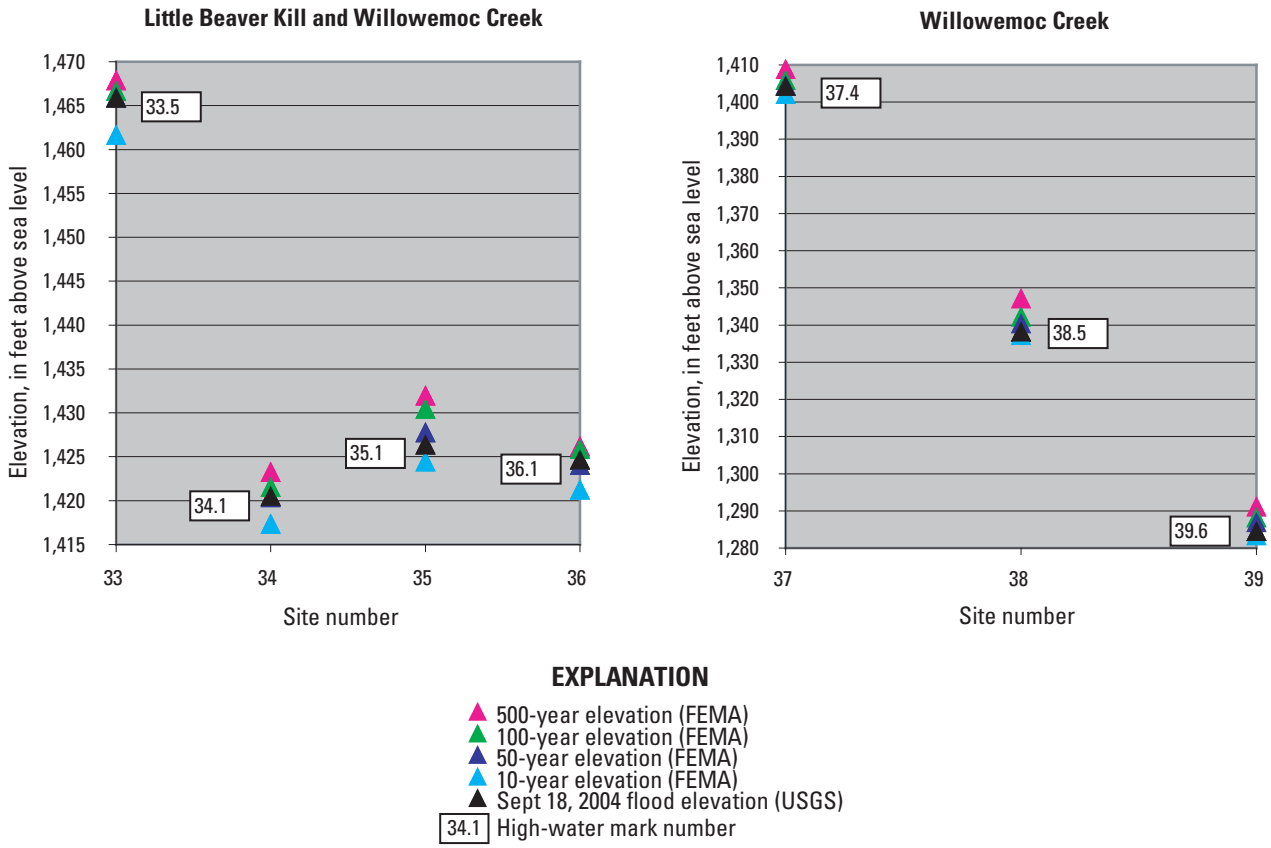


Figure 8. Peak water-surface elevations at selected sites in the upper Delaware River basin during September 18-19, 2004



at selected locations in the upper Delaware River basin and were compared with profiles in flood-insurance studies published by FEMA. Peak water-surface elevations at some study sites in the basin exceeded the 500-year flood elevation, and peak discharges at some long-term U.S. Geological Survey streamflow-gaging stations were the highest ever recorded

Acknowledgments

Thanks are extended to the USGS hydrologists and hydrologic technicians who collected the data for this report during and after the flood: Gary D. Firda, Richard Lumia, Michael D. Corse, Gary J. Hebert, Timothy F. Hoffman, Kenneth McGrath, Alicia M. Olson, Kevin D. Reisig, Thomas P. Suro, and B. Jason Zatorsky; and to Gary D. Firda and Richard Lumia for assistance in the completion of this report.

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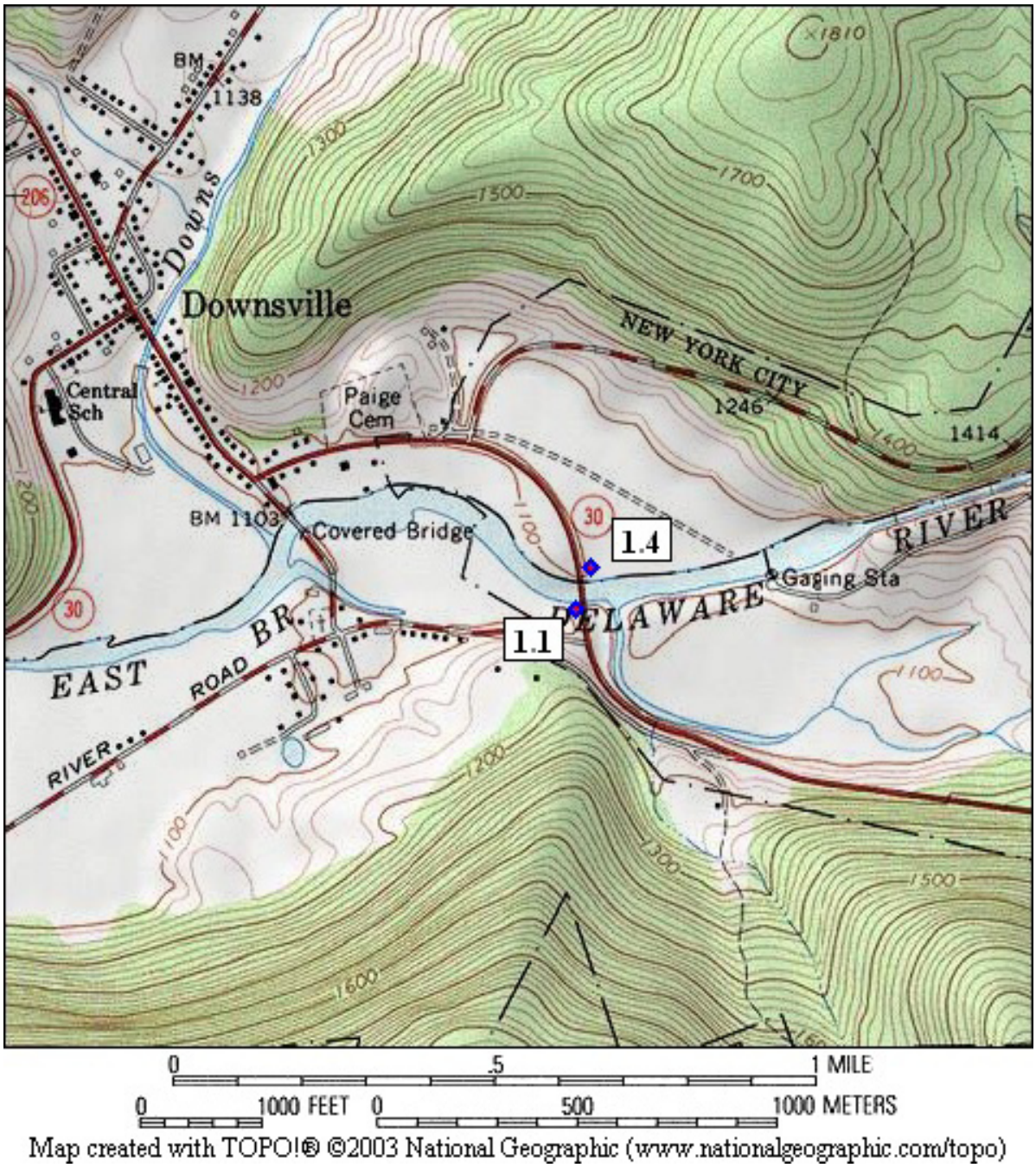
Appendix 1. Site description of and high-water marks at selected stream sites, flood of September 18-19, 2004, in the Upper Delaware River Basin, New York

SITE DESCRIPTION
Site 1: East Branch Delaware River at State Route 30 at Downsville, N.Y.
Site Location: Bridge on State Route 30, Lat 42° 04’ 28.8”, long 74° 58’ 55.2”, NAD 1983
Town of Colchester, Delaware County, N.Y.
Downsville USGS 7.5’ Topographic Quadrangle
High-Water Marks: Four high-water marks were surveyed: 1 debris line and 3 seed lines.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by T.P. Suro and M.D. Corse on November 1, 2004.
High-water-mark elevations were surveyed from a reference mark that is the USGS gaging station 01417000 reference mark RM 5. Elevation is 1,109.82 feet above sea level (NGVD 1929).

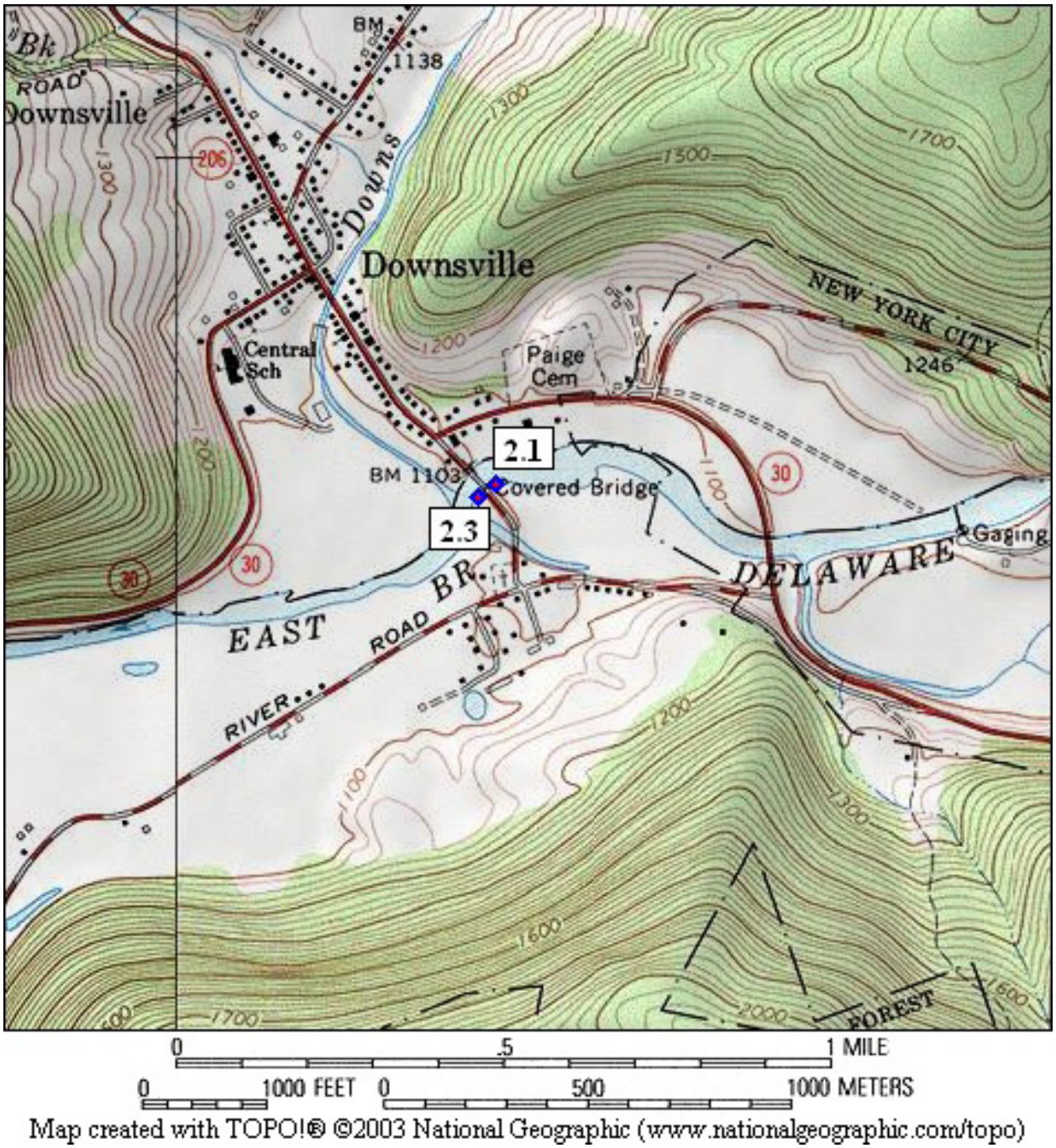


Downsville quad map with location of site 1, East Branch Delaware River at State Route 30 at Downsville, N.Y.

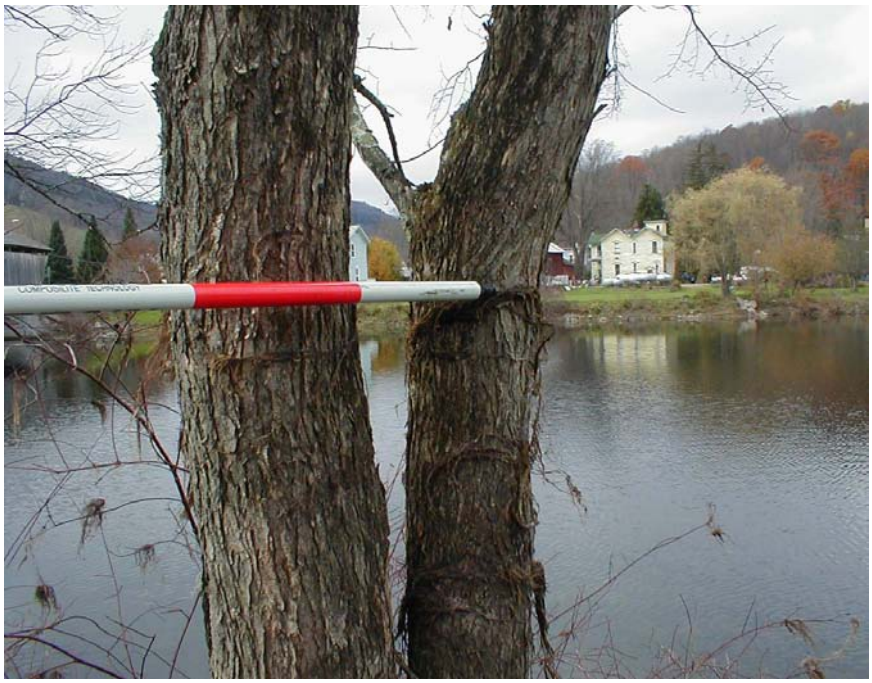
High-water mark 1.1 is an excellent seed line 4.7 feet above the ground, on the side of a wooden barn, on the left bank, 30 feet downstream from the State Route 30 bridge, at elevation 1,105.44 feet above sea level (Lat 42° 04’ 27.1”, long 74° 58’ 55.4”).

High-water mark 1.4 is a poor debris line on the ground, on the right bank, 120 feet upstream from the State Route 30 bridge, at elevation 1,105.38 feet above sea level (Lat 42° 04’ 30.5”, long 74° 58’ 53.2”).

SITE DESCRIPTION
Site 2: East Branch Delaware River at Bridge Street at Downsville, N.Y.
Site Location: Bridge on Bridge Street, Lat 42° 04’ 34.2”, long 74 ° 59’ 26.4”, NAD 1983
Town of Colchester, Delaware County, N.Y.
Downsville USGS 7.5’ Topographic Quadrangle
High-Water Marks: Three high-water marks were surveyed: 3 debris lines.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by T.P. Suro and M.D. Corse on November 1, 2004.
High-water-mark elevations were surveyed from a reference mark that is the USGS gaging station 01417000 reference mark RM 5. Elevation is 1,109.82 feet above sea level (NGVD 1929).



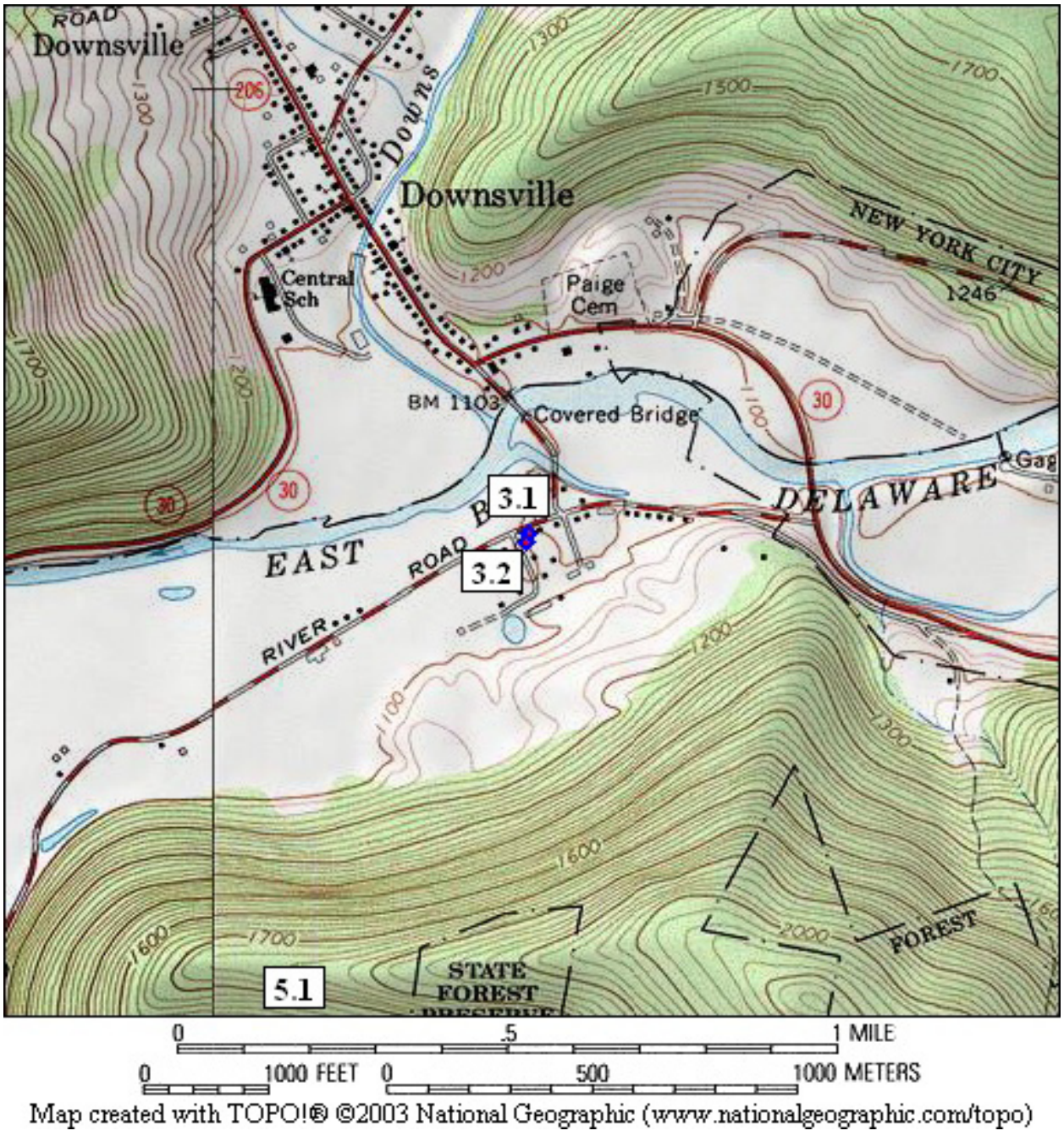
Downsville quad map with location of site 2, East Branch Delaware River at Bridge Street at Downsville, N.Y.



High-water mark 2.1 is a poor debris line about 5 feet above the ground, on a tree on the left bank, 100 feet upstream from the Bridge Street bridge, at elevation 1,103.12 feet above sea level (Lat 42° 04’ 34.1”, long 74° 59’ 23.8”).

High-water mark 2.3 is a poor debris line about 5 feet above the ground, on a tree on the left bank, 70 feet downstream from the Bridge Street bridge, at elevation 1,102.93 feet above sea level (Lat 42° 04’ 34.2”, long 74° 59’ 27.1”).

SITE DESCRIPTION
Site 3: East Branch Delaware River at River Road and Depot Street at Downsville, N.Y.
Site Location: River Road and Depot Street, Lat 42° 04' 24.2", long 75° 59' 24.1", NAD 1983
Town of Colchester, Delaware County, N.Y.
Downsville USGS 7.5' Topographic Quadrangle
High-Water Marks: Two high-water marks were surveyed: 1 seed line and 1 mud line.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by T.P. Suro and M.D. Corse on November 1, 2004.
High-water-mark elevations were surveyed from a reference mark that is the USGS gaging station 01417000 reference mark RM 5. Elevation is 1,109.82 feet above sea level (NGVD 1929).

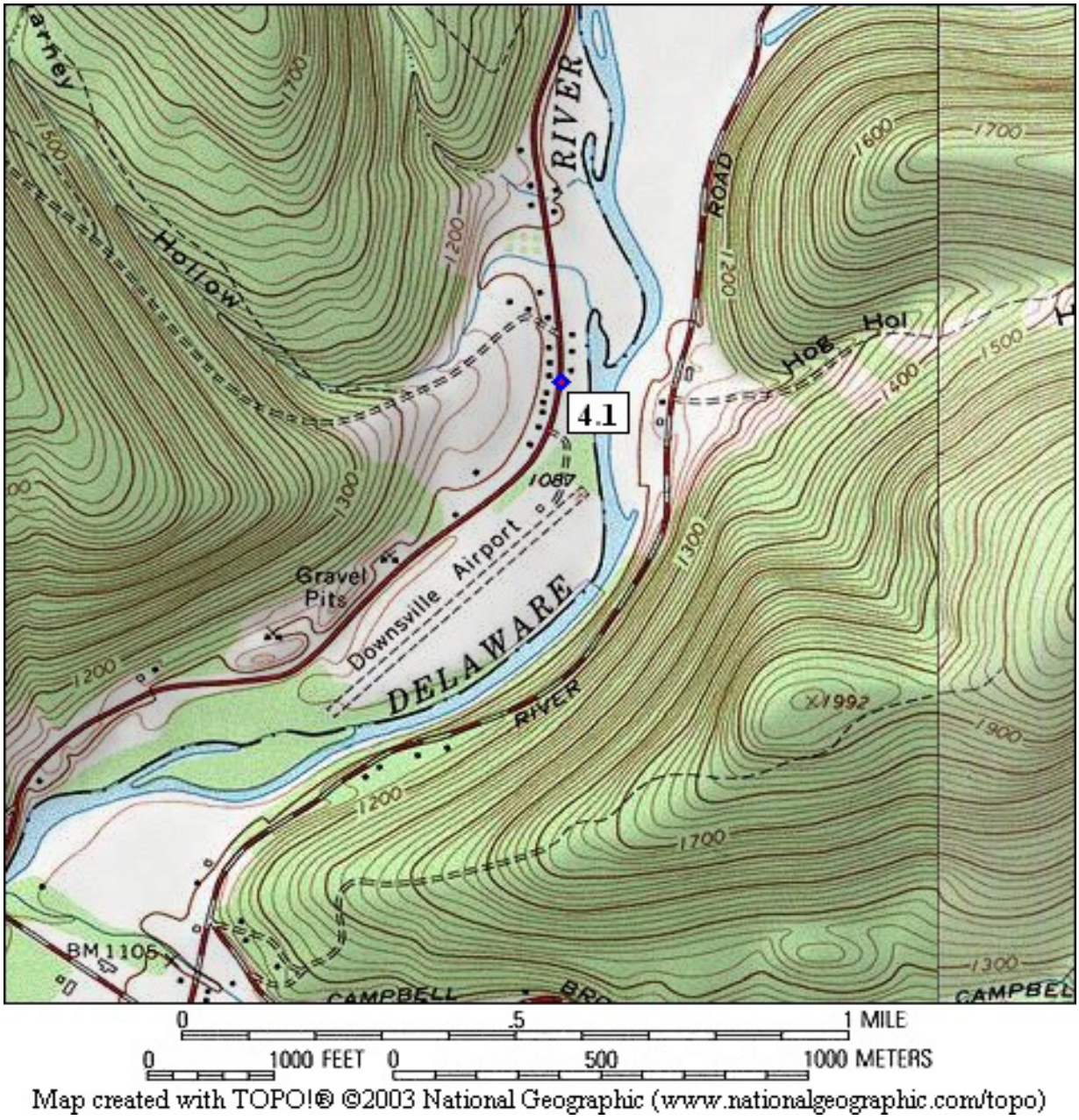


Downsville quad map with location of site 3, East Branch Delaware River at River Road and Depot Street at Downsville, N.Y.

High-water mark 3.1 is an excellent mud line 0.7 feet above the ground, on the foundation of house 6512 on River Road, on the left bank, at elevation 1,100.53 feet above sea level (Lat 42° 04’ 24.2”, long 74° 59’ 24.1”).

High-water mark 3.2 is an excellent seed line 2.4 feet above the ground, on the side of the guest house in the back yard of house 45 on Depot Street, on the left bank, at elevation 1,100.54 feet above sea level (Lat 42° 04’ 22.8”, long 74° 59’ 23.6”).

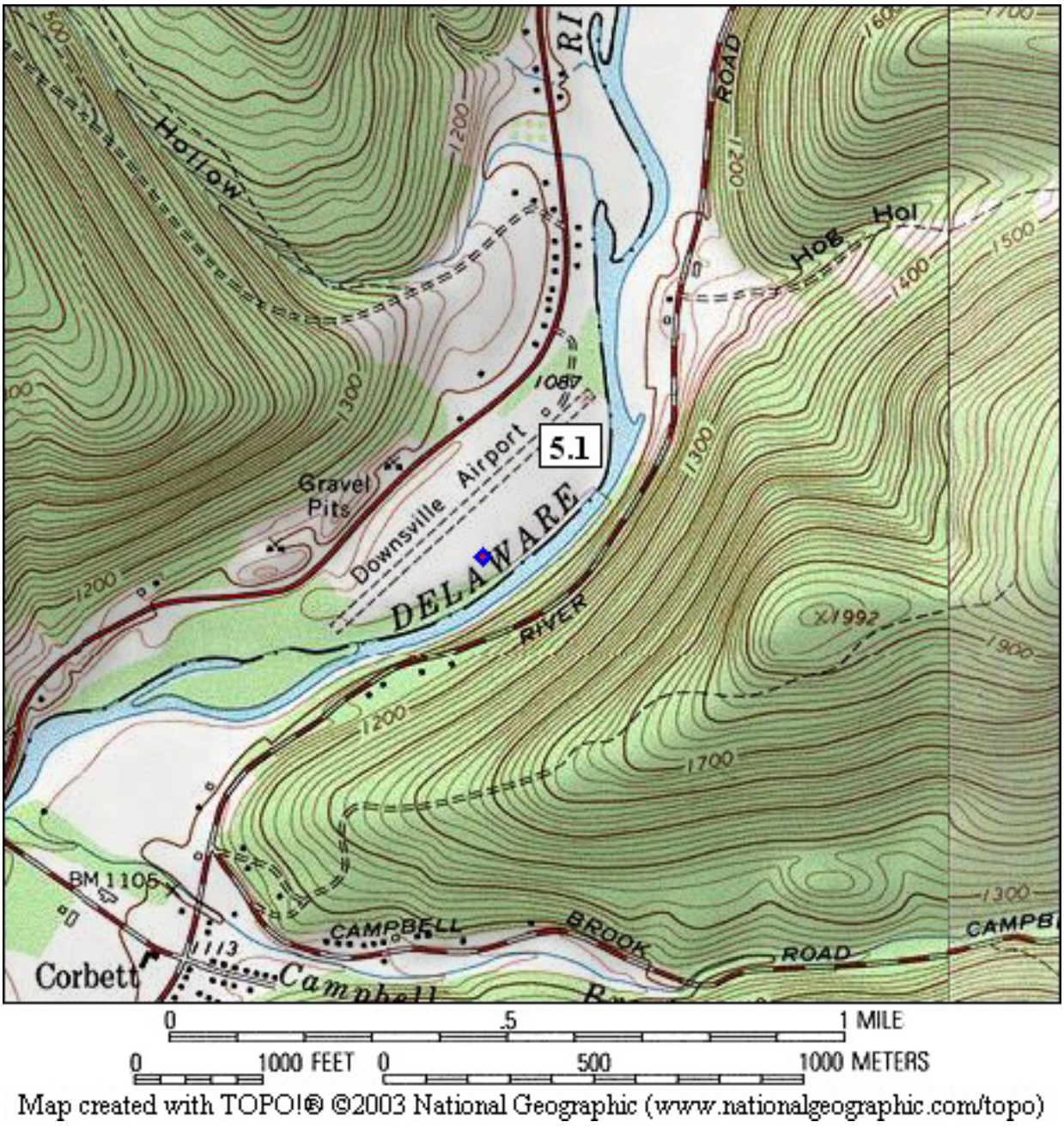
SITE DESCRIPTION
Site 4: East Branch Delaware River at State Route 30 near Airport Road near Downsville, N.Y.
Site Location: State Route 30 near Airport Road, Lat 42° 03' 29.5", long 75° 00' 37.7", NAD 1983
Town of Colchester, Delaware County, N.Y.
Corbett USGS 7.5' Topographic Quadrangle
High-Water Marks: Two high-water marks were surveyed: 1 debris line and 1 mud line.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by T.P. Suro and M.D. Corse on November 1, 2004.
High-water-mark elevations were surveyed from a reference mark that is a chiseled square in the southeast corner of a concrete culvert, 15 feet west of State Route 30, 1.4 miles south of intersection of State Routes 206 and 30 at Downsville. This is RM 7 in the Town of Colchester FEMA flood insurance study. Elevation is 1,115.18 feet above sea level (NGVD 1929).



Corbett quad map with location of site 4, East Branch Delaware River at State Route 30 near Airport Road near Downsville, N.Y.

High-water mark 4.1 is a fair debris line on the piling foundation of a log house on State Route 30, about 350 feet north of Airport Road, on the right bank, at elevation 1,088.12 feet above sea level (Lat 42° 03’ 29.5”, long 75° 00’ 37.7”).

SITE DESCRIPTION
Site 5: East Branch Delaware River at Airport Road near Downsville, N.Y.
Site Location: Airport Road, Lat 42° 03’ 07.8”, long 75 ° 00’ 47.2”, NAD 1983
Town of Colchester, Delaware County, N.Y.
Corbett USGS 7.5’ Topographic Quadrangle
High-Water Marks: One high-water mark was surveyed: 1 mud line.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by T.P. Suro and M.D. Corse on November 2, 2004.
High-water-mark elevations were surveyed from a reference mark that is a chiseled square in the southeast corner of a concrete culvert, 15 feet west of State Route 30, across from the north end of the Downsville Airport near Downsville. This is RM 9 in the Town of Colchester FEMA flood insurance study. Elevation is 1,088.80 feet above sea level (NGVD 1929).

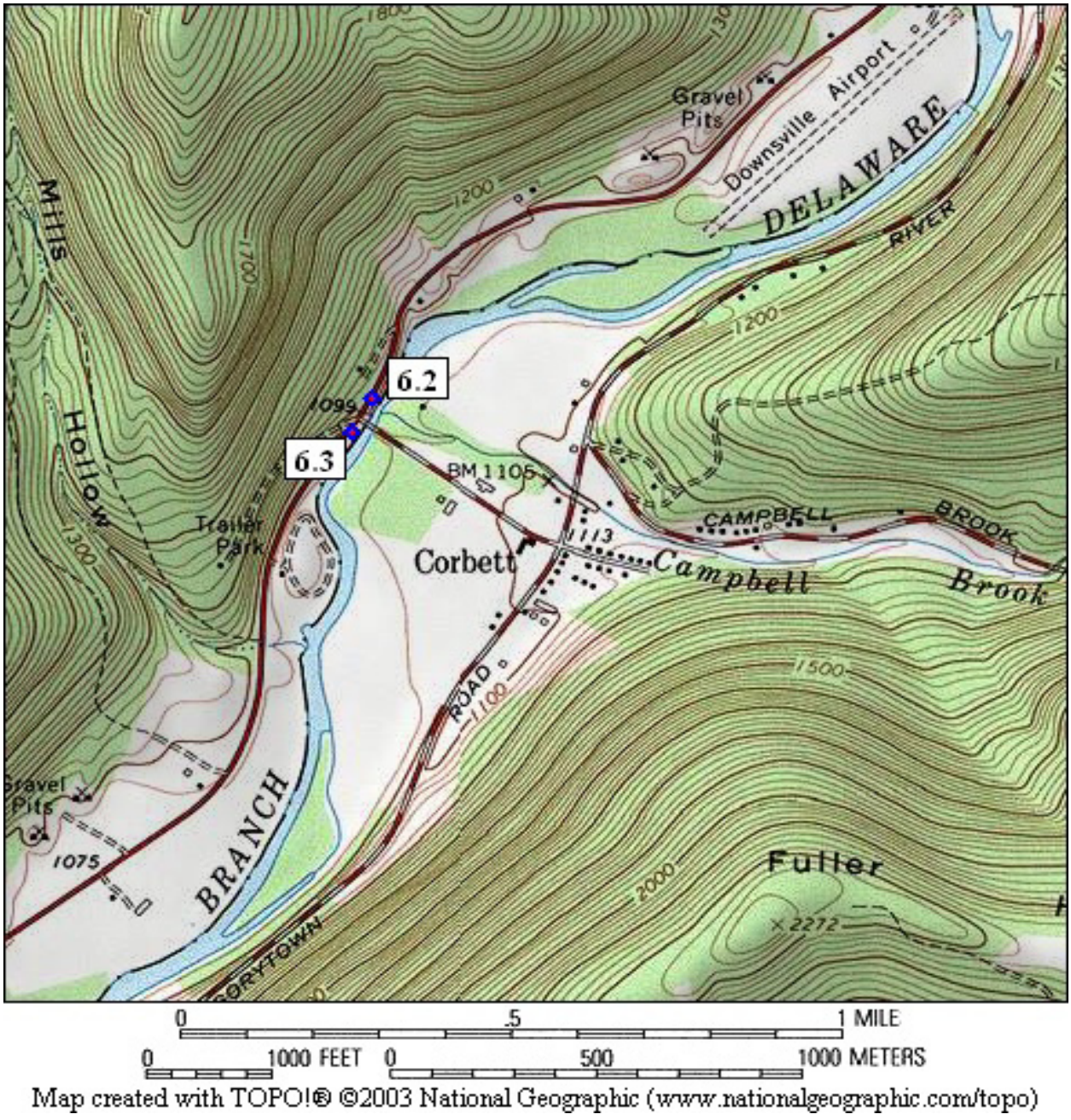


Corbett quad map with location of site 5, East Branch Delaware River at Airport Road near Downsville, N.Y.

High-water mark 5.1 is an excellent mud line about 3.2 feet above the ground, on the front of the yellow house near the end of Airport Road, on the right bank, at elevation 1,088.10 feet above sea level (Lat 42° 03’ 07.8”, long 75° 00’ 47.2”).

Yellow house near the end of Airport Road (Lat 42° 03’ 07.8”, long 75° 00’ 47.2”).

SITE DESCRIPTION
Site 6: East Branch Delaware River at Corbett Road at Corbett, N.Y.
Site Location: Bridge on Corbett Road, Lat 42° 02' 46.2", long 75° 01' 38.4", NAD 1983
Town of Colchester, Delaware County, N.Y.
Corbett USGS 7.5' Topographic Quadrangle
High-Water Marks: Three high-water marks were surveyed: 2 debris lines and 1 seed line.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by T.P. Suro and M.D. Corse on November 2, 2004.
High-water-mark elevations were surveyed from a reference mark that is a chiseled square in the northeast corner of the west abutment of the Corbett Road bridge over the East Branch Delaware River. This is RM 11 in the Town of Colchester FEMA flood insurance study. Elevation is 1,099.49 feet above sea level (NGVD 1929).

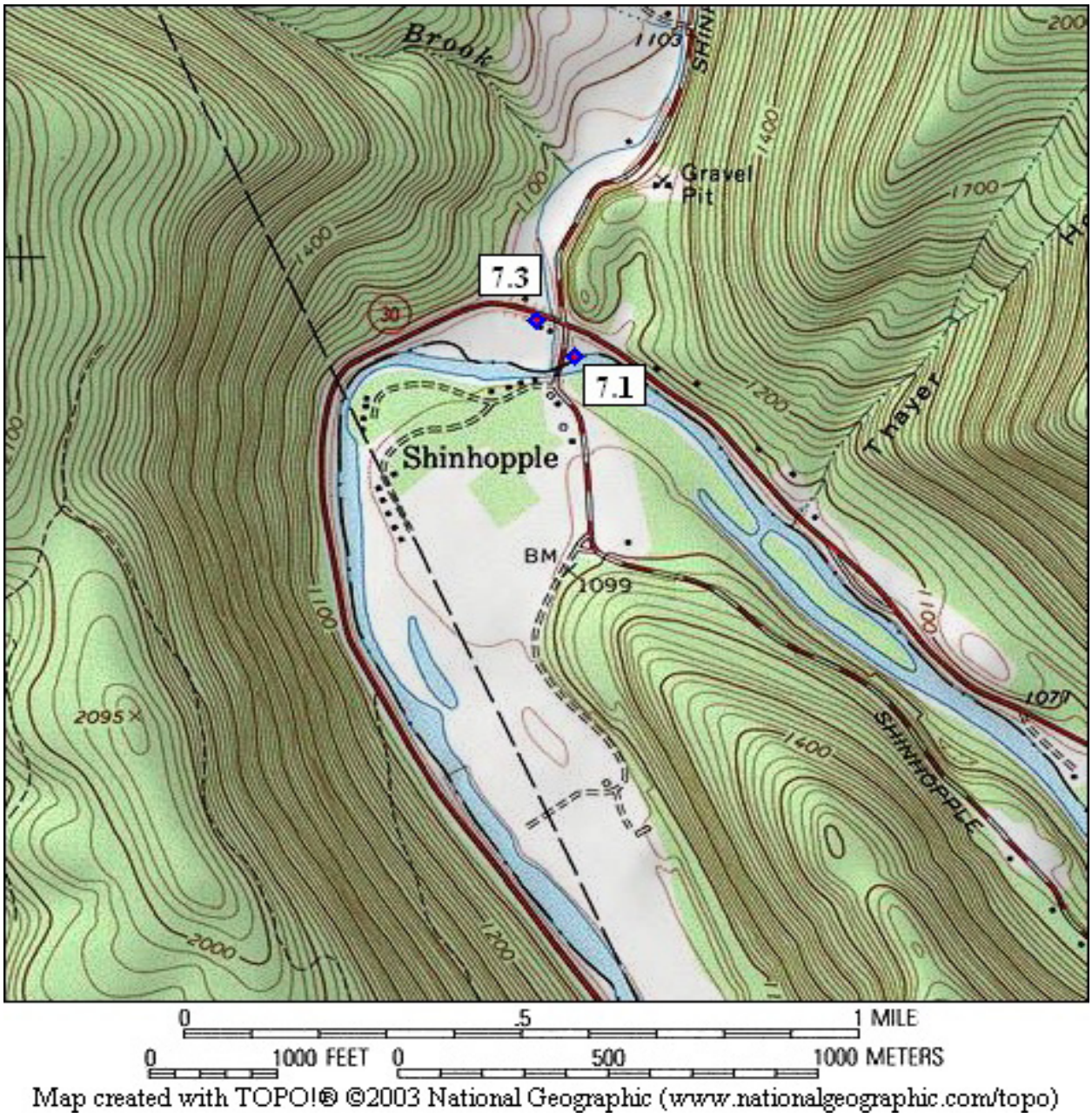


Corbett quad map with location of site 6, East Branch Delaware River at Corbett Road at Corbett, N.Y.

High-water mark 6.2 is a poor debris line on the ground, on the right bank, 110 feet upstream from the Corbett Road bridge, at elevation 1,083.13 feet above sea level (Lat 42° 02’ 48.1”, long 75° 01’ 38.8”).

High-water mark 6.3 is a good seed line about 1 foot above the ground, on a tree on the right bank, 65 feet downstream from the Corbett Road bridge, at elevation 1,082.33 feet above sea level (Lat 42° 02’ 47.1”, long 75° 01’ 39.8”).

SITE DESCRIPTION
Site 7: East Branch Delaware River at River Road at Shinhopple, N.Y.
Site Location: Bridge on River Road, Lat 42° 02' 20.4", long 75° 04' 03.6", NAD 1983
Town of Colchester, Delaware County, N.Y.
Corbett USGS 7.5' Topographic Quadrangle
High-Water Marks: Three high-water marks were surveyed: 1 seed line, 1 debris line and 1 mud line.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by T.P. Suro and M.D. Corse on November 2-3, 2004.
High-water-mark elevations were surveyed from a reference mark that is the top of a 4 inch by 4 inch granite post road marker, midway between the right bank of the East Branch Delaware River and State Route 30, approximately 400 feet upstream from the River Road bridge. This is RM 14 in the Town of Colchester FEMA flood insurance study. Elevation is 1,099.49 feet above sea level (NGVD 1929).

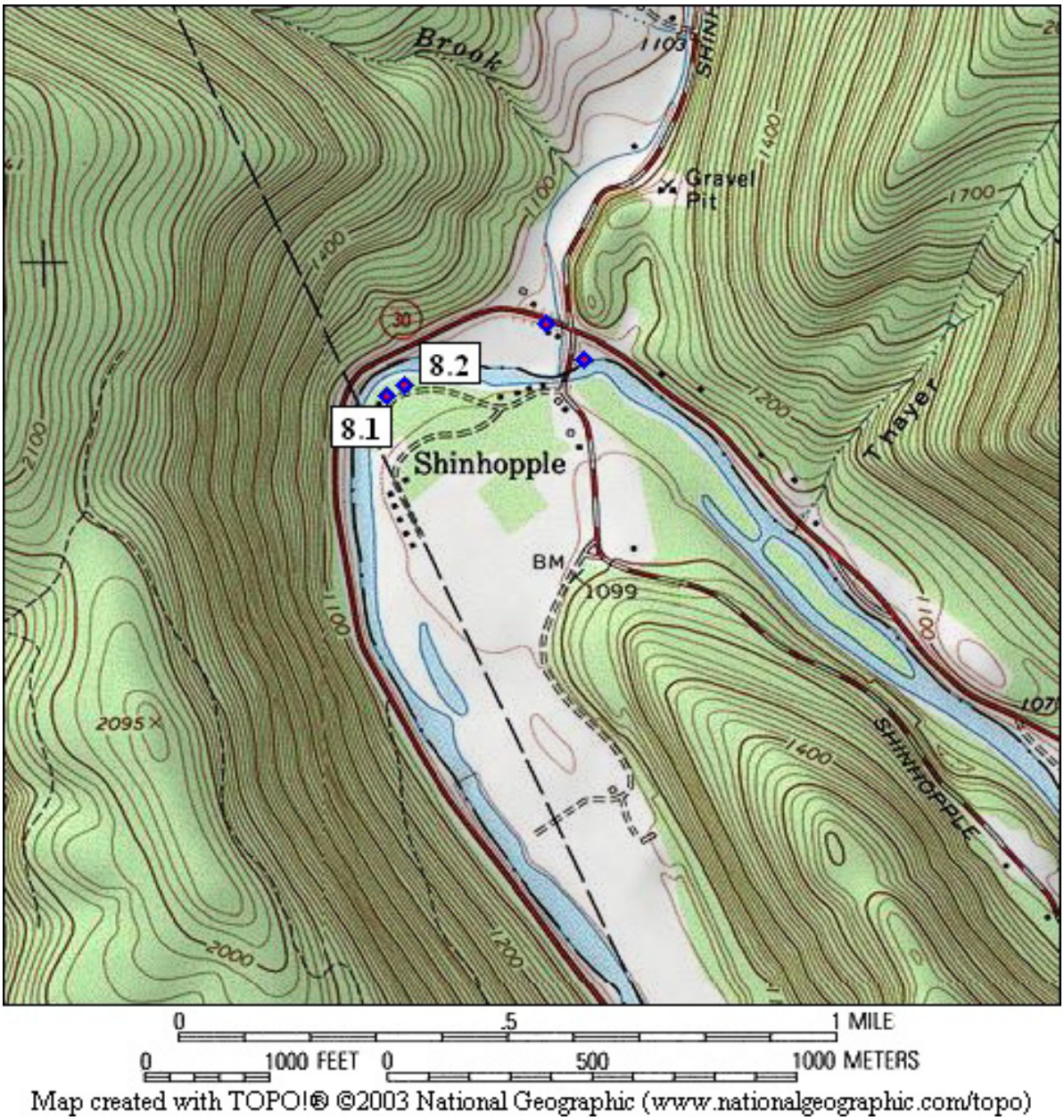


Corbett quad map with location of site 7, East Branch Delaware River at River Road at Shinhopple, N.Y.

High-water mark 7.1 is a poor debris line on the ground, on the right bank, 132 feet upstream from the River Road bridge, at elevation 1,059.11 feet above sea level (Lat 42° 02’ 21.8”, long 75° 04’ 00.5”).

High-water mark 7.3 is an excellent seed line 2.2 feet above the floor, inside of the gray house, on the right bank, 300 feet downstream from the River Road bridge, at elevation 1,057.36 feet above sea level (Lat 42° 02’ 24.5”, long 75° 04’ 05.4”).

SITE DESCRIPTION
Site 8: East Branch Delaware River at Island Road at Shinhopple, N.Y.
Site Location: Island Road, Lat 42° 02’ 20.3”, long 75° 04’ 18.5”, NAD 1983
Town of Colchester, Delaware County, N.Y.
Corbett USGS 7.5’ Topographic Quadrangle
High-Water Marks: Two high-water marks were surveyed: 1 seed line and 1 mud line.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by T.P. Suro and M.D. Corse on November 3, 2004.
High-water-mark elevations were surveyed from a reference mark that is the top of a 4 inch by 4 inch granite post road marker, midway between the right bank of the East Branch Delaware River and State Route 30, approximately 400 feet upstream from the River Road bridge. This is RM 14 in the Town of Colchester FEMA flood insurance study. Elevation is 1,099.49 feet above sea level (NGVD 1929).

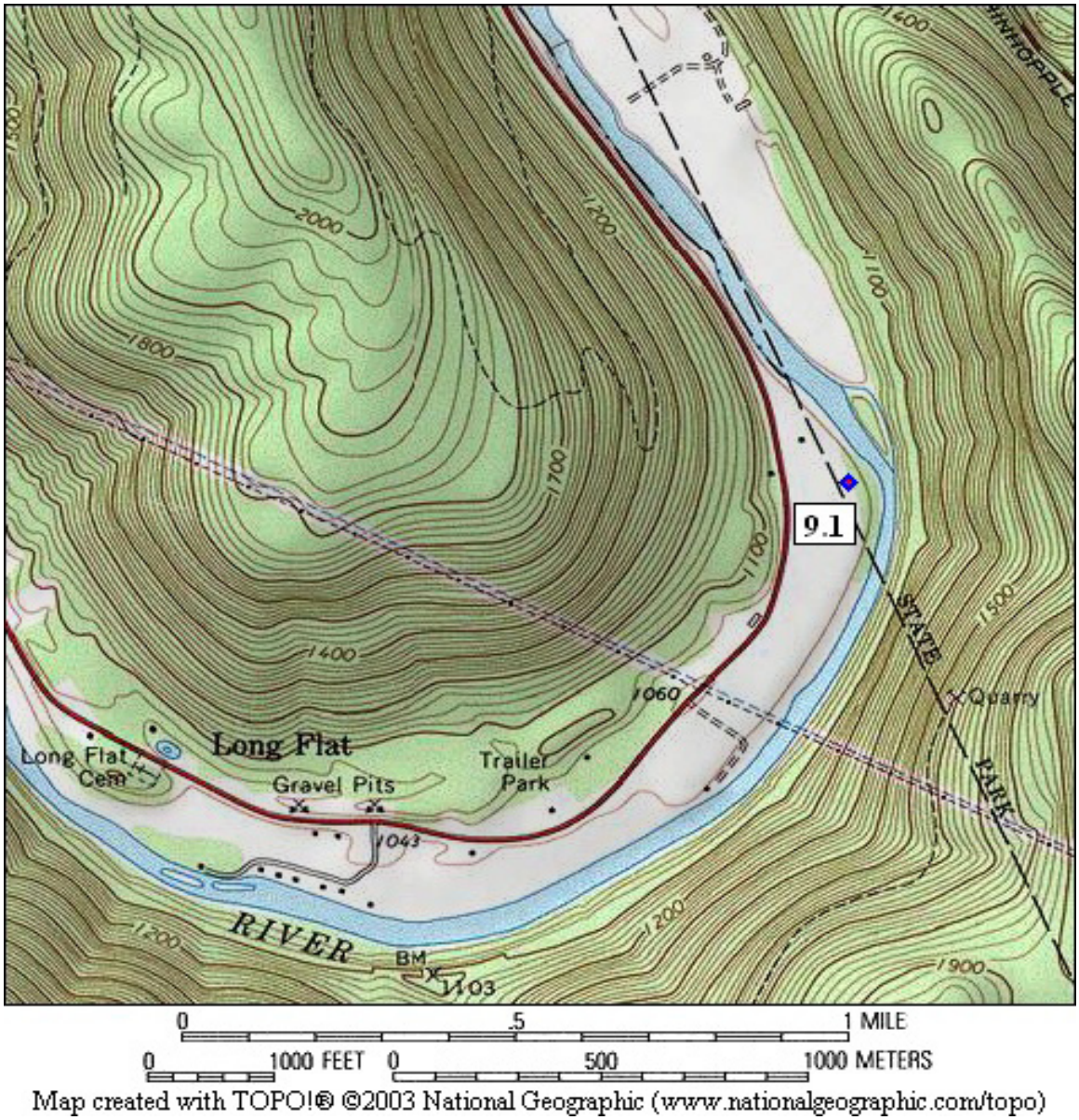


Corbett quad map with location of site 8, East Branch Delaware River at Island Road at Shinhopple, N.Y.

High-water mark 8.1 is a good mud line 2.7 feet above the ground, on the side of the garage next to the house at the end of Island Road, on the left bank, at elevation 1,048.00 feet above sea level (Lat 42° 02’ 18.5”, long 75° 04’ 22.2”).

High-water mark 8.2 is a fair seed line about 6 feet above the ground, inside of the front door of house 188 on Island Road, on the left bank, at elevation 1,048.72 feet above sea level (Lat 42° 02’ 20.3”, long 75° 04’ 18.5”).

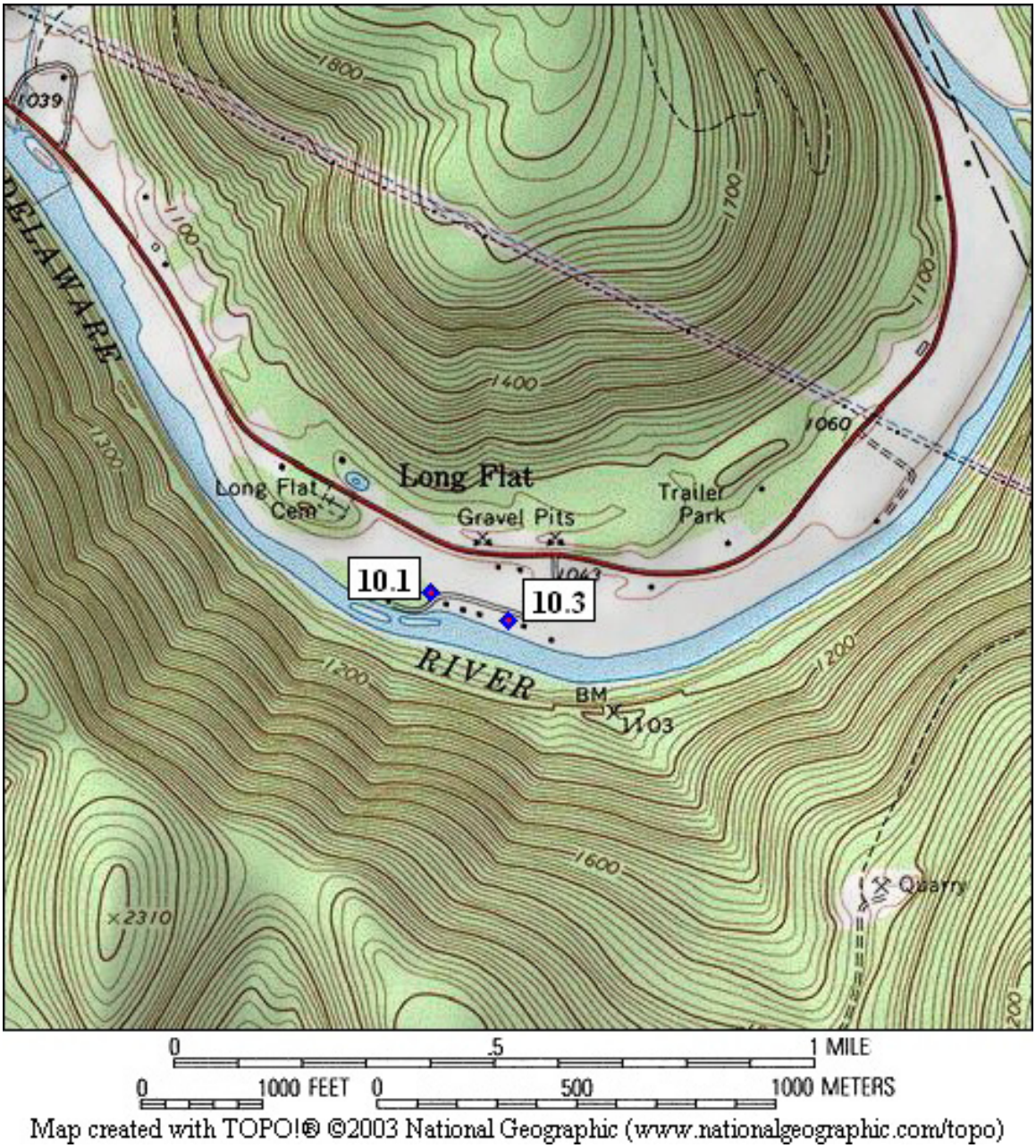
SITE DESCRIPTION
Site 9: East Branch Delaware River at Bronxville Road at Long Flat, N.Y.
Site Location: Bronxville Road, Lat 42° 01' 10.8", long 75 ° 03' 43.1", NAD 1983
Town of Hancock, Delaware County, N.Y.
Corbett USGS 7.5' Topographic Quadrangle
High-Water Marks: One high-water mark was surveyed: 1 mud line.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by T.P. Suro and M.D. Corse on November 4, 2004, and T.P. Suro and M.E. Hendricks on November 9, 2004.
High-water-mark elevations were surveyed from a reference mark that is the top of a nail in pole number 4000/52, approximately 6.4 miles north from Old State Route 17 at East Branch, approximately 3.2 miles east along State Route 30 from the intersection of State Route 30, Baxter Brook Road and Harvard Road in Harvard, approximately 2.3 miles south along State Route 30 from the intersection with River Road in Shinhopple. This is RM 3 in the Town of Hancock FEMA flood insurance study. Elevation is 1,049.50 feet above sea level (NGVD 1929).



Corbett quad map with location of site 9, East Branch Delaware River at Bronxville Road at Long Flat, N.Y.

High-water mark 9.1 is a good mud line 3.2 feet above the ground, on the side of the second log house along Bronxville Road from the intersection with State Route 30, on the right bank, at elevation 1,045.06 feet above sea level (Lat 42° 01’ 10.8”, long 75° 03’ 43.1”).

SITE DESCRIPTION
Site 10: East Branch Delaware River at Long Flats Road at Long Flat, N.Y.
Site Location: Long Flats Road, Lat 42° 00’ 37.7”, long 75 ° 04’ 37.8”, NAD 1983
Town of Hancock, Delaware County, N.Y.
Corbett USGS 7.5’ Topographic Quadrangle
High-Water Marks: Four high-water marks were surveyed: 4 seed lines.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by T.P. Suro and M.D. Corse on November 4, 2004.
High-water-mark elevations were surveyed from a reference mark that is the top of a nail in pole number 4000/52, approximately 6.4 miles north from Old State Route 17 at East Branch, approximately 3.2 miles east along State Route 30 from the intersection of State Route 30, Baxter Brook Road and Harvard Road in Harvard, approximately 2.3 miles south along State Route 30 from the intersection with River Road in Shinhopple. This is RM 3 in the Town of Hancock FEMA flood insurance study. Elevation is 1,049.50 feet above sea level (NGVD 1929).

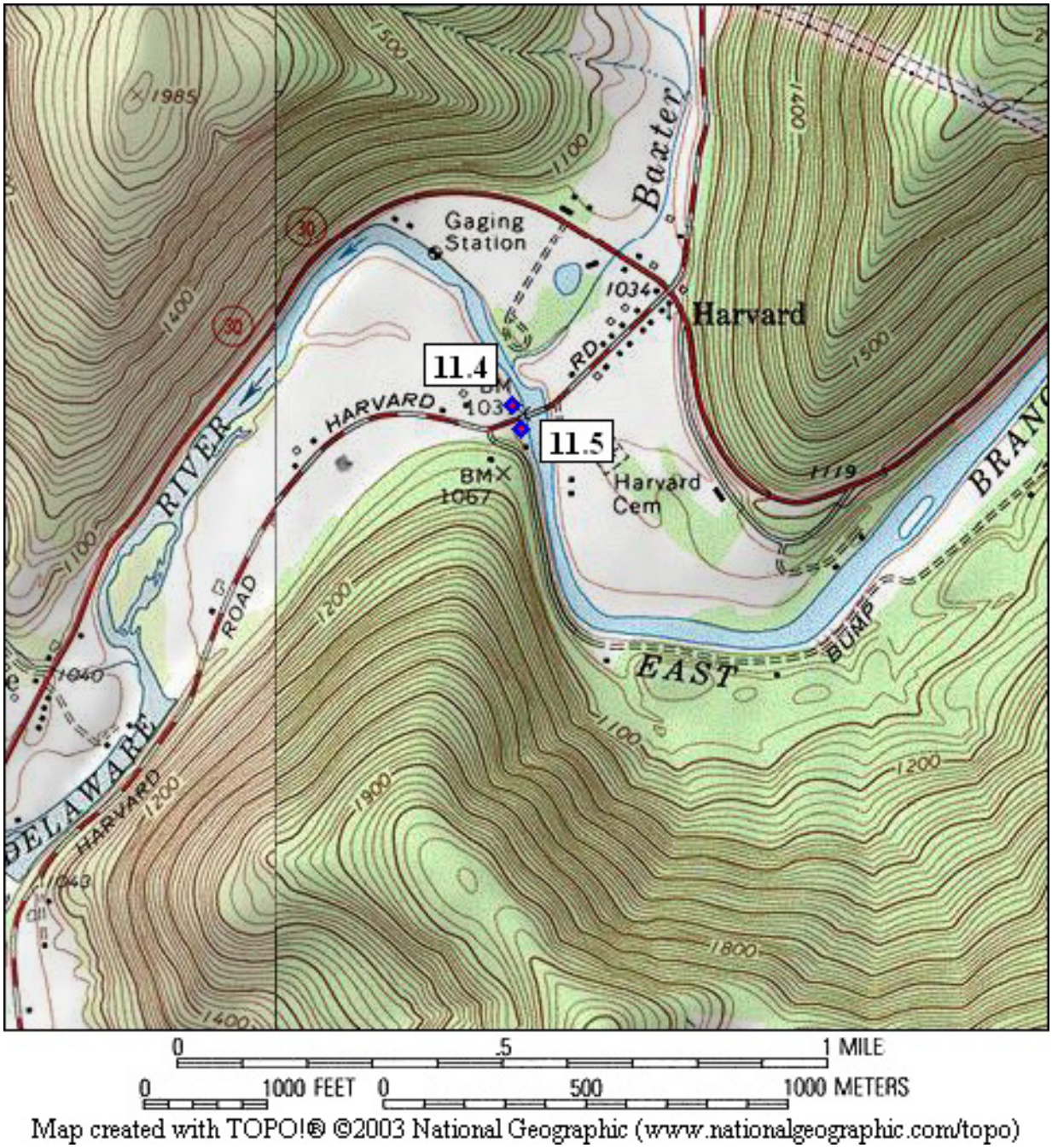


Corbett quad map with location of site 10, East Branch Delaware River at Long Flats Road at Long Flat, N.Y.

High-water mark 10.1 is an excellent seed line 5.0 feet above the ground, on the front of house 285 on Long Flats Road, on the right bank, at elevation 1,037.97 feet above sea level (Lat 42° 00’ 40.4”, long 75° 04’ 46.9”).

High-water mark 10.3 is an excellent seed line 2.0 feet above the ground, on the foundation of house 155 on Long Flats Road, on the right bank, at elevation 1,038.44 feet above sea level (Lat 42° 00’ 37.7”, long 75° 04’ 37.8”).

SITE DESCRIPTION
Site 11: East Branch Delaware River at Harvard Road at Harvard, N.Y.
Site Location: Bridge on Harvard Road, Lat 42° 01’ 16.2”, long 75 ° 07’ 00.6”, NAD 1983
Town of Hancock, Delaware County, N.Y.
Corbett USGS 7.5’ Topographic Quadrangle
High-Water Marks: Five high-water marks were surveyed: 5 debris lines.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by T.P. Suro, R. Lumia and M.E. Hendricks on November 9, 2004.
High-water-mark elevations were surveyed from a benchmark that is an NGS standard disk stamped U 311 1942 set in the north corner of the west abutment of the Harvard Road bridge over the East Branch Delaware River. NGS PID NA1417. This is RM 16 in the Town of Hancock FEMA flood insurance study. Elevation is 1,030.92 feet above sea level (NGVD 1929).

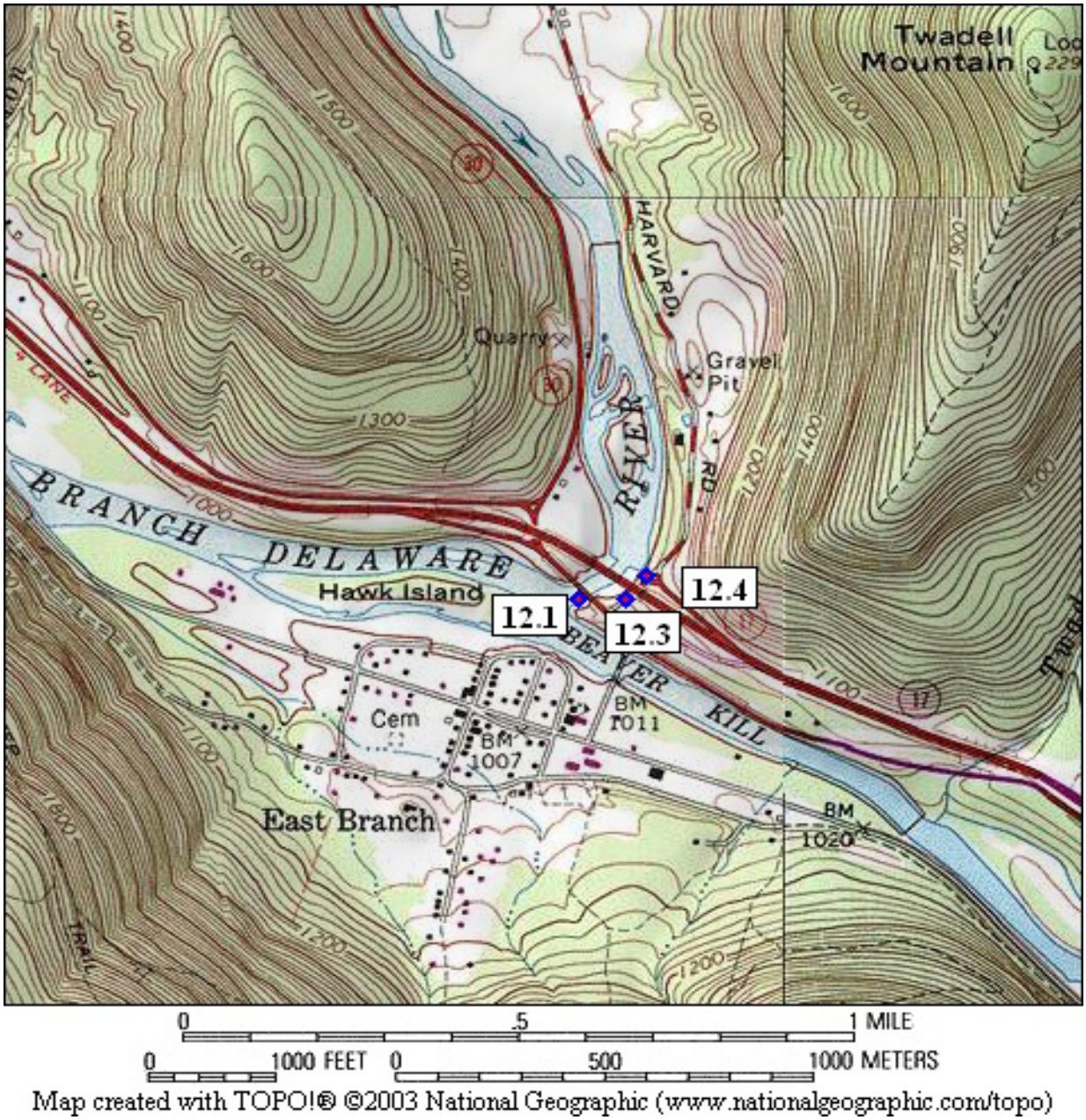


Corbett quad map with location of site 11, East Branch Delaware River at Harvard Road at Harvard, N.Y.

High-water mark 11.4 is a fair debris line about 5 feet above the ground, on a tree on the left bank, 170 feet downstream from the Harvard Road bridge, at elevation 1,025.68 feet above sea level (Lat 42° 01’ 21.0”, long 75° 07’ 03.3”).

High-water mark 11.5 is a fair debris line about 4 feet above the ground, on a tree on the left bank, 100 feet upstream from the Harvard Road bridge, at elevation 1,025.88 feet above sea level (Lat 42° 01’ 15.2”, long 75° 07’ 02.8”).

SITE DESCRIPTION
Site 12: East Branch Delaware River at Old State Route 17 and "new" State Route 17 at East Branch, N.Y.
Site Location: Bridges on Old State Route 17 and "new" State Route 17, Lat 41° 59' 27.6", long 75° 07' 50.4", NAD 1983
Town of Hancock, Delaware County, N.Y.
Fishs Eddy USGS 7.5' Topographic Quadrangle
High-Water Marks: Five high-water marks were surveyed: 1 debris line and 4 seed lines.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by R. Lumia and G.J. Hebert on November 9, 2004.
High-water-mark elevations were surveyed from a benchmark that is an NGS standard disk stamped D48 RESET 1961 on the upstream left abutment (NE end of the east abutment) of Old State Route 17 bridge. NGS PID LY1080. This is RM 27 in the Town of Hancock FEMA flood insurance study. Elevation is 1,022.36 feet above sea level (NGVD 1929).

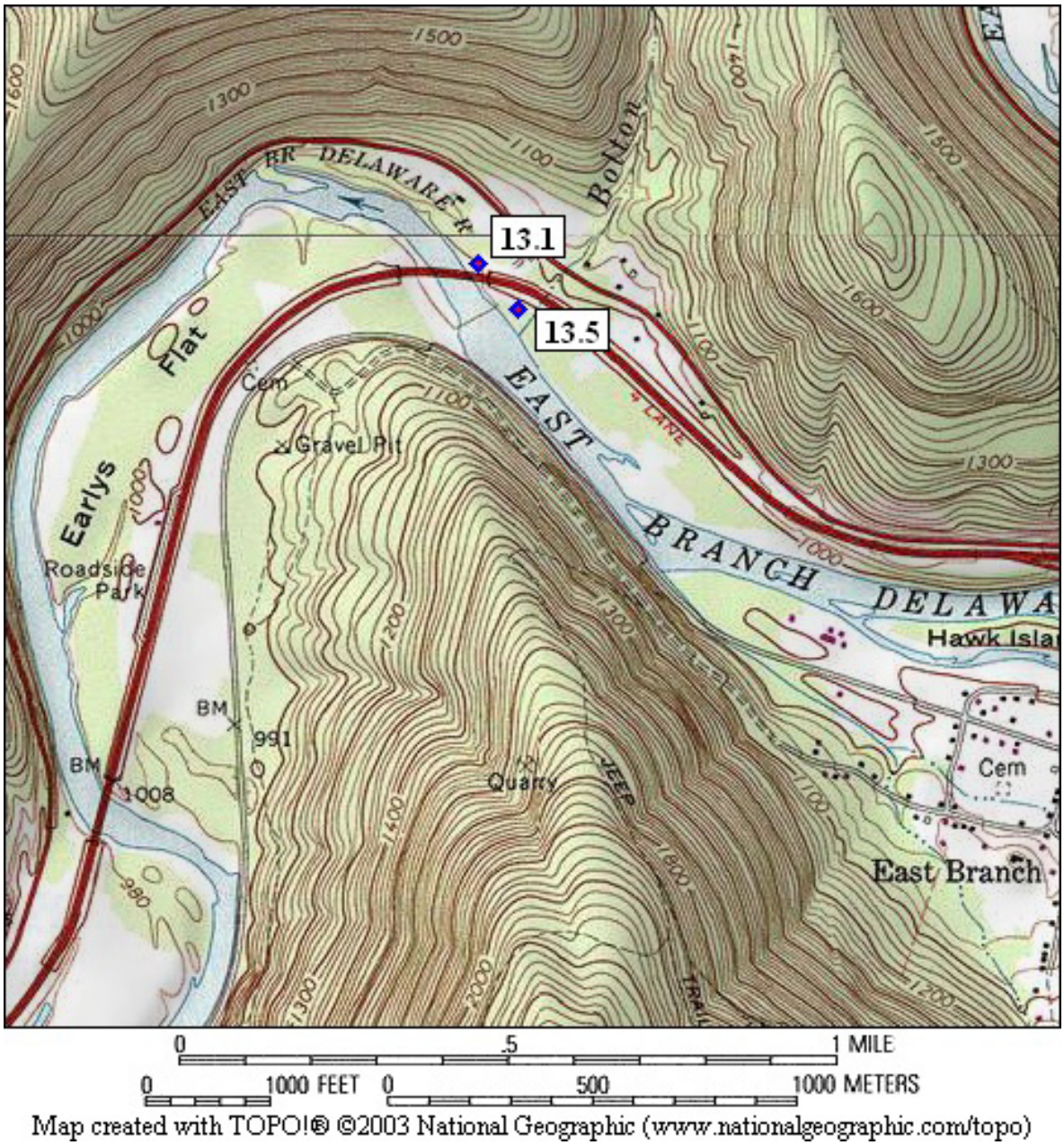


Fishs Eddy quad map with location of site 12, East Branch Delaware River at Old State Route 17 and "new" State Route 17 at East Branch, N.Y.

High-water mark 12.1 is a poor seed line about 5 feet above the ground, on a tree on the left bank, 121 feet downstream from the Old State Route 17 bridge, at elevation 1,005.59 feet above sea level (Lat 41° 59’ 26.5 “, long 75° 07’ 49.9”).

High-water mark 12.3 is a fair debris line on the ground, on the left bank, 249 feet upstream from the Old State Route 17 bridge, at the downstream side of the “new” State Route 17 bridge, at elevation 1,008.40 feet above sea level (Lat 41° 59’ 29.2”, long 75° 07’43.2”).

SITE DESCRIPTION
Site 13: East Branch Delaware River at State Route 17, about 1.0 mile downstream from East Branch, N.Y.
Site Location: Bridge on State Route 17, Lat 41° 59' 57.0", long 75° 09' 09.6", NAD 1983
Town of Hancock, Delaware County, N.Y.
Fishs Eddy USGS 7.5' Topographic Quadrangle
High-Water Marks: Five high-water marks were surveyed: 1 debris line and 4 seed lines.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by R. Lumia and G.J. Hebert on November 9, 2004.
High-water-mark elevations were surveyed from a reference mark that is the top of the downstream right abutment (pedestal), downstream corner painted orange. Elevation is 1,010.31 feet above sea level (NGVD 1929), from NYS DOT bridge plans, BIN 1013431.

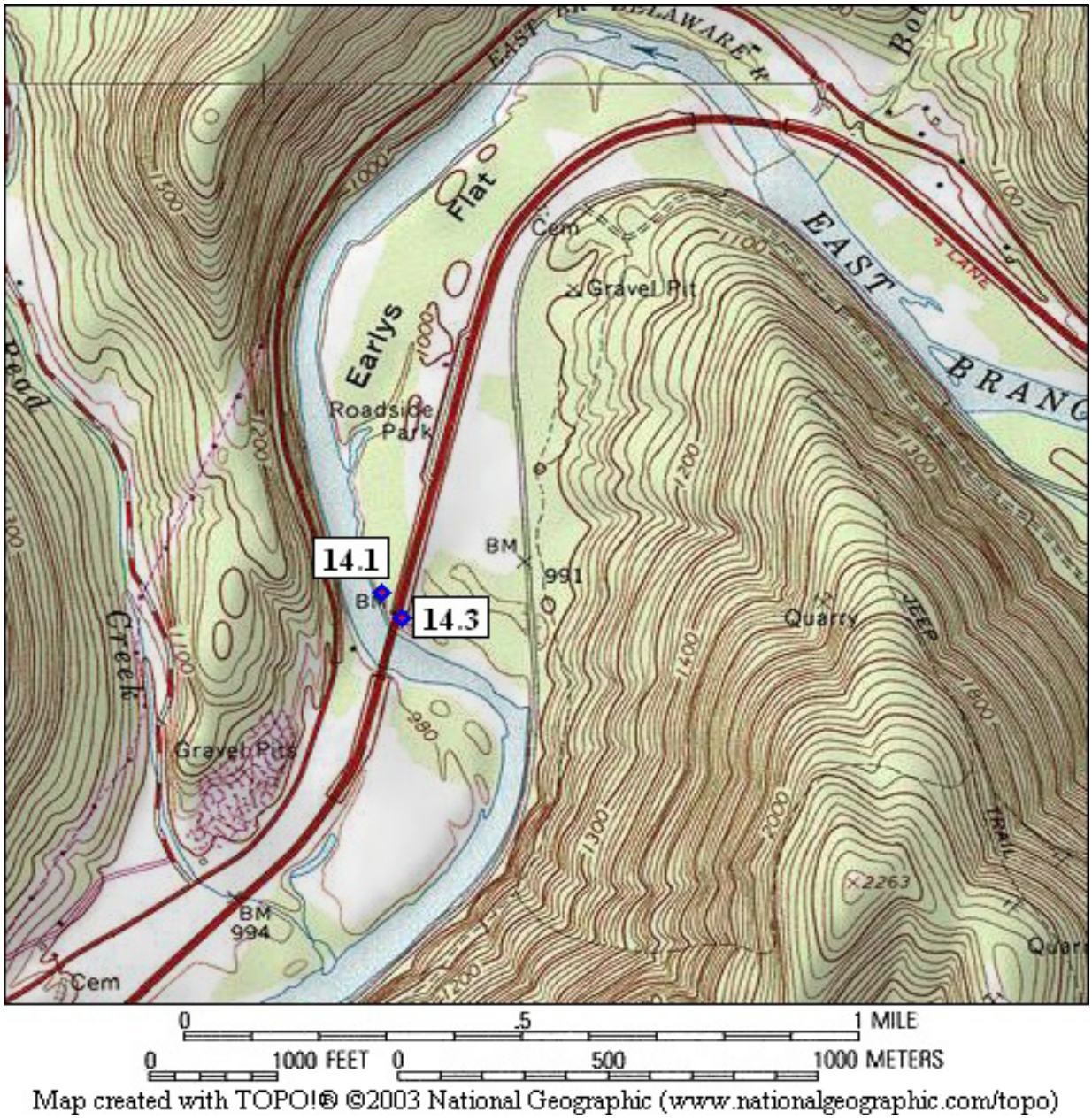


Fishs Eddy quad map with location of site 13, East Branch Delaware River at State Route 17, about 1.0 mile downstream from East Branch, N.Y.

High-water mark 13.1 is a poor debris line on the ground, on the right bank, 10 feet downstream from the State Route 17 bridge, at elevation 995.01 feet above sea level (Lat 41° 59’ 57.8”, long 75° 09’ 05.3”).

High-water mark 13.5 is a fair seed line about 7 feet above the ground, on a tree on the right bank, 248 feet upstream from the State Route 17 bridge, at elevation 997.00 feet above sea level (Lat 41° 59’ 54.0”, long 75° 09’ 01.0”).

SITE DESCRIPTION
Site 14: East Branch Delaware River at State Route 17, about 2.0 miles downstream from East Branch, N.Y.
Site Location: Bridge on State Route 17, Lat 41° 59' 13.8", long 75° 09' 45.6", NAD 1983
Town of Hancock, Delaware County, N.Y.
Fishs Eddy USGS 7.5' Topographic Quadrangle
High-Water Marks: Five high-water marks were surveyed: 1 debris line and 4 seed lines.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by R. Lumia and G.J. Hebert on November 9, 2004.
High-water-mark elevations were surveyed from a reference mark that is a chiseled square on the upstream side of bridge on the concrete rail, 17 feet SE of and 1 foot lower than centerline of east lane of State Route 17 bridge. Line 1, by W.D. Kelly, 1963; Book AV974. Elevation is 1,008.048 feet above sea level (NGVD 1929).

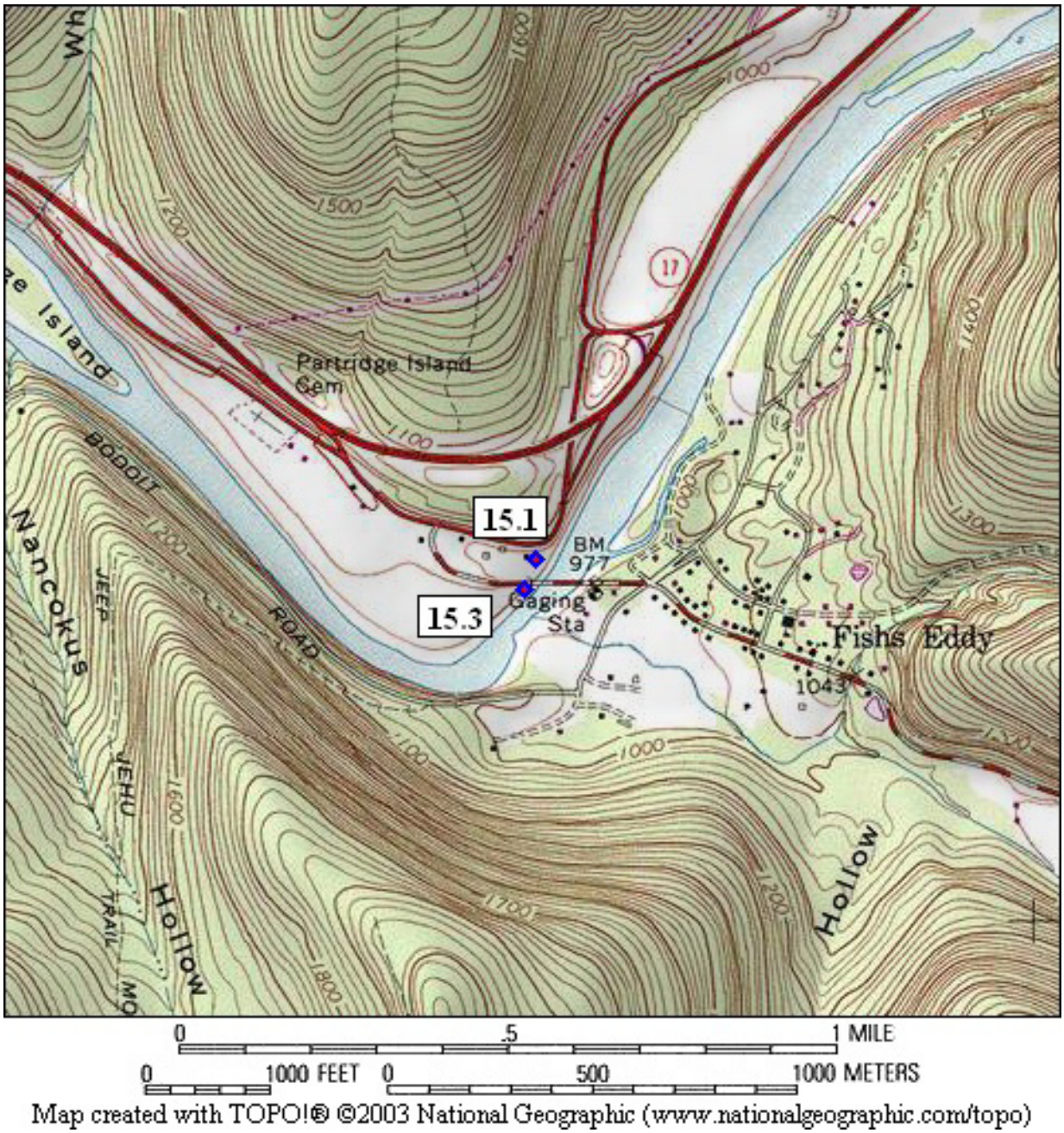


Fishs Eddy quad map with location of site 14, East Branch Delaware River at State Route 17, about 2.0 miles downstream from East Branch, N.Y.

High-water mark 14.1 is a fair seed line about 4 feet above the ground, on a tree on the left bank, 195 feet upstream from the State Route 17 bridge, at elevation 989.45 feet above sea level (Lat 41° 59’ 17.8”, long 75° 09’ 46.0”).

High-water mark 14.3 is a fair debris line on the ground, on the left bank, at the downstream side of the State Route 17 bridge, at elevation 988.50 feet above sea level (Lat 41° 59’ 16.0”, long 75° 09’ 44.3”).

SITE DESCRIPTION
Site 15: East Branch Delaware River at County Route 28 at Fishs Eddy, N.Y.
Site Location: Bridge on County Route 28, Lat 41° 57’ 58.2”, long 75° 10’ 48.6”, NAD 1983
Town of Hancock, Delaware County, N.Y.
Fishs Eddy USGS 7.5’ Topographic Quadrangle
High-Water Marks: Four high-water marks were surveyed: 2 debris lines and 2 seed lines.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by R. Lumia and G.J. Hebert on November 9, 2004.
High-water-mark elevations were surveyed from the top of the downstream left abutment where a previous USGS gaging station reference mark disk was located (destroyed). This is RM 40 in the Town of Hancock FEMA flood insurance study. Elevation is 976.60 feet above sea level (NGVD 1929).

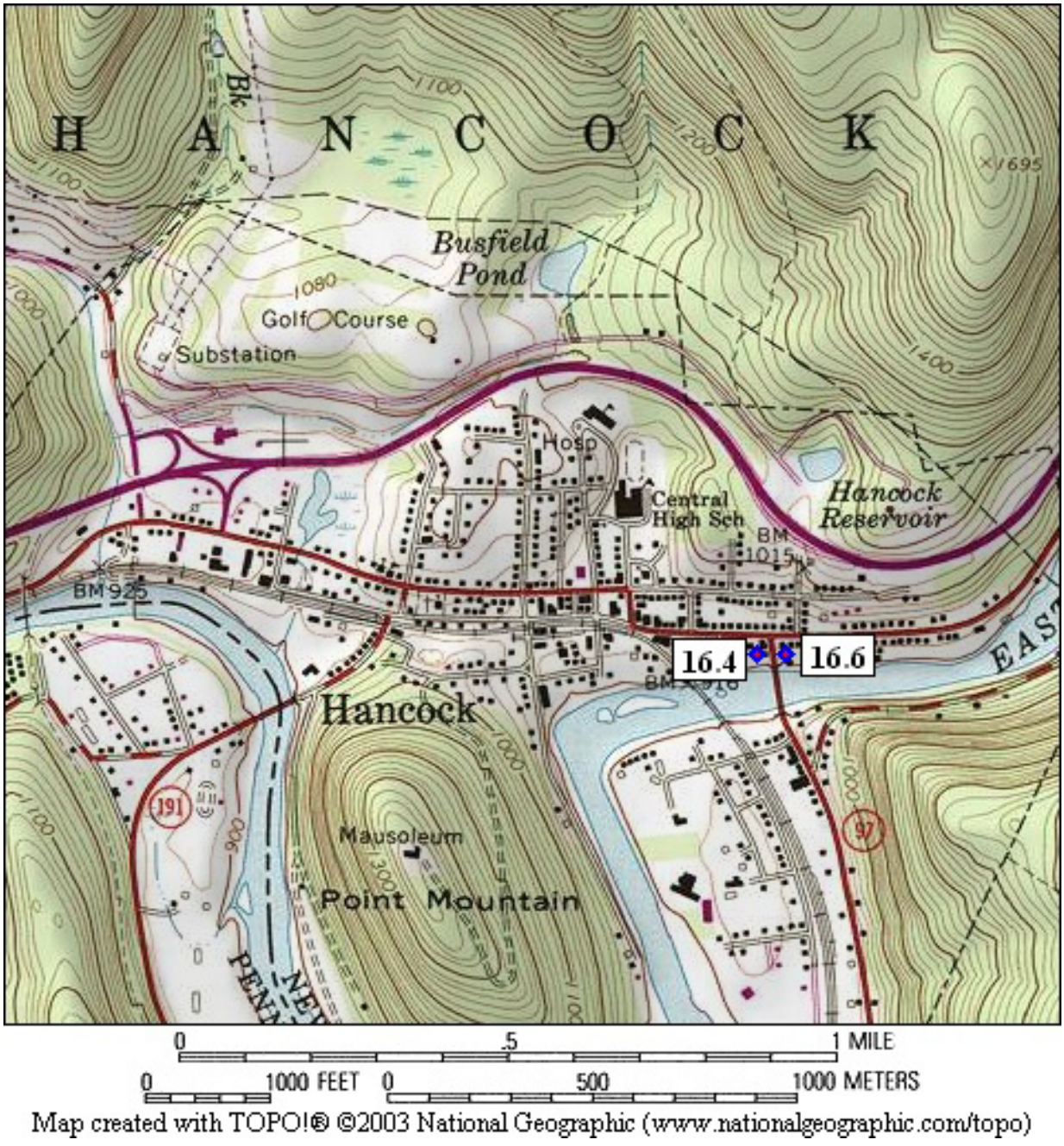


Fishs Eddy quad map with location of site 15, East Branch Delaware River at County Route 28 at Fishs Eddy, N.Y.

High-water mark 15.1 is a fair seed line about 6 feet above the ground, on a tree on the right bank, 325 feet upstream from the County Route 28 bridge, at elevation 971.82 feet above sea level (Lat 41° 58’ 01.0”, long 75° 10’ 47.3”).

High-water mark 15.3 is a fair debris line about 7 feet above the ground, on the bridge wingwall on the right bank, at the downstream side of the County Route 28 bridge, at elevation 971.11 feet above sea level (Lat 41° 57’ 57.8”, long 75° 10’ 52.1”).

SITE DESCRIPTION
Site 16: East Branch Delaware River at State Route 97 at Hancock, N.Y.
Site Location: Bridge on State Route 97 , Lat 41° 57’ 10.2”, long 75° 16’ 36.6”, NAD 1983
Village of Hancock, Delaware County, N.Y.
Hancock USGS 7.5’ Topographic Quadrangle
High-Water Marks: Six high-water marks were surveyed: 6 debris lines.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by R. Lumia and G. J. Hebert on November 8, 2004.
High-water-mark elevations were surveyed from a benchmark that is an NGS standard disk stamped N 456 1982 in the top of the east end of the south abutment of the Route 97 bridge in Hancock (upstream left abutment). NGS PID LY2393. Elevation is 917.11 feet above sea level (NGVD 1929).

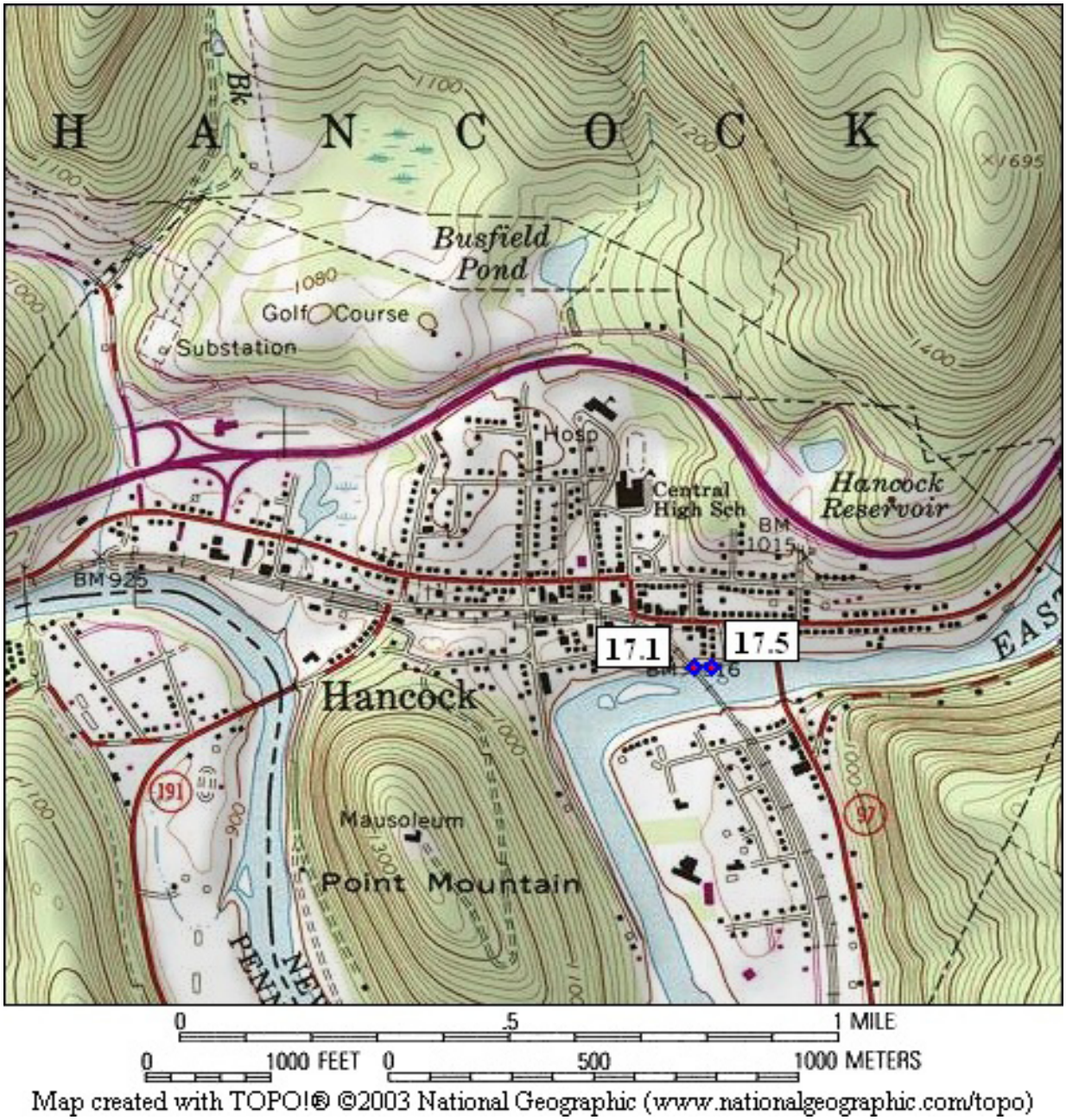


Hancock quad map with location of site 16, East Branch Delaware River at State Route 97 at Hancock, N.Y.

High-water mark 16.4 is a fair debris line on the ground, on the right bank, 40 feet downstream from the State Route 97 bridge, at elevation 905.88 feet above sea level (Lat 41° 57’ 12.7”, long 75° 16’ 37.4”).

High-water mark 16.6 is a fair debris line about one foot above the ground, on a fence on the right bank, 200 feet upstream from the State Route 97 bridge, at elevation 906.08 feet above sea level (Lat 41° 57’ 13.1”, long 75° 16’ 33.8”).

SITE DESCRIPTION
Site 17: East Branch Delaware River at Conrail Railroad at Hancock, N.Y.
Site Location: Bridge on Conrail Railroad, Lat 41° 57’ 09.6”, long 75° 16’ 43.8”, NAD 1983
Village of Hancock, Delaware County, N.Y.
Hancock USGS 7.5’ Topographic Quadrangle
High-Water Marks: Six high-water marks were surveyed: 5 debris lines and 1 seed line.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by R. Lumia and G.J. Hebert on November 8, 2004.
High-water-mark elevations were surveyed from a benchmark that is an NGS standard disk stamped NGS CADOSIA 1934 on top of the SE end of the NW bridge seat. NGS PID LY0985. This is RM 4 in the Village of Hancock FEMA flood insurance study. Elevation is 915.64 feet above sea level (NGVD 1929).

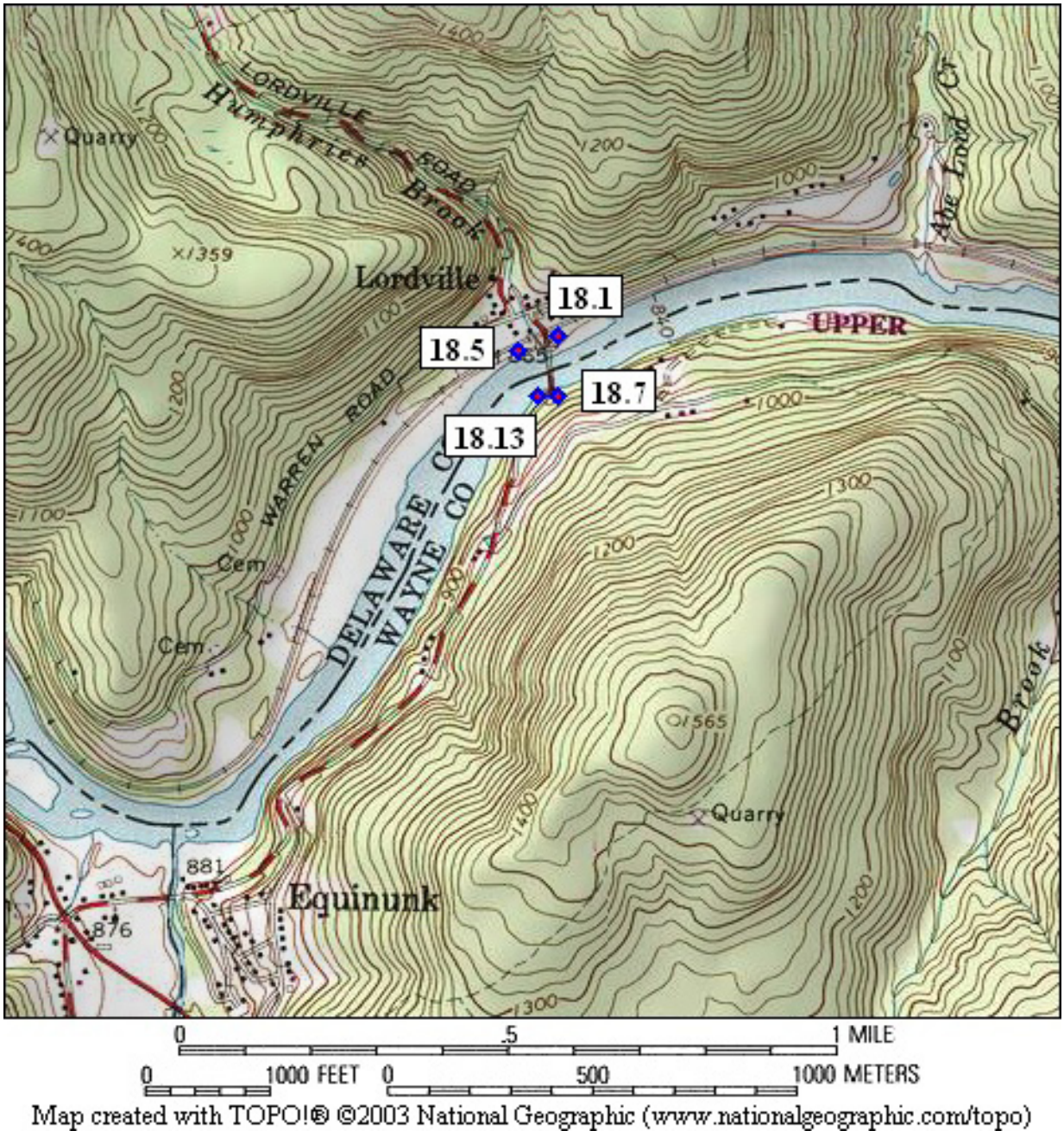


Hancock quad map with location of site 17, East Branch Delaware River at Conrail Railroad at Hancock, N.Y.

High-water mark 17.1 is a fair debris line about 7 feet above the ground, on a stone wall on the right bank, 10 feet downstream from the Conrail Railroad bridge, at elevation 904.93 feet above sea level (Lat 41^{o} 57’10.9”, long 75^{o} 16’ 45.0”).

High-water mark 17.5 is a fair seed line about 3 feet above the ground, on a tree on the right bank, 123 feet upstream from the Conrail Railroad bridge, at elevation 905.35 feet above sea level (Lat 41^{o} 57’ 10.5”, long 75^{o} 16’ 43.1”).

SITE DESCRIPTION
Site 18: Delaware River at Lordville Road at Lordville, N.Y.
Site Location: Bridge on Lordville Road, Lat 41° 52’ 04.2”, long 75° 12’ 49.8”, NAD 1983
Town of Hancock, Sullivan County, N.Y.
Long Eddy USGS 7.5’ Topographic Quadrangle
High-Water Marks: Thirteen high-water marks were surveyed: 3 seed lines, 3 mud lines and 7 debris lines.
Photos and GPS readings were taken at most high-water marks. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by G.D. Firda and T.F. Hoffman on September 29, 2004, and by G.D. Firda and K. McGrath on November 8, 2004.
High-water-mark elevations were surveyed from a benchmark that is an NGS standard disk stamped U 128 RESET 1991 on the top of the north abutment of the Lordville Road bridge. NGS PID LY2910. Elevation is 868.89 feet above sea level (NGVD 1929).



Long Eddy quad map with location of site 18, Delaware River at Lordville Road at Lordville, N.Y.

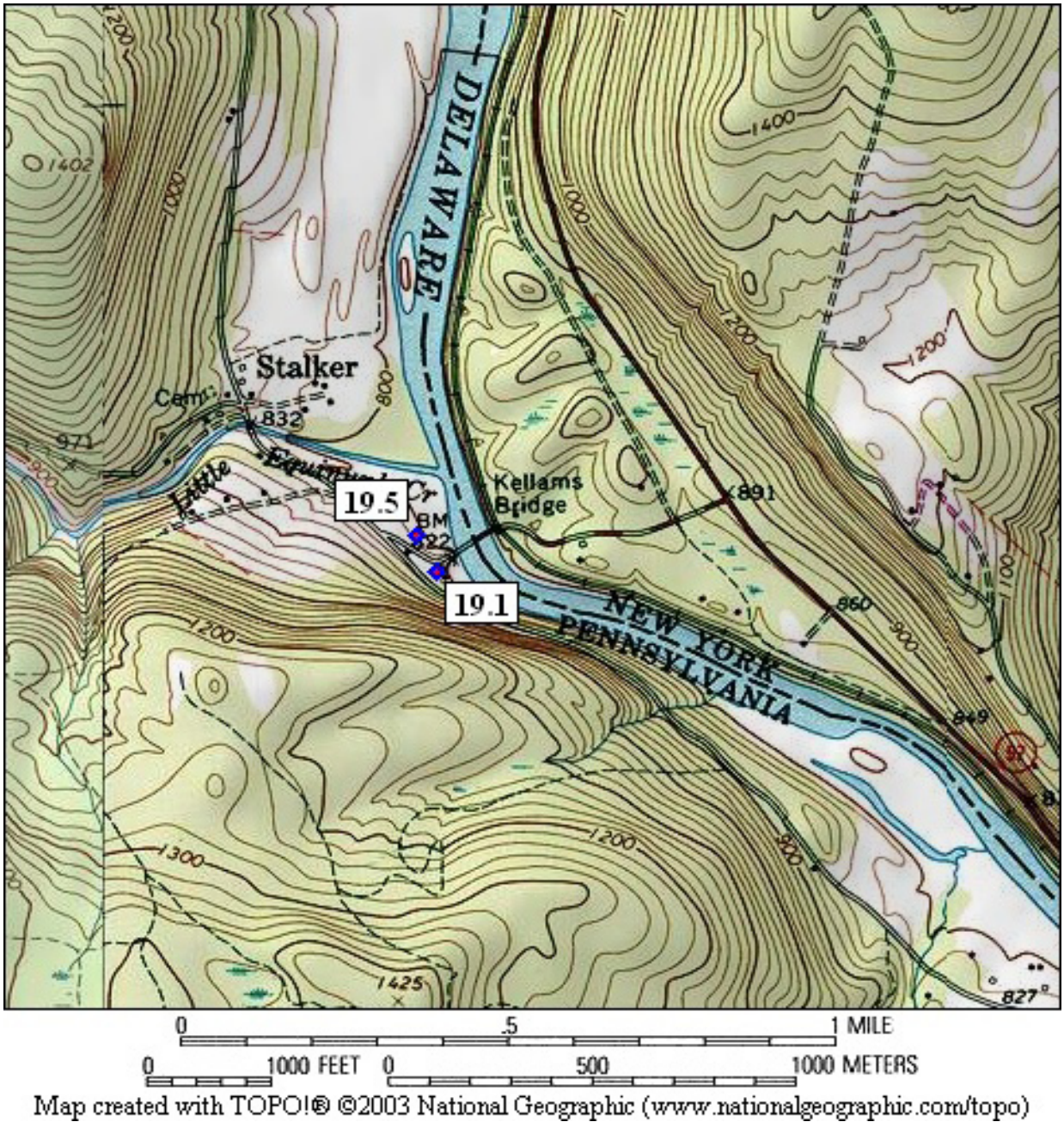
High-water mark 18.1 is a fair seed line on the ground, on the left bank, 29 feet downstream from the Lordville Road bridge, at elevation 858.48 feet above sea level (Lat 41° 52’ 06.5”, long 75° 12’ 49.1”).

High-water mark 18.5 is a good mud line about three feet above the ground, on a trailer on the left bank, 290 feet upstream from the Lordville Road bridge, at elevation 860.77 feet above sea level (Lat 41° 52’ 05.5”, long 75° 12’ 53.3”).

No photos were taken of the high-water mark. High-water mark 18.7 is a fair debris line about 1 foot above the ground, on the bridge wingwall on the right bank, at the downstream side of the Lordville Road bridge, at elevation 858.53 feet above sea level (Lat 41° 52’ 02.4”, long 75° 12’ 49.2”).

No photos were taken of the high-water mark. High-water mark 18.13 is a good debris line on the ground, on the right bank, 3 feet upstream from the Lordville Road bridge, at elevation 859.38 feet above sea level (Lat 41° 52’ 02.4”, long 75° 12’ 51.0”).

SITE DESCRIPTION
Site 19: Delaware River at Kellams Bridge Road at Hankins, N.Y.
Site Location: Bridge on Kellams Bridge Road, Lat 41° 49’ 24.6”, long 75° 06’ 49.2”, NAD 1983
Town of Fremont, Sullivan County, N.Y.
Callicoon USGS 7.5’ Topographic Quadrangle
High-Water Marks: Seven high-water marks were surveyed: 5 debris lines and 2 seed lines.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by G.D. Firda and K. McGrath on November 8-9, 2004.
High-water-mark elevations were surveyed from benchmark that is a USGS chiseled square that is 10 feet north and 1 foot higher than the centerline of the west end of the bridge over Little Equinunk Creek, on the low concrete rail. This is RM 12 in the Town of Fremont FEMA flood insurance study. Elevation is 832.93 feet above sea level (NGVD 1929).

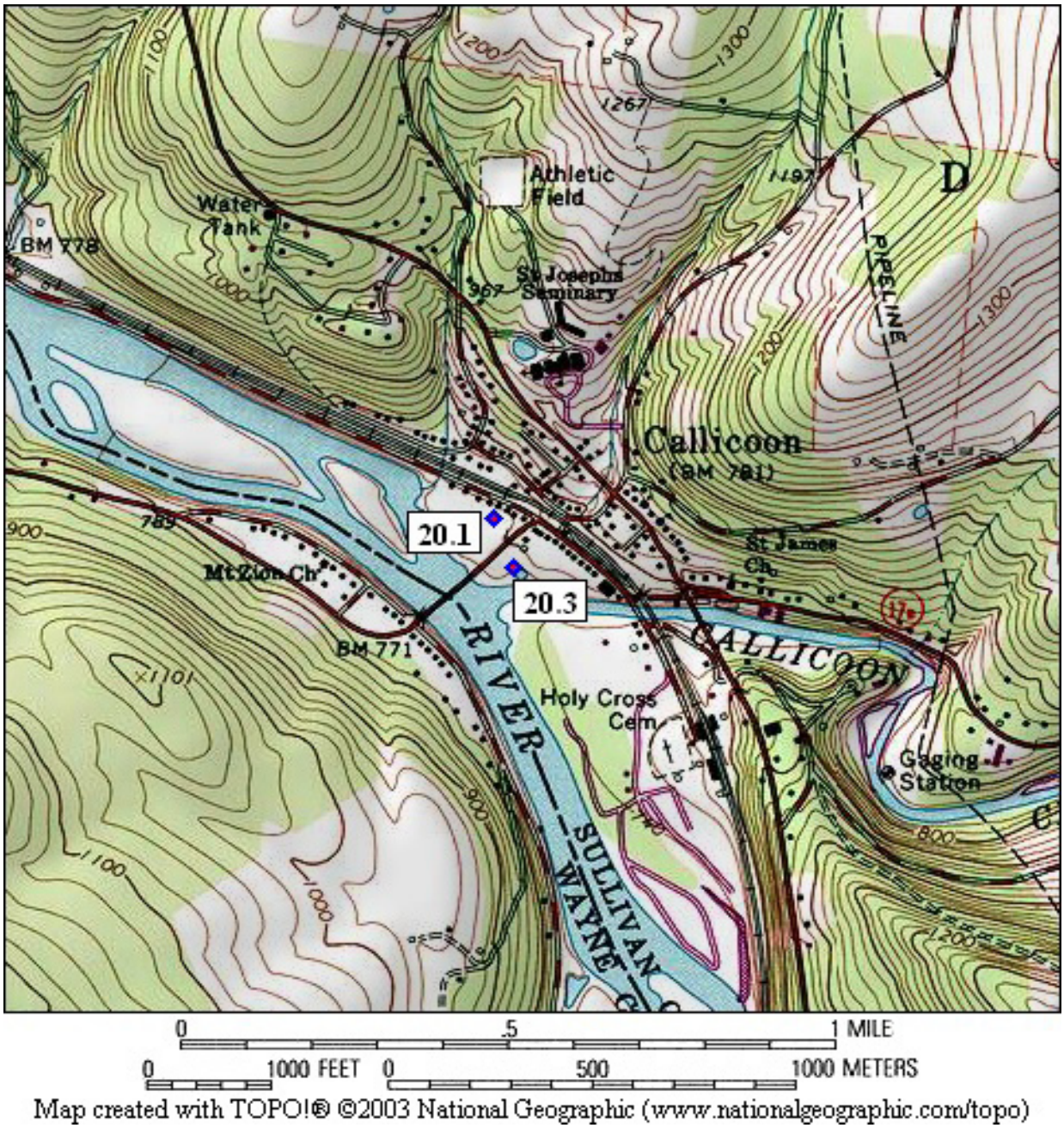


Callicoon quad map with location of site 19, Delaware River at Kellams Bridge Road at Hankins, N.Y.

High-water mark 19.1 is a fair debris line on the ground, on the right bank, 51 feet downstream from the Kellams Bridge Road bridge, at elevation 811.43 feet above sea level (Lat 41° 49’ 22.4”, long 75° 06’ 52.6”).

High-water mark 19.5 is a good seed line about two feet above the ground, on a tree on the right bank, 240 feet upstream from the Kellams Bridge Road bridge, at elevation 811.57 feet above sea level (Lat 41° 49’ 25.0”, long 75° 06’ 54.5”).

SITE DESCRIPTION
Site 20: Delaware River at Bridge Street at Callicoon, N.Y.
Site Location: Bridge on Bridge Street, Lat 41° 45’ 54.6”, long 75° 03’ 38.4”, NAD 1983
Town of Delaware, Sullivan County, N.Y.
Callicoon USGS 7.5’ Topographic Quadrangle
High-Water Marks: Four high-water marks were surveyed: 2 seed/mud lines and 2 debris lines.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by G.D. Firda and K. McGrath on November 9, 2004.
High-water-mark elevations were surveyed from a benchmark that is a USGS/New York State Department of Public Works standard disk stamped 9F 52 set in the northwest end of the Bridge Street bridge abutment. Elevation is 770.57 feet above sea level (NGVD 1929).

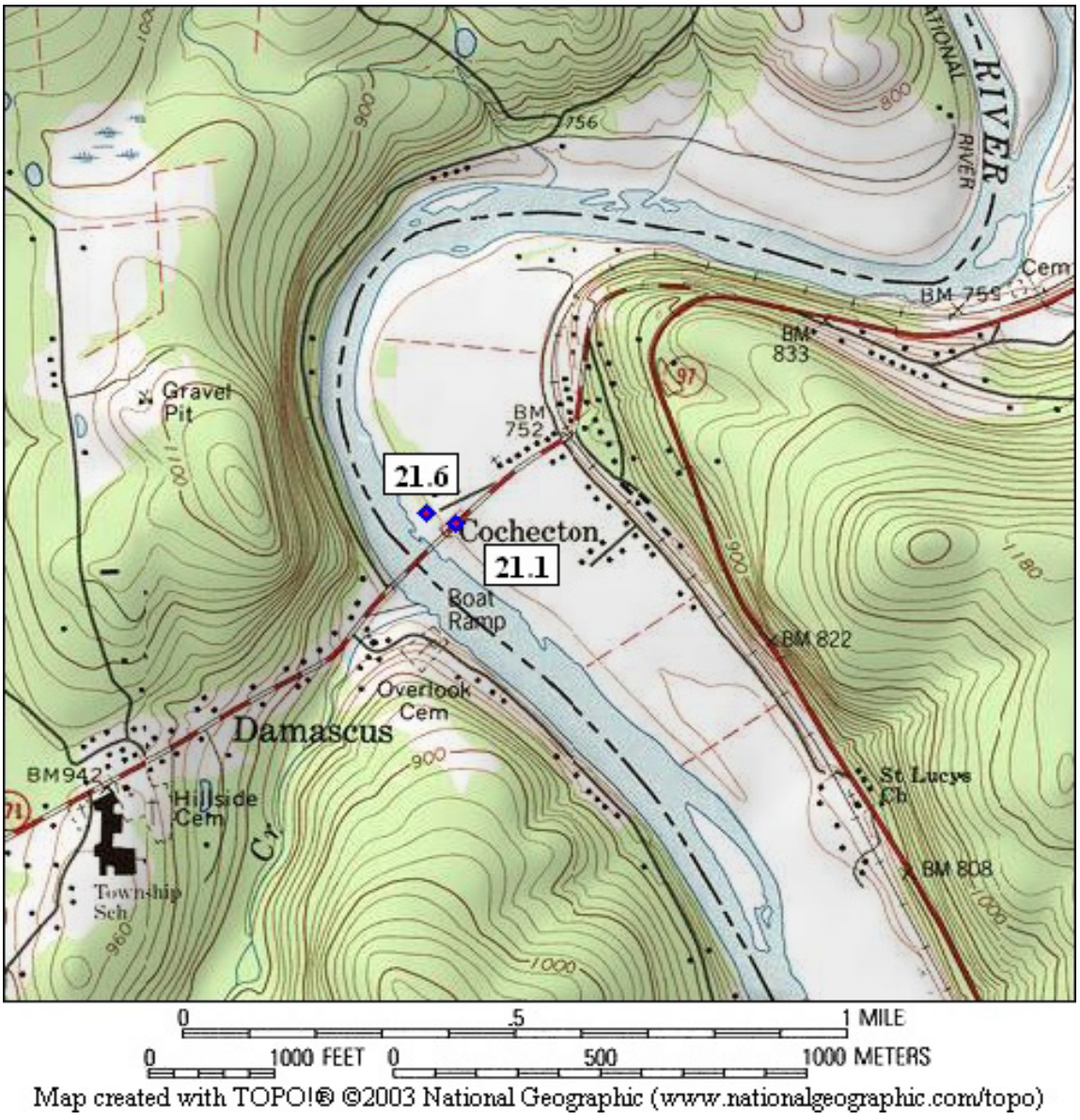


Callicoon quad map with location of site 20, Delaware River at Bridge Street at Callicoon, N.Y.

High-water mark 20.1 is a good seed/mud line 0.5 feet above the ground, on a storage shed on the left bank, 215 feet upstream from the Bridge Street bridge, at elevation 755.98 feet above sea level (Lat 41° 46’ 00.2”, long 75° 03’ 35.0”).

High-water mark 20.3 is a good debris line on the ground, on the left bank, 140 feet downstream from the Bridge Street bridge, at elevation 755.61 feet above sea level (Lat 41° 45’ 56.5”, long 75° 03’ 33.4”).

SITE DESCRIPTION
Site 21: Delaware River at State Route 371 at Cochecton, N.Y.
Site Location: Bridge on State Route 371, Lat 41° 42' 17.4", long 75° 04' 00.6", NAD 1983
Town of Cochecton, Sullivan County, N.Y.
Damascus, PA USGS 7.5' Topographic Quadrangle
High-Water Marks: Six high-water marks were surveyed: 6 debris lines.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by G.D. Firda and K. McGrath on November 9, 2004, and G.D. Firda and R. Lumia on November 17, 2004.
High-water-mark elevations were surveyed from a benchmark that is an NGS standard disk stamped R 142 1941, 4.0 miles south along State Route 97 from the junction of State Route 17B in Callicoon, in the top of a rock boulder, 0.05 miles NNW from the highway, 74 feet south and across a single set of railroad tracks from Mile Post 131, 6 feet from a witness post. NGS PID LY1021. This is RM 7 in the Town of Cochecton FEMA flood insurance study. Elevation is 758.65 feet above sea level (NGVD 1929).

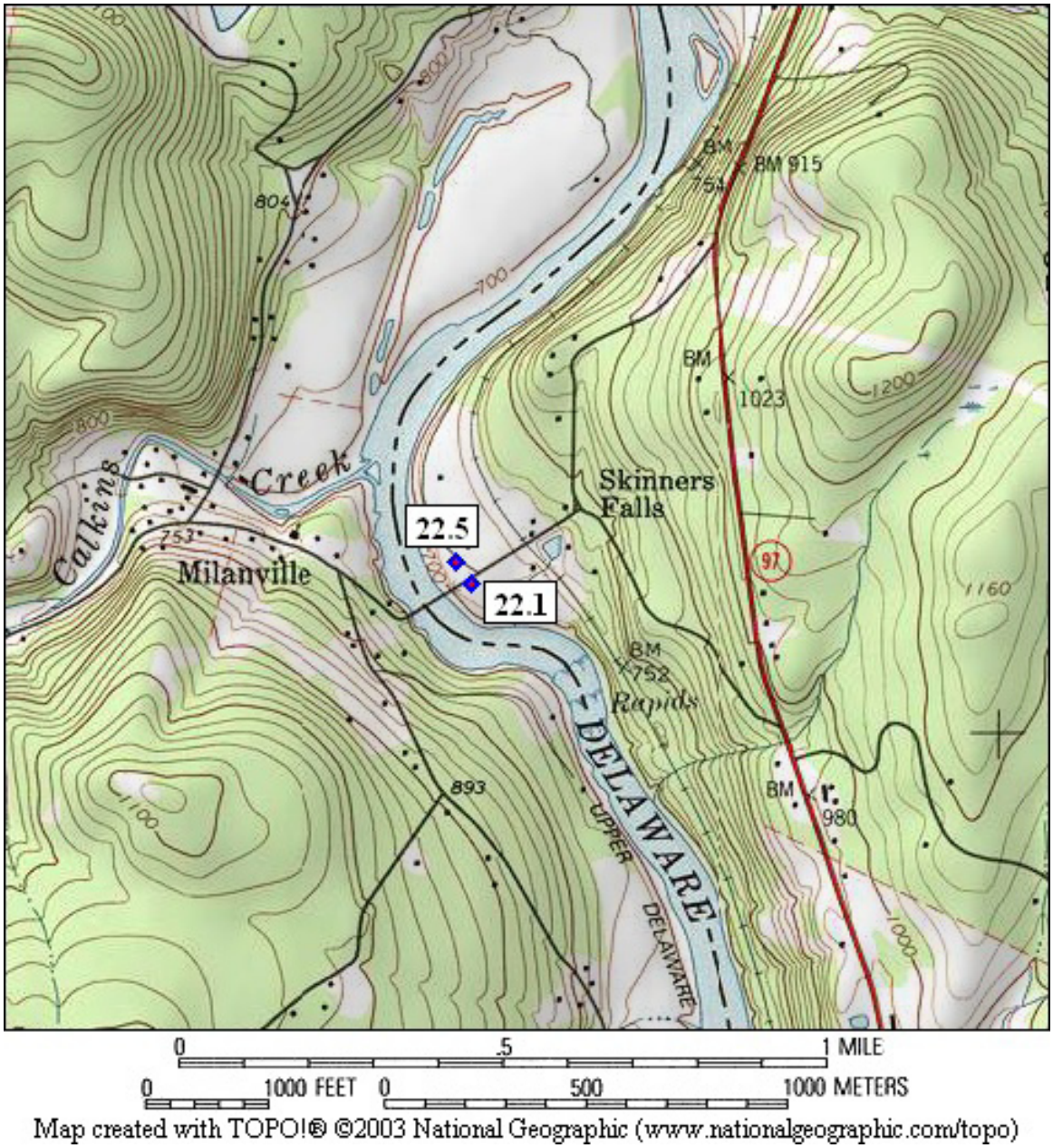


Damascus, PA quad map with location of site 21, Delaware River at State Route 371 at Cochecton, N.Y.

High-water mark 21.1 is a good debris line on the ground, on the left bank, at the downstream side of the State Route 371 bridge, at elevation 735.92 feet above sea level (Lat 41° 42’ 21.1”, long 75° 03’ 56.3”).

High-water mark 21.6 is a good debris line on the ground, on the left bank, 84 feet upstream from the State Route 371 bridge, at elevation 736.10 feet above sea level (Lat 41° 42’ 21.7”, long 75° 03’ 59.0”).

SITE DESCRIPTION
Site 22: Delaware River at Skinners Falls Road at Skinners Falls, N.Y.
Site Location: Bridge on Skinners Falls Road, Lat 41° 40’ 10.8”, long 75° 03’ 30.0”, NAD 1983
Town of Cochecton, Sullivan County, N.Y.
Damascus, PA USGS 7.5’ Topographic Quadrangle
High-Water Marks: Six high-water marks were surveyed: 3 debris lines, 2 seed lines and 1 mud line.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by G.D. Firda and K. McGrath on November 10, 2004, and G.D. Firda and R. Lumia on November 17, 2004.
High-water-mark elevations were surveyed from a reference mark that is a discontinued USGS gaging station 01427705 reference mark RM 2. RM 2 was tied to NGS benchmark V142 1941 on November 6, 1967. V142 1941 is RM 2 in the Town of Cochecton FEMA flood insurance study. Elevation is 734.26 feet above sea level (NGVD 1929).

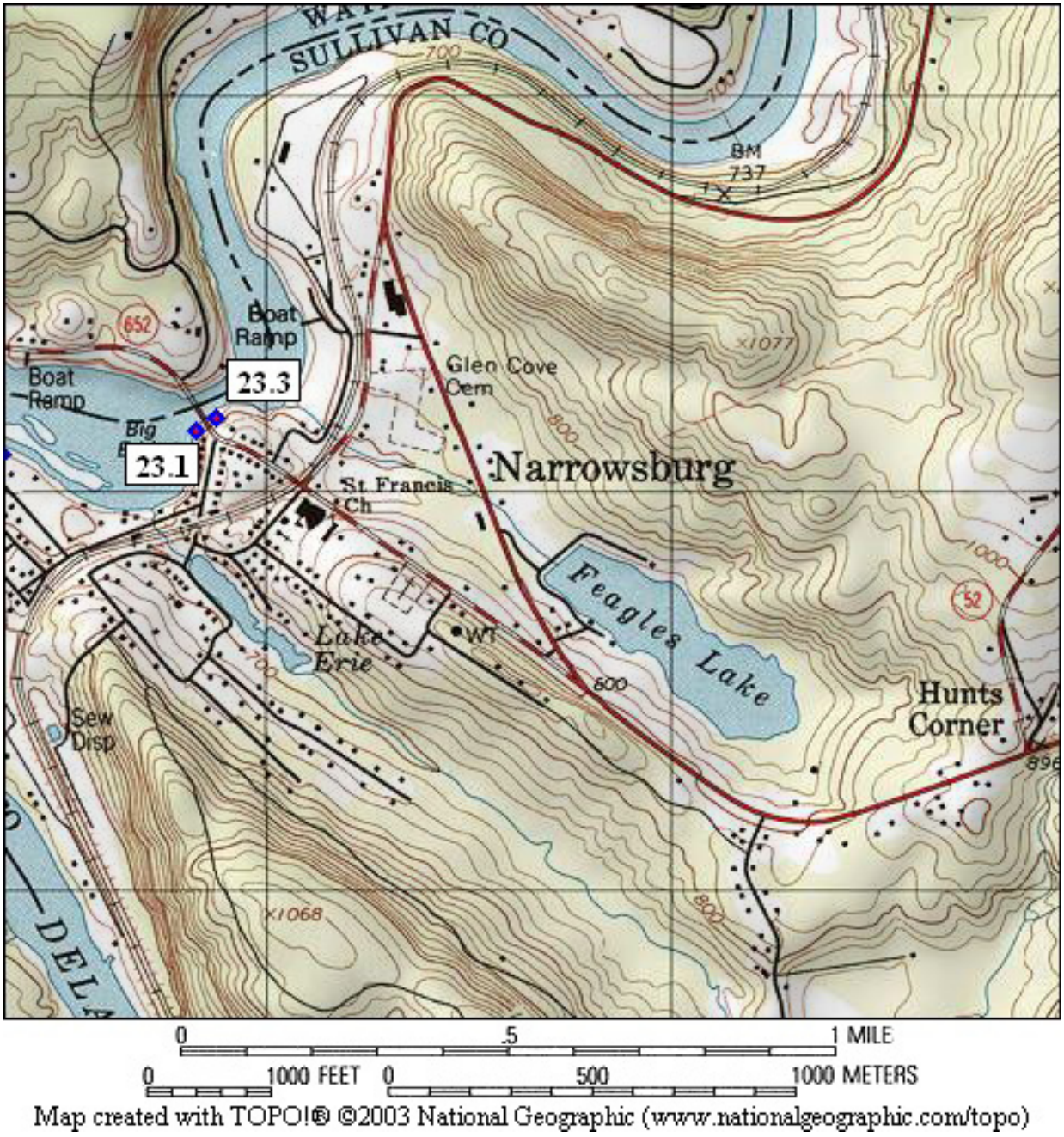


Damascus, PA quad map with location of site 22, Delaware River at Skinners Falls Road at Skinners Falls, N.Y.

High-water mark 22.1 is a fair debris line on the ground, on the left bank, 25 feet downstream from the Skinners Falls Road bridge, at elevation 720.25 feet above sea level (Lat 41° 40’ 12.5”, long 75° 03’ 26.0”).

High-water mark 22.5 is a good mud line about 3 feet above the ground, on a house on the left bank, 84 feet upstream from the Skinners Falls Road bridge, at elevation 720.60 feet above sea level (Lat 41° 40’ 13.6”, long 75° 03’ 26.3”).

SITE DESCRIPTION
Site 23: Delaware River at U.S Route 652 at Narrowsburg, N.Y.
Site Location: Bridge on U.S. Route 652, Lat 41° 36' 35", long 75° 03' 42", NAD 1983
Town of Tusten, Sullivan County, N.Y.
Narrowsburg USGS 7.5' Topographic Quadrangle
High-Water Marks: Four high-water marks were surveyed: 4 debris lines.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by G.D. Firda and K. McGrath on November 10, 2004.
High-water-mark elevations were surveyed from a reference mark that is a chiseled X, painted yellow, on the northeast abutment of the U.S. Route 652 bridge over the Conrail railroad tracks in Narrowsburg. This is RM 4 in the Town of Tusten FEMA flood insurance study. Elevation is 746.93 feet above sea level (NGVD 1929).

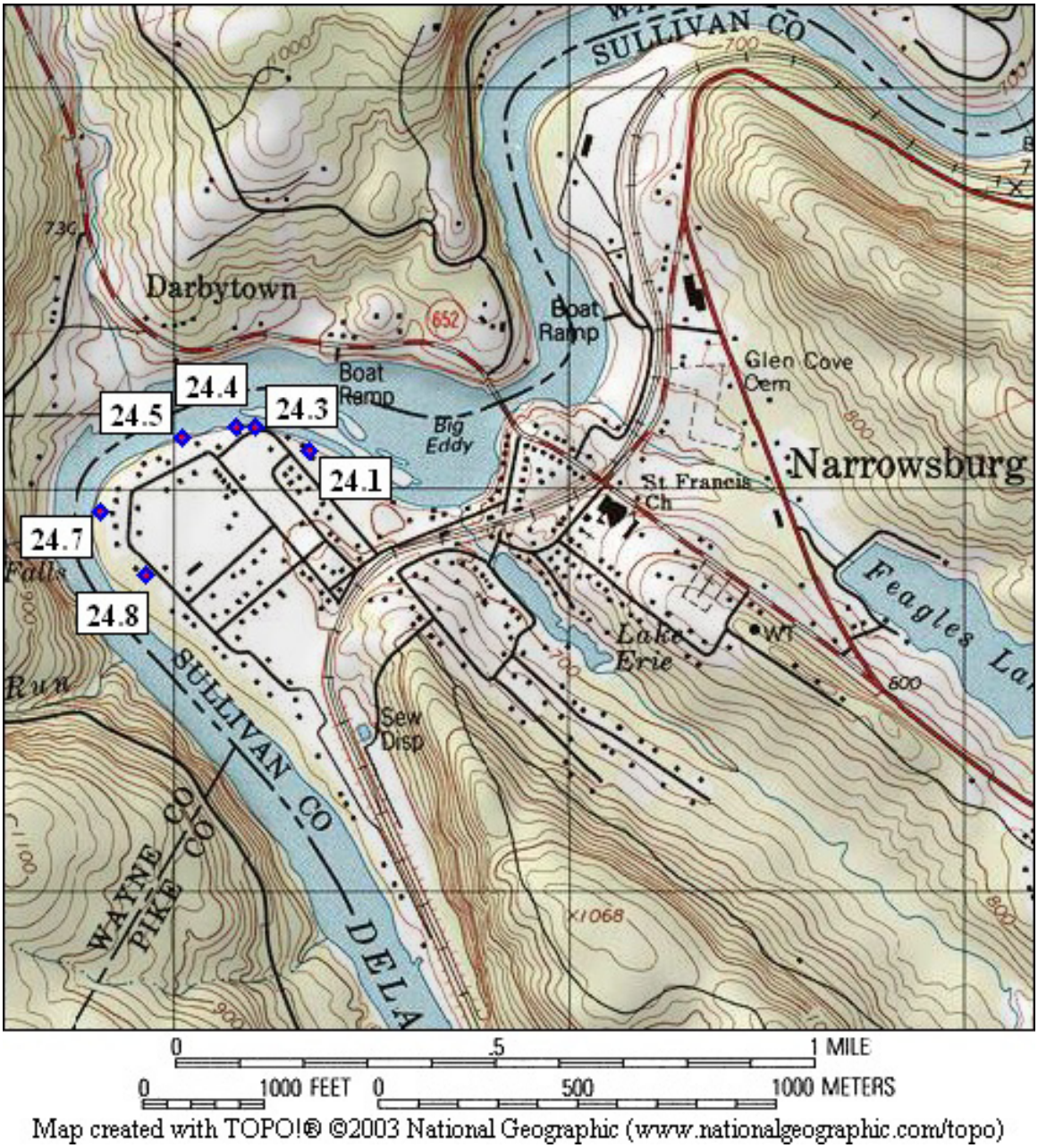


Narrowsburg quad map with location of site 23, Delaware River at U.S. Route 652 at Narrowsburg, N.Y.

High-water mark 23.1 is a poor debris line on the ground, on the left bank, 40 feet downstream from the U.S. Route 652 bridge, at elevation 693.54 feet above sea level (Lat 41° 36’ 33.4”, long 75° 03’ 41.6”).

High-water mark 23.3 is a poor debris line on the ground, on the left bank, 75 feet upstream from the U.S. Route 652 bridge, at elevation 695.91 feet above sea level (Lat 41° 36’ 34.1”, long 75° 03’ 40.4”).

SITE DESCRIPTION
Site 24: Delaware River at 2nd Avenue and Delaware Drive at Narrowsburg, N.Y.
Site Location: 2nd Avenue and Delaware Drive, Lat 41° 36’ 31.1”, long 75° 04’ 03.1”, NAD 1983
Town of Tusten, Sullivan County, N.Y.
Narrowsburg USGS 7.5’ Topographic Quadrangle
High-Water Marks: Ten high-water marks were surveyed: 5 debris lines, 4 mud lines and 1 from communication with homeowner.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by G.D. Firda and K. McGrath on November 11, 2004, and G.D. Firda and R. Lumia on November 17, 2004.
High-water-mark elevations were surveyed from a reference mark that is a chiseled X, painted yellow, on the northeast abutment of the U.S. Route 652 bridge over the Conrail railroad tracks in Narrowsburg. This is RM 4 in the Town of Tusten FEMA flood insurance study. Elevation is 746.93 feet above sea level (NGVD 1929).



Narrowsburg quad map with location of site 24, Delaware River at 2nd Avenue and Delaware Drive at Narrowsburg, N.Y.

High-water mark 24.1 is a fair mud line about 2 feet above the ground, on a storage shed between house 72 and house 80 on 2nd Avenue, on the left bank, at elevation 694.57 feet above sea level (Lat 41° 36’ 31.1”, long 75° 03’ 03.1”).

High-water mark 24.3 is a good debris line on the ground, at park on 2nd Avenue, on the left bank, at elevation 693.44 feet above sea level (Lat 41° 36’ 32.6”, long 75° 04’ 08.6”).

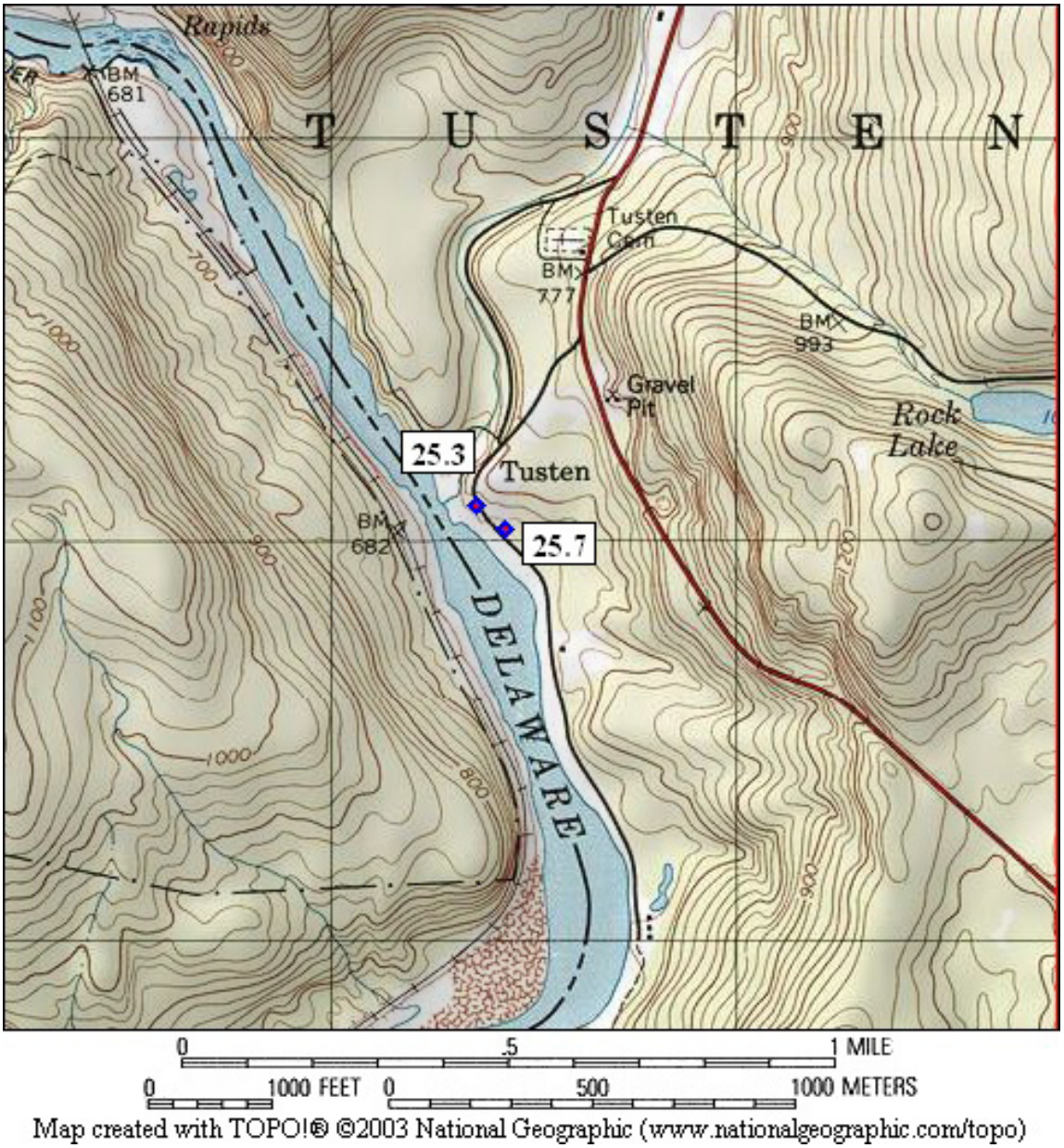
High-water mark 24.4 is an excellent mud line about 2 feet above the ground, on the upstream side of house 122 on 2nd Avenue, on the left bank, at elevation 693.52 feet above sea level (Lat 41° 36’ 33.1”, long 75° 04’ 10.8”).

High-water mark 24.5 is a fair debris line on the ground, behind house 140 on Delaware Drive, on the left bank, at elevation 692.26 feet above sea level (Lat 41° 36’ 31.7”, long 75° 04’ 17.1”).

High-water mark 24.7 is a poor debris line on the ground, between house 204 and house 210 on Delaware Drive, on the left bank, at elevation 689.53 feet above sea level (Lat 41° 36’ 25.7”, long 75° 04’ 25.7”).

High-water mark 24.8 is a fair mud line about 3 feet above the ground, on the downstream side of house 242 on Delaware Drive, on the left bank, at elevation 688.27 feet above sea level (Lat 41° 36’ 21.0”, long 75° 04’ 21.2”).

SITE DESCRIPTION
Site 25: Delaware River at Crawford Road at Tusten, N.Y.
Site Location: Crawford Road, Lat 41° 33' 15.5", long 75° 01' 08.6", NAD 1983
Town of Tusten, Sullivan County, N.Y.
Narrowsburg USGS 7.5' Topographic Quadrangle
High-Water Marks: Seven high-water marks were surveyed: 5 seed lines and 2 debris lines.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by G.D. Firda and K. McGrath on November 12, 2004.
High-water-mark elevations were surveyed from a benchmark that is an NGS standard disk stamped 166LRP 1965 777 set in the top of a culvert headwall 3.7 miles southeast along State Route 97 from the junction of State Route 52 in Hunts Corner, to the mark on the right, 17 feet west of the centerline of the highway, 20 feet south of the centerline of a dirt drive heading west. NGS PID LY2328. Elevation is 776.95 feet above sea level (NGVD 1929) from USGS Mapping Division October 25, 2004. NGS elevation only available in NAVD 1988.

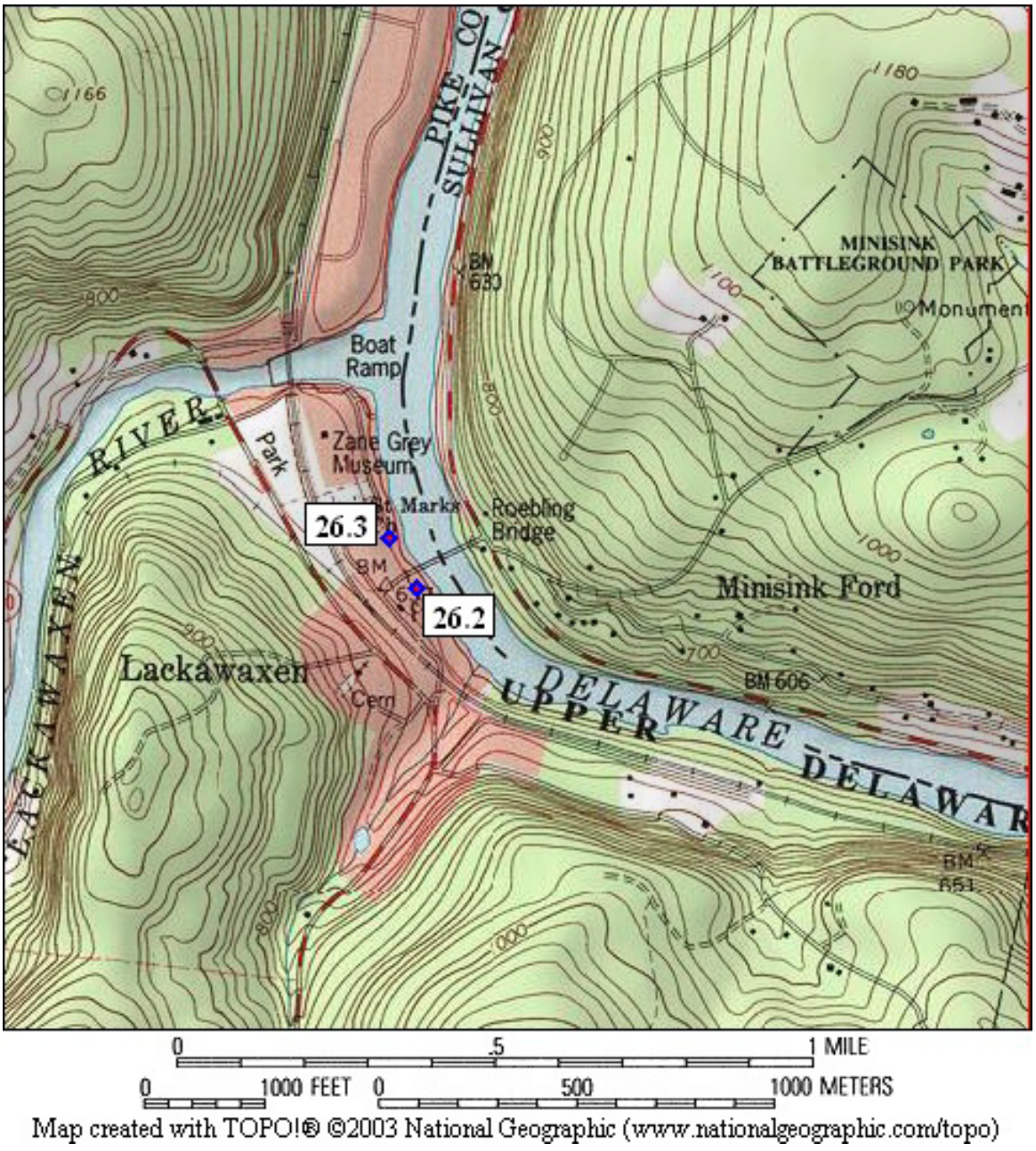


Narrowsburg quad map with location of site 25, Delaware River at Crawford Road at Tusten, N.Y.

High-water mark 25.3 is a good seed line about 3 feet above the ground, on a tree on the left bank, 25 feet downstream from the Tusten Trail sign, at elevation 665.40 feet above sea level (Lat 41° 33’ 15.5”, long 75° 01’ 08.6”).

High-water mark 25.7 is a fair seed line about 3 feet above the ground, on a tree on the left bank, 280 feet downstream from the Tusten Trail sign, at elevation 665.31 feet above sea level (Lat 41° 33’ 13.6”, long 75° 01’ 06.2”).

SITE DESCRIPTION
Site 26: Delaware River at Minisink Road at Minisink Ford, N.Y.
Site Location: Bridge on Minisink Road (Roebling Bridge), Lat 41° 28’ 57.6”, long 74° 59’ 04.2”, NAD 1983
Town of Highland, Sullivan County, N.Y.
Shohola, PA USGS 7.5’ Topographic Quadrangle
High-Water Marks: Four high-water marks were surveyed: 2 seed lines, 1 mud line and 1 debris line.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by R. Lumia and G.J. Hebert on November 11, 2004.
High-water-mark elevations were surveyed from a benchmark that is a USGS standard disk stamped PRIM TRAV STA NO. 2 set in a stone wall, 400 feet NW of the Erie Railroad station at Lackawaxen, PA, 50 feet NE of fork in road to Roebling Bridge (right bank of bridge). This is RM 1 in the Town of Highland FEMA flood insurance study. Elevation is 637.37 feet above sea level (NGVD 1929).

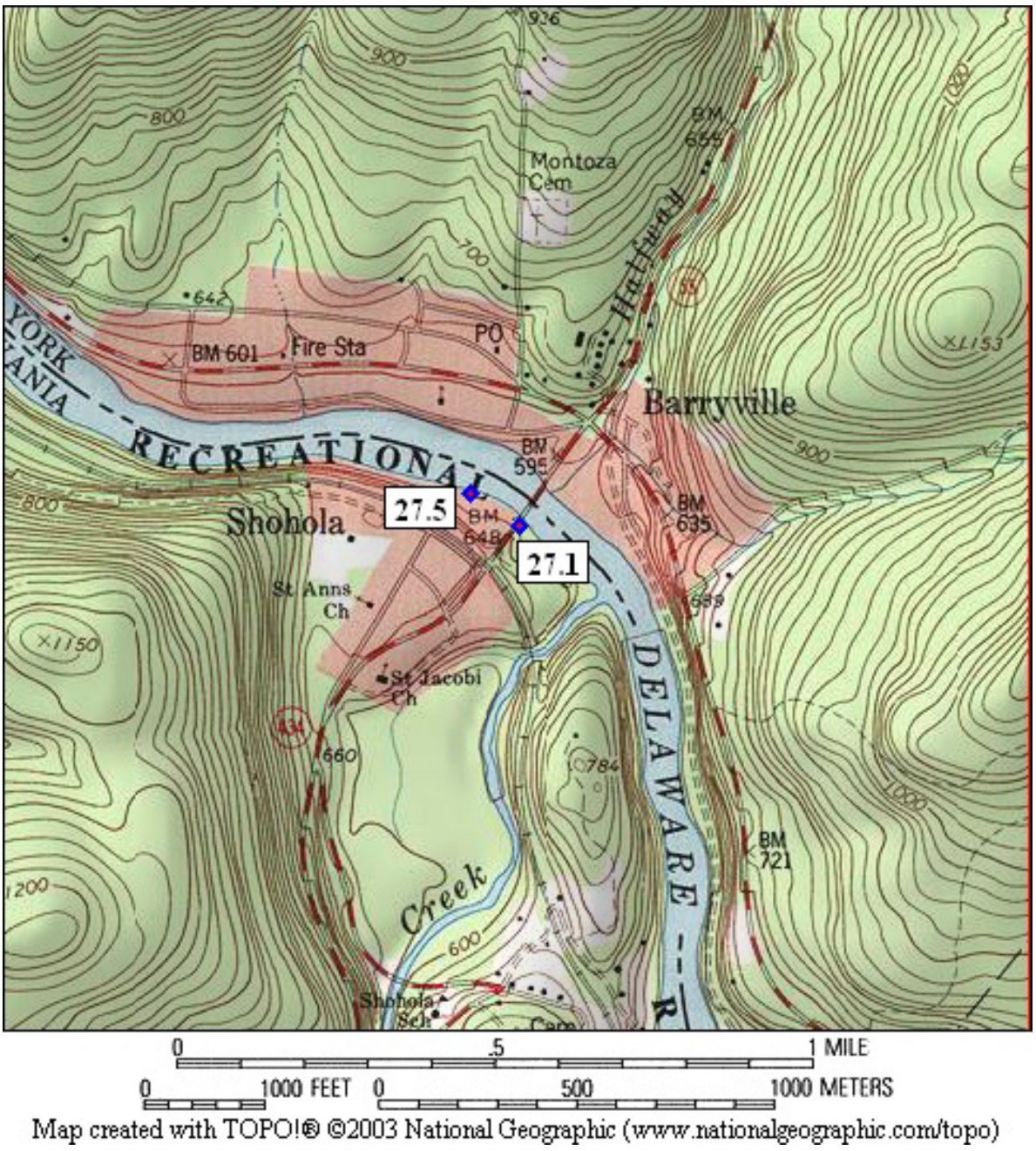


Shohola, PA quad map with location of site 26, Delaware River at Minisink Road at Minisink Ford, N.Y.

High-water mark 26.2 is a fair seed line about one foot above the ground, on a tree on the right bank, 72 feet downstream from the Roebling Bridge, at elevation 617.09 feet above sea level (Lat 41° 28’ 55.2”, long 74° 59’ 07.0”).

High-water mark 26.3 is a good seed line about one foot above the ground, on a concrete wall on the right bank, 275 feet upstream from the Roebling Bridge, at elevation 617.35 feet above sea level (Lat 41° 28’ 58.9”, long 74° 59’ 09.5”).

SITE DESCRIPTION
Site 27: Delaware River at State Route 55 at Barryville, N.Y.
Site Location: Bridge on State Route 55, Lat 41° 28’ 32.4”, long 74° 54’ 45.6”, NAD 1983
Town of Highland, Sullivan County, N.Y.
Shohola, PA USGS 7.5’ Topographic Quadrangle
High-Water Marks: Five high-water marks were surveyed: 4 debris lines and 1 seed line.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by R. Lumia and G.J. Hebert on November 11, 2004.
High-water-mark elevations were surveyed from a benchmark that is an NGS standard disk stamped Y 149 1941, 0.1 mile east along the Erie Railroad from the station at Shohola, PA, at concrete overpass in south end of west headwall. NGS PID LY0603. Elevation is 674.52 feet above sea level (NGVD 1929).

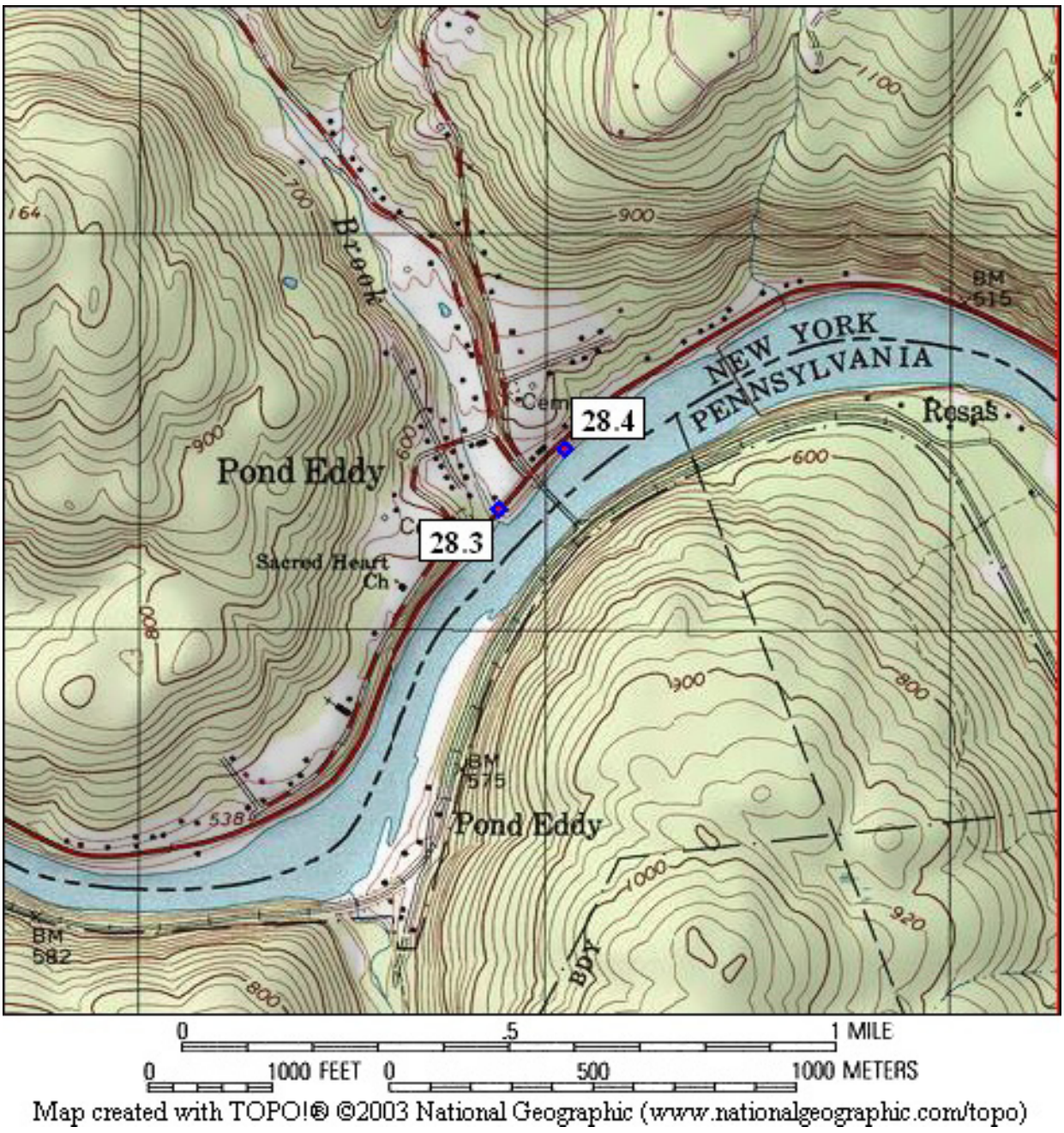


Shohola PA quad map with location of site 27, Delaware River at State Route 55 at Barryville, N.Y.

High-water mark 27.1 is an excellent seed line about 4 feet above the ground, inside of the USGS gage house, on the right bank, 15 feet downstream from the State Route 55 bridge, at elevation 585.14 feet above sea level (Lat 41° 28’ 30.7”, long 74° 54’ 47.0”).

High-water mark 27.5 is a fair debris line on the ground, on the right bank, 315 feet upstream from the State Route 55 bridge, at elevation 586.24 feet above sea level (Lat 41° 28’ 33.4”, long 74° 54’ 52.4”).

SITE DESCRIPTION
Site 28: Delaware River at County Route 41 at Pond Eddy, N.Y.
Site Location: Bridge on County Route 41 , Lat 41° 26’ 21.6”, long 74° 49’ 11.4”, NAD 1983
Town of Lumberland, Sullivan County, N.Y.
Pond Eddy USGS 7.5’ Topographic Quadrangle
High-Water Marks: Three high-water marks were surveyed: 3 debris lines.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by R. Lumia and G.J. Hebert on November 11-12, 2004.
High-water-mark elevations were surveyed from a reference mark that is a nail in pole number 36497-52733 (about 2 feet above land surface) on the east side of Hollow Road, about 0.5 mi. north of the intersection with State Route 97. This is RM 1 in the Town of Lumberland FEMA flood insurance study. Elevation is 600.41 feet above sea level (NGVD 1929).

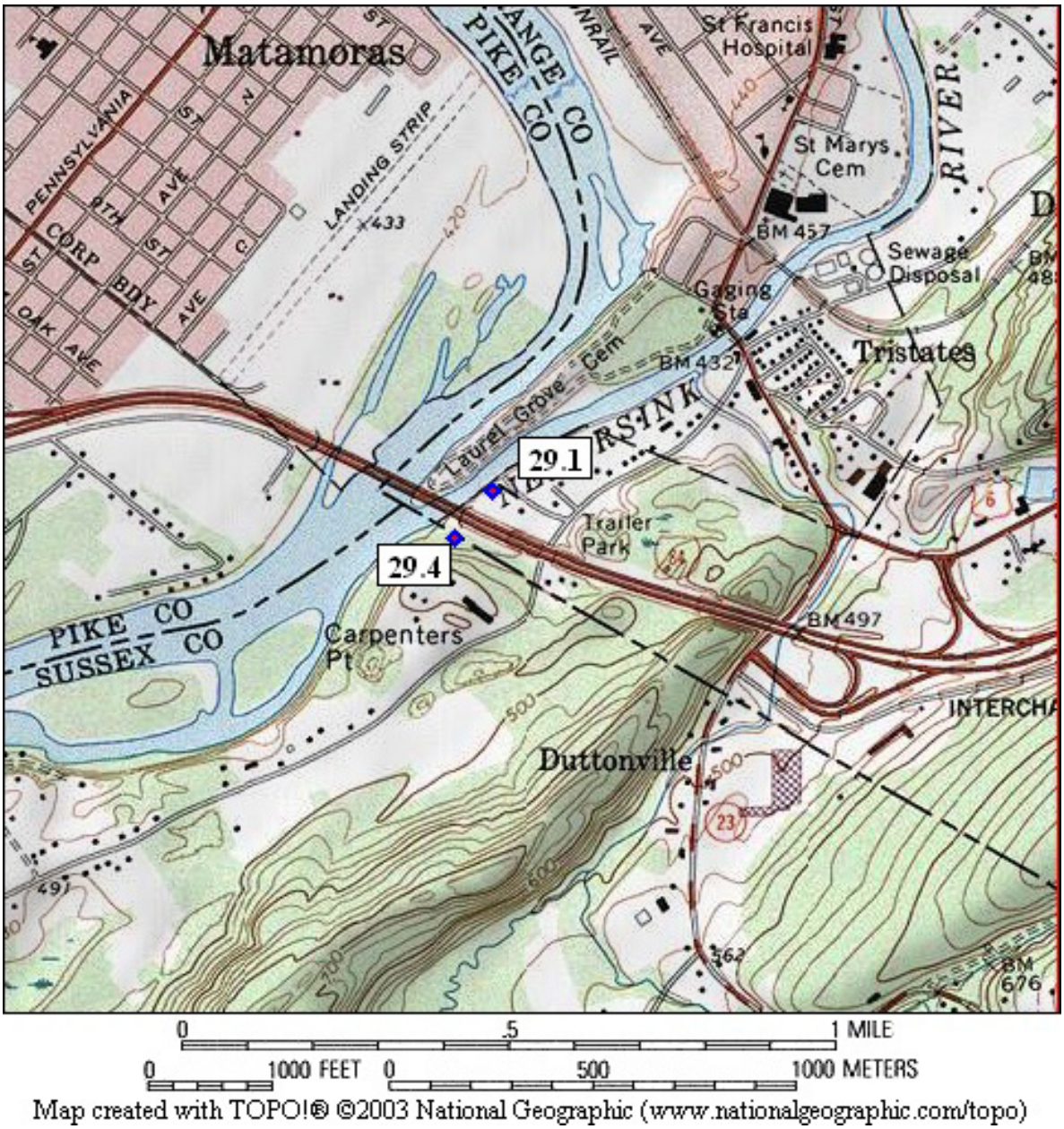


Pond Eddy quad map with location of site 28, Delaware River at County Route 41 at Pond Eddy, N.Y.

High-water mark 28.3 is a fair debris line on the ground, on the left bank, 300 feet upstream from the County Route 41 bridge, at elevation 525.42 feet above sea level (Lat 41° 26’ 20.8”, long 74° 49’ 16.6”).

High-water mark 28.4 is a fair debris line on the ground, under the wooden steps on the left bank, 273 feet downstream from the County Route 41 bridge, at elevation 523.69 feet above sea level (Lat 41° 26’ 26.3”, long 74° 49’10.1”).

SITE DESCRIPTION
Site 29: Confluence of Delaware and Neversink Rivers at Interstate Route 84 at Port Jervis, N.Y.
Site Location: Bridges on Interstate Route 84, Lat 41° 21’ 28.2”, long 74° 41’ 43.8”, NAD 1983
City of Port Jervis, Orange County, N.Y.
Port Jervis South USGS 7.5’ Topographic Quadrangle
High-Water Marks: Five high-water marks were surveyed: 5 seed lines.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by R. Lumia and G.J. Hebert on November 12, 2004, and G.D. Firda and R. Lumia on November 16, 2004.
High-water-mark elevations were surveyed from a benchmark that is an NGS standard disk stamped 431.623 NEVERSINK 1933 on East Main Street bridge over the Neversink River at Port Jervis on the south concrete backwall. NGS PID LY0728. Elevation is 431.62 feet above sea level (NGVD 1929).

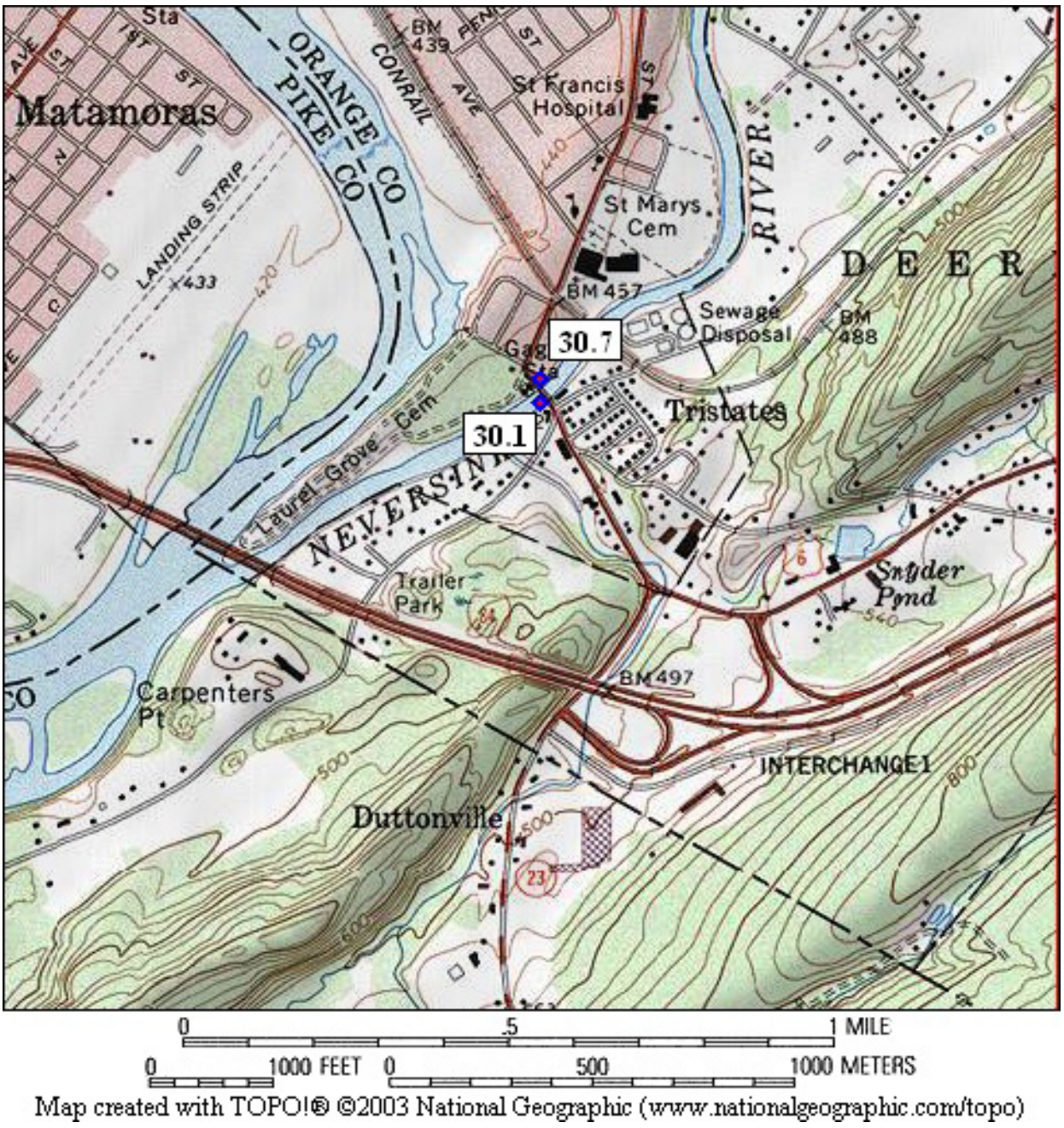


Port Jervis South quad map with location of site 29, Confluence of Delaware and Neversink Rivers at Interstate Route 84 at Port Jervis, N.Y.

High-water mark 29.1 (bottom of orange flagging) is an excellent seed line about 5 feet above the ground, on house 25 on Butler Road, on the left bank, 430 feet upstream from the westbound (upstream) Interstate Route 84 bridge, at elevation 428.30 feet above sea level (Lat 41° 21’ 28.0”, long 74° 41’ 33.1”).

High-water mark 29.4 is a fair seed line about 4 feet above the ground, on a tree on the left bank, 100 feet downstream from the eastbound (downstream) Interstate Route 84 bridge, at elevation 428.18 feet above sea level (Lat 41° 21’ 23.3”, long 74° 41’ 35.7”).

SITE DESCRIPTION
Site 30: Neversink River at State Route 6 (Main Street) at Port Jervis, N.Y.
Site Location: Bridge on State Route 6, Lat 41° 21’ 40.2”, long 74° 41’ 06.6”, NAD 1983
City of Port Jervis, Orange County, N.Y.
Port Jervis South USGS 7.5’ Topographic Quadrangle
High-Water Marks: Five high-water marks were surveyed: 4 seed lines and 1 seed/mud line.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by R. Lumia and G.J. Hebert on November 12, 2004.
High-water-mark elevations were surveyed from a benchmark that is an NGS standard disk stamped 431.623 NEVERSINK 1933 on East Main Street bridge over the Neversink River at Port Jervis on the south concrete backwall. NGS PID LY0728. Elevation is 431.62 feet above sea level (NGVD 1929).

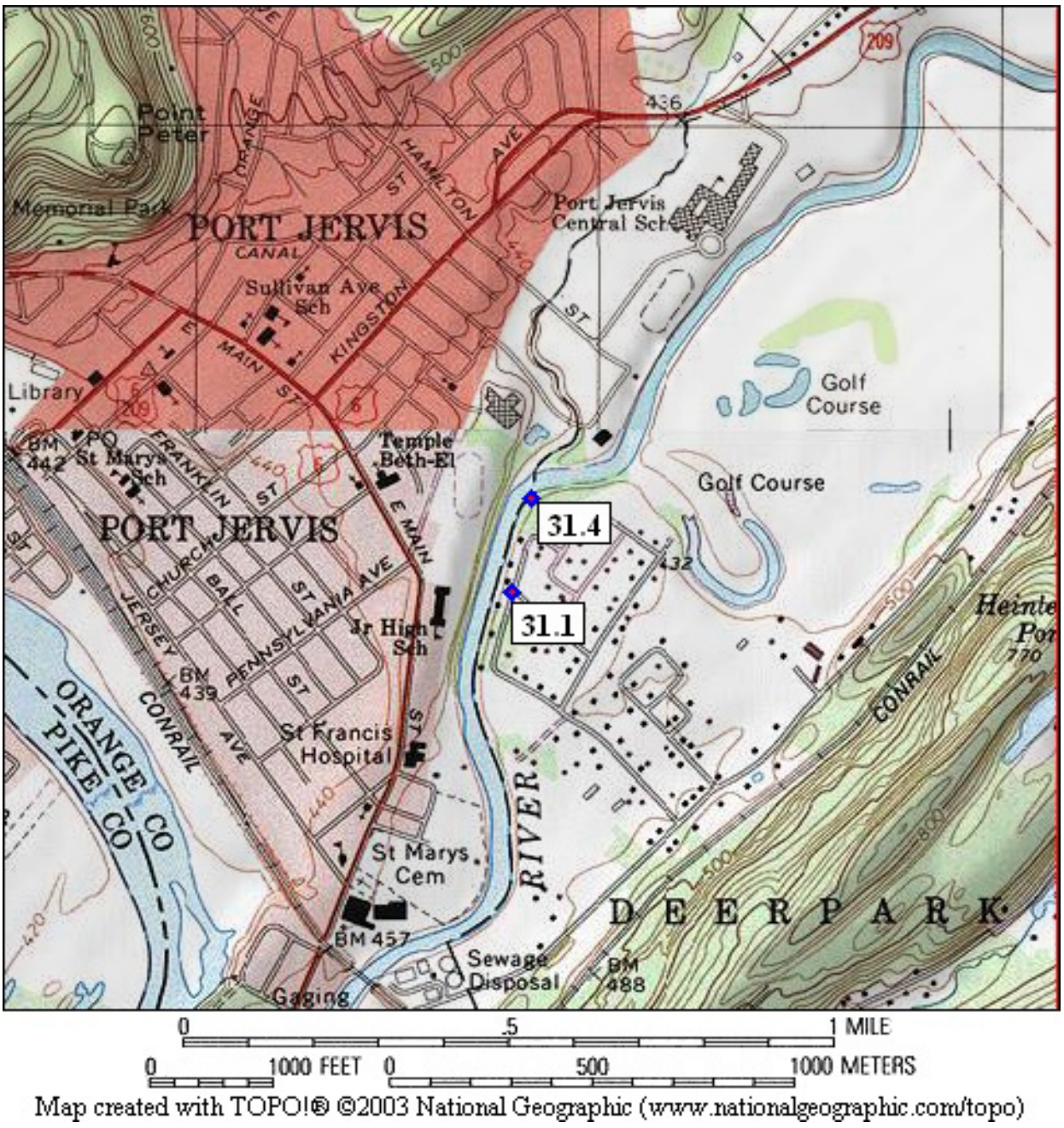


Port Jervis South quad map with location of site 30, Neversink River at State Route 6 (Main Street) at Port Jervis, N.Y.

High-water mark 30.1 (bottom of orange flagging) is a fair seed line about 6 feet above the ground, on a tree on the left bank, 95 feet downstream from the State Route 6 bridge, at elevation 428.37 feet above sea level (Lat 41° 21’ 38.5”, long 74° 41’ 07.4”).

High-water mark 30.7 (bottom of orange flagging) is an excellent seed line about 4 feet above the ground, on a support post on the right bank, at the upstream side of the State Route 6 bridge, at elevation 428.57 feet above sea level (Lat 41° 21’ 40.6”, long 74° 41’ 07.3”).

SITE DESCRIPTION
Site 31: Neversink River at Rivers Edge Road at Port Jervis, N.Y.
Site Location: Rivers Edge Road at Port Jervis, Lat 41° 22’ 24.5”, long 74° 40’ 42.4”, NAD 1983
City of Port Jervis, Orange County, N.Y.
Port Jervis South USGS 7.5’ Topographic Quadrangle
High-Water Marks: Four high-water marks were surveyed: 4 mud lines.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by G.D. Firda and K. McGrath on November 12-13, 2004.
High-water-mark elevations were surveyed from a benchmark that is an NGS standard disk stamped 431.623 NEVERSINK 1933 on East Main Street bridge over the Neversink River at Port Jervis on the south concrete backwall. NGS PID LY0728. Elevation is 431.62 feet above sea level (NGVD 1929).

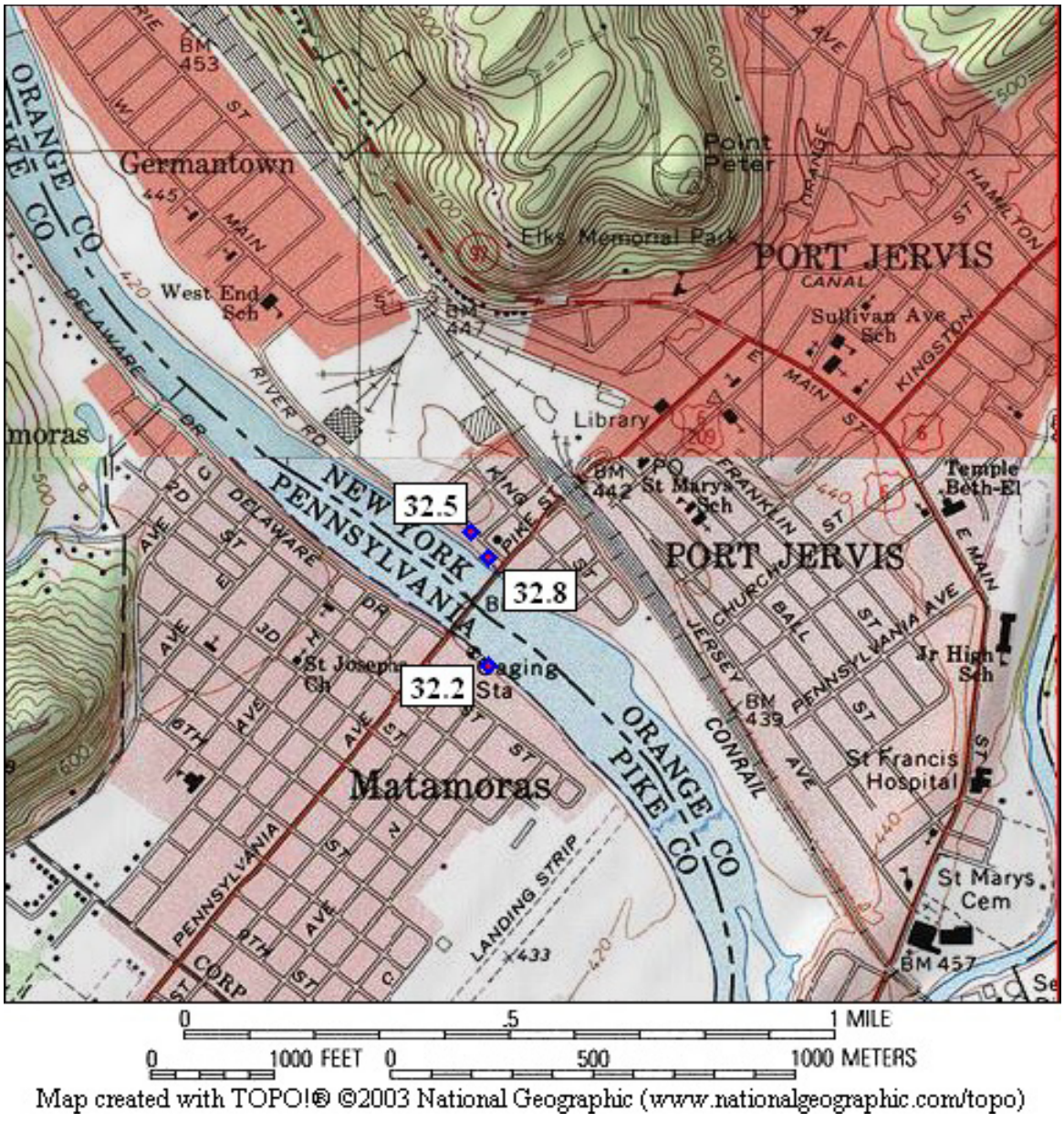


Port Jervis South quad map with location of site 31, Neversink River at Rivers Edge Road at Port Jervis, N.Y.

High-water mark 31.1 is an excellent mud line about 4 feet above the ground, on the landward side of house 23 on Rivers Edge Road, on the left bank, at elevation 429.01 feet above sea level (Lat 41° 22’ 17.4”, long 74° 40’ 45.3”).

High-water mark 31.4 is an excellent mud line about 3 feet above the ground, on the downstream side of house 33 on Rivers Edge Road, on the left bank, at elevation 429.08 feet above sea level (Lat 41° 22’ 24.5”, long 74° 40’ 42.4”).

SITE DESCRIPTION
Site 32: Delaware River at U.S. Routes 6 and 209 at Port Jervis, N.Y.
Site Location: Bridge on U.S. Routes 6 and 209, Lat 41° 22' 18.6", long 74° 41' 49.8", NAD 1983
City of Port Jervis, Orange County, N.Y.
Port Jervis South USGS 7.5' Topographic Quadrangle
High-Water Marks: Eight high-water marks were surveyed: 5 debris lines, 2 mud lines and 1 seed line.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by G.D. Firda and R. Lumia on November 16 and 18, 2004.
Upstream high-water-mark elevations were surveyed from a benchmark that is an NGS standard disk stamped STATE LINE RESET 1938 on the top and at the northwest end of the center pier of the U.S. Routes 6 and 209 bridge over the Delaware River, 28 feet northwest of the centerline, 6 feet lower than the bridge sidewalk and directly under a steel trap door. NGS PID LY0558. Elevation is 444.21 feet above sea level (NGVD 1929). Downstream high-water-mark elevations were surveyed from a reference mark which is the USGS gaging station 01434000 reference mark RM 5. Elevation is 439.58 feet above sea level (NGVD 1929).



Port Jervis South quad map with location of site 32, Delaware River at U.S. Routes 6 and 209 at Port Jervis, N.Y.

High-water mark 32.2 is a fair debris line on the ground, on the right bank, 110 feet downstream from the USGS gaging station 01434000, 360 feet downstream from U.S. Routes 6 and 209 bridge, at elevation 435.51 feet above sea level (Lat 41° 22’ 13.3”, long 74° 41’ 48.5”).

High-water mark 32.5 is a fair debris line on the ground, on the left bank, 344 feet upstream from the U.S. Routes 6 and 209 bridge, at elevation 436.46 feet above sea level (Lat 41° 22’ 23.6”, long 74° 41’ 50.3”).

High-water mark 32.8 is a good mud line about 2 feet above the ground, on the streamward side of a restaurant on the left bank, 130 feet upstream from the U.S. Routes 6 and 209 bridge, at elevation 436.51 feet above sea level (Lat 41° 22’ 22.0”, long 74° 41’ 48.3”).

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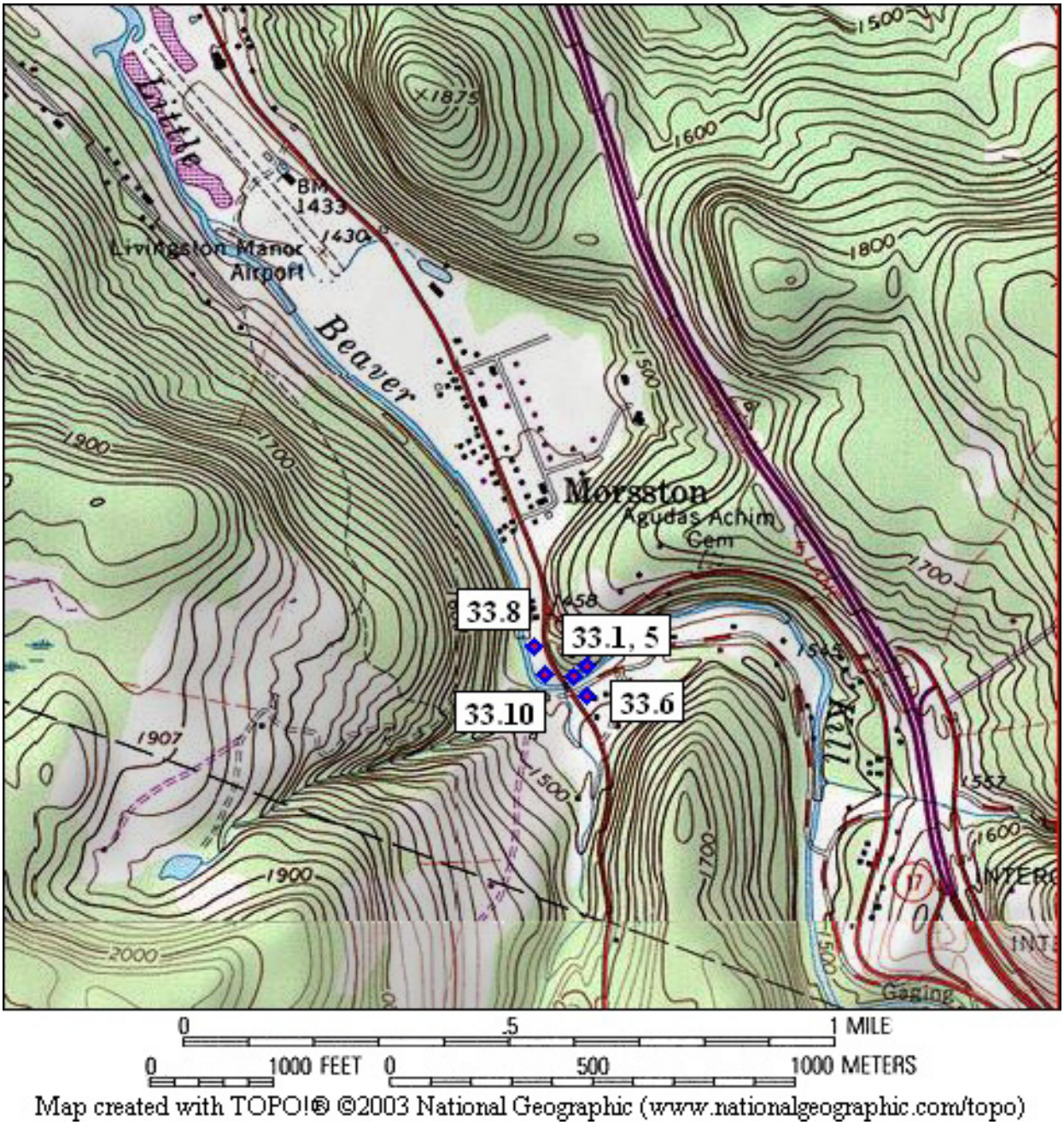
SITE DESCRIPTION
Site 33: Little Beaver Kill at County Route 146 at Morsston, N.Y.
Site Location: Bridge on County Route 146, Lat 41° 52' 49.8", long 74° 48' 32.4", NAD 1983
Town of Rockland, Sullivan County, N.Y.
Livingston Manor USGS 7.5' Topographic Quadrangle
High-Water Marks: Ten high-water marks were surveyed: 9 debris lines and 1 from communication with homeowner.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by L.T. Brooks and A.M. Olson on November 11, 2004.
High-water-mark elevations were surveyed from a reference mark which is a cross cut on the northerly upper flange bolt of a hydrant located between the two buildings on the old airport site in Livingston Manor, 55 feet southwest of the centerline of County Route 146. Elevation is 1,428.92 feet (NAVD 1988), from NYS DOT. Elevation converted to 1,429.39 (NGVD 1929).



Livingston Manor quad map showing location of site 33, Little Beaver Kill at County Route 146 at Morsston, N.Y.

High-water mark 33.1 is a poor debris line on the ground, on the right bank, 75 feet upstream from the County Route 146 bridge, at elevation 1,465.23 feet above sea level (Lat 41° 52’ 50.3”, long 74° 48’ 31.0”).

High-water mark 33.6 from communication with homeowner, is at the base of a tree, on the left bank, 57 feet upstream from the County Route 146 bridge, at elevation 1,466.22 feet above sea level (Lat 41° 52’ 48.9”, long 74° 48’ 30.3”). Tree is visible in upper left corner of above photo. Note debris on upstream side of bridge.

No photos were taken of the high-water mark. High-water mark 33.5 is a poor debris line on the ground, on the right bank, 40 feet upstream from the County Route 146 bridge, at elevation 1,465.83 feet above sea level (Lat 41° 52’ 49.9”, long. 74° 48’ 31.6”).

High-water mark 33.10 is a poor debris line on the ground, on the right bank, 107 feet downstream from the County Route 146 bridge, at elevation 1,462.70 feet above sea level (Lat 41° 52’ 50.4”, long 74° 48’ 33.9”).

High-water mark 33.8 is a poor debris line on the ground, on the right bank, 340 feet downstream from the County Route 146 bridge, at elevation 1,459.66 feet above sea level (Lat 41° 52’ 52.9”, long 74° 48’ 35.7”).

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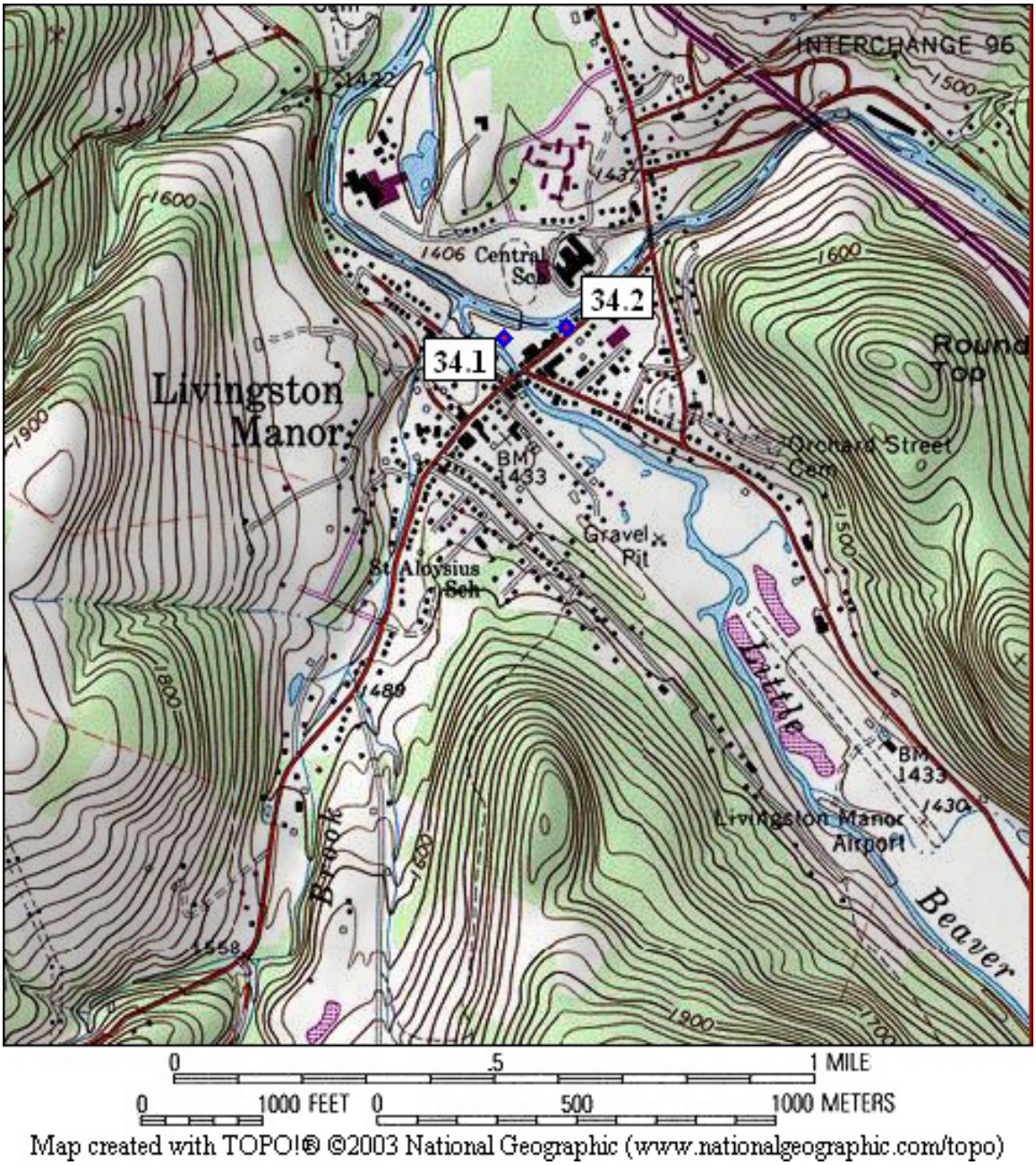
SITE DESCRIPTION
Site 34: Confluence of Willowemoc Creek and Little Beaver Kill at Main Street at Livingston Manor, N.Y.
Site Location: Bridge on Main Street, Lat 41° 54’ 01.2”, long 74° 49’ 42.6”, NAD 1983
Town of Rockland, Sullivan County, N.Y.
Livingston Manor USGS 7.5’ Topographic Quadrangle
High-Water Marks: Three high-water marks were surveyed: 1 debris line and 2 from communications with business owners.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by L.T. Brooks and T.F. Hoffman on November 17, 2004.
High-water-mark elevations were surveyed from a benchmark that is a USGS standard disk stamped 1441 NY 1920 set in the front sill of the front wall of the Town of Rockland Office Building, formally Livingston Manor National Bank. This is RM 20 in the Town of Rockland FEMA flood insurance study. Elevation is 1,441.02 feet above sea level (NGVD 1929).



Livingston Manor quad map showing location of site 34, Confluence of Willowemoc Creek and Little Beaver Kill at Main Street at Livingston Manor, N.Y.

High-water mark 34.1 is a poor debris line on the ground, on the right bank of Little Beaver Kill, 251 feet downstream from the Main Street bridge, at elevation 1,420.45 feet above sea level (Lat 41° 54’ 4.1”, long 74° 49’ 44.7”).

High-water mark 34.2 from communications with business owners and photos taken during the flood, is on the ground, on the left bank of Willowemoc Creek, 436 feet northeast from the northeast end of the Main Street bridge, at elevation 1,423.53 feet above sea level (Lat 41° 54’ 04.9”, long 74° 49’ 37.9”).

High-water mark 34.2 photo provided by George Fulton, Surveyor, Livingston Manor. Note water surface on grass.

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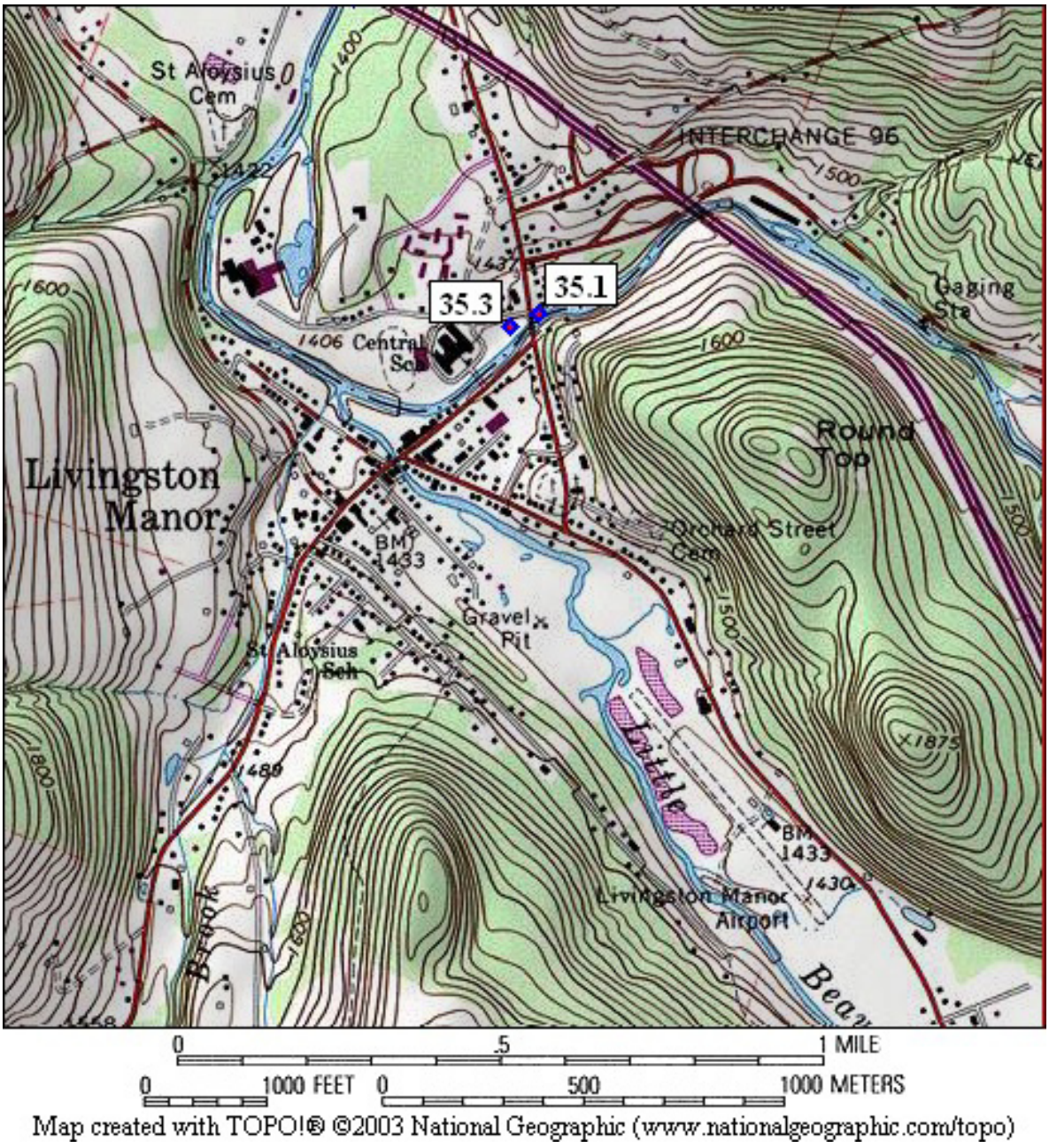
SITE DESCRIPTION
Site 35: Willowemoc Creek at County Route 178 (Old State Route 17) at Livingston Manor, N.Y.
Site Location: Bridge on County Route 178, Lat 41° 54' 12.0", long 74° 49' 27.6", NAD 1983
Town of Rockland, Sullivan County, N.Y.
Livingston Manor USGS 7.5' Topographic Quadrangle
High-Water Marks: Three high-water marks were surveyed: 2 debris lines and 1 from communications with business owners.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by L.T. Brooks and T.F. Hoffman on November 18, 2004.
High-water-mark elevations were surveyed from a benchmark that is a USGS standard disk stamped 1441 NY 1920 set in the front sill of the front wall of the Town of Rockland Office Building, formally Livingston Manor National Bank. This is RM 20 in the Town of Rockland FEMA flood insurance study. Elevation is 1,441.02 feet above sea level (NGVD 1929).



Livingston Manor quad map showing location of site 35, Willowemoc Creek at County Route 178 at Livingston Manor, N.Y.

High-water mark 35.1 is a poor debris line on the ground, on the right bank, 90 feet upstream from the County Route 178 bridge, at elevation 1,426.34 feet above sea level (Lat 41° 54’ 13.2”, long 74° 49’ 26.0”).

High-water mark 35.3 from communications with business owners and photos taken during the flood, is on the ground, on the right bank, 162 feet downstream from the County Route 178 bridge, at elevation 1,423.20 feet above sea level (Lat 41° 54’ 11.6”, long 74° 49’ 30.1”).

High-water photo provided by George Fulton, Surveyor, Livingston Manor. Walkway is located about 550 feet downstream from the County Route 178 bridge, low chord of walkway near left bank at elevation 1,424.6 feet above sea level (Lat 41° 54' 07.8", long 74° 49' 34.2").

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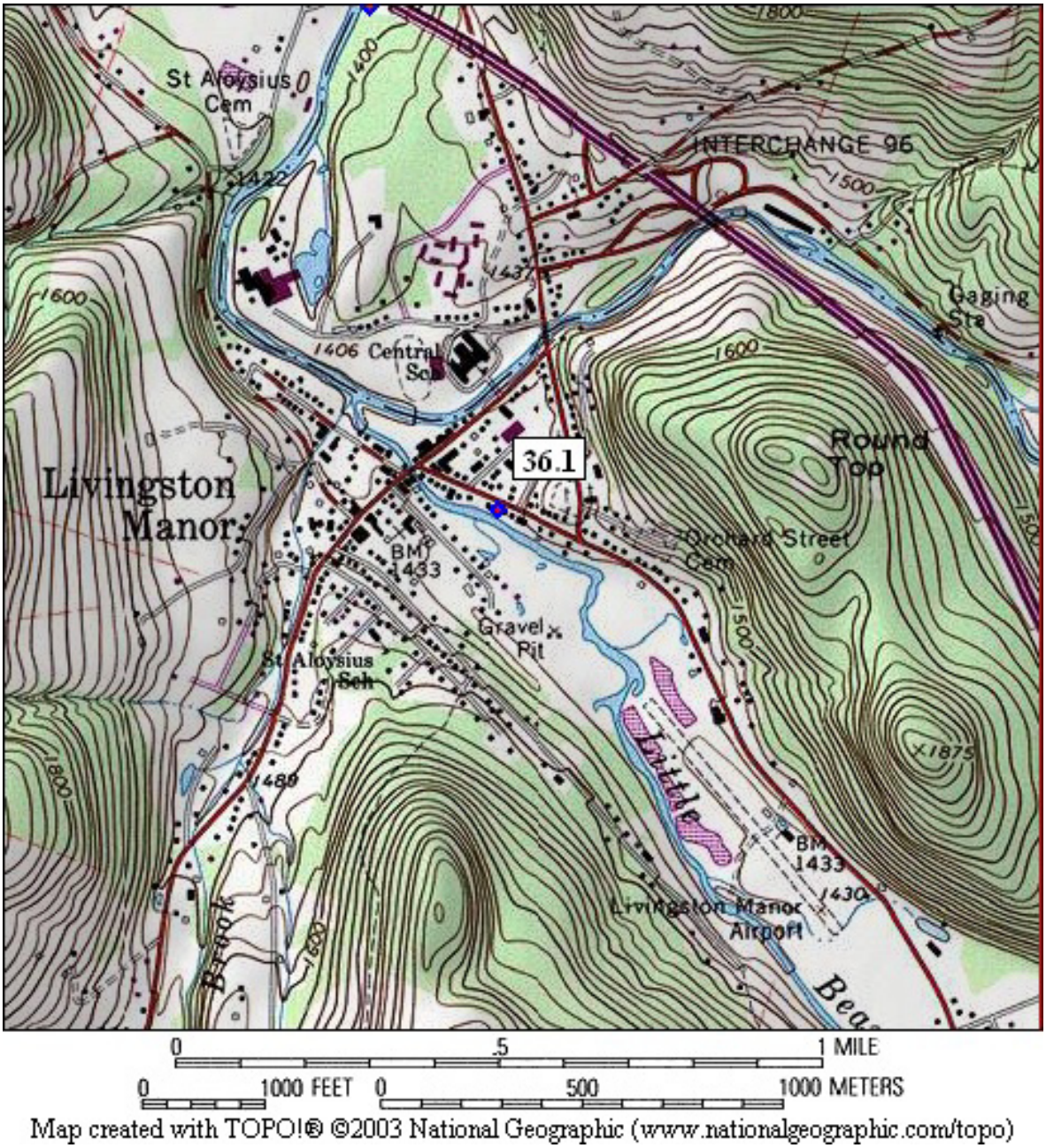
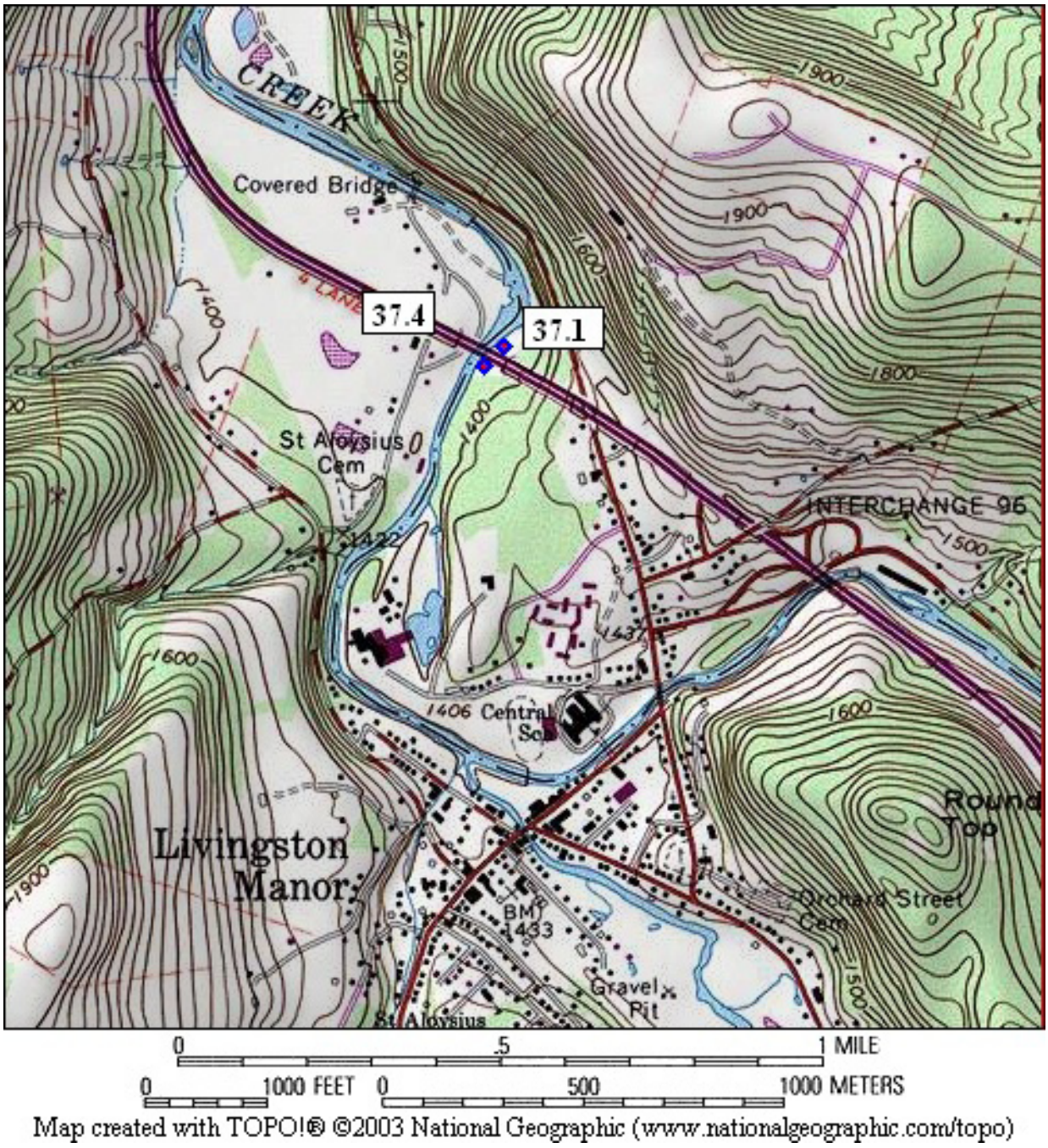
SITE DESCRIPTION
Site 36: Little Beaver Kill at Pearl Street at Livingston Manor, N.Y.
Site Location: Pearl Street, Lat 41° 53'58.4", long 74° 49' 33.2", NAD 1983
Town of Rockland, Sullivan County, N.Y.
Livingston Manor USGS 7.5' Topographic Quadrangle
High-Water Marks: Two high-water marks were surveyed: 2 mud lines.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by L.T. Brooks and T.F. Hoffman on November 17, 2004.
High-water-mark elevations were surveyed from a benchmark that is a USGS standard disk stamped 1441 NY 1920 set in the front sill of the front wall of the Town of Rockland Office Building, formally Livingston Manor National Bank. This is RM 20 in the Town of Rockland FEMA flood insurance study. Elevation is 1,441.02 feet above sea level (NGVD 1929).



Livingston Manor quad map showing location of site 36, Little Beaver Kill at Pearl Street at Livingston Manor, N.Y.

High-water mark 36.1 is a good mud line about 2 feet above the floor, on garage wall of house 32 on Pearl Street, on the right bank, 719 feet upstream from the Main Street bridge, at elevation 1,424.60 feet above sea level (Lat 41° 53’ 58.4”, long 74° 49’ 33.2”).

SITE DESCRIPTION
Site 37: Willowemoc Creek at State Route 17 at Livingston Manor, N.Y.
Site Location: Bridges on State Route 17, Lat 41° 54’ 40.2”, long 74° 49’ 47.4”, NAD 1983
Town of Rockland, Sullivan County, N.Y.
Livingston Manor USGS 7.5’ Topographic Quadrangle
High-Water Marks: Four high-water marks were surveyed: 4 debris lines.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by L.T. Brooks and T.F. Hoffman on November 18, 2004.
High-water-mark elevations were surveyed from a reference mark that is the top of the east pier footing of the west bound bridge on State Route 17. Elevation is 1,404.00 feet above sea level (NGVD 1929), from NYS DOT bridge plans.

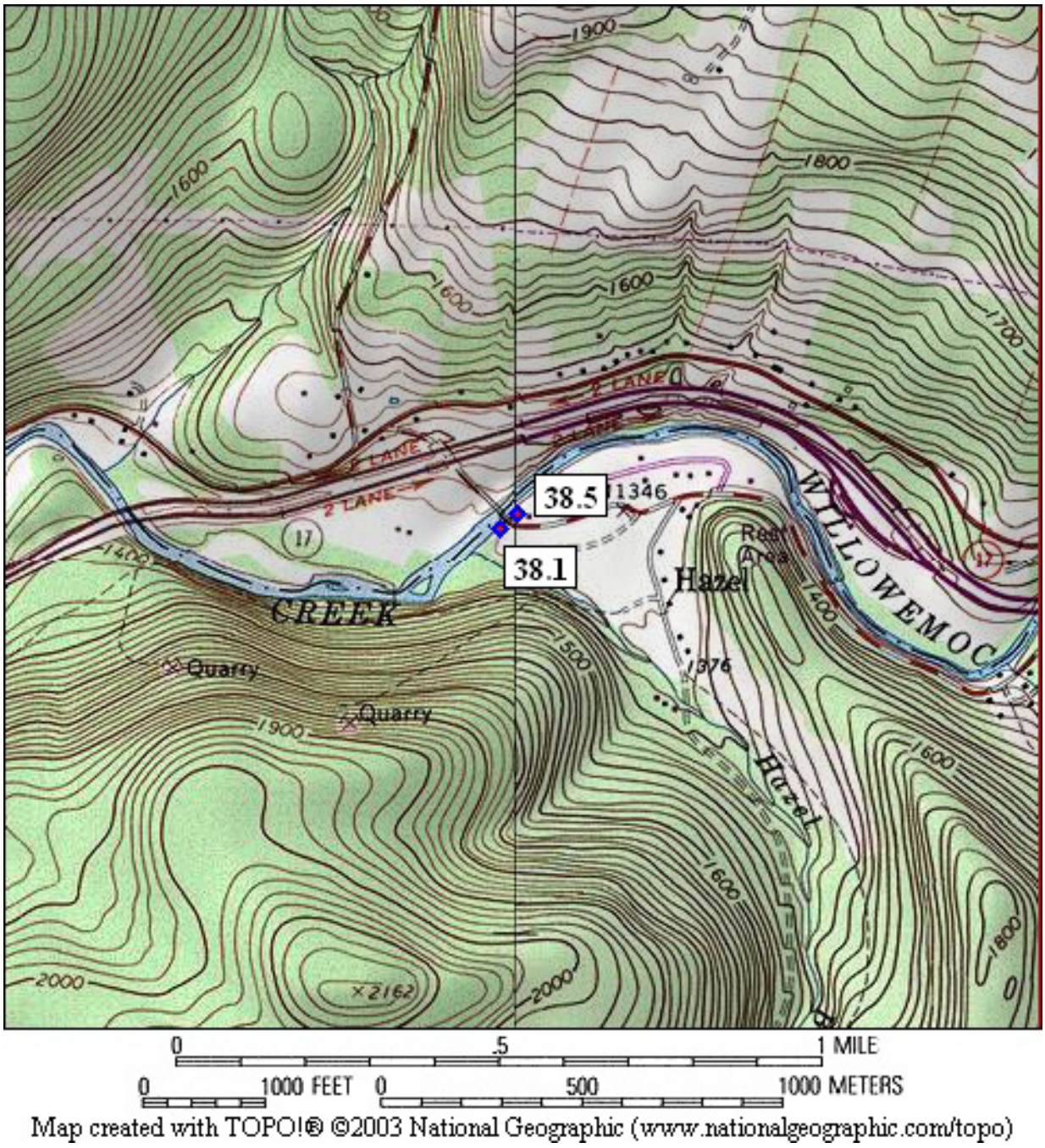


Livingston Manor quad map showing location of site 37, Willowemoc Creek at State Route 17 at Livingston Manor, N.Y.

High-water mark 37.1 is a poor debris line on the ground, on the right bank, 51 feet downstream from the westbound (downstream) State Route 17 bridge, at elevation 1,402.42 feet above sea level (Lat 41° 54’ 40.9”, long 74° 49’ 45.5”).

High-water mark 37.4 is a poor debris line on the ground, on the right bank, 102 feet upstream from the eastbound (upstream) State Route 17 bridge, at elevation 1,404.14 feet above sea level (Lat 41° 54’ 38.4”, long 74° 49’ 46.8”).

SITE DESCRIPTION
Site 38: Willowemoc Creek at Hazel Road at Hazel, N.Y.
Site Location: Bridge on Hazel Road, Lat 41° 55’ 34.2”, long 74° 52’ 30.6”, NAD 1983
Town of Rockland, Sullivan County, N.Y.
Roscoe and Livingston Manor USGS 7.5’ Topographic Quadrangles
High-Water Marks: Seven high-water marks were surveyed: 7 debris lines.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by L.T. Brooks and A.M. Olson on November 9, 2004.
High-water-mark elevations were surveyed from a reference mark that is a chiseled square on the top of the downstream left wingwall. Elevation is 1,344.34 feet above sea level (NGVD 1929), from NYS DOT bridge plans, BIN 3367570.

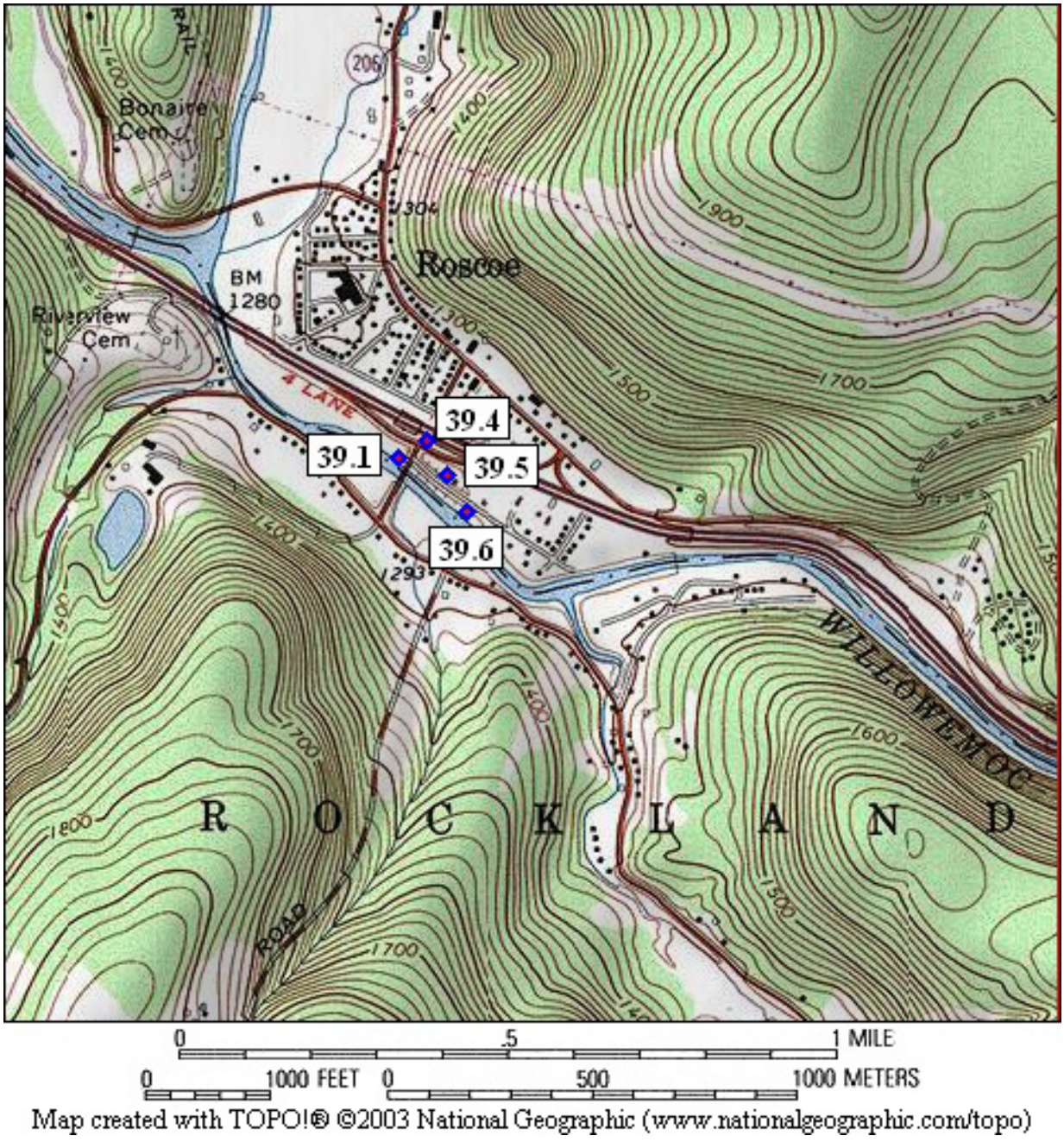


Roscoe and Livingston Manor quad maps showing location of site 38, Willowemoc Creek at Hazel Road at Hazel, N.Y.

High-water mark 38.1 is a poor debris line on the ground, on the left bank, 56 feet downstream from the Hazel Road bridge, at elevation 1,337.43 feet above sea level (Lat 41° 55’ 33.7”, long 74° 52’ 30.6”).

High-water mark 38.5 is a poor debris line on the ground, on the left bank, 116 feet upstream from the Hazel Road bridge, at elevation 1,338.06 feet above sea level (Lat 41° 55’ 33.6”, long 74° 52’ 28.3”).

SITE DESCRIPTION
Site 39: Willowemoc Creek at Stewart Avenue at Roscoe, N.Y.
Site Location: Bridge on Stewart Avenue, Lat 41° 55' 49.2", long 74° 54' 52.8", NAD 1983
Town of Rockland, Sullivan County, N.Y.
Roscoe USGS 7.5' Topographic Quadrangle
High-Water Marks: Six high-water marks were surveyed: 2 debris lines, 1 seed line and 3 from communications with business owners.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by L.T. Brooks and A.M. Olson on November 8, 2004.
High-water-mark elevations were surveyed from a reference mark that is a chiseled square on the right, downstream wingwall. This is RM 13 in the Town of Rockland FEMA flood insurance study. Elevation is 1288.30 feet (NGVD 1929).



Roscoe quad map showing location of site 39, Willowemoc Creek at Stewart Avenue at Roscoe, N.Y.

High-water mark 39.1 is a poor debris line on the ground, on the right bank, 12 feet downstream from the Stewart Avenue bridge, at elevation 1,282.24 feet above sea level (Lat 41° 55’ 50.5”, long 74° 54’ 53.2”).

High-water mark 39.4 from communication with business owner, is 2 inches above the bottom of the Roscoe sign, on the right bank, 230 feet landward and about 50 feet upstream from the Stewart Avenue bridge, at elevation 1,283.20 feet above sea level (Lat 41° 55’ 51.9”, long 74° 54’ 50.6”).

High-water mark 39.5 from communication with business owner, is at the bottom of the concrete base of pump number 6 at the Mobil station, on the right bank, 368 feet upstream from the Stewart Avenue bridge, at elevation 1,284.33 feet above sea level (Lat 41° 55’ 48.7”, long 74° 54’ 48.5”).

High-water mark 39.6 from communication with business owner, is at the bottom of the blue siding of the NAPA store, on the right bank, 665 feet upstream from the Stewart Avenue bridge, at elevation 1,284.35 feet above sea level (Lat 41° 55’ 46.4”, long 74° 54’ 46.0”).

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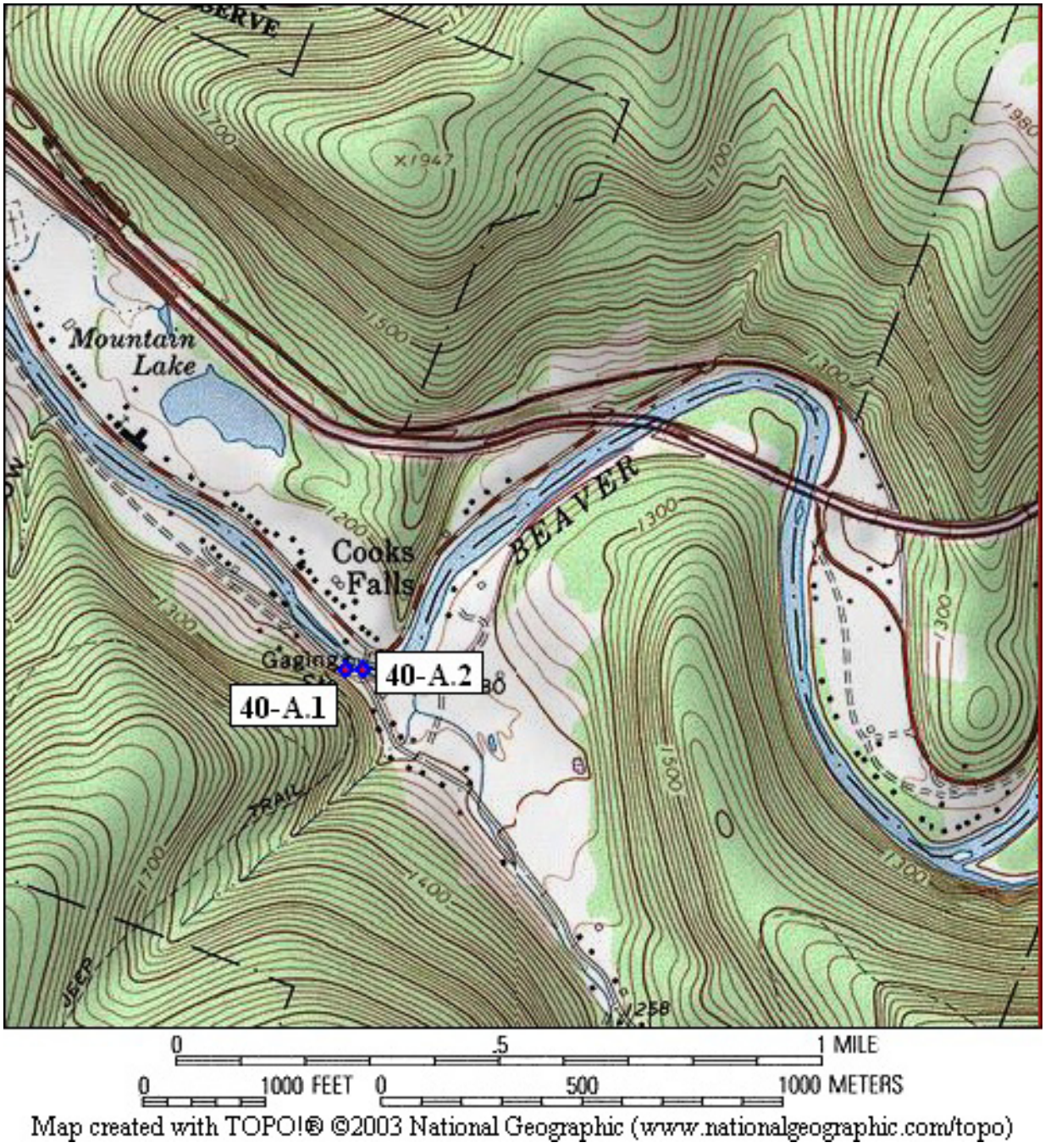
SITE DESCRIPTION
Site 40-A: Beaver Kill at Cooks Brook Road at Cooks Falls, N.Y.
Site Location: Bridge on Cooks Brook Road, Lat 41° 56’ 46.8”, long 74° 58’ 45.6”, NAD 1983
Town of Colchester, Delaware County, N.Y.
Roscoe USGS 7.5’ Topographic Quadrangle
High-Water Marks: Four high-water marks were surveyed: 1 seed line and 3 debris lines.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by A.M. Olson and L.T. Brooks on November 11, 2004.
High-water-mark elevations were surveyed from a reference mark that is the USGS gaging station 01420500 reference mark RM 5. Elevation is 1,167.27 feet above sea level (NGVD 1929).

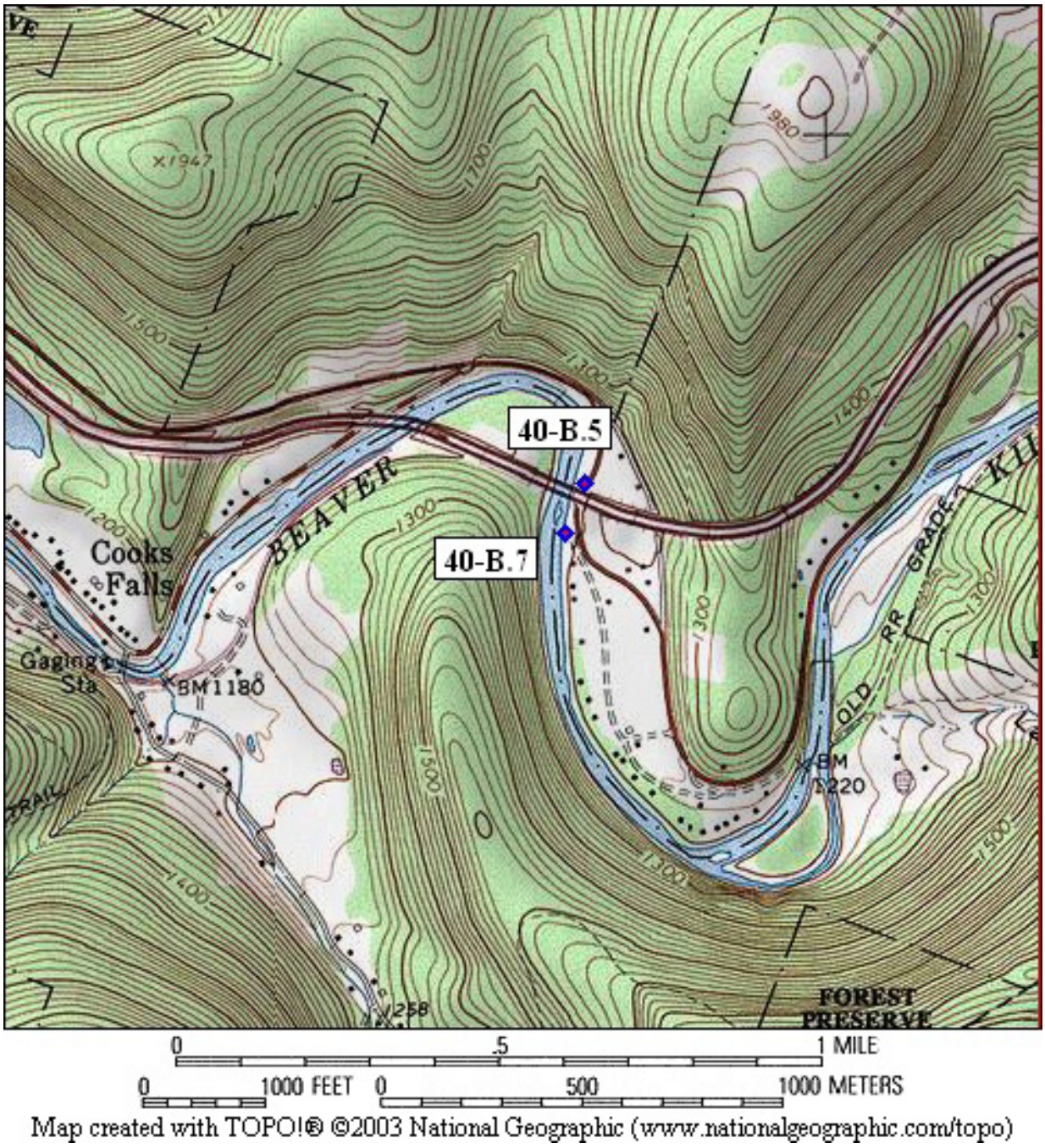


Roscoe quad map showing location of site 40-A, Beaver Kill at Cooks Brook Road at Cooks Falls, N.Y.

High-water mark 40-A.1 is a good seed line about 2 feet above the floor, inside of the USGS gage house, on the left bank, 125 feet downstream from the Cooks Brook Road bridge, at elevation 1,169.61 feet above sea level (Lat 41° 56’ 46.8”, long 74° 58’ 47.4”).

High-water mark 40-A.2 is a poor debris line on the ground, on the left bank, 51 feet upstream from the Cooks Brook Road bridge, at elevation 1,173.67 feet above sea level (Lat 41° 56’ 46.7”, long 74° 58’ 45.1”).

SITE DESCRIPTION
Site 40-B: Beaver Kill at State Route 17 near Cooks Falls, N.Y.
Site Location: Bridges on State Route 17, Lat 41° 57’ 01.2”, long 74° 57’ 57.6”, NAD 1983
Town of Colchester, Delaware County, N.Y.
Roscoe USGS 7.5’ Topographic Quadrangle
High-Water Marks: Six high-water marks were surveyed: 6 debris lines.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by A.M. Olson and L.T. Brooks on November 10, 2004.
High-water-mark elevations were surveyed from a reference mark that is the USGS gaging station 01420500 reference mark RM 5. Elevation is 1,167.27 feet above sea level (NGVD 1929).

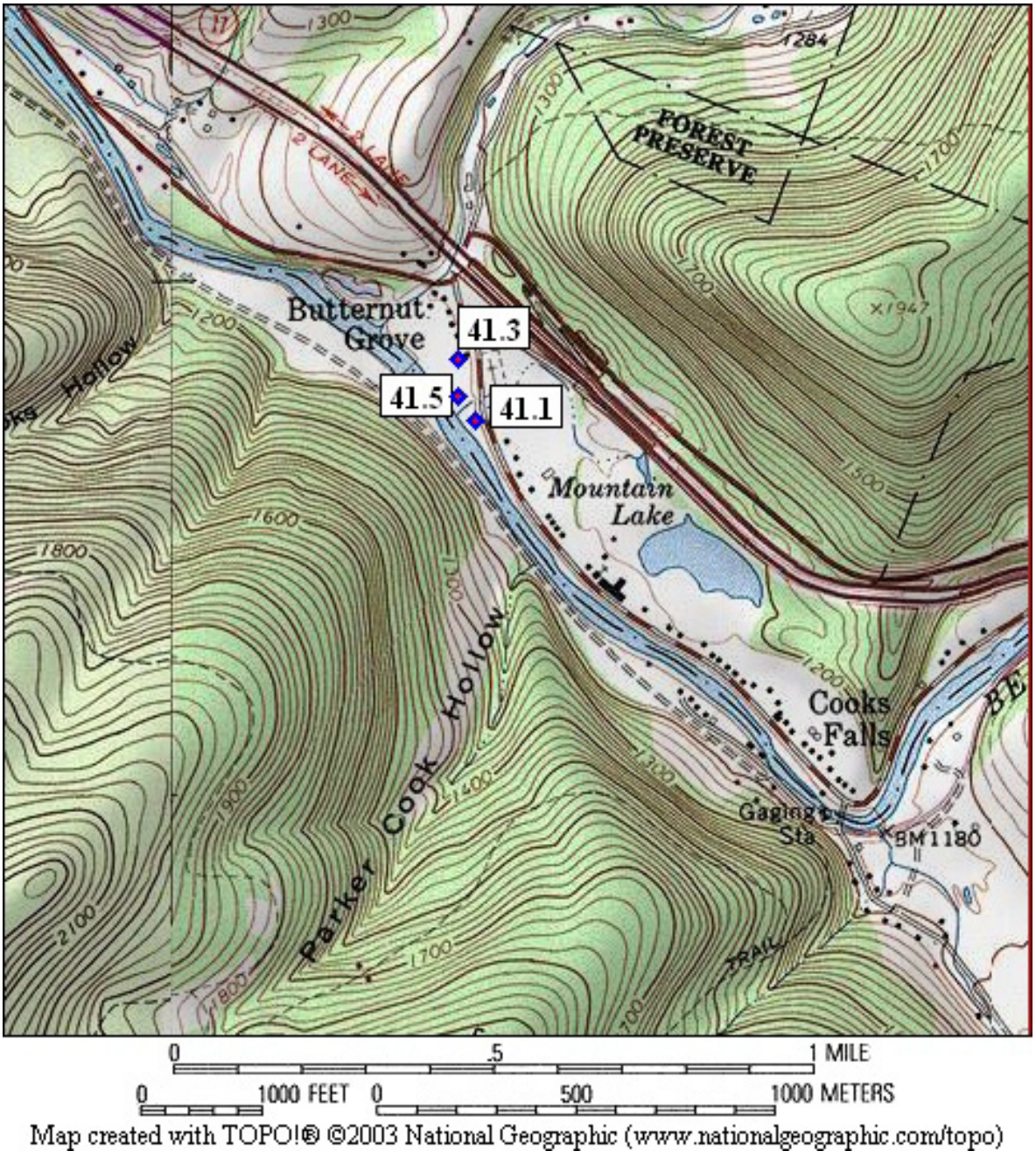


Roscoe quad map showing location of site 40-B, Beaver Kill at State Route 17 near Cooks Falls, N.Y.

High-water mark 40-B.5 is a poor debris line on the ground, on the right bank, at the downstream side of the westbound (upstream) State Route 17 bridge, at elevation 1,194.89 feet above sea level (Lat 41° 57’ 01.9”, long 74° 57’ 55.4”).

High-water mark 40-B.7 is a good debris line on the ground, on the right bank, 296 feet upstream from the eastbound (downstream) State Route 17 bridge, at elevation 1,196.04 feet above sea level (Lat 41° 56’ 57.5”, long 74° 57’ 56.5”).

SITE DESCRIPTION
Site 41: Beaver Kill at Cooks Falls Road at Butternut Grove, N.Y.
Site Location: Cooks Falls Road, Lat 41° 57'19.1", long 74 ° 59' 23.9", NAD 1983
Town of Colchester, Delaware County, N.Y.
Roscoe USGS 7.5' Topographic Quadrangle
High-Water Marks: Five high-water marks were surveyed: 3 debris lines and 2 from communications with Town of Colchester personnel.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by A.M. Olson and L.T. Brooks on November 11, 2004.
High-water-mark elevations were surveyed from a reference mark that is the USGS gaging station 01420500 reference mark RM 5. Elevation is 1,167.27 feet above sea level (NGVD 1929).



Roscoe quad map showing location of site 41, Beaver Kill at Cooks Falls Road at Butternut Grove, N.Y.

High-water mark 41.1 is a fair debris line on the ground, across the road from house 227 on Cooks Falls Road, on the right bank, at elevation 1,154.76 feet above sea level (Lat 41° 57’ 19.1’’, long 74° 59’ 23.9”).

High-water mark 41.5 is a poor debris line on the ground, near a shed about 300 feet south from the firehouse on Cooks Falls Road, on the right bank, at elevation 1,153.12 feet above sea level (Lat 41° 57’ 21.0”, long. 74° 59’ 27.1”).

High-water mark 41.3 from communications with Town of Colchester personnel and photos taken during the flood, is at the corner of the concrete slab, of the firehouse on Cooks Falls Road, on the right bank, at elevation 1,152.87 feet above sea level (Lat 41° 57’ 24.3”, long 74° 59’ 26.4”). Concrete slab is visible in extreme left of above photo.

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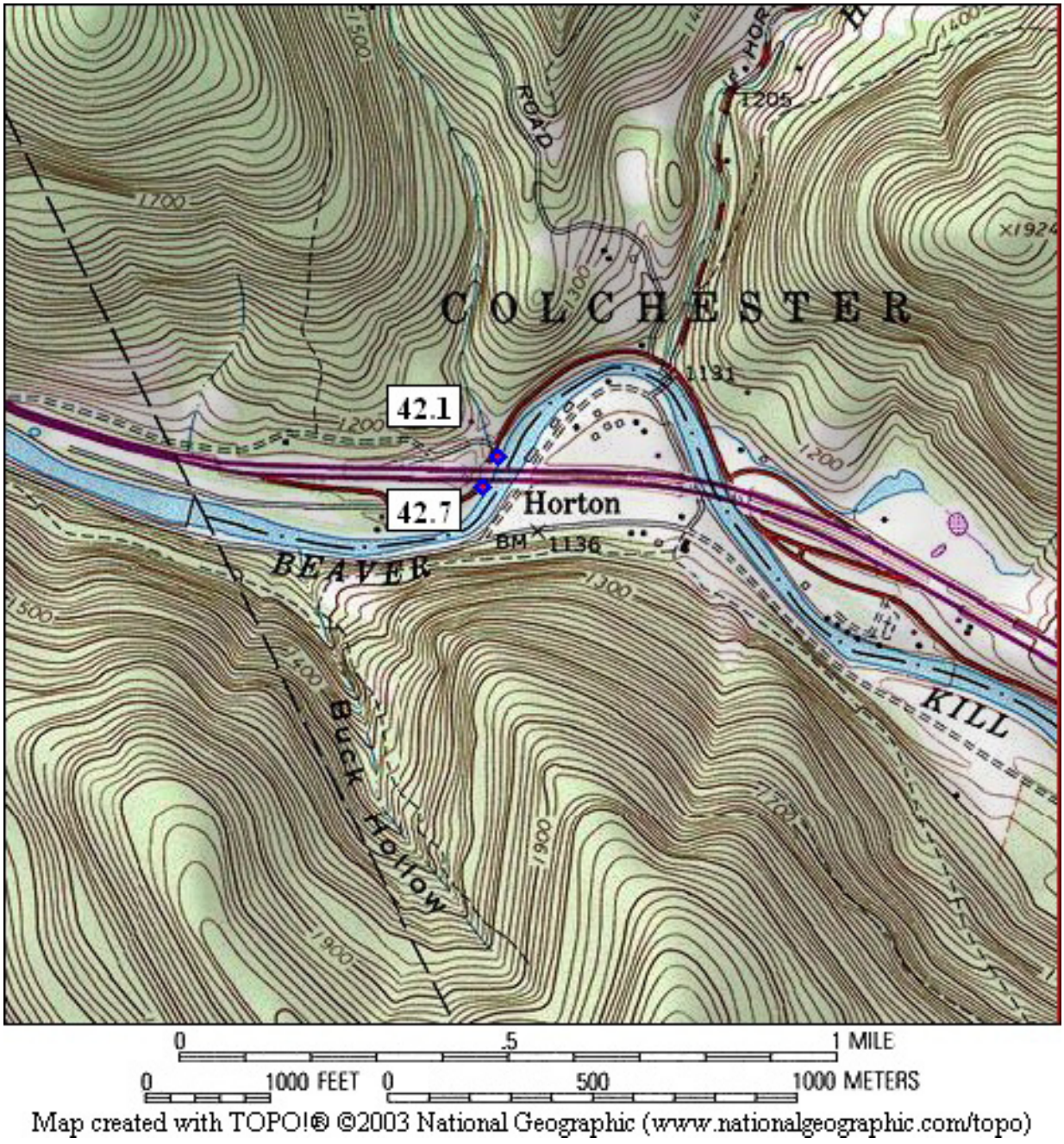
SITE DESCRIPTION
Site 42: Beaver Kill at State Route 17 at Horton, N.Y.
Site Location: Bridges on State Route 17, Lat 41° 58’ 13.2”, long 75° 01’ 18.0”, NAD 1983
Town of Colchester, Delaware County, N.Y.
Horton USGS 7.5’ Topographic Quadrangle
High-Water Marks: Nine high-water marks were surveyed: 9 debris lines.
Photos and GPS readings were taken at each high-water mark. Field notes are filed at the USGS office in Troy, N.Y.
Marks were surveyed and photos taken by L.T. Brooks and A.M. Olson on November 8, 2004.
High-water-mark elevations were surveyed from a benchmark that is an NGS 3D-monument with the access cover stamped HORTON 93-1, located in the grass median of State Route 17, just east of the bridge over Horton Road. Elevation is 1,158.72 feet (NAVD 1988), from NYS DOT. Elevation converted to 1,159.22 feet (NGVD 1929).



Horton quad map showing location of site 42, Beaver Kill at State Route 17 at Horton, N.Y.

High-water mark 42.1 is a poor debris line on the ground, on the right bank, 110 feet upstream from the westbound (upstream) State Route 17 bridge, at elevation 1,120.49 feet above sea level (Lat 41° 58’ 14.5”, long 75° 01’18.8”).

High-water mark 42.7 is a poor debris line on the ground, on the right bank, 35 feet downstream from the eastbound (downstream) State Route 17 bridge, at elevation 1,118.42 feet above sea level (Lat 41° 58’ 12.3”, long 75° 01’ 20.2”).